

Workshop Manual Audi A3 2004 ➤

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

Engine ID	CAW B	CCT A	CBF A	CCZ A					
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Edition 10.2011



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List of Workshop Manual Repair Groups

Repair Group

24 - Mixture preparation - injection

28 - Ignition system



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

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24 – Mixture preparation - injection

1 Safety precautions and rules for cleanliness

Overview

⇒ „1.1 General notes on self-diagnosis“, page 1

⇒ „1.2 Safety precautions when using testers and measuring instruments during a road test“, page 2

⇒ „1.3 Safety precautions for vehicles with start/stop system“, page 2

⇒ „1.4 Rules for cleanliness and instructions for working on fuel system“, page 2

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⇒ „1.7 Checking vacuum system“, page 5

1.1 General notes on self-diagnosis

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

1.2 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.*

1.3 Safety precautions for vehicles with start/stop system



WARNING

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

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

1.4 Rules for cleanliness and instructions for working on fuel system



WARNING

- ◆ *If the battery is not disconnected, the fuse for the fuel pump control unit -J538- must be removed as a precautionary measure before opening the fuel system because the fuel pump will otherwise be activated by the contact switch on the driver's door.*
- ◆ *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; for procedure see ⇒ [page 4](#) .*
- ◆ *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.*

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.

1.5 Safety precautions when working on the ignition system

To prevent injuries to persons and/or irreparable damage to the fuel injection and ignition system, the following must be noted:

- ◆ Persons wearing a cardiac pacemaker must at all times maintain a safe distance from high-voltage components such as the ignition system and gas-discharge headlights.
- ◆ Do not open any fuel line connections while the engine is running.
- ◆ Always switch off the ignition before connecting or disconnecting injection or ignition system wiring or tester cables.
- ◆ If engine is to be operated at cranking speed without it starting (e.g. compression test), unplug connectors from ignition coils and remove fuse for electric fuel pump.
- ◆ Certain tests may lead to a fault being detected by the control unit and stored. The event memory should therefore be interrogated and (if necessary) erased after completing the tests and any repair work that may be required.
- ◆ 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 puller -T40039-. Also remove fuse for fuel pump control unit -J538-.

1.6 Reducing pressure in high-pressure section of injection system



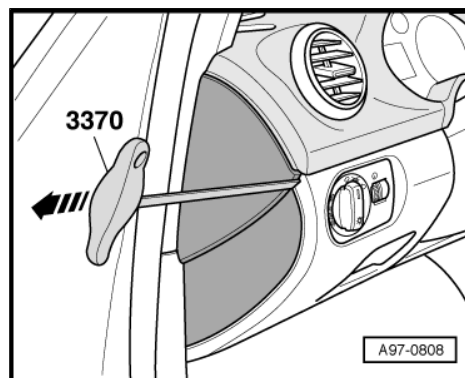
WARNING

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. 6 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 specified level. The procedure is described below.*

Reducing fuel pressure in high-pressure section

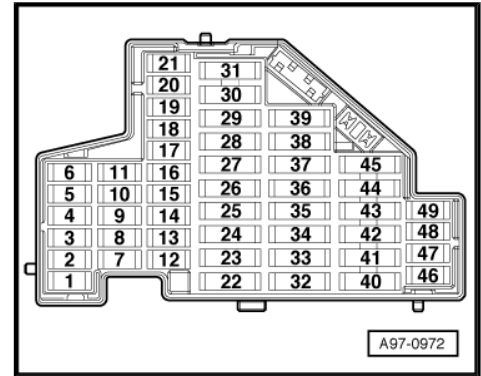
- Connect a **Vehicle diagnostic tester**.
- Start engine and run at idling speed.
- Select „Engine electronics“ in vehicle self-diagnosis.
- Then select function read „Measured values“.
- Select measured value block 140.
- With engine idling the fuel pressure is displayed in zone 3.
- ◆ Specification: between 35 and 45 bar
- Pry off cover on left side of dash panel using front-end hook -3370- -arrow-.



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



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



WARNING

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

- ◆ *The fuel lines are still filled with fuel, however the fuel is no longer under high pressure. Wear safety goggles and protective clothing when opening the fuel system.*
- ◆ *Before opening the high-pressure section, wrap a cloth around the connection.*

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



- ◆ *The 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

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

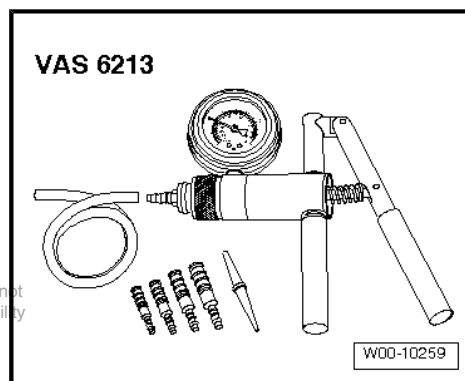
1.7 Checking vacuum system

Special tools and workshop equipment required

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◆ Hand vacuum pump -VAS 6213-



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Procedure

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



2 Technical data

Engine data		2.0 ltr. 147 kW turbo FSI engine
Idling speed (cannot be adjusted; is regulated by idling speed stabilisation)		640 ... 800 rpm
Maximum rpm governed by deactivation of fuel injectors		6500 rpm
Fuel pressure Initial fuel pressure up to high-pressure pump (generated by electric fuel pump in fuel tank) Pressure in high-pressure fuel circuit (generated by mechanical single-plunger pump) at a coolant temperature of approx. 85°C.		approx. 6.0 bar (identical for all operating conditions)
		approx. 35 bar at idling speed approx. 150 bar in certain parts of operating range

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3 Overview of fitting locations

Components A to V are not shown in the overview.

1 - Camshaft control valve 1 - N205-

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

2 - Charge pressure control solenoid valve -N75-

- ☐ Located directly on turbocharger ⇒ [page 19](#)

3 - Turbocharger air recirculation valve -N249-

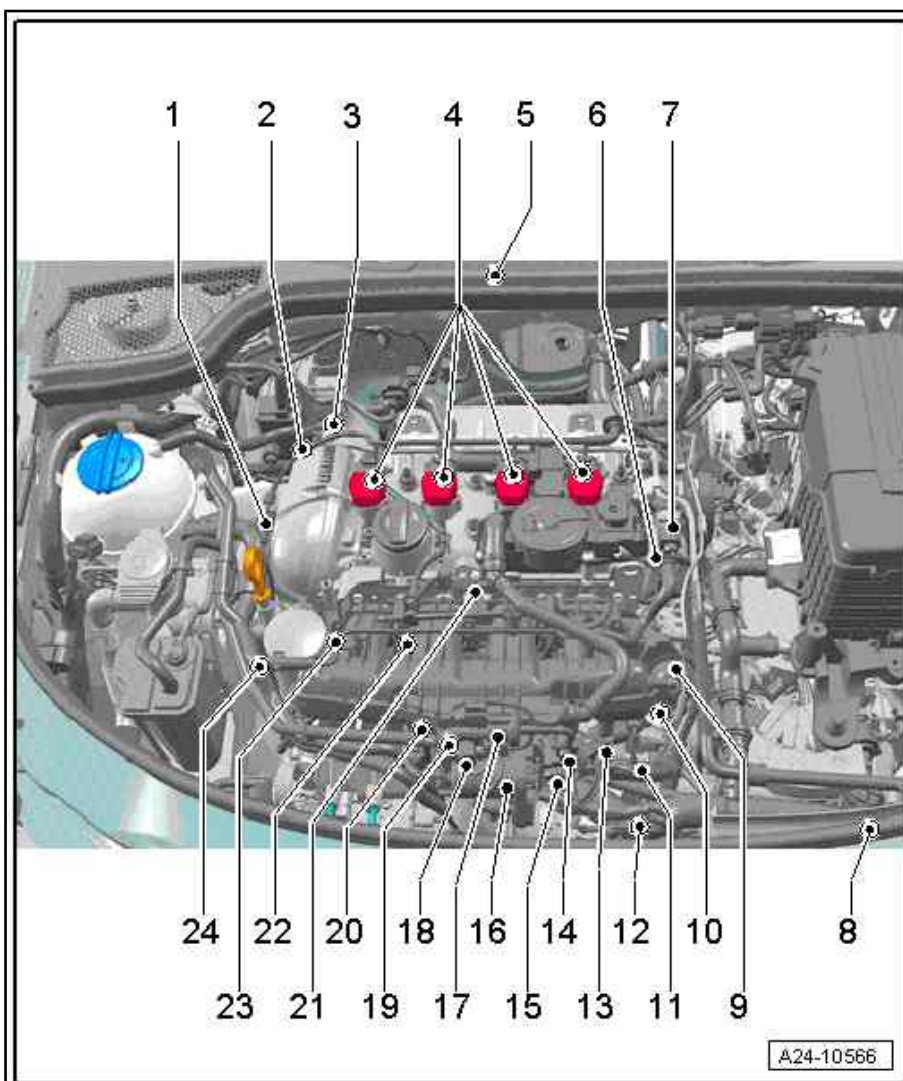
- ☐ Located directly on turbocharger ⇒ [page 19](#)

4 - Ignition coils with output stages

- ☐ Removing and installing
⇒ [page 73](#)
- ☐ 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.

5 - Engine control unit -J623-

- ☐ Removing and installing



⇒ [page 67](#)

6 - High-pressure pump

- ☐ Fitting location ⇒ [page 12](#)
- ☐ Removing and installing ⇒ [page 39](#)

7 - Fuel pressure regulating valve -N276-

- ☐ Fitting location ⇒ [page 12](#)

8 - Radiator outlet coolant temperature sender -G83-

- ☐ Fitting location ⇒ [page 15](#)

9 - Vacuum unit for air flow control flaps

- ☐ Fitting location ⇒ [page 12](#)

10 - Intake manifold flap valve -N316-

- ☐ Fitting location ⇒ [page 12](#)

11 - Engine speed sender -G28-

- ☐ Fitting location ⇒ [page 14](#)

12 - Charge pressure sender -G31-

- ☐ Fitting location ⇒ [page 15](#)

13 - Electrical connector for knock sensor 1 -G61-

- ☐ Fitting location ⇒ [page 14](#)

14 - Electrical connector for Hall sender -G40-

- ☐ Fitting location ⇒ [page 14](#)

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15 - 8-pin connector for injectors

- ☐ Fitting location ⇒ [page 14](#)

16 - 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- . Use vehicle diagnostic tester to do so.

17 - Activated charcoal filter solenoid valve 1 -N80-

18 - Intake air temperature sender -G42-

- ☐ 11 Nm

19 - Knock sensor 1 -G61-

- ☐ 20 Nm
- ☐ Knock sensor 2 -G66- (not installed in all vehicles)
- ☐ Removing and installing ⇒ [page 74](#)

20 - Coolant temperature sender -G62-

- ☐ Fitting location ⇒ [page 15](#)

21 - Hall sender -G40-

- ☐ Located below cover with oil separator ⇒ [page 14](#)

22 - Fuel pressure sender -G247-

- ☐ 27 Nm
- ☐ Fitting location ⇒ [page 12](#)
- ☐ Removing and installing ⇒ [page 48](#)

23 - Intake manifold flap potentiometer -G336-

- ☐ Fitting locations ⇒ [page 12](#)



24 - Oil pressure switch -F1-

- ☐ Engine codes CAWB, CCTA, CBFA: Oil pressure switch -F1-
- ☐ Engine code CCZA: Oil pressure switch for reduced oil pressure -F378-
- ☐ Fitting locations ⇒ [page 16](#)
- ☐ Removing and installing ⇒ Rep. gr. 17

A - Oil pressure switch -F22-

- ☐ Engine code CCZA only
- ☐ Fitting locations ⇒ [page 16](#)

B - Valve for oil pressure control -N428-

- ☐ Engine code CCZA only
- ☐ Fitting locations ⇒ [page 16](#)

C - Diagnostic connector

- ☐ In driver's knee restraint

D - Air mass meter -G70- and intake air temperature sender 2 -G299-

- ☐ Fitting location ⇒ [page 13](#)
- ☐ Removing and installing ⇒ [page 48](#)

E - Fuel pump control unit -J538-

- ☐ Fitting location ⇒ [page 13](#)

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

- ☐ Fitting location for engine code CAWB ⇒ [page 16](#)
- ☐ Fitting location for engine codes CCTA and CCZA ⇒ [page 17](#)
- ☐ Fitting location for engine code CBFA ⇒ [page 17](#)
- ☐ Lambda probes - overview ⇒ [page 55](#)

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G - Electrical connector for Lambda probe -G39- and Lambda probe heater -Z19-

- ☐ Fitting location for engine code CAWB ⇒ [page 16](#)
- ☐ Fitting location for engine codes CCTA, CBFA and CCZA ⇒ [page 17](#)

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

- ☐ Only fitted in vehicles with engine codes CCTA and CBFA
- ☐ Fitting location for engine codes CCTA and CCZA ⇒ [page 18](#)
- ☐ Fitting location for engine code CBFA ⇒ [page 18](#)
- ☐ Lambda probes - overview ⇒ [page 55](#)

I - Electrical connector for Lambda probe after catalytic converter -G130- and Lambda probe 1 heater after catalytic converter -Z29-

- ☐ Only fitted in vehicles with engine codes CCTA and CBFA
- ☐ Fitting location for engine codes CCTA and CCZA ⇒ [page 17](#)
- ☐ Fitting location for engine code CBFA ⇒ [page 18](#)

J - Lambda probe 3 after catalytic converter -G287- and Lambda probe heater 3 after catalytic converter -Z64-

- ☐ Only fitted in vehicles with engine code CBFA
- ☐ Fitting location for engine code CBFA ⇒ [page 18](#)
- ☐ Lambda probes - overview ⇒ [page 55](#)

K - Electrical connector for Lambda probe 3 after catalytic converter -G287-

- ☐ Only fitted in vehicles with engine code CBFA
- ☐ Fitting location for engine code CBFA ⇒ [page 18](#)

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

- ☐ Fitting location ⇒ [page 14](#)
- ☐ Removing and installing ⇒ Rep. gr. 45



M - 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

N - Clutch position sender -G476-

- ☐ Only fitted on vehicles with manual gearbox
- ☐ Fitting location ⇒ [page 13](#)
- ☐ Removing and installing, see Power transmission, clutch ⇒ Rep. gr. 30

O - Relay and fuse holder in electronics box

- ☐ Relay and fuse assignment see ⇒ Current flow diagrams, Electrical fault finding and Fitting locations

P - Radiator fan control unit -J293-

- ☐ Fitting location ⇒ [page 15](#)

Q - Injectors

- ☐ Removing and installing ⇒ [page 42](#)
- ☐ Injector, cylinder 1 -N30-
- ☐ Injector, cylinder 2 -N31-
- ☐ Injector, cylinder 3 -N32-
- ☐ Injector, cylinder 4 -N33-

R - Continued coolant circulation pump -V51-

- ☐ Fitting location ⇒ [page 19](#)

S - Secondary air pump motor -V101-

- ☐ Only fitted in vehicles with engine code CBFA
- ☐ Removing and installing ⇒ Rep. gr. 26

T - Secondary air inlet valve -N112-

- ☐ Only fitted in vehicles with engine code CBFA
- ☐ Fitting location ⇒ [page 18](#)

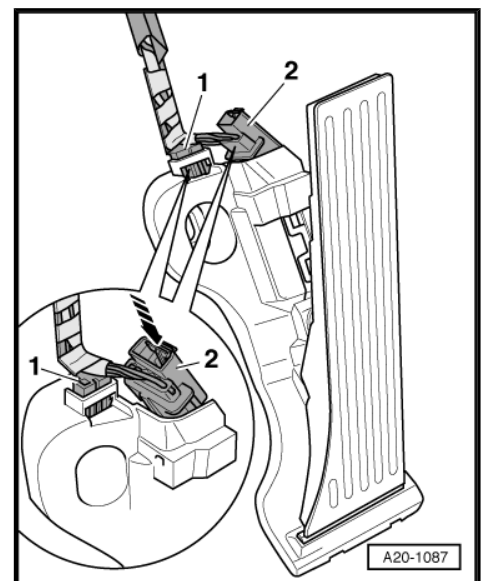
V - Sender 1 for secondary air pressure -G609-

- ☐ Only fitted in vehicles with engine code CBFA
- ☐ Fitting location ⇒ [page 18](#)

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

2 - Electrical connector for accelerator pedal module

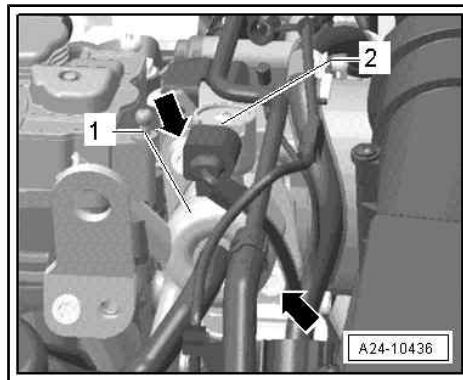
Removing and installing ⇒ Rep. gr. 20





High-pressure fuel pump -1-

2 - Fuel pressure regulating valve -N276-



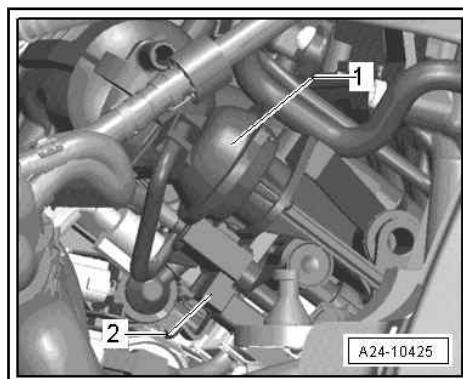
Intake manifold flap valve -N316- -2-

1 - Vacuum unit for intake manifold flaps

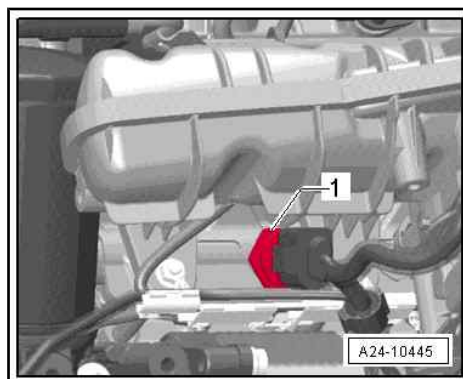


Note

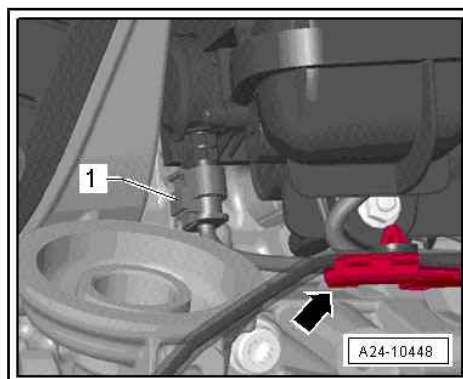
Intake manifold flaps are the same as air flow control flaps.



Fuel pressure sender -G247- -1-

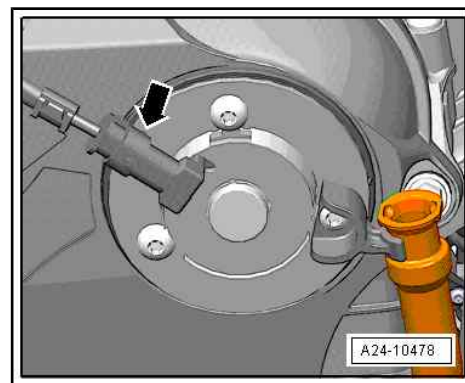


Intake manifold flap potentiometer -G336- -1-

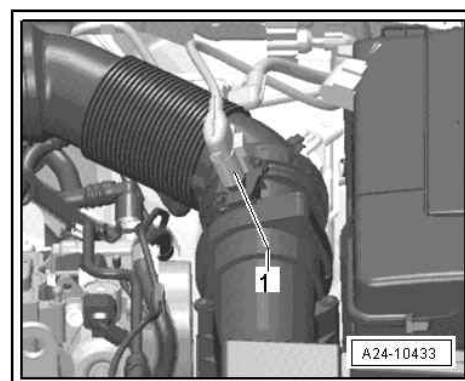


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Camshaft control valve 1 -N205- -arrow-

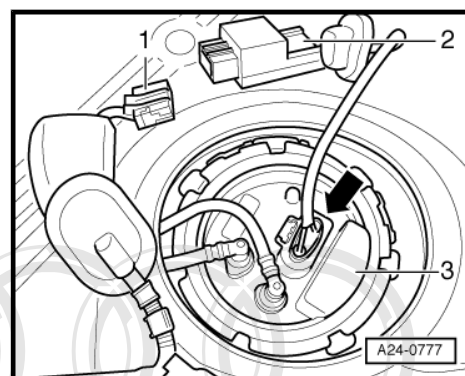


Air mass meter -G70- and intake air temperature sender 2 -G299- -1-



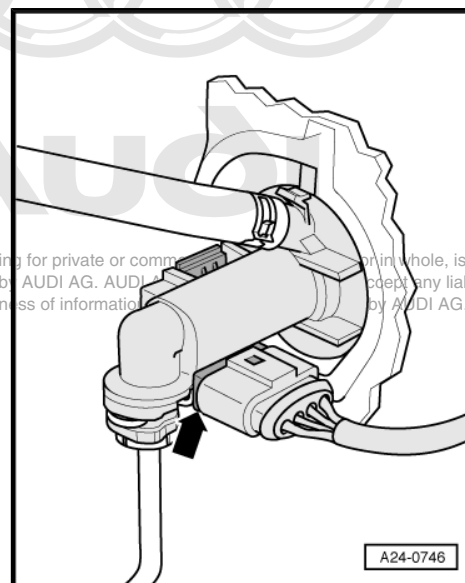
Fuel pump control unit -J538- -2-

- 1 - Connector for fuel pump control unit -J538-
- 2 - Fuel pump control unit -J538-
- 3 - Fuel system pressurisation pump -G6-



Clutch position sender -G476-

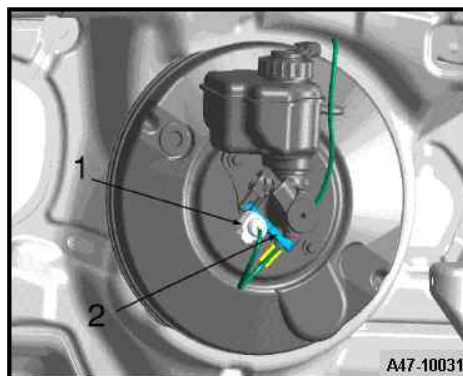
Removing and installing, see Power transmission, clutch ⇒ Rep.
gr. 30



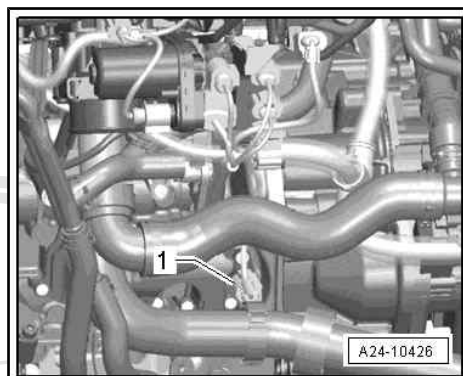
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Brake light switch -F- and brake pedal switch -F63-

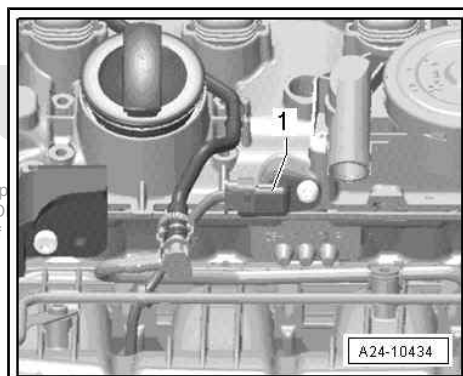
Removing and installing ⇒ Rep. gr. 45



Engine speed sender -G28- -1-



Hall sender -G40- -1-

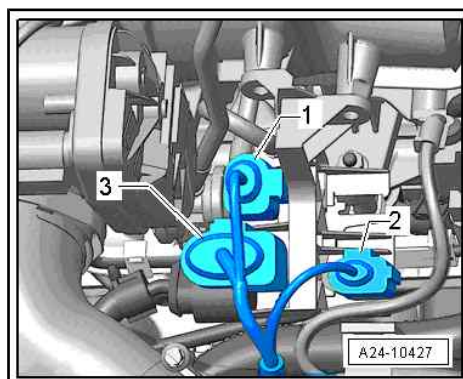


Electrical connectors

1 - From Hall sender -G40- and intake manifold flap potentiometer -G336-

2 - From knock sensor 1 -G61-

3 - 8-pin connector for injectors

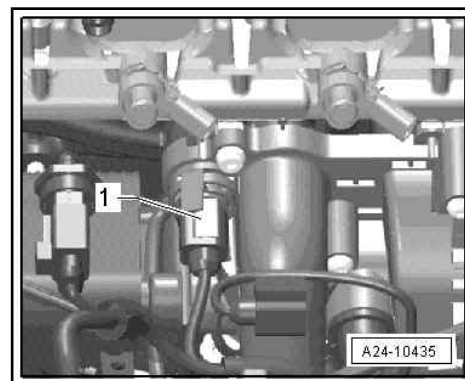


Coolant temperature sender -G62- -1-

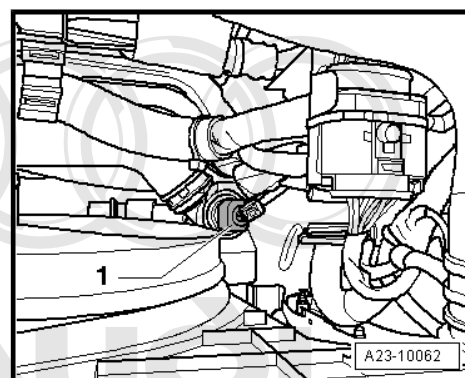


Note

Below intake manifold (intake manifold is removed in illustration)

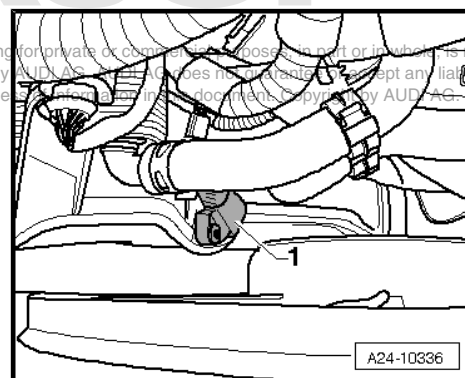


Radiator outlet coolant temperature sender -G83- -1-



Charge pressure sender -G31- -1-

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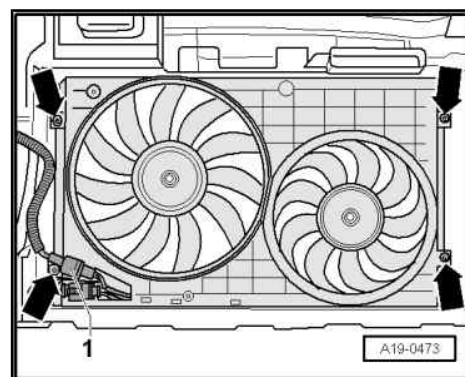
Radiator fan control unit -J293-

1 - Connector for radiator fan control unit -J293-



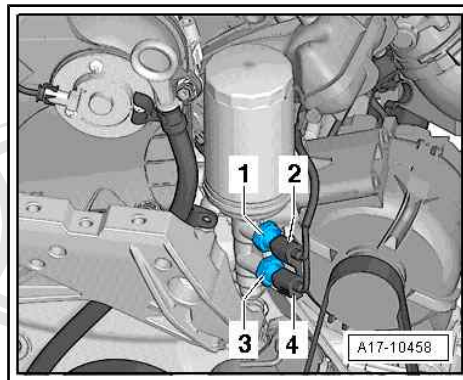
Note

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



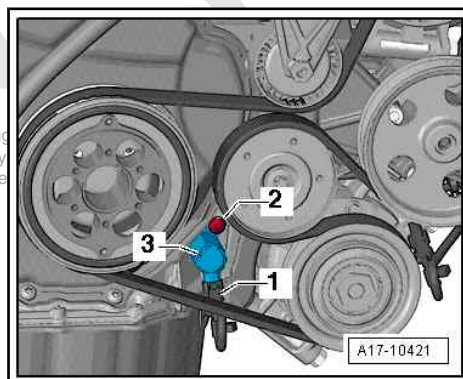
Oil pressure switch

- 1 - Oil pressure switch for reduced oil pressure -F378- (engine code CCZA)
- 2 - Electrical connector for oil pressure switch for reduced oil pressure -F378- (engine code CCZA)
- 3 - Oil pressure switch -F1- (engine codes CAWB, CCTA, CBFA)
- 3 - Oil pressure switch -F22- (engine code CCZA)
- 4 - Electrical connector for oil pressure switch -F1- or oil pressure switch -F22-



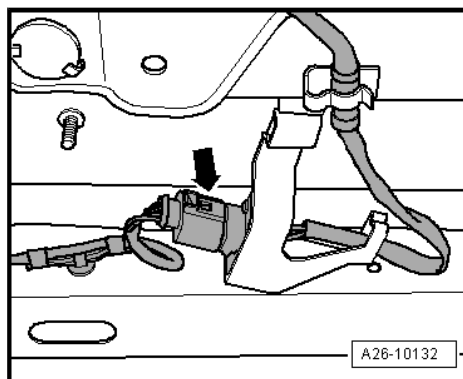
Valve for oil pressure control -N428- -3- (engine code CCZA)

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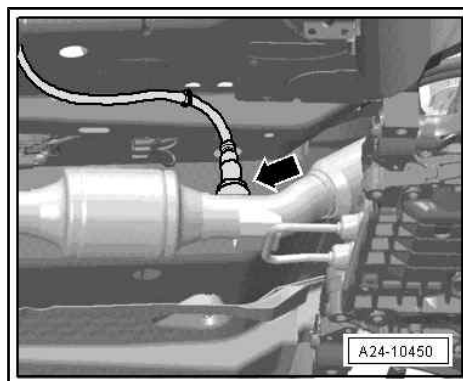
Fitting location for engine code CAWB

-Arrow- electrical connector for Lambda probe -G39- and Lambda probe heater -Z19-



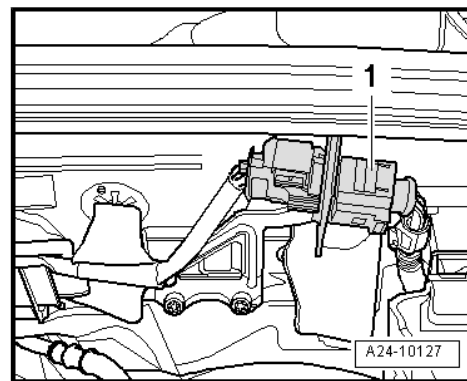
Fitting location for engine code CAWB

-Arrow- indicates Lambda probe -G39- and Lambda probe heater -Z19-



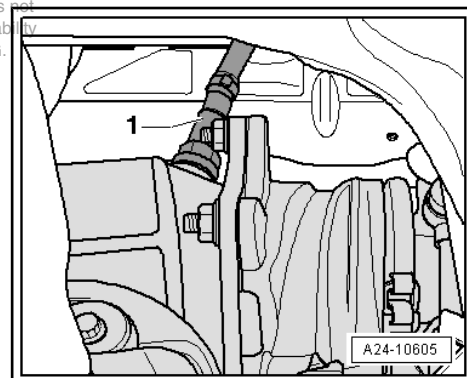
Fitting location for engine codes CCTA, CCZA and CBFA

- 1 - Electrical connector for Lambda probe -G39- and Lambda probe heater -Z19-



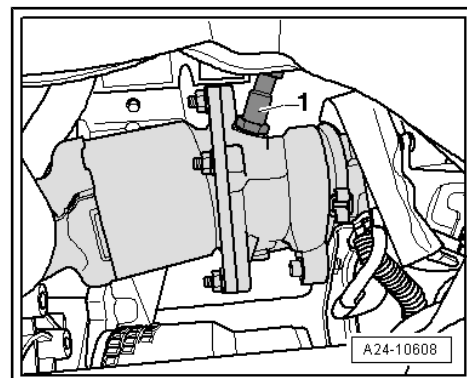
Fitting location for engine codes CCTA and CCZA

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



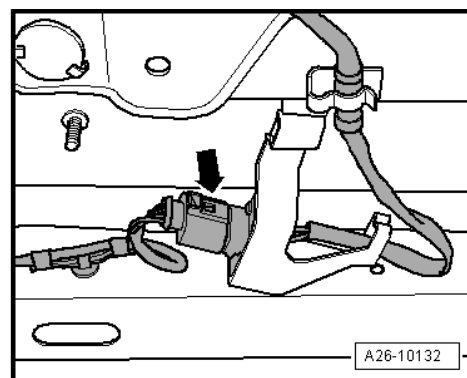
Fitting location for engine code CBFA

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



Fitting location for engine codes CCTA and CCZA

-Arrow- electrical connector for Lambda probe after catalytic converter -G130- and Lambda probe 1 heater after catalytic converter -Z29-



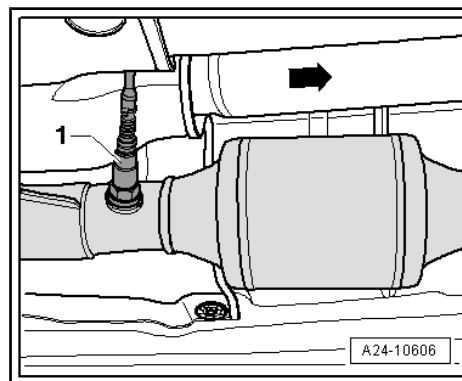
Fitting location for engine codes CCTA and CCZA

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



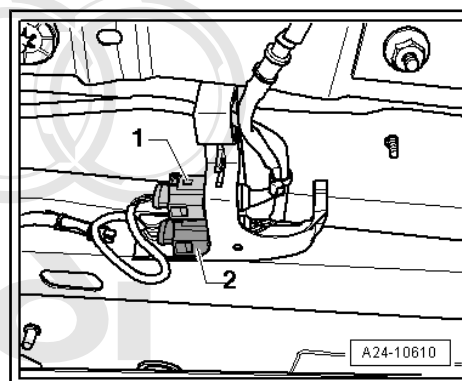
Note

The arrow in the illustration points in the direction of travel.



Fitting location for engine code CBFA

- 1 - Electrical connector for Lambda probe 3 after catalytic converter -G287- and Lambda probe heater 3 after catalytic converter -Z64-
- 2 - Electrical connector for Lambda probe after catalytic converter -G130- and Lambda probe 1 heater after catalytic converter -Z29-



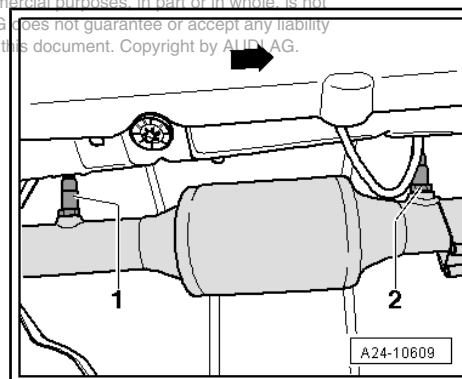
Fitting location for engine code CBFA

- 1 - Lambda probe 3 after catalytic converter -G287- and Lambda probe heater 3 after catalytic converter -Z64-
- 2 - Lambda probe after catalytic converter -G130- and Lambda probe heater 1 after catalytic converter -Z29-



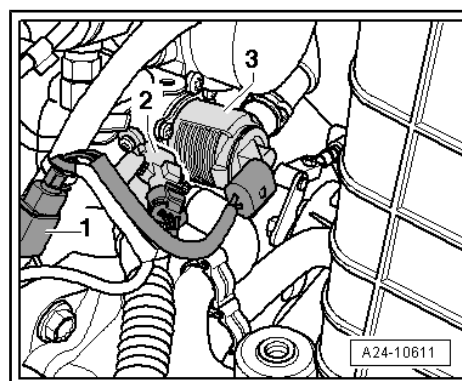
Note

The arrow in the illustration points in the direction of travel.



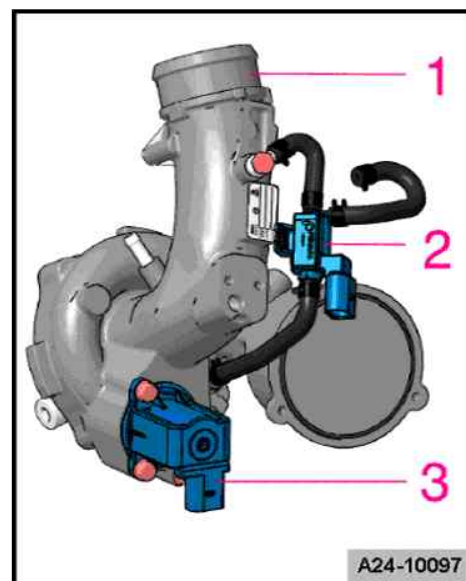
Secondary air (only engine code CBFA)

- 1 - Electrical connector for secondary air inlet valve -N112-
- 2 - Sender 1 for secondary air pressure -G609-
- 3 - Secondary air inlet valve -N112-

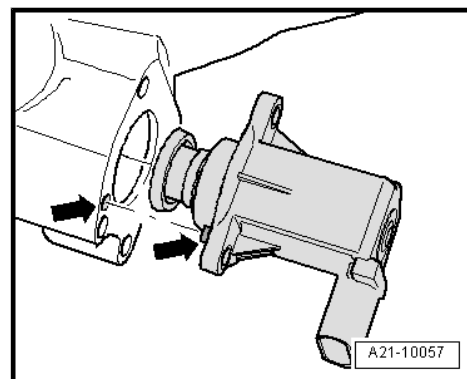


Components on turbocharger

- 1 - Removing and installing turbocharger ⇒ Rep. gr. 21
- 2 - Tighten charge pressure control solenoid valve -N75- to 3 Nm
- 3 - Tighten turbocharger air recirculation valve -N249- to 7 Nm (note installation position, refer to next illustration)

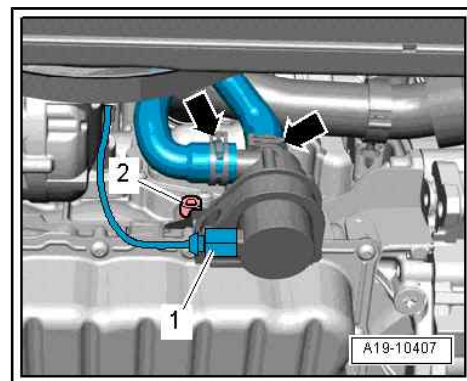


Pay attention to installation position of turbocharger air recirculation valve -N249-



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Continued coolant circulation pump -V51-



4 Air cleaner

Overview

⇒ „4.1 Air cleaner - exploded view“, page 20

⇒ „4.2 Removing and installing engine cover panel“, page 21

⇒ „4.3 Removing and installing air filter element“, page 21

⇒ „4.4 Removing and installing air cleaner housing“, page 22

4.1 Air cleaner - exploded view

1 - Spring-type clip

2 - Air hose

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

3 - Air mass meter -G70-

- ☐ 1.5 Nm
- ☐ Removing and installing
⇒ page 48

4 - Bolts

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

5 - Bolts

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

6 - Air cleaner (top section)

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

7 - Filter element

- ☐ Always use genuine part for air filter element
- ☐ Removing and installing
⇒ page 21
- ☐ Observe change intervals ⇒ Maintenance ; Booklet 808

8 - Bolt

- ☐ For air cleaner (bottom section)

9 - Snow screen

- ☐ Not installed in all vehicles

10 - Air cleaner (bottom section)

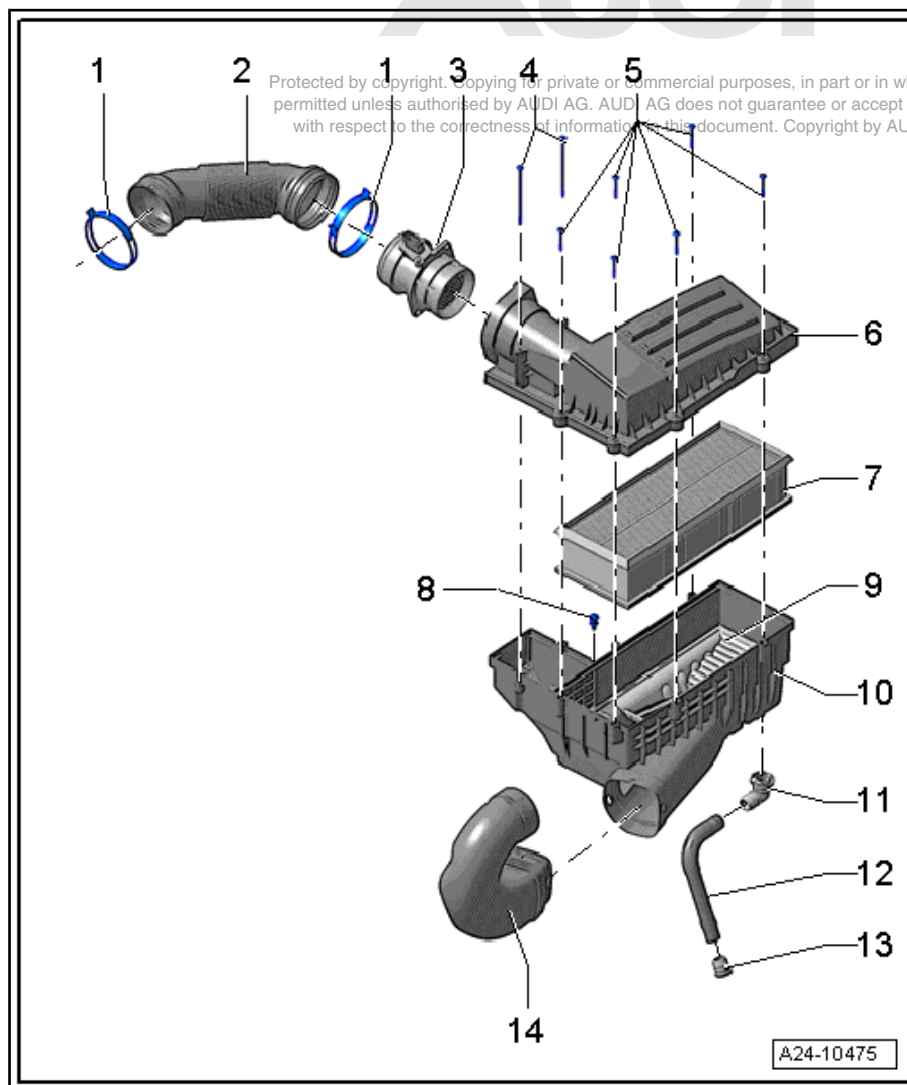
- ☐ Clean any salt residue, leaves and dirt out of air cleaner (bottom section)

11 - Connection for water drain hose

- ☐ Clean connection

12 - Water drain hose

- ☐ Clean water drain hose



13 - Flutter valve

- ☐ Clean and re-install

14 - Intake air duct

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

4.2 Removing and installing engine cover panel

Removing

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

Installing

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

4.3 Removing and installing air filter element

Removing

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



Note

Disregard items 1 to 3.

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

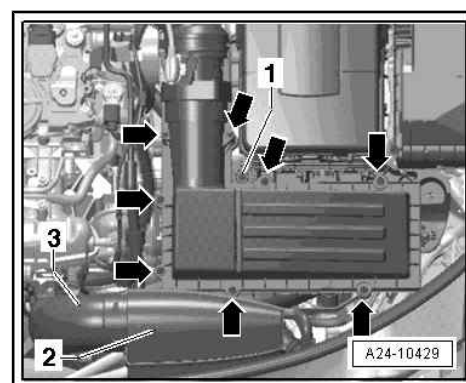
Installing



Note

- ◆ Always use genuine part for air filter element.
- ◆ Hose connections and hoses for charge air system must be free of oil and grease before assembly. Do not use any lubricants containing silicone when assembling.
- ◆ The air cleaner housing must be clean.
- ◆ Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue
- ◆ To prevent malfunctions, cover all critical parts of the engine air intake tract (air mass meter, intake pipes, etc.) with a clean cloth when blowing out the air cleaner housing with compressed air.
- ◆ Please observe requirements for disposal.
- Check for salt residue, dirt and leaves in air mass meter and air intake hose (engine intake side).

- Check for dirt in air intake hose from air duct.



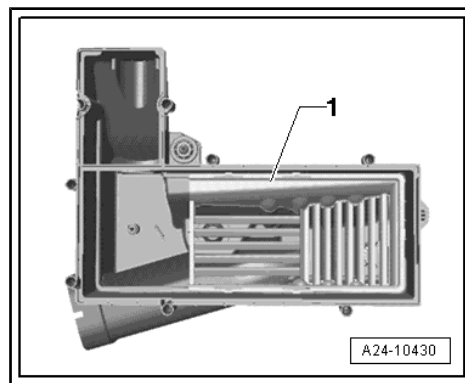
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- Remove snow screen -1- and clean it.



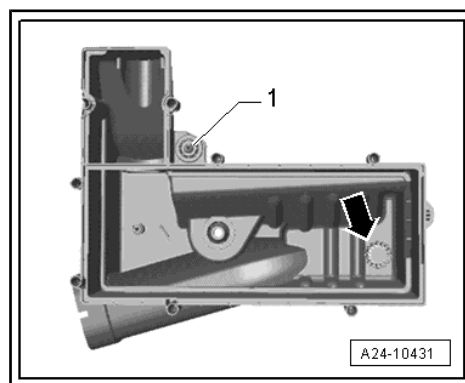
Note

The snow screen is not fitted on all vehicles.



- Clean water drain -arrow- and air cleaner (bottom section).
- When installing the air filter element, check that it is properly centred in the retainer in the air cleaner (bottom section).
- Fit the top section of the air cleaner carefully on the bottom section, without using force. Make sure the top section of the air cleaner is fitted straight on the air filter element (note position of sealing lip on air filter element).

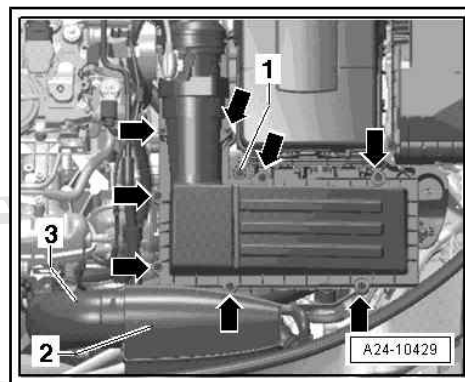
The remaining installation steps are carried out in the reverse sequence.



4.4 Removing and installing air cleaner housing

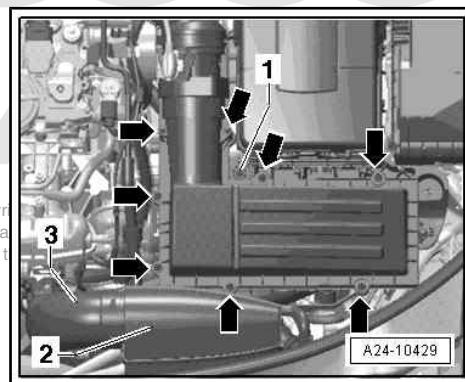
Removing

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



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

Installing



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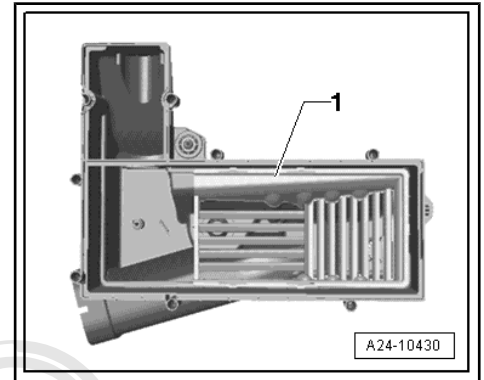
whole, is not
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- Remove snow screen -1- and clean it.

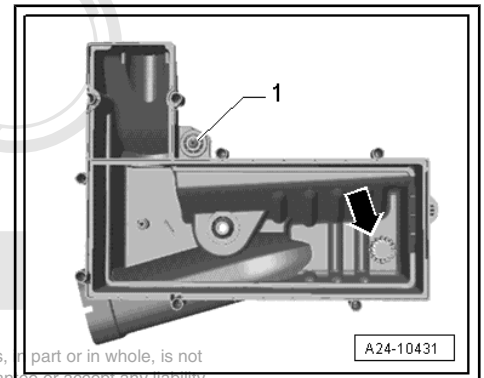


Note

The snow screen is not fitted on all vehicles.



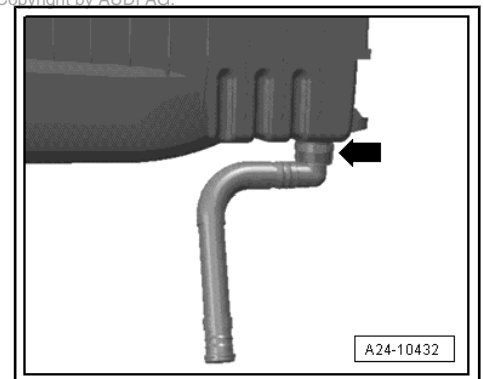
- Clean water drain -arrow- and air cleaner (bottom section).



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

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



5 Intake manifold

Overview

⇒ „5.1 Intake manifold - exploded view“, page 24

⇒ „5.2 Fuel rail - exploded view“, page 25

⇒ „5.3 Removing and installing intake manifold with fuel rail“, page 26

⇒ „5.4 Removing and installing throttle valve module J338“, page 33

⇒ „5.5 Cleaning throttle valve module J338“, page 34

⇒ „5.6 Checking intake manifold change-over function“, page 34

⇒ „5.7 Checking dual non-return valve“, page 36

5.1 Intake manifold - exploded view

1 - Screw for intake air temperature sender -G42-

□ 5 Nm

2 - Intake air temperature sender -G42-

3 - Activated charcoal filter solenoid valve 1 -N80-

□ With dual non-return valve; checking
⇒ page 36

4 - Intake manifold

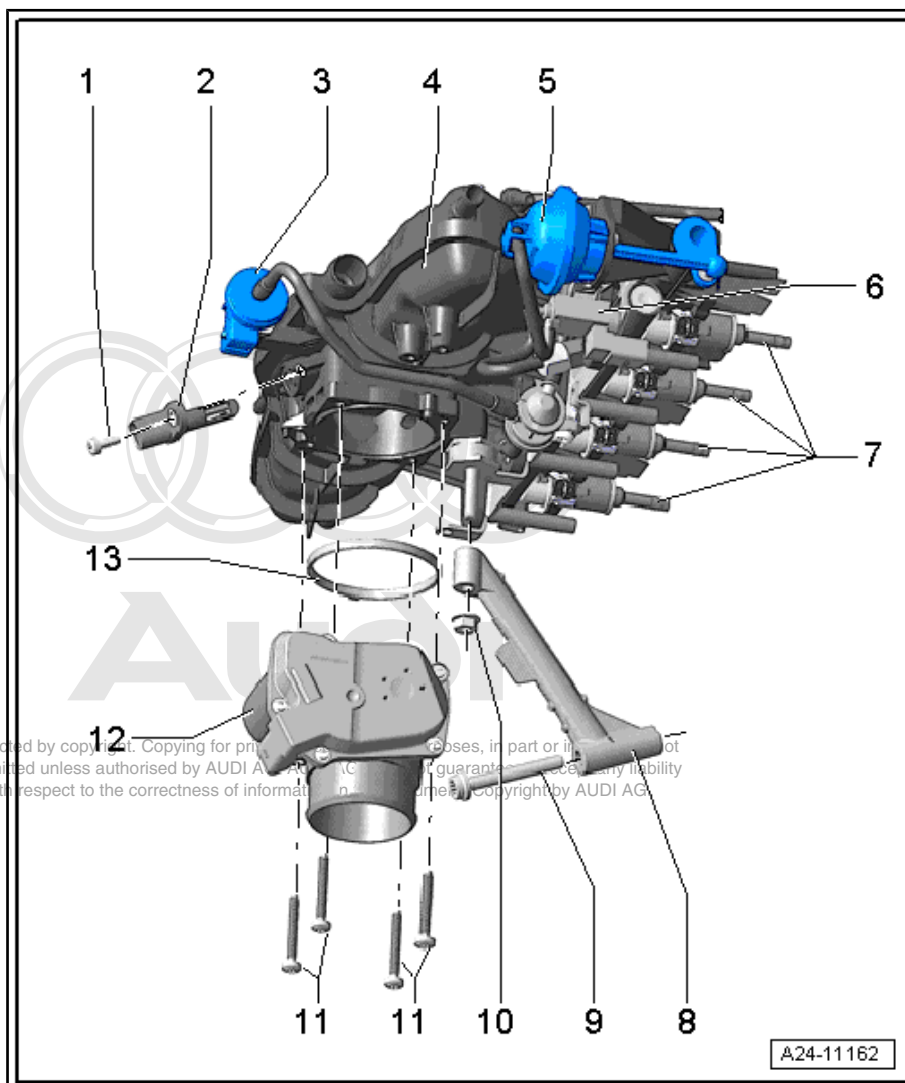
□ Removing and installing
⇒ page 26

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

6 - Intake manifold flap valve - N316-

7 - Injectors

□ Renew O-ring and teflon ring
□ Ensure correct installation position.
□ Removing and installing



⇒ [page 42](#)

8 - Intake manifold support

9 - Bolt for intake manifold support

- ☐ 23 Nm

10 - Securing nut for intake manifold support

- ☐ 10 Nm

11 - Bolts for throttle valve module -J338-

- ☐ 5 Nm

12 - 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- . Use vehicle diagnostic tester to do so.

13 - Seal

- ☐ Renew

5.2 Fuel rail - exploded view

1 - Injector

- ☐ With combustion chamber ring seal (teflon ring seal): always renew
- ☐ Renew O-rings
- ☐ Ensure correct installation position.
- ☐ Removing and installing
⇒ [page 42](#)

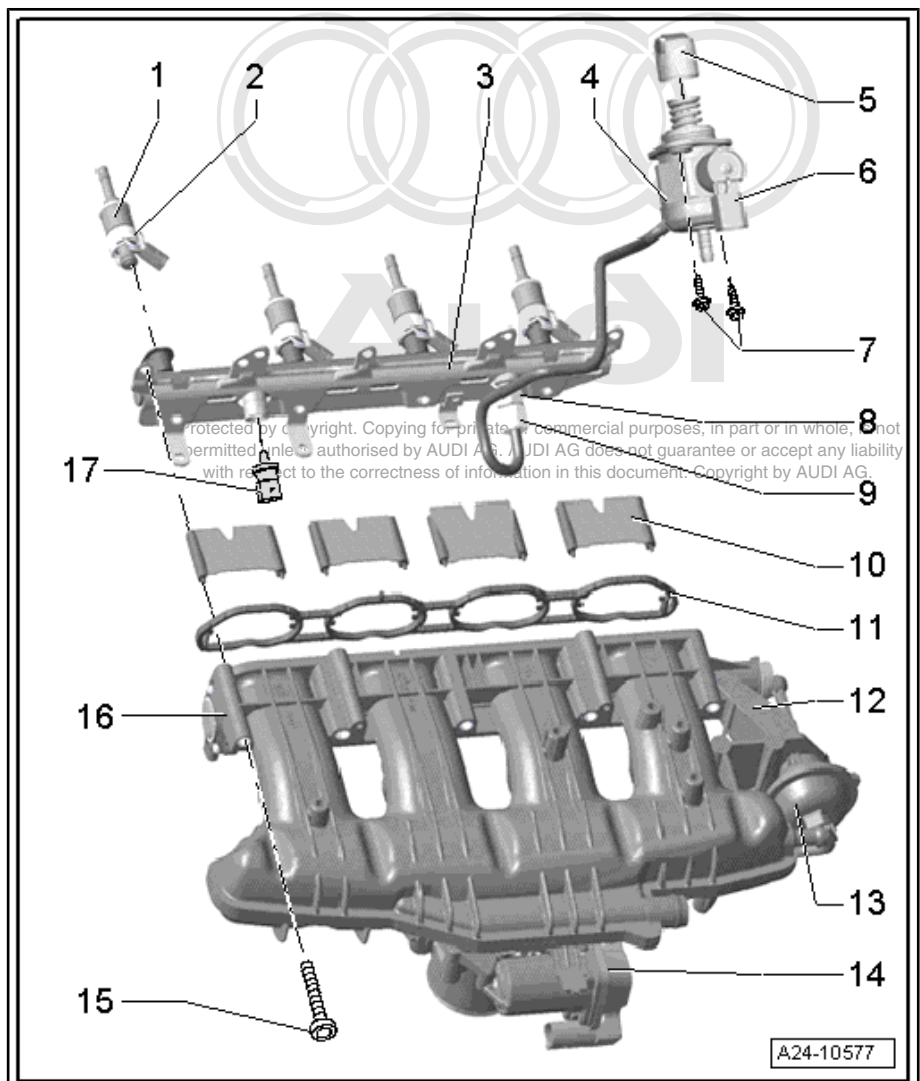
2 - Support ring

3 - Fuel rail

- ☐ Removing and installing
⇒ [page 26](#)

4 - 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
- ☐ 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 4](#)
- ☐ Fuel pipes must be free of tension when instal-





led.

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

5 - Roller tappet

6 - Fuel pressure regulating valve -N276-

7 - Bolts for high-pressure pump

- ☐ Hand-tighten in diagonal sequence, then tighten to 5 Nm
- ☐ Final torque for bolts with M8 thread: 20 Nm
- ☐ Do not tilt high-pressure pump

8 - Connecting piece for fuel supply line

- ☐ Renew
- ☐ 40 Nm

9 - Union nut for fuel supply line

- ☐ 20 Nm

10 - Air flow control flaps (intake manifold flaps)

11 - Gasket

- ☐ Renew

12 - Intake manifold

- ☐ Removing and installing ⇒ [page 26](#)

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

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- . Use vehicle diagnostic tester to do so.

15 - Bolts for intake manifold

- ☐ 9 Nm

16 - Intake manifold flap potentiometer -G336-

- ☐ After intake manifold flap potentiometer -G336- or intake manifold has been removed and installed or renewed, intake manifold flap potentiometer -G336- must be adapted to engine control unit -J623- . Use ⇒ Vehicle diagnostic tester in „Guided Functions“ mode.

17 - Fuel pressure sender -G247-

- ☐ 27 Nm
- ☐ Lubricate threads lightly with clean engine oil
- ☐ Always renew connecting piece and tighten to 40 Nm
- ☐ Fitting location ⇒ [page 12](#)
- ☐ Removing and installing ⇒ [page 48](#)

5.3 Removing and installing intake manifold with fuel rail

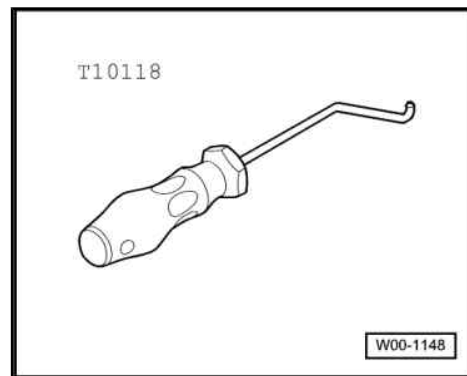
After the fuel rail has been removed or renewed, intake manifold flap potentiometer -G336- must be adapted to engine control unit -J623- . Use vehicle diagnostic tester to do so.

Special tools and workshop equipment required

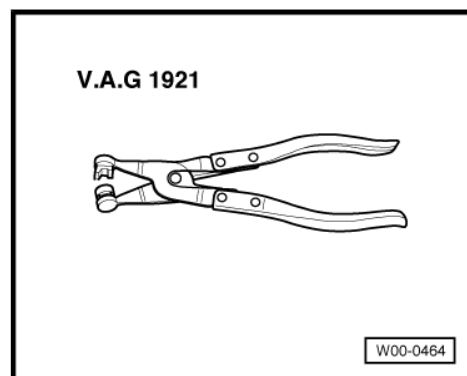


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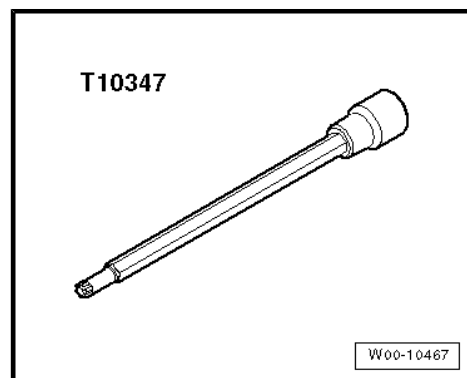
◆ Assembly tool -T10118-



◆ Hose clip pliers -V.A.G 1921-



◆ Socket Torx T30 -T10347-



Removing

- Remove engine cover panel.



Note

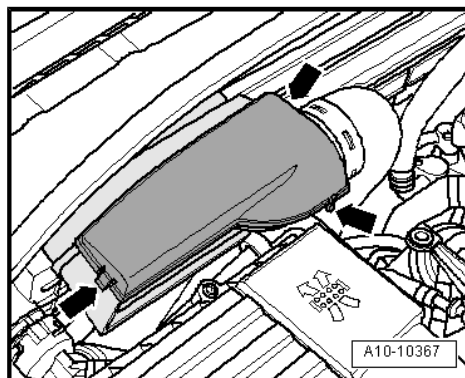
- ◆ *The injectors can only be accessed after the intake manifold and the fuel rail with the air flow control flaps have been removed.*
- ◆ *The combustion chamber (teflon) ring seal and the O-ring must always be renewed.*
- ◆ *Intake manifold - exploded view ➔ [page 24](#)*
- ◆ *Fuel rail - exploded view ➔ [page 25](#)*

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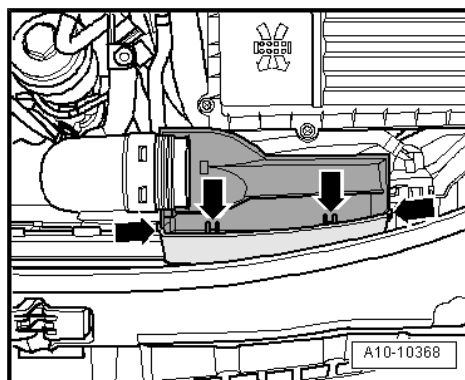

WARNING

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 4](#).

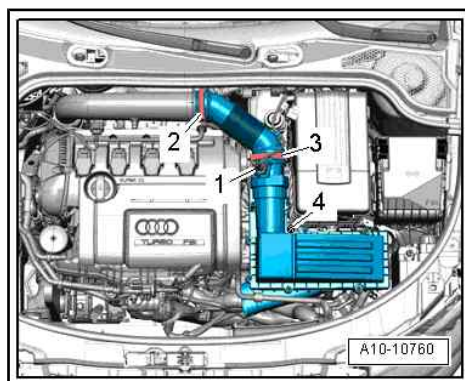
- Disconnect negative terminal from battery.
- Clean joint between intake manifold and cylinder head.
- Pull cover off air duct (release clips on sides) -arrows-.
- Unclip air duct at the bottom by releasing clips -arrows-.



- Detach air duct at bottom together with air hose.

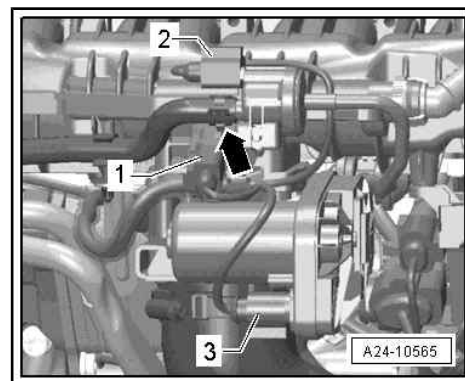


- Unplug electrical connector -1- from air mass meter -G70-.
- Release hose clip -2-.
- Unscrew bolt -4- and remove air cleaner housing with air intake hose.

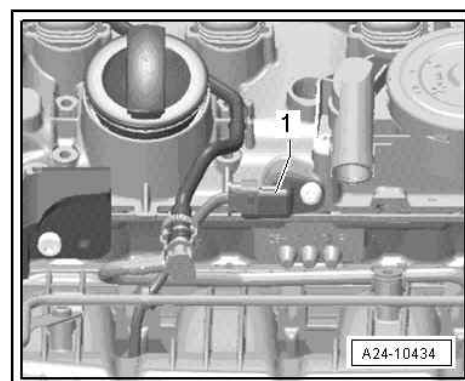

Note

Disregard item -3-.

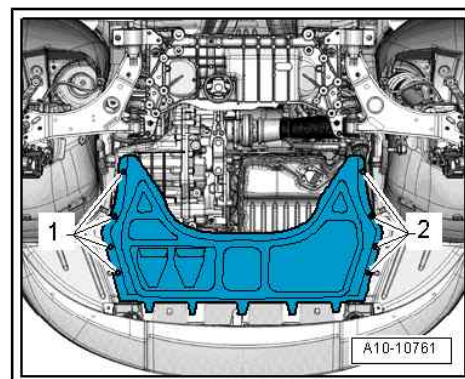
- Disconnect vacuum line -arrow- leading to activated charcoal filter.
- Unplug following electrical connectors:
 - 1 - Intake air temperature sender -G42-
 - 2 - Activated charcoal filter solenoid valve 1 -N80-
 - 3 - Throttle valve module -J338-



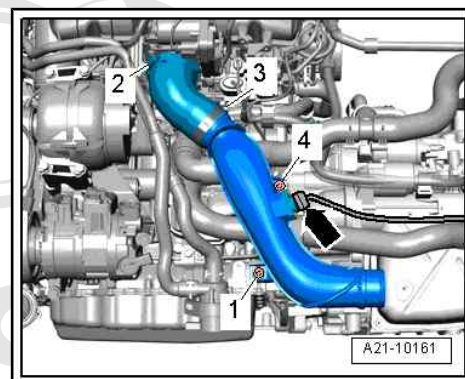
Unplug electrical connector -1- at Hall sender -G40- .



- Release fasteners -1 and 2- and remove noise insulation.

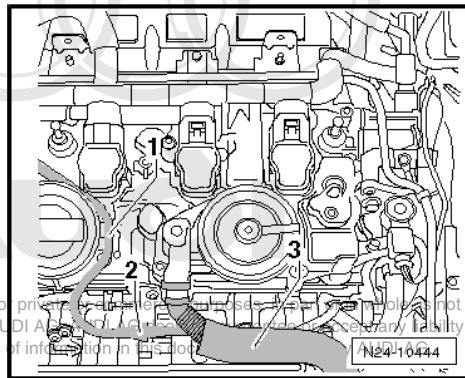


- Release hose clips -2- on air pipe.
- Unplug electrical connector -arrow-.
- Unscrew bolts -1 and 4- and remove air hose from throttle valve module -J338- downwards.
- Pull out air hose.



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- Disconnect vacuum line -1- at position marked -2- and remove crankcase breather hose -3-.

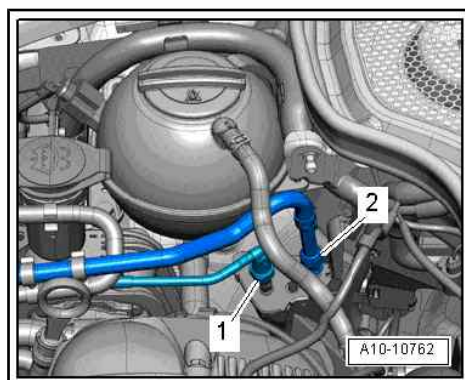


- Disconnect fuel supply hose -2- by pressing release ring.



Note

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

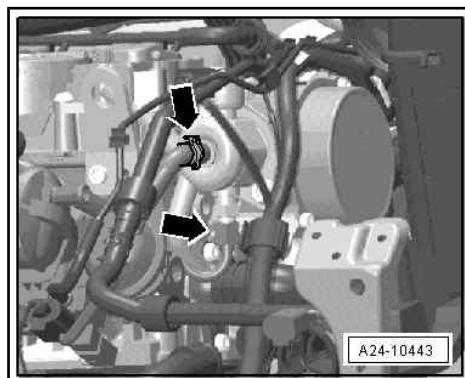


- Release spring-type clip -top arrow- and detach fuel supply hose from high-pressure pump.
- Unscrew union nut for high-pressure fuel pipe -bottom arrow- at high-pressure pump.

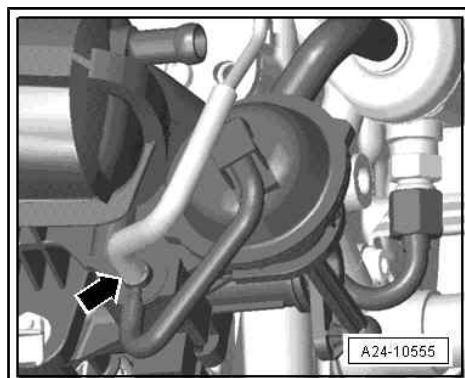


Note

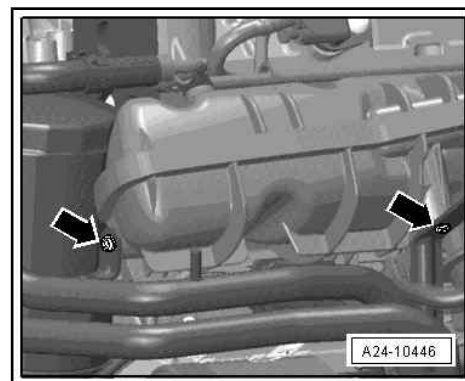
Seal off open connections with clean caps. It is essential to ensure that no dirt enters the fuel system.



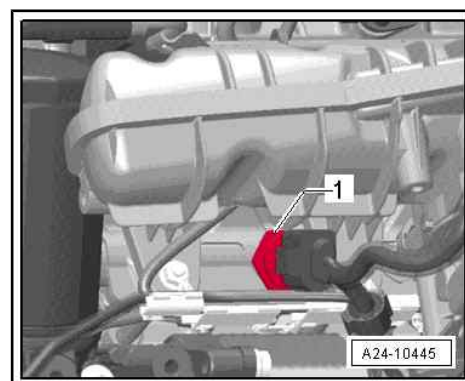
- Disconnect vacuum line -arrow- at intake manifold flap valve - N316- .



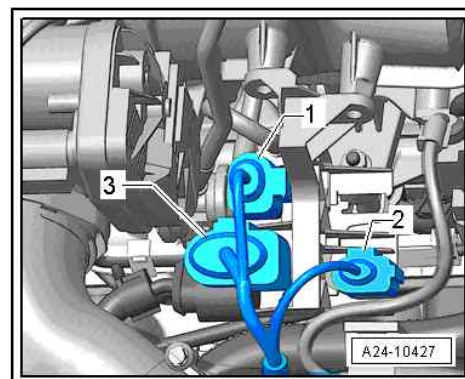
- Remove two bolts -arrows- for coolant line from intake manifold.



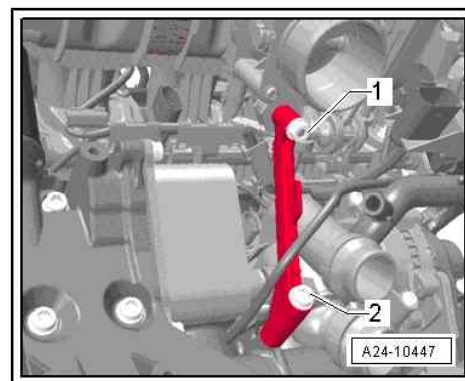
- Unplug electrical connector at fuel pressure sender -G247-1-.

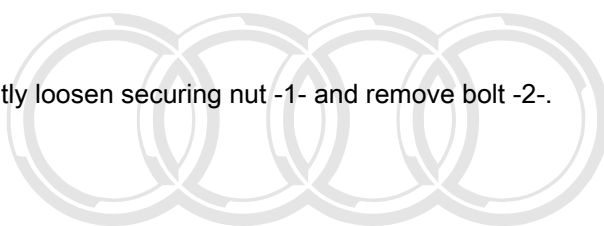


- Unplug electrical connectors -1- and -3- and detach connectors from retainer towards one side.



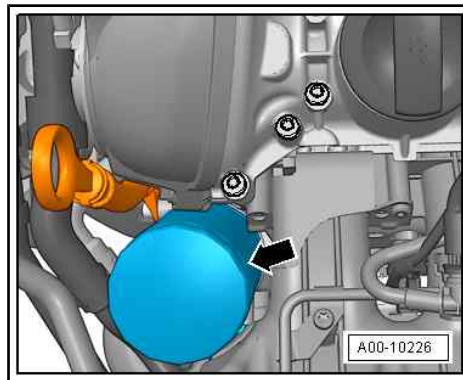
- Slightly loosen securing nut -1- and remove bolt -2-.




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- Loosen oil filter with Hazet strap wrench -2171-1- or with oil filter tool -3417- and remove oil filter.



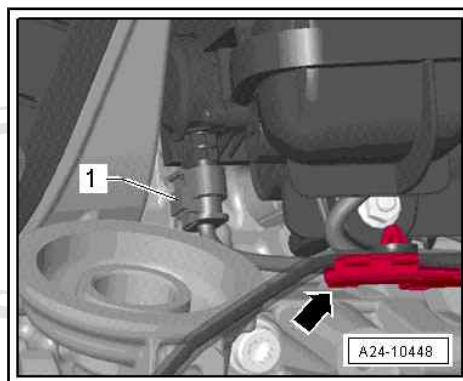
- Open cable retainer -arrow- and move wiring clear.
- Unscrew bolts from intake manifold using socket Torx T30 -T10347-.



Note

To remove the bolts that cannot be accessed if you do not have socket Torx T30 -T10347-, the throttle valve module -J338- must be removed.

- Carefully pull intake manifold and fuel rail slightly away from cylinder head.
- Unplug electrical connector -1- from intake manifold flap potentiometer -G336- and then detach intake manifold.



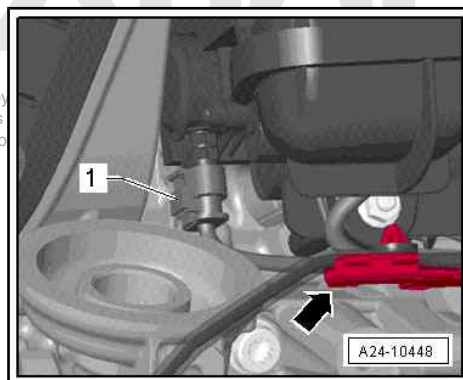
Note

- ♦ The injectors can remain in the fuel rail.
- ♦ Block off intake ports with a clean cloth.

- Disconnect intake manifold from fuel rail ⇒ [page 32](#).

Installing

- Fit intake manifold onto studs (left and right) on cylinder head.



Note

Make sure that injectors are installed correctly.

- The remaining installation steps are carried out in the reverse sequence.
- Tightening torque: intake manifold - exploded view ⇒ [page 24](#)
- Tightening torque: fuel rail - exploded view ⇒ [page 25](#)

5.3.1 Removing and installing fuel rail



Note

Intake manifold must be removed; removing intake manifold ⇒ [page 26](#).

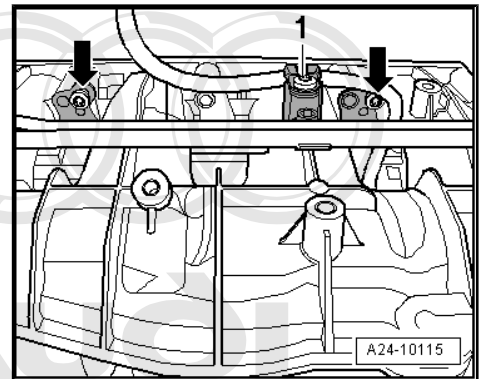
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- Release hose clip -1-.
- Remove hoses from activated charcoal filter.
- Disconnect fuel pipe at fuel rail.
- Unscrew two bolts -arrows- on fuel rail.
- Detach fuel rail from intake manifold.

Installing

- Always renew both connecting pieces for fuel supply line.
- Connect fuel pipe.
- The remaining installation steps are carried out in the reverse sequence.
- Re-connect electrical connectors.
- Install intake manifold ➔ [page 26](#) .

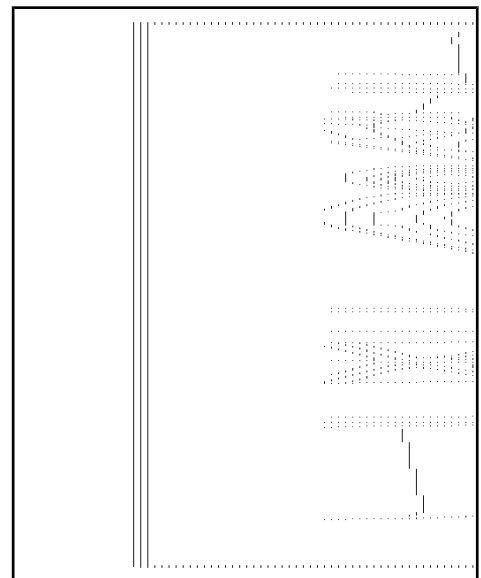


5.4 Removing and installing throttle valve module -J338-

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Removing

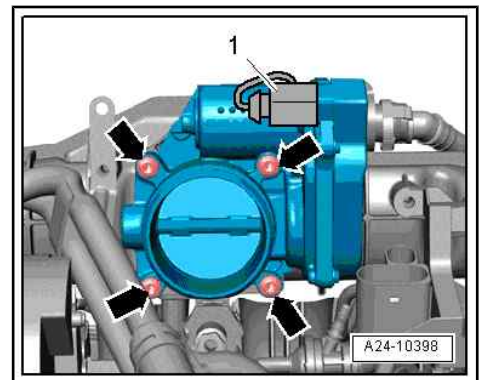
- Remove engine cover panel.
- Remove noise insulation.
- Release clips -top arrows-, unscrew bolts -bottom arrows- and remove charge air pipe and hose from below.
- Unplug electrical connector -1- from throttle valve module - J338- .



- 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: intake manifold - exploded view ➔ [page 24](#) .
- After throttle valve module -J338- has been renewed, it must be re-adapted to engine control unit -J623- . Use vehicle diagnostic tester to do so.



5.5 Cleaning throttle valve module -J338-



Note

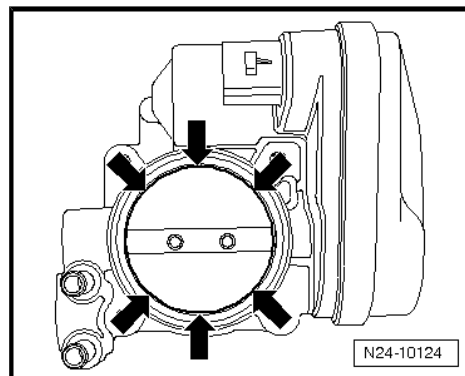
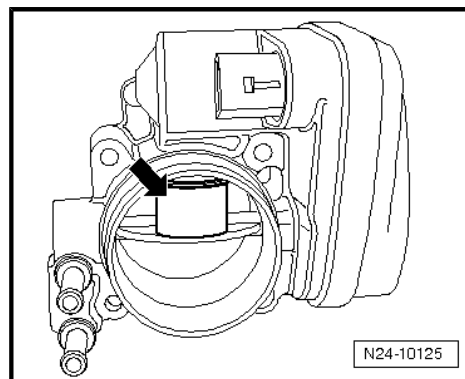
- ◆ *The throttle valve module must be adapted if a new engine control unit -J623- is installed.*
- ◆ *Take care not to scratch the throttle valve housing when cleaning it.*
- Remove throttle valve module -J338- ⇒ [page 33](#) .
- Open throttle valve by hand and block it in the open position with a suitable object (e.g. plastic or wooden wedge) -arrow-.



WARNING

Acetone is highly flammable. Please 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 possible injury and skin contact.

- 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 evaporate completely and re-install throttle valve module after cleaning.
- Erase learnt values and adapt engine control unit -J623- to throttle valve module -J338- . Use ⇒ Vehicle diagnostic tester.



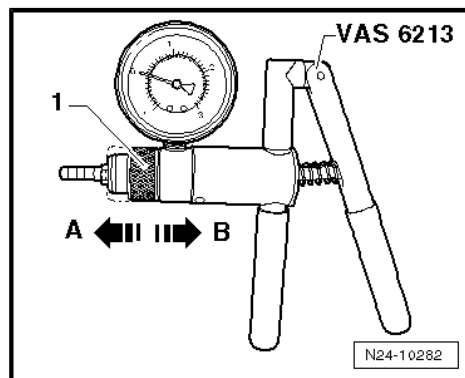
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5.6 Checking intake manifold change-over function

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

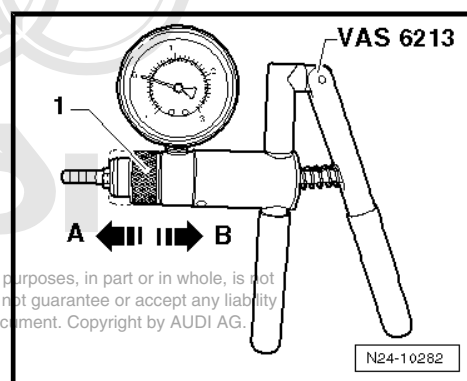
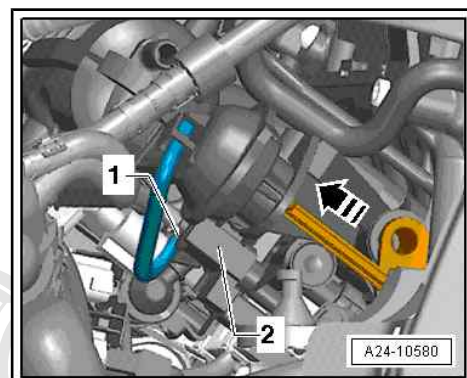
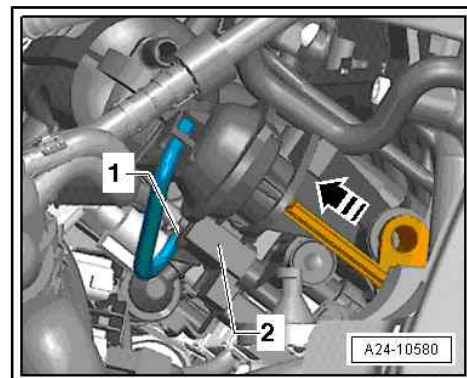
- ◆ Intake manifold flap valve -N316- has been checked with vehicle diagnostic tester.

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-.

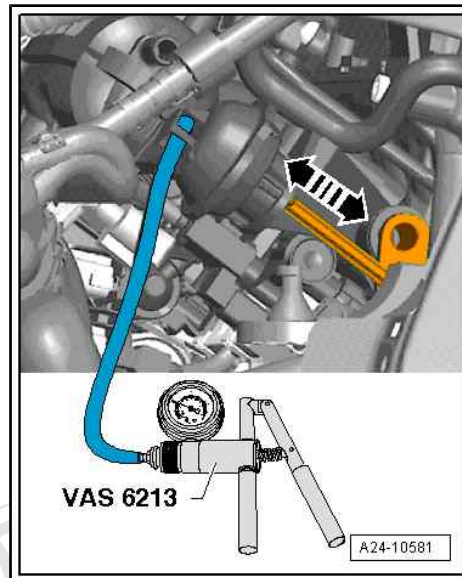
If the change-over does not operate as described:

- 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".



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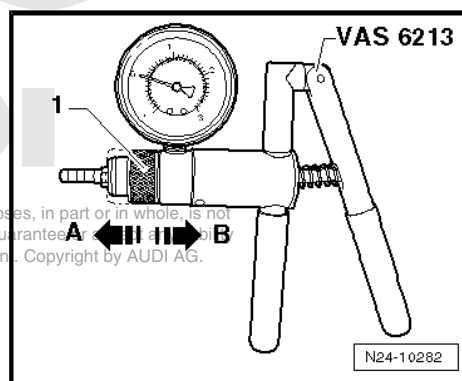
- Connect hand vacuum pump -VAS 6213- to vacuum unit for intake manifold flap valve -N316- .
 - Operate the hand vacuum pump -VAS 6213- several times.
- The vacuum unit should move -arrows-.
- If vacuum unit does not move, renew vacuum unit.



5.7 Checking dual non-return valve

Special tools and workshop equipment required

- ◆ Hand vacuum pump -VAS 6213-

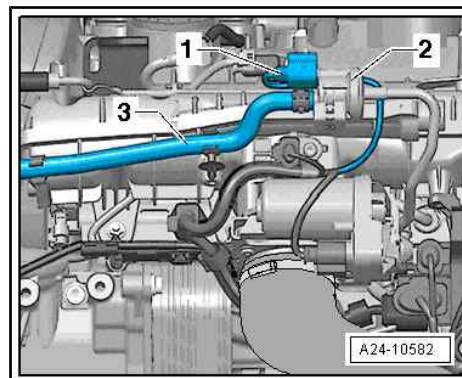


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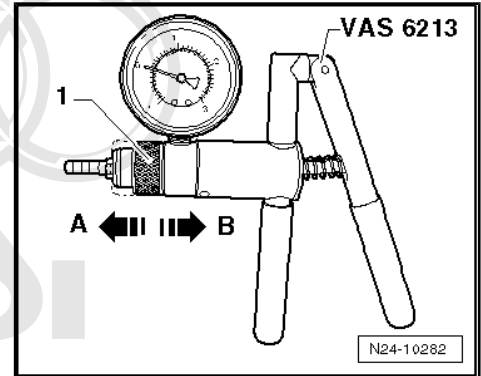
- ◆ Auxiliary measuring set -V.A.G 1594C-

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 hose -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- .

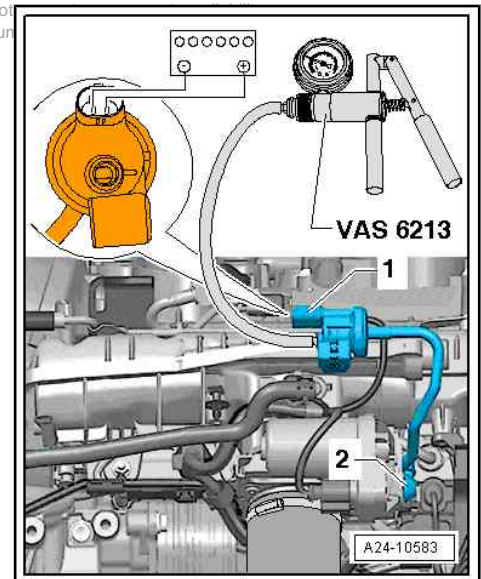
Then immediately operate hand vacuum pump -VAS 6213- several times.

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

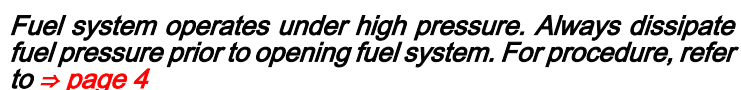
If vacuum does not build up:

- Renew dual non-return valve -1-.

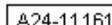
Dual non-return valve, activated charcoal filter solenoid valve 1 -N80- and plastic hoses are combined as one unit and can only be renewed together.



6.1 High-pressure pump - exploded view



- May remain lodged in vacuum pump when high-pressure pump is



removed

6 - Connecting piece

- ☐ Not available as replacement part, part of high-pressure pump
- ☐ Do not loosen

7 - Adapter

- ☐ An adapter may be fitted between connecting piece and fuel supply line on some versions
- ☐ If fitted, adapter must be renewed; refer to ⇒ Electronic parts catalogue
- ☐ 40 Nm

8 - High-pressure fuel pipe

- ☐ Fuel pipe must be free of tension when installed.
- ☐ 20 Nm

9 - Bolt for high-pressure pump

- ☐ Hand-tighten in diagonal sequence, then tighten to 5 Nm and finally tighten to 20 Nm
- ☐ Do not tilt high-pressure pump

10 - Connecting piece for fuel supply line at fuel rail

- ☐ Renew
- ☐ 25 Nm

11 - Fuel rail

- ☐ Removing and installing ⇒ [page 32](#)

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6.2 Removing and installing high-pressure pump

Removing



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.*
- ◆ *Always ensure that the high-pressure fuel pipes are free of tension when tightening the connections.*

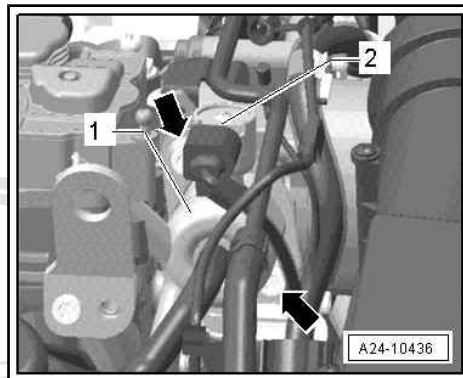


WARNING

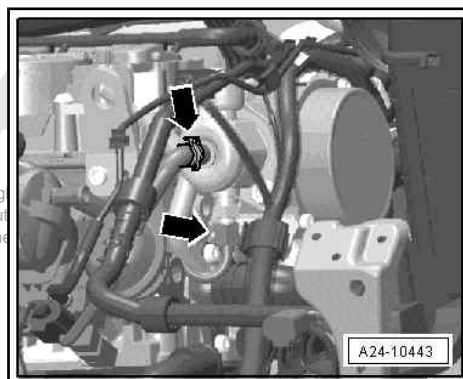
Fuel system operates under high pressure. Always dissipate fuel pressure prior to opening fuel system. For procedure, refer to ⇒ [page 4](#)

- Remove engine cover panel.

- Detach electrical connector -2- from fuel pressure regulating valve -N276- .



- Disconnect both fuel lines -arrows-.



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

Installing

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



Note

♦ *The roller tappet must be positioned at the lowest point when installing the high-pressure pump.*

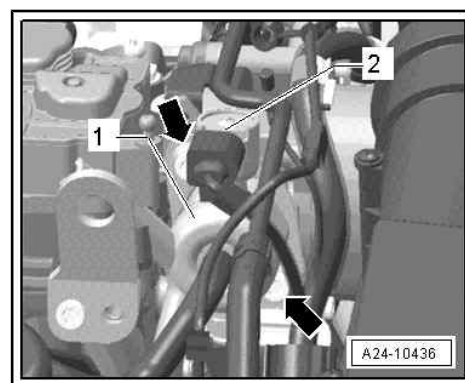
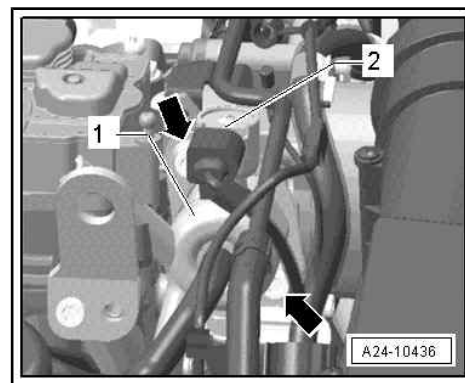
♦ *If the old high-pressure pump is re-installed, or if a used pump is installed, the connecting piece for the fuel supply line (high-pressure section of the system) must be renewed. Refer to high-pressure pump - exploded view (item 11) ⇒ [page 38](#).*

- Turn crankshaft in direction of engine rotation until roller tappet is positioned at lowest point.
- Fit high-pressure pump in vacuum pump.
- Tighten bolts hand-tight.
- Renew connecting piece at high-pressure pump.
- Tightening torque: refer to exploded view of high-pressure pump ⇒ [page 38](#).
- Now tighten bolts in diagonal sequence to specified torque.
- Tighten union nut on fuel supply line hand-tight. Align so that parts are free of tension.
- Tightening torque for fuel supply line (union nut): Intake manifold - exploded view ⇒ [page 24](#).
- Re-attach electrical connector -2- for fuel pressure regulating valve -N276-.
- Put back fuse if it has been removed.



Note

Check fuel system for leaks.



7 Injectors

⇒ „7.1 Removing and installing injectors“, page 42

⇒ „7.2 Cleaning injectors“, page 46

7.1 Removing and installing injectors

Removing

- Remove engine cover panel.
- Remove intake manifold and fuel rail ⇒ [page 26](#) .

Removing injectors (from fuel rail)

Carefully pull injectors out of fuel rail.

Removing injectors (from cylinder head)

Special tools and workshop equipment required

- ◆ Tool set for FSI engines -T10133-



Note

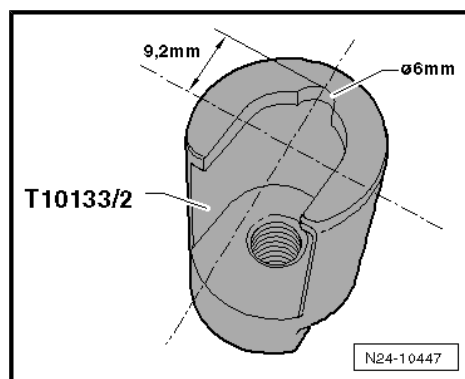
Special tool T10133/2 (puller) has been modified and now has the designation puller T10133/2 A . If you have not yet received the new tool you can make the modification yourself.

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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 (old version)

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

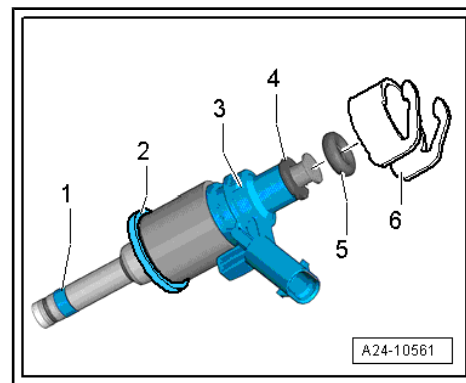
2 - Support ring is replaced by intermediate ring; see next illustration ⇒ [page 43](#)

3 - Injector

4 - Spacer ring (renew if damaged)

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

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



Injector (new version)

1 - Intermediate ring (renew)

2 - Retainer

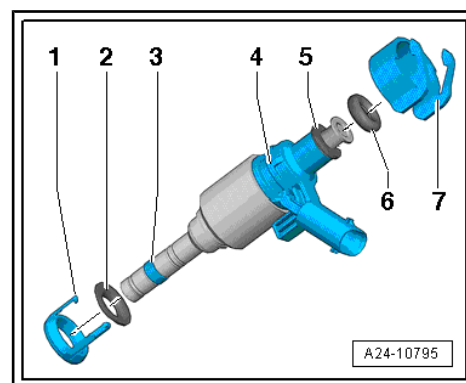
3 - Combustion chamber ring seal (teflon ring seal) - renew; when fitting, do not grease ring or use any other lubricant

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)

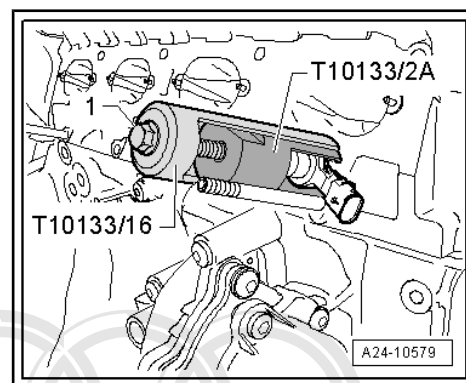


- Cover open inlet ports with a clean cloth.
- Unplug electrical connector at injector that is to be removed.
- Guide puller -T10133/2A- into groove on injector.
- Then attach removal tool -T10133/16- and pull out injector by turning bolt -1-.



Note

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



7.1.1 Renewing combustion chamber ring seal (teflon ring seal)



Note

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

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



Note

The injector must be renewed if the groove is damaged.

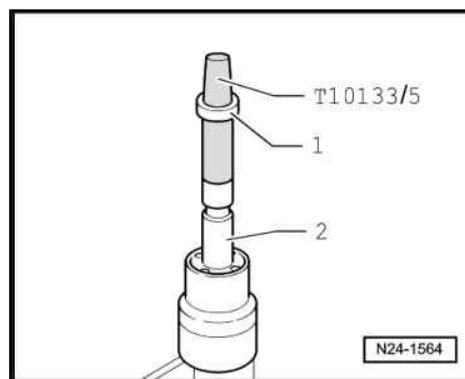
- Before new teflon ring is fitted, any combustion residue must be removed from ring groove and injector stem using a clean cloth.



Note

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

- Fit 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.



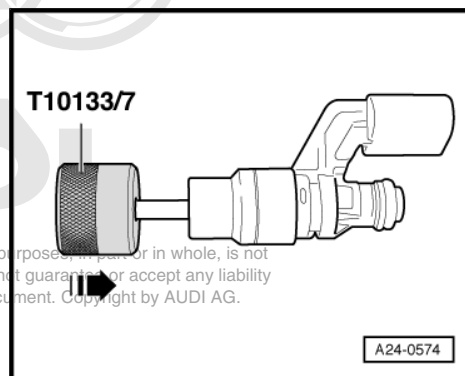
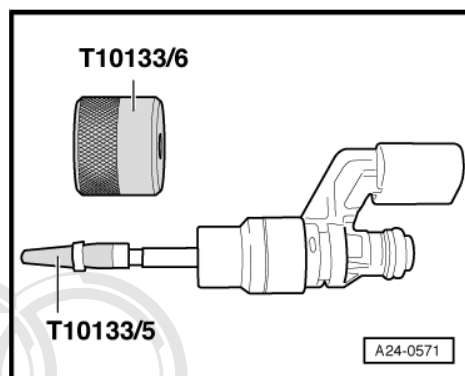
Note

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

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

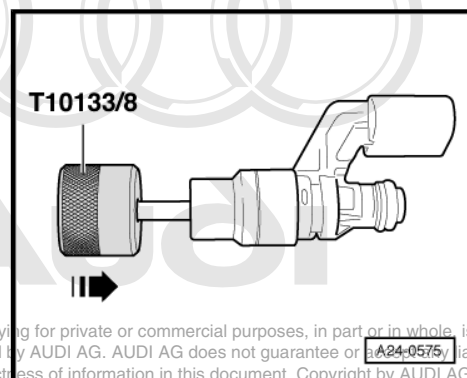
- Slide calibration sleeve -T10133/7- onto injector as far as the stop by pressing lightly and turning approx. 180°. Pull calibration sleeve -T10133/7- off again by turning it in the opposite direction.

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



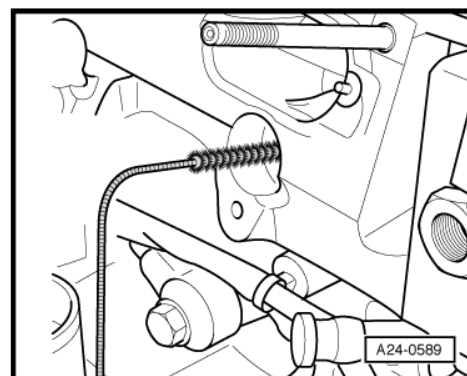
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- Slide calibration sleeve -T10133/8- onto injector as far as the stop by pressing lightly and turning approx. 180°. Pull calibration sleeve -T10133/8- off again by turning it in the opposite direction.
- Fit new O-ring on injector. Lubricate O-ring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



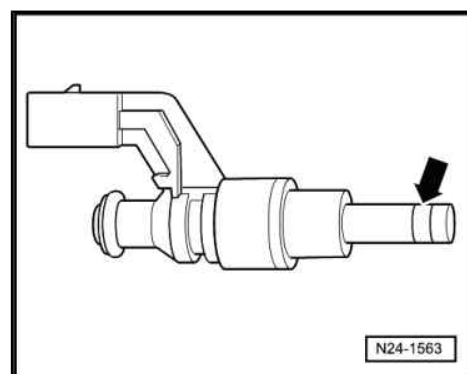
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- Before installing injectors, thoroughly clean apertures for injectors in cylinder head using supplied nylon brush - T10133/4- .



Note

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

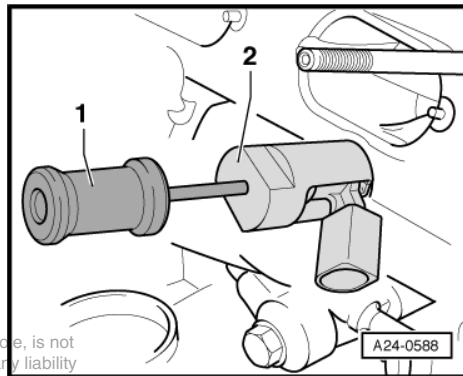




Note

- ◆ 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 teflon seal on the injector must not be oiled or greased.
- Make sure there is no cleaning fluid or oil in the cylinder head bores when installing the injectors.
- Coat O-rings of high-pressure injectors with clean engine oil to facilitate insertion into fuel rail.
- Renew all seals.
- Fuel rail must be positioned on injectors and pressed in evenly.
- Install intake manifold with fuel rail ⇒ [page 26](#) .

7.2 Cleaning injectors

Special tools and workshop equipment required

- ◆ Ultrasonic cleaning unit -VAS 6418-
- ◆ Mounting plate for injection modules -VAS 6418/1-
- ◆ Cleaning fluid -VAS 6418/2-

Cleaning

- Remove injectors ⇒ [page 42](#) .



Note

Observe safety precautions and operating instructions for ultrasonic unit.

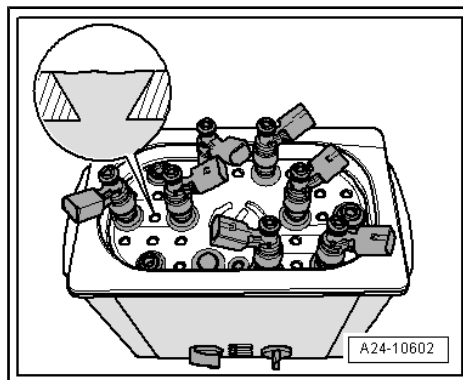
- Ultrasonic unit must be filled with cleaning fluid -VAS 6418/2- .



Note

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

- Insert injectors -1- all the way into mounting plate for injection modules -VAS 6418/1- -2-.

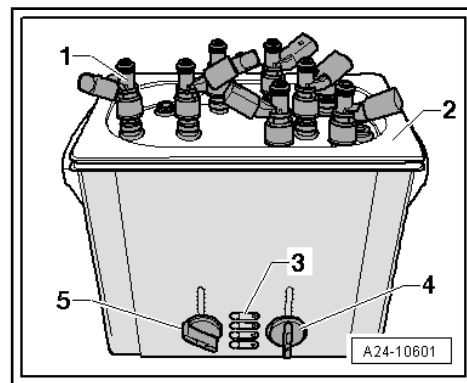


- Immerse injectors together with mounting plate for injection modules -VAS 6418/1- into cleaning fluid.
- Set rotary knob -4- to a temperature of 50°C.
- Select a cleaning time of 30 minutes with rotary knob -5-.
- Switch on ultrasonic unit with button -3-.



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 43](#) .
- Then re-install injectors ⇒ [page 42](#) .



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8 Senders and sensors

⇒ „8.1 Removing and installing air mass meter G70“, page 48

⇒ „8.2 Removing and installing fuel pressure sender G247“, page 48

⇒ „8.3 Checking fuel pressure sender G247“, page 50

⇒ „8.4 Checking fuel pressure and residual pressure (up to high-pressure pump)“, page 52

8.1 Removing and installing air mass meter -G70-

- Unplug electrical connector -1- at air mass meter -G70- .
- Unscrew both bolts from air mass meter -G70- and carefully pull air mass meter -G70- out of guide on air cleaner housing.

Installing

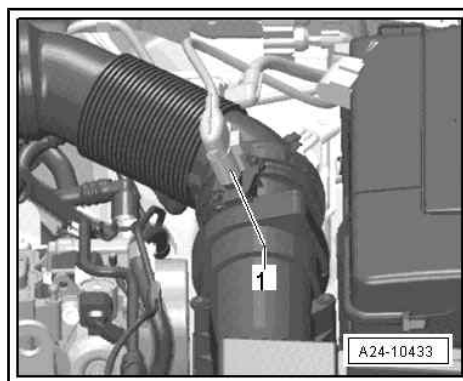
To ensure the proper function of the air mass meter -G70- it is important to observe the following notes and instructions.



Note

- ♦ *If the air filter element is very dirty or wet, dirt or water could reach the air mass meter -G70- and affect the air mass value. This would lead to loss of power, since a smaller injection quantity is calculated.*
- ♦ *Always use genuine part for air filter element.*
- ♦ *Use a silicone-free lubricant when installing the intake hose.*
- ♦ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue*
- Check for salt residue, dirt and leaves in air mass meter and air intake hose (engine intake side).
- Check for dirt in air duct leading to air filter element. If necessary, clean salt residue, dirt and leaves out of air cleaner housing (top and bottom sections); wash out or use a vacuum cleaner as required. Removing and installing air cleaner ⇒ [page 21](#)

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

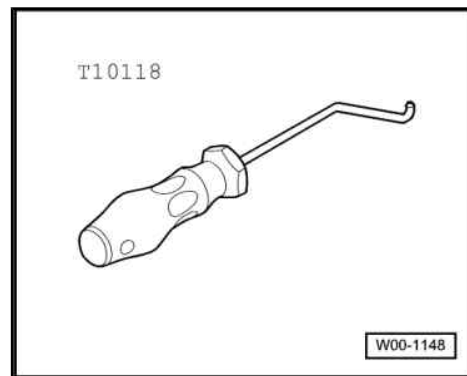


8.2 Removing and installing fuel pressure sender -G247-

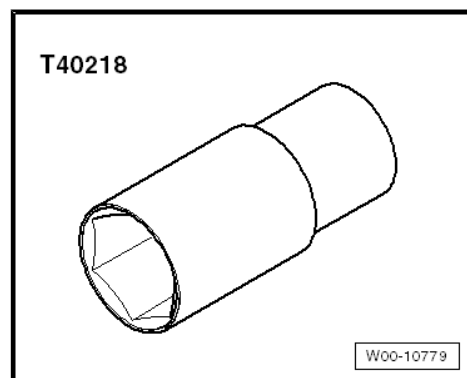
Special tools and workshop equipment required

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- ◆ Assembly tool -T10118-



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



Removing

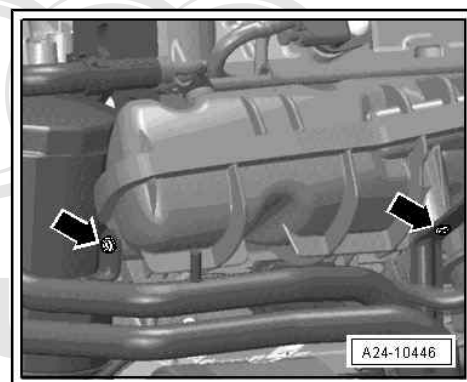
- Pull off top engine cover panel carefully.



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 4](#).

- Detach coolant pipe from intake manifold -arrows-.

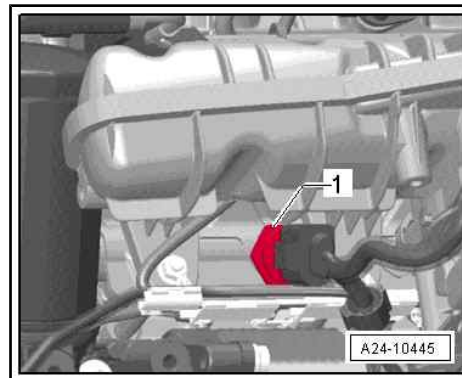


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- Release connector on fuel pressure sender -G247- using assembly tool -T10118- .
- Unscrew fuel pressure sender -G247- using bit, 27mm - T40218- .

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: Fuel rail - exploded view ⇒ [page 25](#)
- ◆ Tightening torque for fuel pressure sender -G247- : Fuel rail - exploded view ⇒ [page 25](#)



8.3 Checking fuel pressure sender -G247-

Special tools and workshop equipment required

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- ◆ Assembly tool -T10118-
- ◆ Double hexagon socket, 27 mm -VAS 5301/7-
- ◆ Pressure sensor tester -VAS 6394/1-
- ◆ Adapter -VAS 6394/2-
- ◆ Test instrument adapter -VAS 5570-
- ◆ Torque wrench -V.A.G 1331-
- ◆

Procedure:

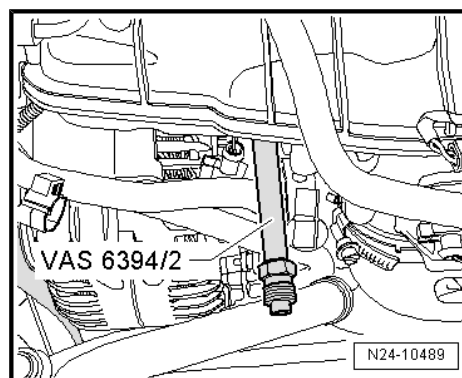
- Remove engine cover panel ⇒ [page 21](#) .



WARNING

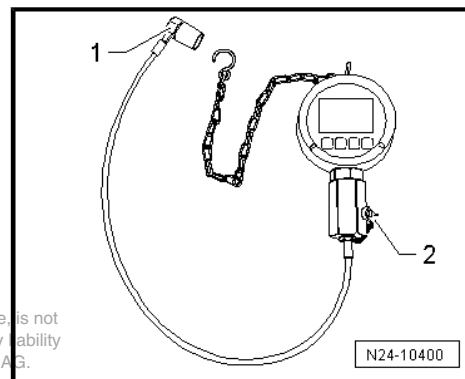
The fuel system is pressurised. The fuel pressure in the high-pressure part of the injection system must be reduced to a residual pressure prior to opening; for procedure see ⇒ [page 4](#) .

- Remove fuel pressure sender -G247- ⇒ [page 48](#) .
- 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: fuel rail - exploded view ⇒ [page 25](#)



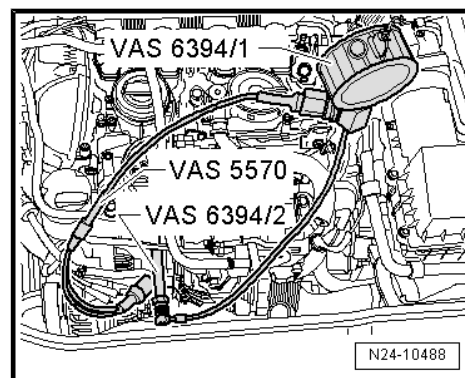
- Unscrew plug -2- on pressure gauge -VAS 6394/1- and screw in the removed fuel pressure sender -G247-. Tighten to torque normally specified for fuel pressure sender.

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- Use test instrument adapter -VAS 5570- to make electrical connection between vehicle and fuel pressure sender -G247-.
- Connect a vehicle diagnostic tester.
- Switch on ignition.
- Select „Engine electronics“ in vehicle self-diagnosis.
- Then select function read „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-.



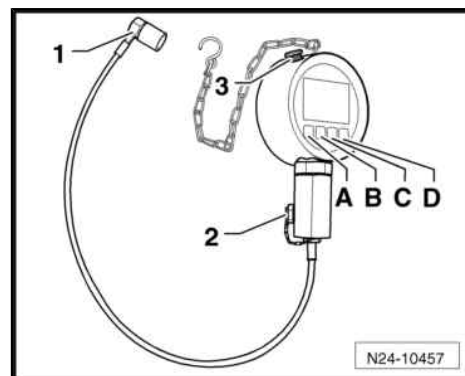
- Switch on pressure gauge -VAS 6394/1- by pressing button -A- once briefly.



Note

You can press and hold button -A- for 2 seconds to switch on the illumination for 20 seconds.

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

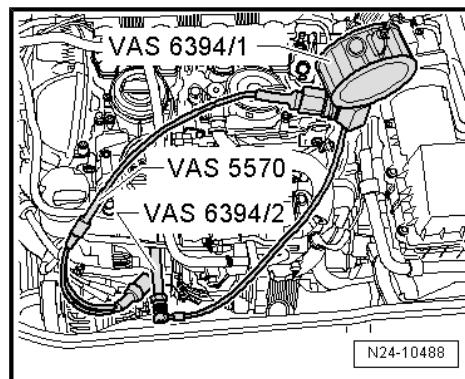


- Connect pressure line of pressure gauge -VAS 6394/1- to adapter -VAS 6394/2- .
- Start engine.
- Compare the pressure indicated by pressure gauge -VAS 6394/1- with the actual pressure value on the vehicle diagnostic tester .
- The pressure readings must not deviate by more than 5 bar.
- If the deviation 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 4](#) .



- 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:

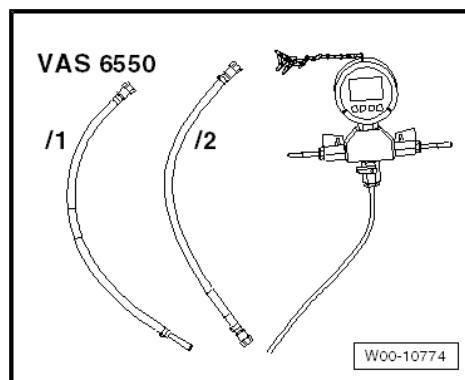
- Install the new fuel pressure sender -G247- ⇒ [page 48](#) .

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8.4 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

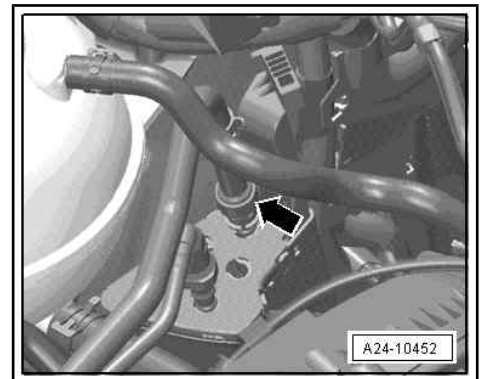


WARNING

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.

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

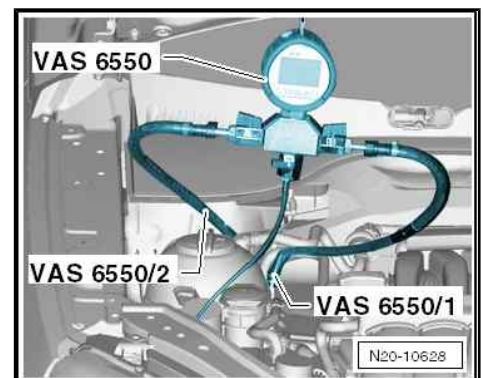
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- Connect pressure tester -VAS 6550- with adapters -VAS 6550/1- and -VAS 6550/2- to fuel supply line.
- Make sure that drain tap (centre hose) is closed and cut-off valves (left and right) are open.
- Switch on ignition.
- Fuel pump will run for approx.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

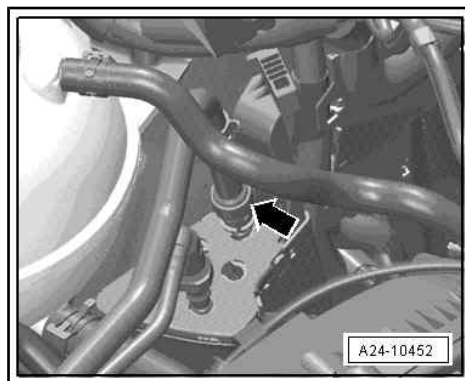
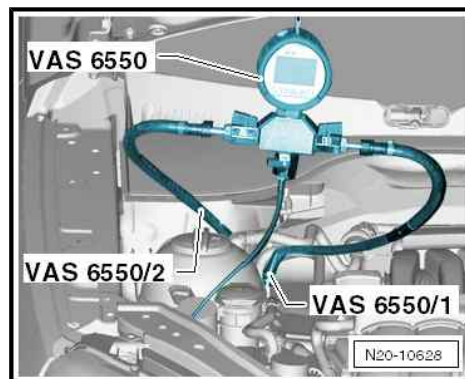
- The ignition must be switched off.



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.

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



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9 Lambda probe

⇒ „9.1 Lambda probes - overview“, page 55

⇒ „9.2 Removing and installing Lambda probe G39 and Lambda probe heater Z19 before catalytic converter (engine code CAWB)“, page 58

⇒ „9.3 Removing and installing Lambda probe G39 and Lambda probe heater Z19 before catalytic converter (engine codes CCTA and CCZA)“, page 59

⇒ „9.4 Removing and installing Lambda probe G39 and Lambda probe heater Z19 before catalytic converter (engine code CBFA)“, page 61

⇒ „9.5 Removing and installing Lambda probe after catalytic converter G130 and Lambda probe 1 heater after catalytic converter Z29 (engine codes CCTA and CCZA)“, page 61

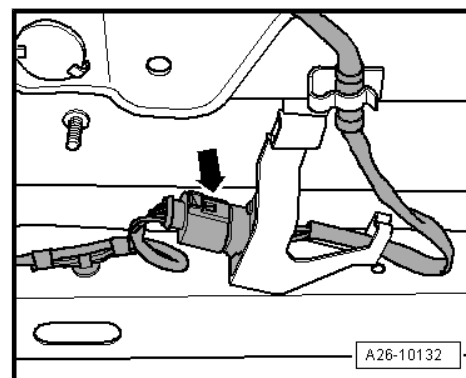
⇒ „9.6 Removing and installing Lambda probe after catalytic converter G130 and Lambda probe 1 heater after catalytic converter Z29 (engine code CBFA)“, page 62

⇒ page 63

9.1 Lambda probes - overview

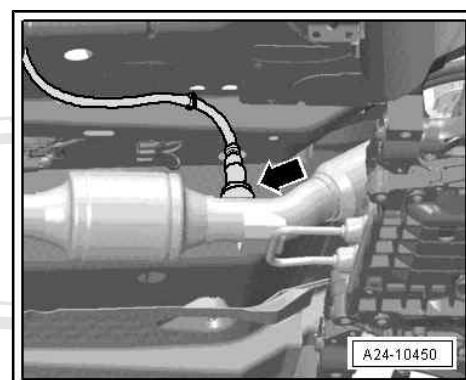
Fitting location for engine code CAWB

-Arrow- electrical connector for Lambda probe -G39- and Lambda probe heater -Z19-



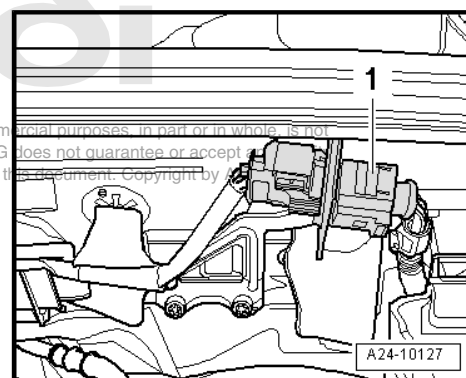
Fitting location for engine code CAWB

-Arrow- indicates Lambda probe -G39- and Lambda probe heater -Z19-



Fitting location for engine codes CCTA, CBFA and CCZA

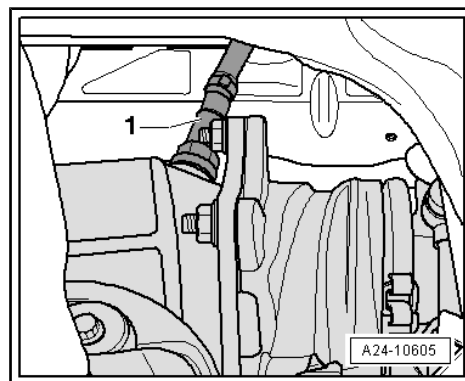
1 - Electrical connector for Lambda probe -G39- and Lambda probe heater -Z19-



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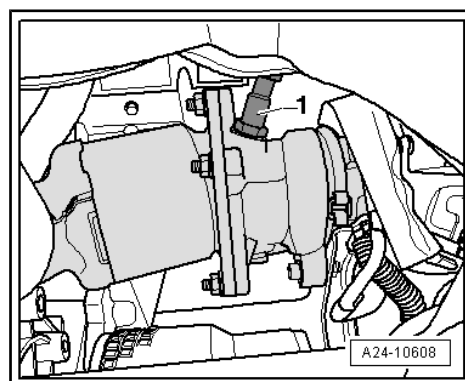
Fitting location for engine codes CCTA and CCZA

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



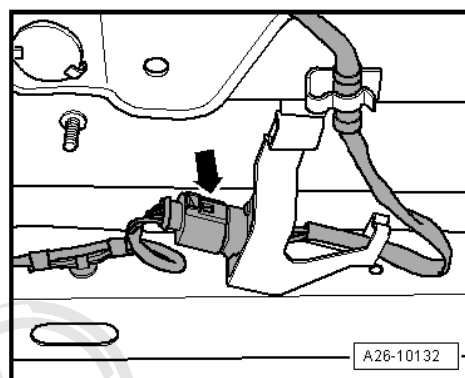
Fitting location for engine code CBFA

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



Fitting location for engine codes CCTA and CCZA

-Arrow- electrical connector for Lambda probe after catalytic converter -G130- and Lambda probe 1 heater after catalytic converter -Z29-



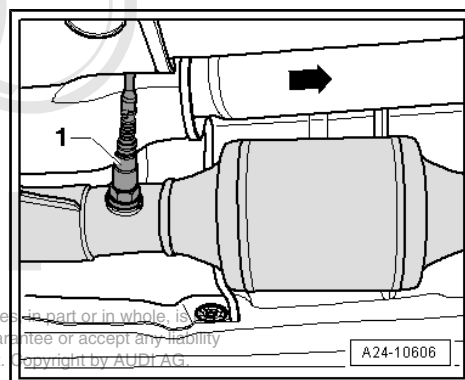
Fitting location for engine codes CCTA and CCZA

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



Note

The arrow in the illustration points in the direction of travel.



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Fitting location for engine code CBFA

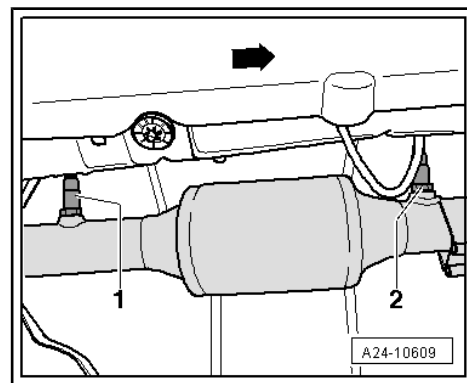
1 - Lambda probe 3 after catalytic converter -G287- and Lambda probe heater 3 after catalytic converter -Z64-

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



Note

The arrow in the illustration points in the direction of travel.



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Fitting location for engine code CBFA

1 - Electrical connector for Lambda probe 3 after catalytic converter -G287- and Lambda probe heater 3 after catalytic converter -Z64-

2 - Electrical connector for Lambda probe after catalytic converter -G130- and Lambda probe 1 heater after catalytic converter -Z29-



Note

- ◆ *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- ◆ *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. High-temperature paste → Parts catalogue*
- ◆ *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*

- Tightening torque: 55 Nm

Engine code CAWB: Removing and installing Lambda probe - G39- and Lambda probe heater -Z19-

⇒ „9.2 Removing and installing Lambda probe G39 and Lambda probe heater Z19 before catalytic converter (engine code CAWB)“, page 58

Engine codes CCTA and CCZA: Removing and installing Lambda probe -G39- and Lambda probe heater -Z19- before catalytic converter

⇒ „9.3 Removing and installing Lambda probe G39 and Lambda probe heater Z19 before catalytic converter (engine codes CCTA and CCZA)“, page 59

Engine code CBFA: Removing and installing Lambda probe - G39- and Lambda probe heater -Z19- before catalytic converter

⇒ „9.4 Removing and installing Lambda probe G39 and Lambda probe heater Z19 before catalytic converter (engine code CBFA)“, page 61

Engine codes CCTA and CCZA: Removing and installing Lambda probe after catalytic converter -G130- and Lambda probe 1 heater after catalytic converter -Z29-

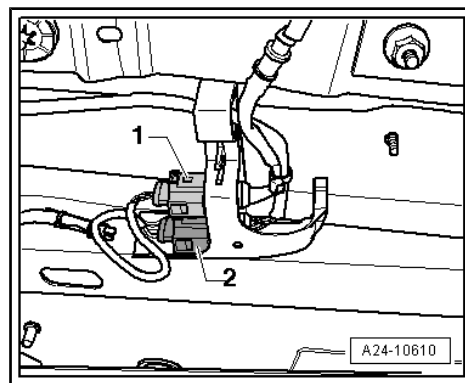
⇒ „9.5 Removing and installing Lambda probe after catalytic converter G130 and Lambda probe 1 heater after catalytic converter Z29 (engine codes CCTA and CCZA)“, page 61

Engine code CBFA: Removing and installing Lambda probe after catalytic converter -G130- and Lambda probe 1 heater after catalytic converter -Z29-

⇒ „9.6 Removing and installing Lambda probe after catalytic converter G130 and Lambda probe 1 heater after catalytic converter Z29 (engine code CBFA)“, page 62

Engine code CBFA: Removing and installing Lambda probe 3 after catalytic converter -G287- and Lambda probe heater 3 after catalytic converter -Z64-

⇒ „9.7 Removing and installing Lambda probe 3 after catalytic converter G287 and Lambda probe heater 3 after catalytic converter Z64 (engine code CBFA)“, page 63

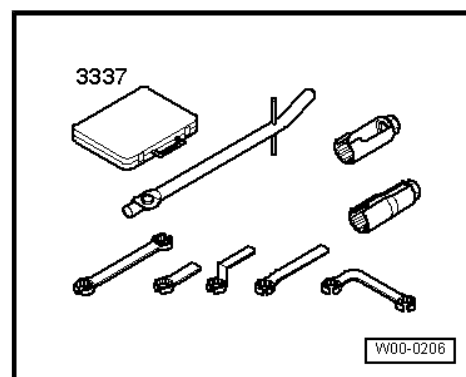


9.2 Removing and installing Lambda probe -G39- and Lambda probe heater -Z19-

before catalytic converter (engine code CAWB)

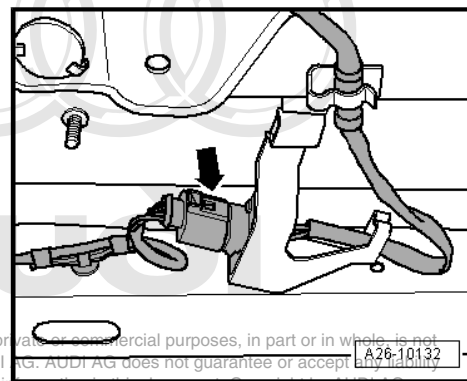
Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set -3337-



Removing Lambda probe

- Remove cover (right-side) from underbody.
- Unplug electrical connector -arrow- for Lambda probe -G39- and Lambda probe heater -Z19- .



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

Installing Lambda probe

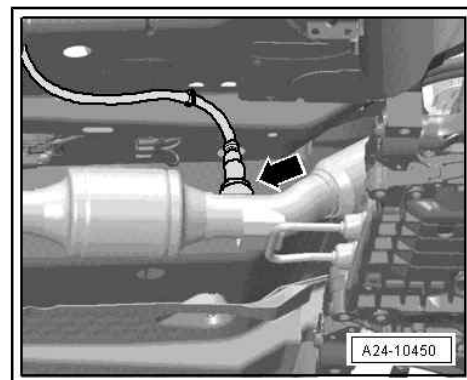
When installing, note the following:



Note

- ◆ *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- ◆ *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. High-temperature paste → Parts catalogue*
- ◆ *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*

- Tightening torque: Lambda probe - overview ➔ [page 55](#)

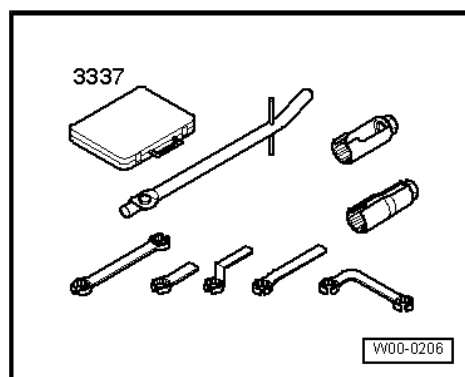


9.3 Removing and installing Lambda probe -G39- and Lambda probe heater -Z19-

before catalytic converter (engine codes CCTA and CCZA)

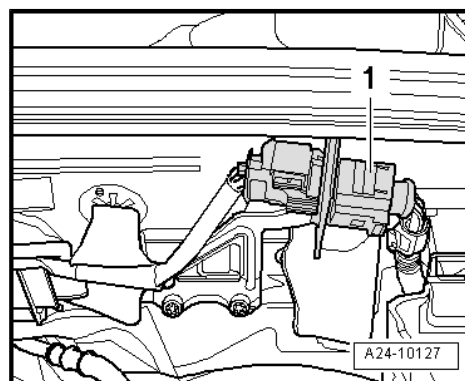
Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set -3337-



Removing Lambda probe

- Unplug electrical connector -1- for Lambda probe -G39- and Lambda probe heater -Z19- .



- Unscrew Lambda probe -G39- -1- using tool from Lambda probe open ring spanner set -3337- .

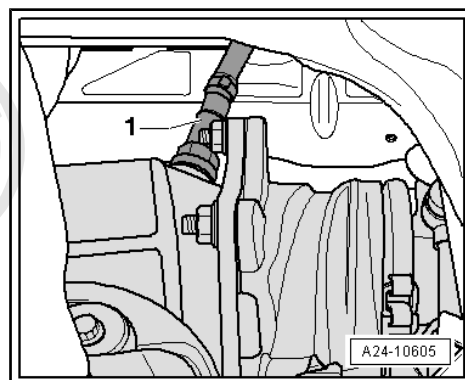
Installing Lambda probe

When installing, note the following:



Note

- ◆ *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- ◆ *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. High-temperature paste ⇒ Parts catalogue*
- ◆ *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*

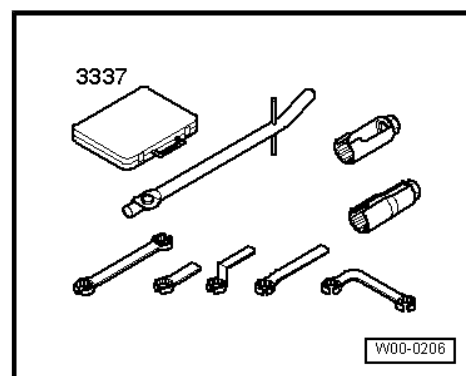


- Tightening torque: Lambda probe - overview ⇒ [page 55](#)

9.4 Removing and installing Lambda probe -G39- and Lambda probe heater -Z19- before catalytic converter (engine code CBFA)

Special tools and workshop equipment required

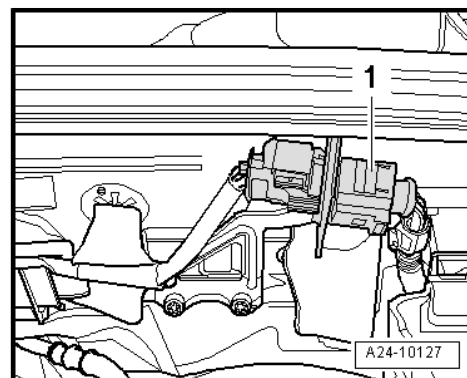
- ◆ Lambda probe open ring spanner set -3337-



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Removing Lambda probe

- Unplug electrical connector -1- for Lambda probe -G39- and Lambda probe heater -Z19- .



- Unscrew Lambda probe -G39- -1- using tool from Lambda probe open ring spanner set -3337- .

Installing Lambda probe

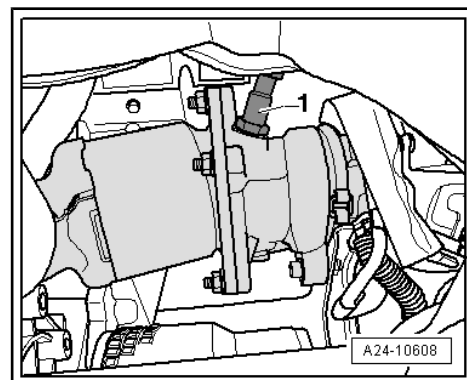
When installing, note the following:



Note

- ◆ *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- ◆ *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. High-temperature paste ⇒ Parts catalogue*
- ◆ *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*

- Tightening torque: Lambda probe - overview ⇒ [page 55](#)

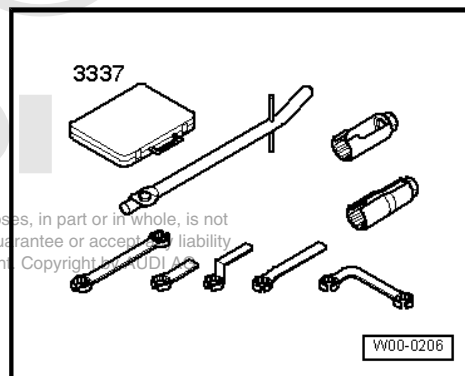


9.5 Removing and installing Lambda probe after catalytic converter -G130- and Lambda probe 1 heater after catalytic

converter -Z29- (engine codes CCTA and CCZA)

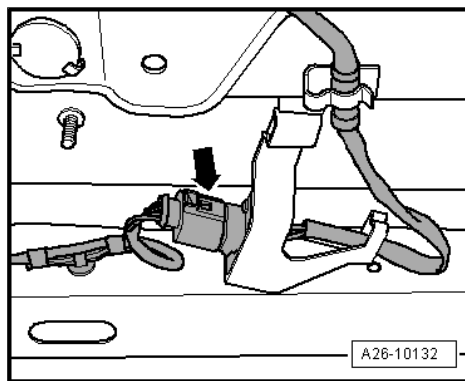
Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set -3337-



Removing Lambda probe

- Remove cover (right-side) from underbody.
- Unplug electrical connector -arrow- for Lambda probe after catalytic converter -G130- and Lambda probe 1 heater after catalytic converter -Z29- .



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

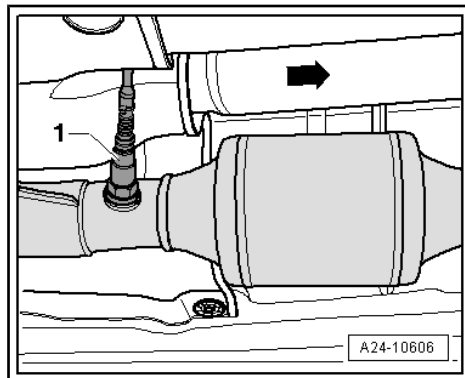
Installing Lambda probe

When installing, note the following:



Note

- ◆ *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- ◆ *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. High-temperature paste ⇒ Parts catalogue*
- ◆ *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*



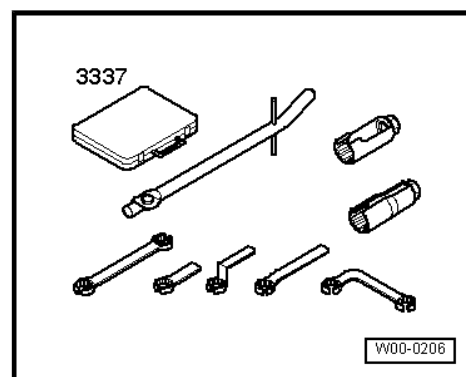
- Tightening torque: Lambda probe - overview ⇒ [page 55](#)

9.6 Removing and installing Lambda probe after catalytic converter -G130- and

Lambda probe 1 heater after catalytic converter -Z29- (engine code CBFA)

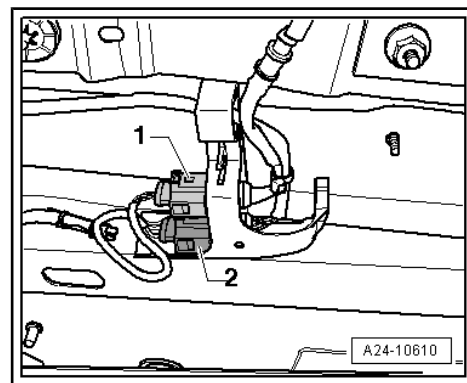
Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set -3337-



Removing Lambda probe

- Remove cover (right-side) from underbody.
- Unplug electrical connector -2- for Lambda probe after catalytic converter -G130- and Lambda probe 1 heater after catalytic converter -Z29-.



- Unscrew Lambda probe after catalytic converter -G130- -2- using tool from Lambda probe open ring spanner set -3337-.

Installing Lambda probe

When installing, note the following:

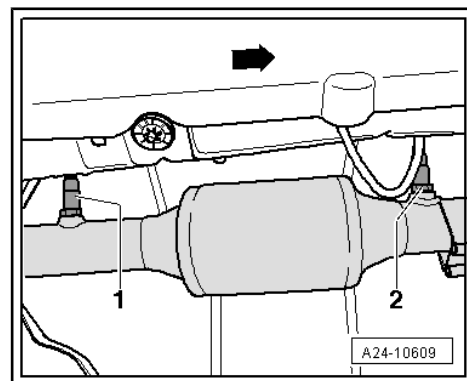
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Note

- ◆ *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- ◆ *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. High-temperature paste → Parts catalogue*
- ◆ *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*

- Tightening torque: Lambda probe - overview ➔ [page 55](#)

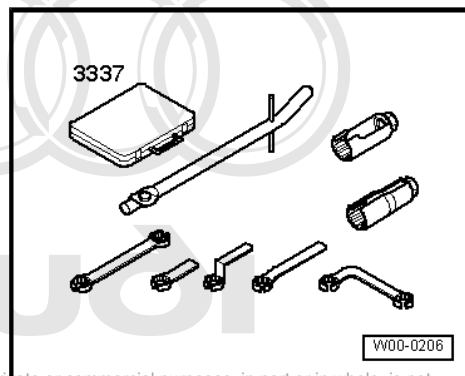


9.7 Removing and installing Lambda probe 3 after catalytic converter -G287- and

Lambda probe heater 3 after catalytic converter -Z64- (engine code CBFA)

Special tools and workshop equipment required

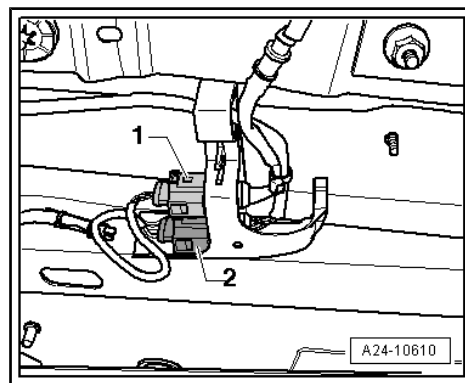
- ◆ Lambda probe open ring spanner set -3337-



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Removing Lambda probe

- Remove cover (right-side) from underbody.
- Unplug electrical connector -1- for Lambda probe 3 after catalytic converter -G287- and Lambda probe heater 3 after catalytic converter -Z64- .



- Unscrew Lambda probe 3 after catalytic converter -G287- -1- using tool from Lambda probe open ring spanner set -3337- .

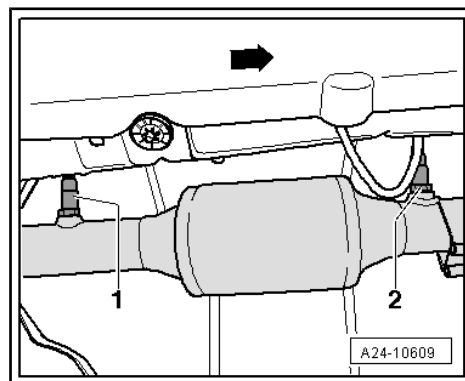
Installing Lambda probe

When installing, note the following:



Note

- ◆ *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- ◆ *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. High-temperature paste → Parts catalogue*
- ◆ *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*
- Tightening torque: Lambda probe - overview ⇒ [page 55](#)



10 Engine control unit

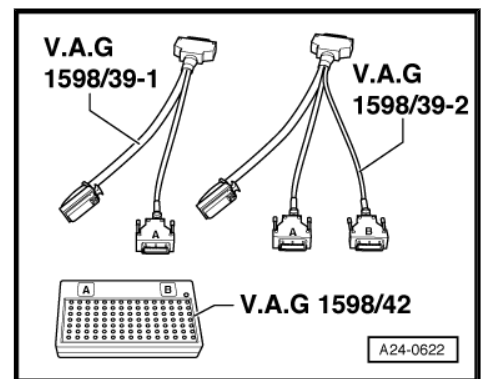
⇒ „10.1 Wiring and component check with test box V.A.G 1598/42“
„ page 65

⇒ „10.2 Renewing engine control unit J623“, page 67

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

Special tools and workshop equipment required

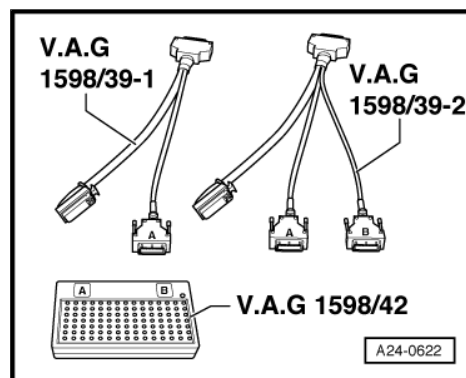
- ◆ Adapter cable -V.A.G 1598/39-1-
- ◆ Adapter cable -V.A.G 1598/39-2-
- ◆ Test box -V.A.G 1598/42-





Note

- ◆ The test box has 105 sockets. The connecting cable can be disconnected from the test box. This means that only the cable (and not the test box) has to be purchased for future engine control units with different types of connectors.
- ◆ The smaller of the two connectors on the engine control unit has the contacts 1 to 60. The larger of the two connectors has the contacts 1 to 94.
- ◆ To carry out tests on the 60-pin wiring harness connector, the adapter cable -V.A.G 1598/39-1- is connected to connector -A- on the test box. For components connected to 60-pin wiring harness connector → Current flow diagrams, Electrical fault finding and Fitting locations.
- ◆ To carry out tests on the 94-pin wiring harness connector, the adapter cable -V.A.G 1598/39-2- must be connected to connectors -A- and -B- on the test box. For components connected to 94-pin wiring harness connector → Current flow diagrams, Electrical fault finding and Fitting locations.
- ◆ The test box -V.A.G 1598/42- is designed so it can be connected both to the wiring harness for the engine control unit and to the engine control unit itself at the same time.
- ◆ The advantage of this is that the electronic engine control system remains fully functional when the test box is connected (for example, for measuring signals when the engine is running).
- ◆ The relevant test procedure will state whether it is necessary to also connect the engine control unit to the test box.
- ◆ 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.

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The engine control unit has to be removed before multi-pin connectors can be unplugged from engine control unit ⇒ [page 67](#).

- Connect test box -V.A.G 1598/42- to wiring harness connector. The earth clip on the test box must be connected to the negative battery terminal. The instructions for performing the individual tests indicate whether or not the engine control unit itself also needs to be connected to the test box.
- Carry out test as described in appropriate repair procedures.

Installing engine control unit

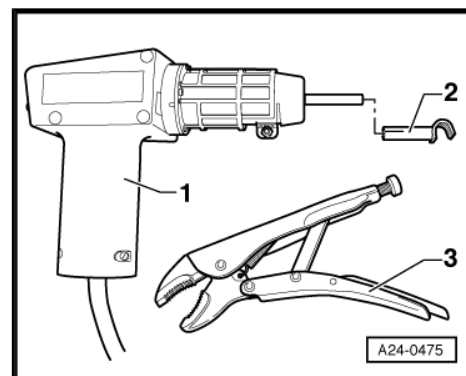
Installation is performed in the reverse sequence.

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

10.2 Renewing engine control unit -J623-

Special tools and workshop equipment required

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

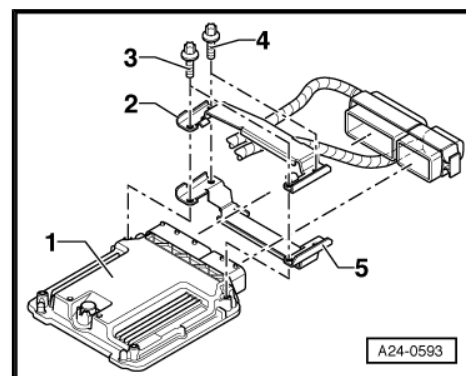


- ◆ Mole grips (commercially available) -3-



Note

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



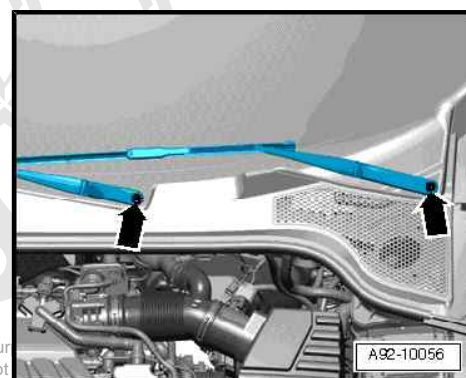
Removing

- When renewing engine control unit, select diagnosis object „Replace engine control unit“ in „Guided Functions“ ⇒ Vehicle diagnostic tester.
- Switch off ignition and remove ignition key.
- Lever off caps on windscreen wiper arms with a screwdriver.
- Loosen hexagon nuts -arrows- several turns.
- Loosen wiper arms from wiper shafts by tilting them slightly.
- Completely remove hexagon nuts and detach wiper arms from wiper shafts.



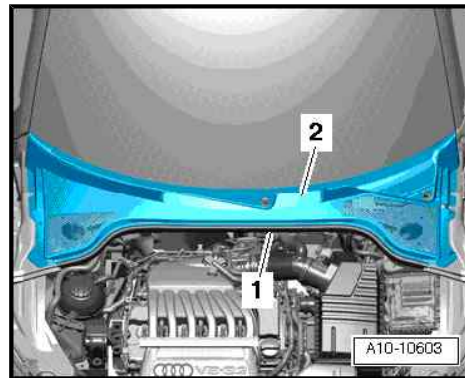
Note

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



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

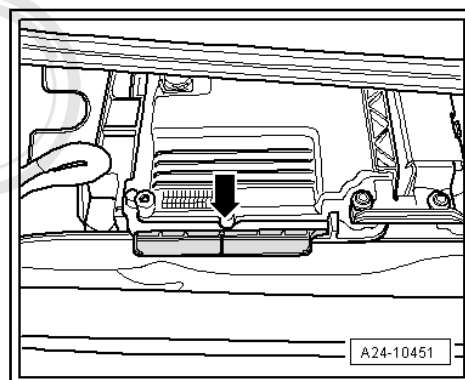


- Release clip -arrow- and remove engine control unit -J623- .

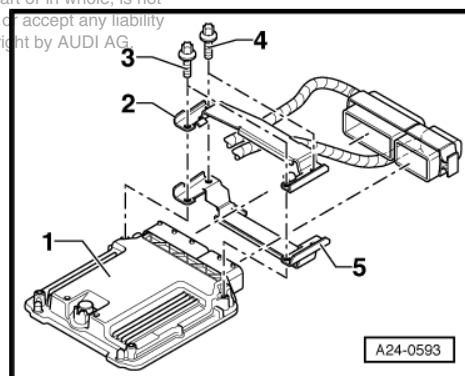


Note

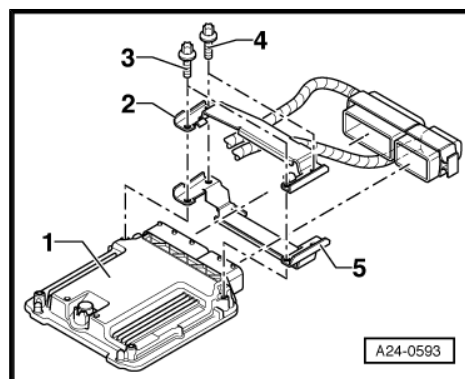
Cover painted surfaces with a cloth to prevent scratching.



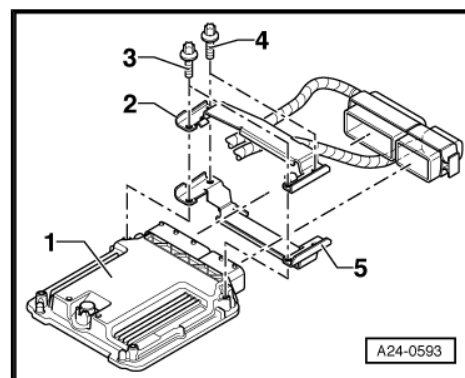
To help prevent unauthorised access to the connectors on the engine control unit, the control unit is secured by means of shear bolts to a locking plate and a metal casing.



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



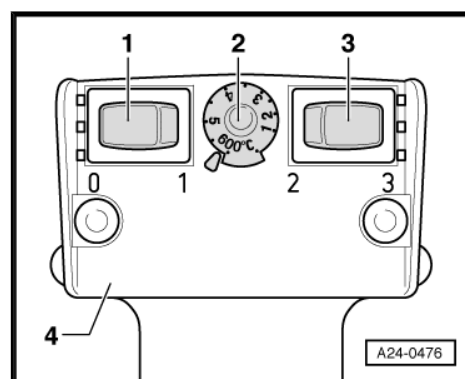
The threads of the two shear bolts -3- which are screwed into the engine control unit are not secured with locking fluid. Do not apply heat to the threads in the control unit housing; this is not necessary and would cause overheating of the control unit.



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

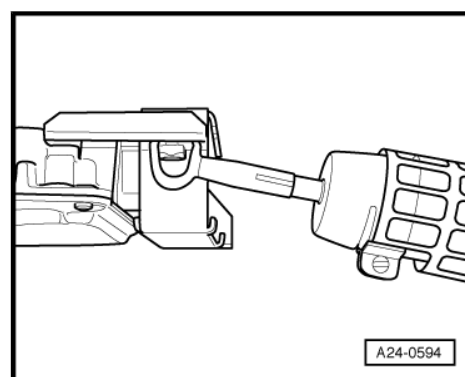
 **WARNING**

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



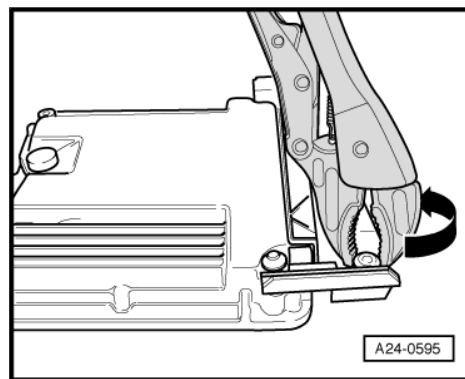
Apply heat to the threads of the shear bolts on the connector side as shown in the illustration.

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





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



Installing engine control unit

Installation is performed in the reverse sequence.

- Make sure you fit protective housing (if fitted) back on engine 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.

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 General notes and safety precautions

⇒ „1.1 General notes on ignition system“, page 71

⇒ „1.2 Safety precautions“, page 71

1.1 General notes on ignition system

- ◆ The engine control unit has a self-diagnosis capability.
- ◆ A voltage of at least 11.5 V is required for proper operation of the electrical components.
- ◆ Certain tests may lead to a fault being detected by the control unit and stored. The event memory should therefore be interrogated and (if necessary) erased after completing the tests and any repair work that may be required.
- ◆ If the engine starts, runs for a short period and then cuts out after completing fault finding, repairs or component tests, this may be due to the immobilizer disabling the engine control unit. The event memory must then be interrogated and, if necessary, the control unit must be adapted.

1.2 Safety precautions

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



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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.*

To prevent injuries to persons and/or irreparable damage to the fuel injection and ignition system, the following must be noted:

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



2 Servicing ignition system

⇒ „2.1 Test data“, page 72

⇒ „2.2 Ignition system - exploded view“, page 72

⇒ „2.3 Removing and installing ignition coils with output stages“, page 73

⇒ „2.4 Removing and installing knock sensor 1 G61“, page 74

2.1 Test data

Engine data	2.0 ltr. 147 kW turbo FSI engine
Idling speed is not adjustable; controlled by the idling speed stabilisation	640...800 rpm
Engine speed limiter (deactivates injectors/closes throttle valve)	approx. 6,500 rpm
Ignition timing is determined by the control unit. Ignition timing cannot be adjusted.	
Ignition system	Multi-coil ignition system with 4 ignition coils (integrated output stages) connected directly to spark plugs via spark plug connectors; ignition coils can be pulled out of cylinder head using puller - T40039 -
Firing order	1-3-4-2

2.2 Ignition system - exploded view

1 - Knock sensor 1 -G61-

- ☐ Contacts gold-plated
- ☐ Before removing, re-move coolant distributor housing
- ☐ Removing and installing
⇒ [page 74](#)

2 - Knock sensor 2 -G66-

- ☐ Not installed in all vehicles
- ☐ Contacts gold-plated

3 - Ignition coil with output stage -(N70, N127, N291, N292)-

- ☐ Removing and installing
⇒ [page 73](#)
- ☐ Use puller -T40039- for removal

4 - Spark plug

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

5 - Bolt

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

6 - Bolt

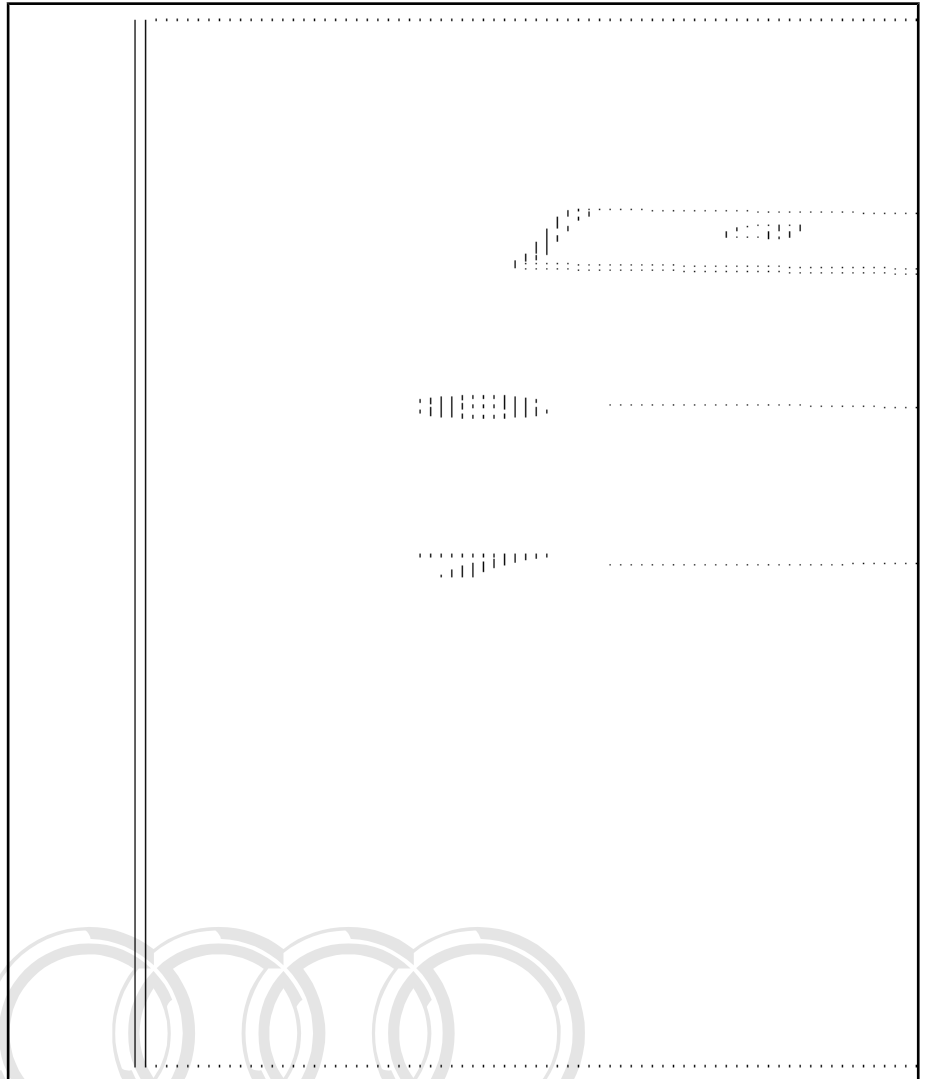
- ☐ 10 Nm

7 - Hall sender -G40-

- ☐ Contacts gold-plated

8 - O-ring

- ☐ Renew O-Ring if damaged

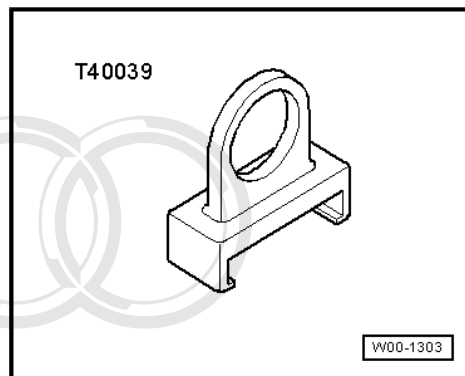


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2.3 Removing and installing ignition coils with output stages

Special tools and workshop equipment required

◆ Puller -T40039-

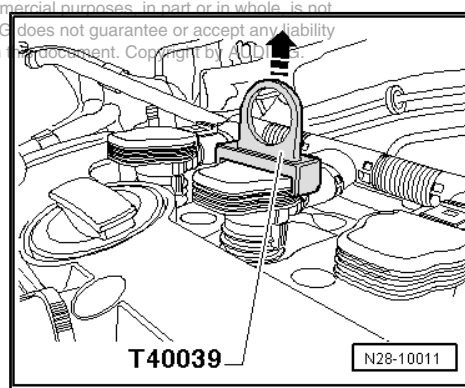


Removing:

- 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).



2.4 Removing and installing knock sensor 1 -G61-

Removing

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



Note

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

- Unscrew knock sensor 1 -G61- .

Installing

- Install in reverse order.
- Tightening torque: refer to exploded view of ignition system ⇒ [page 72](#) .

