Workshop Manual

Audi TT 2007 ➢

Direct petrol injection and ignition system (4-cyl. 1.8 ltr., 2.0 ltr. 4-valve turbo with timing chain)									
Engine ID	CDA A	CCZ A	CCT A	CES A	CET A				

Edition 06.2010

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

Repair Group

24 - Mixture preparation - injection

28 - Ignition system

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

Contents

24 – Mixture preparation - injection

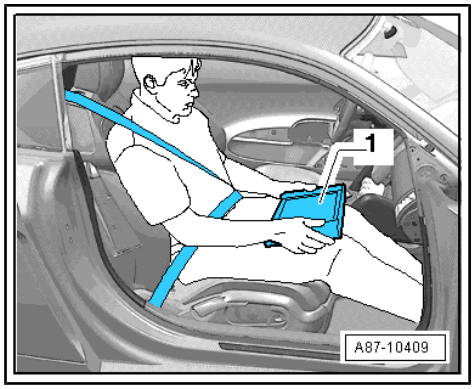
1 Safety precautions and rules for cleanliness

1.1 General notes on self-diagnosis

- The engine control unit has a self-diagnosis capability. Before carrying out repairs and fault finding, the 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

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.*

◆ *Move the passenger's seat back as far as it will go.*

◆ *Use only vehicle diagnosis and service information system -VAS 5052 A- or diagnosis system -VAS 5053- .*

◆ *The test equipment -1- must rest flat on the passenger's thighs (as shown in illustration) and must be operated by the passenger.*

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 .

The connection must be opened immediately after reducing the pressure; wrap a cloth around the connection and allow the residual pressure (approx. 6 bar) to dissipate.

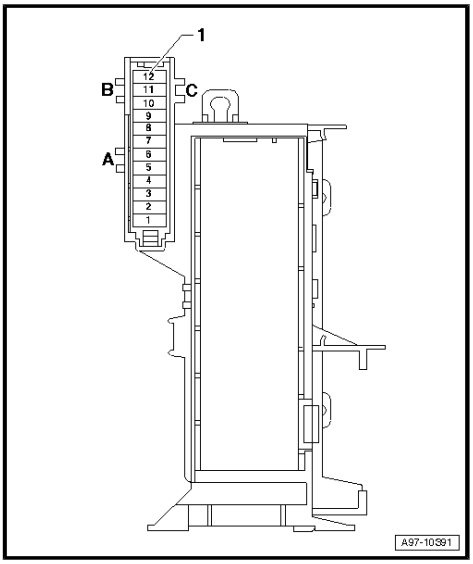
Caution

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

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

– Disconnect battery ⇒ Rep. Gr. 27 .

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



- For safety reasons, the battery must be disconnected before opening the fuel system to prevent the fuel pump from being activated by the contact switch on the driver's door.
- Persons wearing a cardiac pacemaker must at all times maintain a safe distance from high-voltage components such as the ignition system and gas-discharge headlights.
- Do not open any fuel line connections while the engine is running.
- Always switch off the ignition before connecting or disconnecting injection or ignition system wiring or tester cables.
- If engine is to be operated at cranking speed without it starting (e.g. compression test), unplug connectors from ignition coils and remove fuse for electric fuel pump.
- Certain tests may lead to a fault being detected by the control unit and stored. The 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.
- If the engine has to be operated at the starting speed without actually starting (e.g. to test compression pressure), detach the four connectors from the ignition coils using assembly tool -T40039- ⇒ page 84 . Also remove fuse for fuel pump control unit -J538- .

Note

- *The fuse is located in the fuse holder in the luggage compartment (right-side).*
- *Removing the fuse will interrupt the voltage supply "terminal 30" for the fuel pump control unit -J538- . ⇒ Current flow diagrams, Electrical fault finding and Fitting locations*

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

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

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

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

⚠ Caution

The injection system consists of a high-pressure section (maximum approx. 150 bar) and a low-pressure section (approx. 7 bar).

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

Reducing fuel pressure in high-pressure section

– Connect 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

– The fuse is located in the fuse holder in the luggage compartment (right-side).

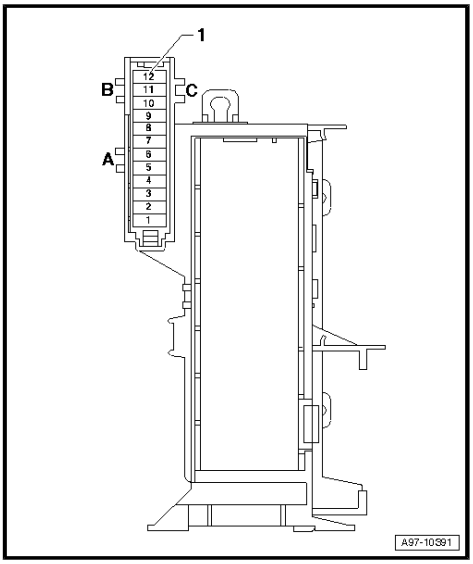
– Remove luggage compartment trim (rear right) ⇒ Rep. Gr. 70 .

– With engine idling, pull out fuse for fuel pump control unit -J538- ⇒ 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.



Note

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

WARNING

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

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

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

The following operations must be performed after completing repair work:

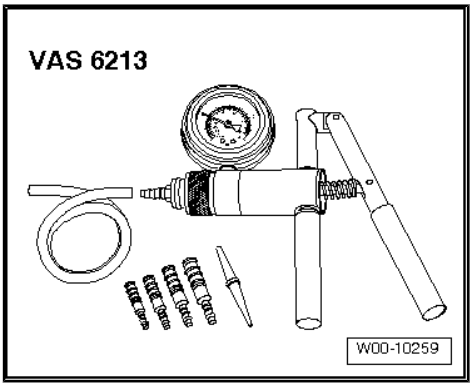
– Refit fuse.

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

1.6 Checking vacuum system

Special tools and workshop equipment required

♦ Hand vacuum pump -VAS 6213-



Procedure

– Check all vacuum lines in the complete vacuum system for:

♦ Cracks

- ♦ Traces of animal bites
- ♦ Kinked or crushed lines
- ♦ Lines porous or leaking

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

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

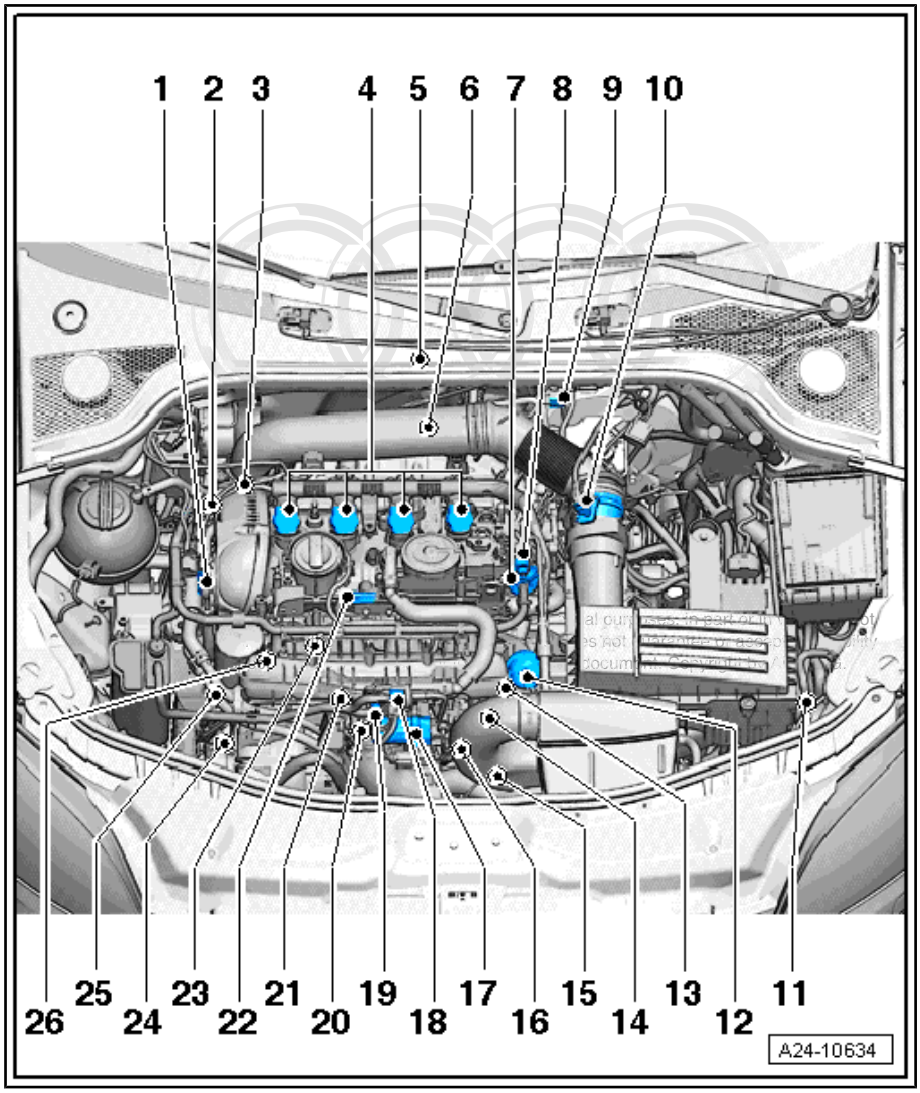
2 Technical data

Engine data		1.8 ltr. and 2.0 ltr. turbo FSI engine
Idling speed is not adjustable; controlled by the idling speed stabilisation		640 ... 800 rpm
Maximum rpm governed by deactivation of fuel injectors		6500 rpm
Fuel pressure	Initial fuel pressure up to high-pressure pump (generated by electric fuel pump in fuel tank)	3.0 to 7.0 bar (identical for all operating conditions)
	Pressure in high-pressure fuel circuit (generated by mechanical single-plunger pump) at a coolant temperature of approx. 85°C.	approx. 40 bar at idling speed approx. 150 bar in certain parts of operating range.

3 Overviews - fitting locations

3.1 Overview - fitting locations (engine codes CDAA, CCZA and CCTA)

Components A to K are not shown in the overview.



1 - Camshaft control valve 1 -N205-

- ❑ Fitting location ⇒ page 14
- ❑ Removing and installing ⇒ Rep. Gr. 15

2 - Charge pressure control solenoid valve -N75-

- ❑ Located directly on turbocharger ⇒ page 17
- ❑ Removing and installing ⇒ Rep. Gr. 21

3 - Turbocharger air recirculation valve -N249-

- ❑ Located directly on turbocharger ⇒ page 17
- ❑ Removing and installing ⇒ Rep. Gr. 21

4 - Ignition coils with output stages

- ❑ Removing and installing ⇒ page 84
- ❑ 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-

- ❑ Fitting location ⇒ page 11
- ❑ Removing and installing ⇒ page 77

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

- ❑ Fitting location ⇒ page 17
- ❑ Lambda probes - overview ⇒ page 71

7 - High-pressure pump

- ❑ Fitting location (engine code CDAA, 1.8 ltr.) ⇒ page 12
- ❑ Fitting location (engine codes CCZA and CCTA, 2.0 ltr.) ⇒ page 12
- ❑ Removing and installing ⇒ page 50

8 - Fuel pressure regulating valve -N276-

- ❑ Fitting location (engine code CDAA, 1.8 ltr.) ⇒ page 12
- ❑ Fitting location (engine codes CCZA and CCTA, 2.0 ltr.) ⇒ page 12

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

- ❑ Fitting location ⇒ page 16

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

- ❑ Removing and installing ⇒ page 65

11 - Radiator outlet coolant temperature sender -G83-

- ❑ Fitting location ⇒ page 16

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

- ❑ Fitting location ⇒ page 13

13 - Intake manifold flap valve -N316-

- ❑ Fitting location ⇒ page 13

14 - Engine speed sender -G28-

- ❑ Fitting location ⇒ page 15
- ❑ Removing and installing ⇒ page 85
- ❑ 4.5 Nm

15 - Charge pressure sender -G31-

- ❑ Fitting location ⇒ page 16

16 - Electrical connectors

- ❑ From knock sensor 1 -G61- , fitting location ⇒ page 15
- ❑ From Hall sender -G40- , fitting location ⇒ page 15
- ❑ For injectors, fitting location ⇒ page 15

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

- ❑ Throttle valve drive angle sender 1 for electric throttle -G187- and throttle valve drive angle sender 2 for electric throttle -G188-
- ❑ After throttle valve module -J338- has been renewed, it must be re-adapted to engine control unit -J623- , see vehicle diagnostic, testing and information system -VAS 5051B-

18 - Activated charcoal filter solenoid valve 1 -N80-

- ❑ Fitting location ⇒ page 13

19 - Intake air temperature sender -G42-

20 - Knock sensor 1 -G61-

- ❑ Fitting location ⇒ page 13
- ❑ 20 Nm
- ❑ Removing and installing ⇒ page 85

21 - Coolant temperature sender -G62-

- ❑ Fitting location ⇒ page 15
- ❑ Removing and installing ⇒ Rep. Gr. 19

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

23 - Fuel pressure sender -G247-

- ❑ 27 Nm
- ❑ Fitting location ⇒ page 13
- ❑ Removing and installing ⇒ page 59

24 - Valve for oil pressure control -N428-

- ❑ Fitting location ⇒ page 14
- ❑ Removing and installing ⇒ Rep. Gr. 17

25 - Oil pressure switch

- ❑ Oil pressure switch for reduced oil pressure -F378-
- ❑ Oil pressure switch -F22-
- ❑ Fitting location ⇒ page 14
- ❑ Removing and installing ⇒ Rep. Gr. 17

26 - Intake manifold flap potentiometer -G336-

- ❑ Fitting location ⇒ page 14

A - Diagnostic connector

- ❑ In driver's knee restraint

B - Fuel pump control unit -J538-

- ❑ Fitting location ⇒ page 11

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

- ❑ Fitting location ⇒ page 12
- ❑ Removing and installing ⇒ Rep. Gr. 45

D - Clutch position sender -G476-

- ❑ Only fitted on vehicles with manual gearbox
- ❑ Fitting location ⇒ page 12
- ❑ Removing and installing, see Power transmission, clutch ⇒ Rep. Gr. 30

E - 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

F - Radiator fan control unit -J293-

- ❑ Fitting location ⇒ page 16

G - Injectors

- ❑ Removing and installing ⇒ page 53
- ❑ Injector, cylinder 1 -N30-
- ❑ Injector, cylinder 2 -N31-
- ❑ Injector, cylinder 3 -N32-
- ❑ Injector, cylinder 4 -N33-

H - Continued coolant circulation pump -V51-

- ❑ Fitting location ⇒ page 18
- ❑ Removing and installing ⇒ Rep. Gr. 19

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

- ❑ Fitting location ⇒ page 17
- ❑ Lambda probes - overview ⇒ page 71

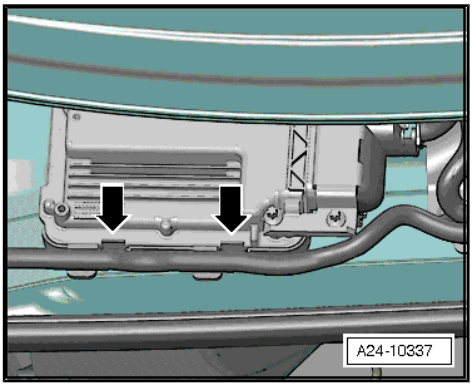
J - Electrical connector for Lambda probe after catalytic converter -G130- and Lambda probe 1 heater after catalytic converter -Z29-

- ❑ Fitting location ⇒ page 17

K - Relay and fuse holder in electronics box

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

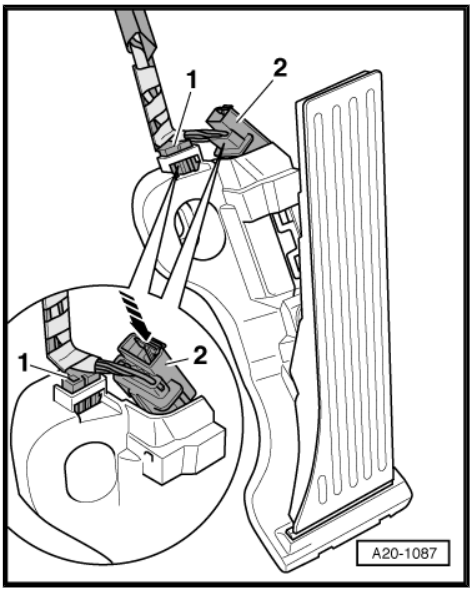
Engine control unit -J623-



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

2 - Electrical connector for accelerator pedal module

Removing and installing ⇒ Rep. Gr. 20

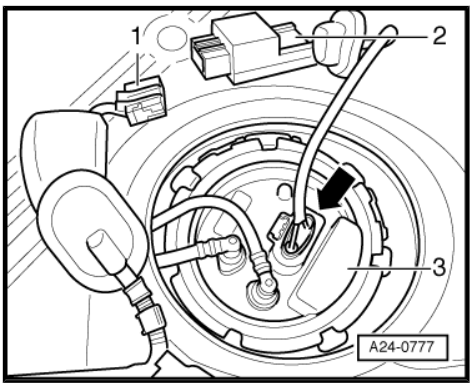


Fuel pump control unit -J538- -2-

1 - Connector for fuel pump control unit -J538-

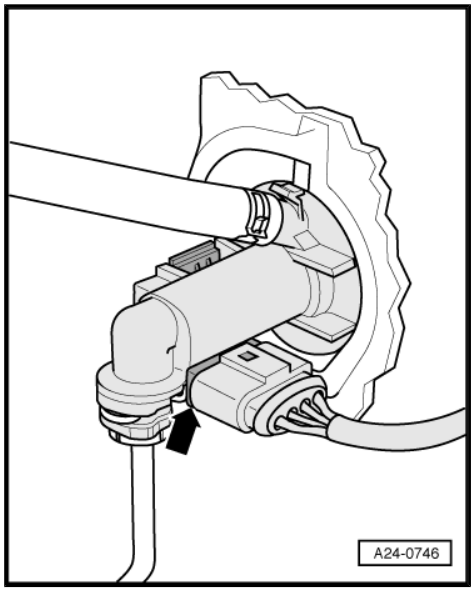
2 - Fuel pump control unit -J538-

3 - Fuel system pressurisation pump -G6-

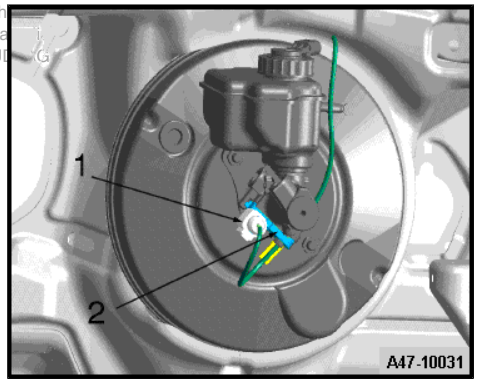


Clutch position sender -G476-

Removing and installing ⇒ Rep. Gr. 30



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

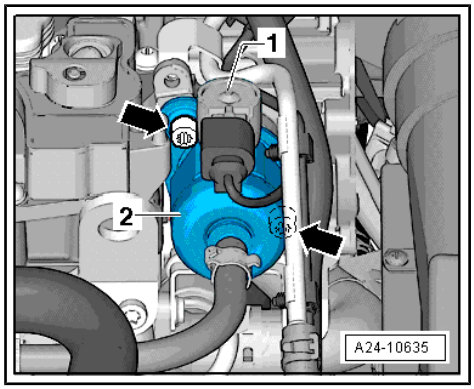


High-pressure pump -2-

1 - Fuel pressure regulating valve -N276-

Note

Illustration shows pump of engine code CDAA, 1.8 ltr.

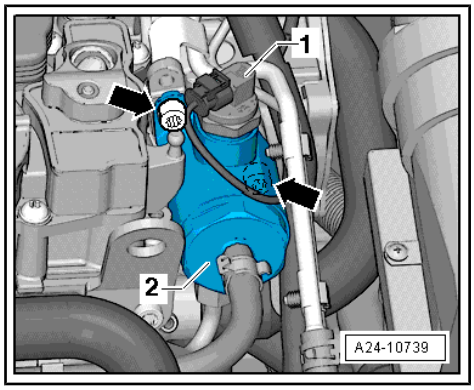


High-pressure pump -2-

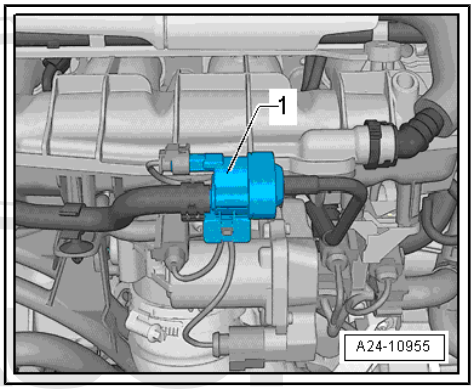
1 - Fuel pressure regulating valve -N276-

Note

Illustration shows pump of engine codes CCZA and CCTA, 2.0 ltr.



Activated charcoal filter solenoid valve 1 -N80- -1-

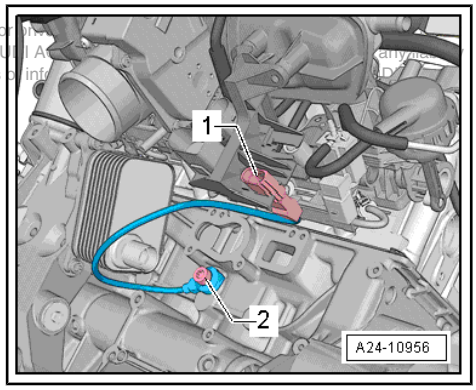


Fitting location of knock sensor 1 -G61-

1 - Electrical connector for knock sensor 1 -G61-

2 - Knock sensor 1 -G61-

Fitting location: below intake manifold and coolant pump

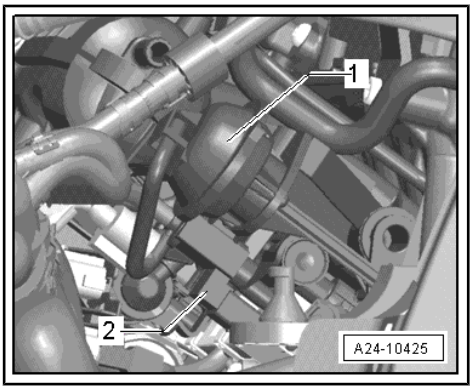


Intake manifold flap valve -N316- -2-

1 - Vacuum unit for intake manifold flaps

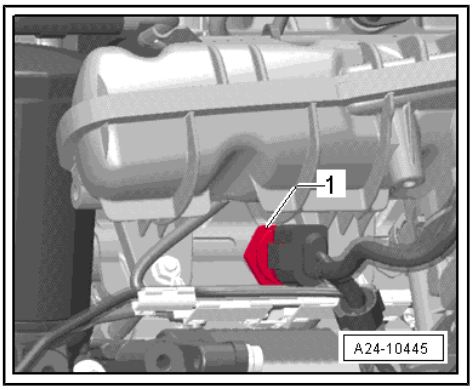
Note

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

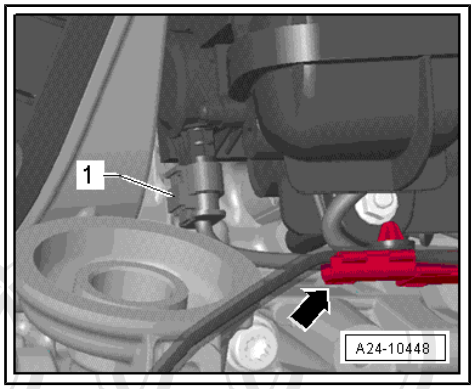


Fuel pressure sender -G247- -1-

Removing and installing ⇒ page 59



Intake manifold flap potentiometer -G336- -1-



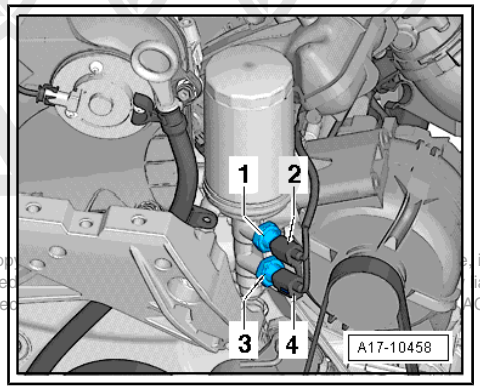
Oil pressure switch

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

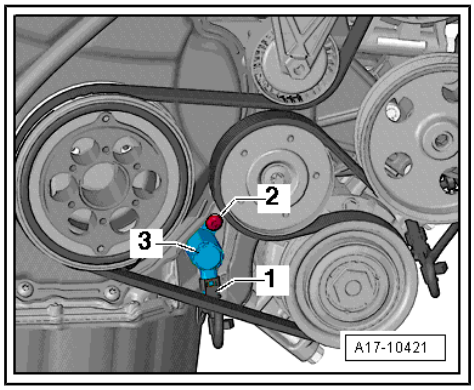
2 - Electrical connector for oil pressure switch for reduced oil pressure -F378-

3 - Oil pressure switch -F22-

4 - Electrical connector for oil pressure switch -F22-

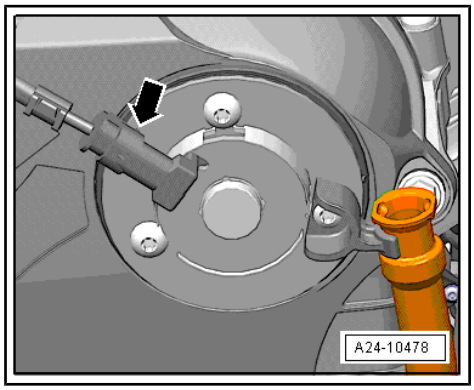


Valve for oil pressure control -N428- -3-

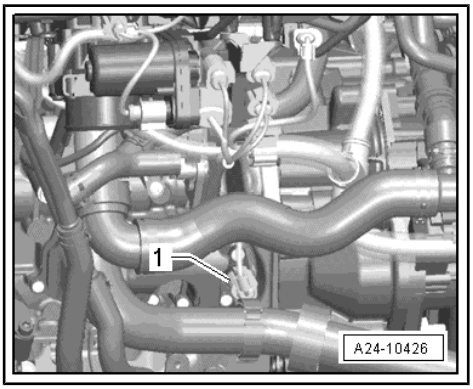


Camshaft control valve 1 -N205- -arrow-

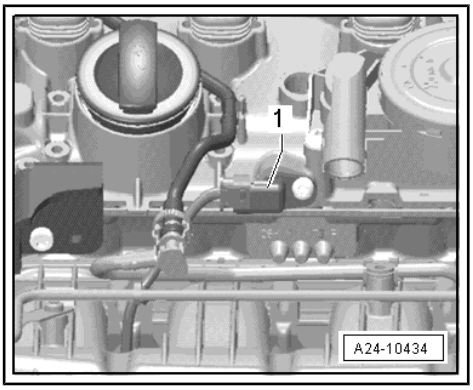
Removing and installing ⇒ Rep. Gr. 45



Engine speed sender -G28- -1-



Hall sender -G40- -1-

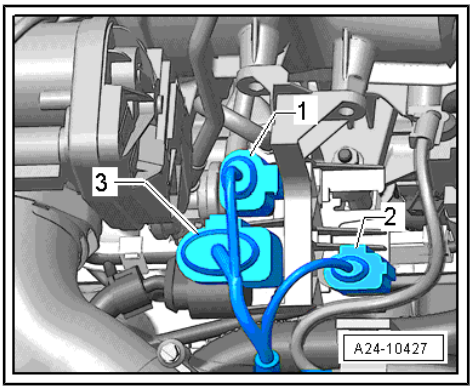


Electrical connectors

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

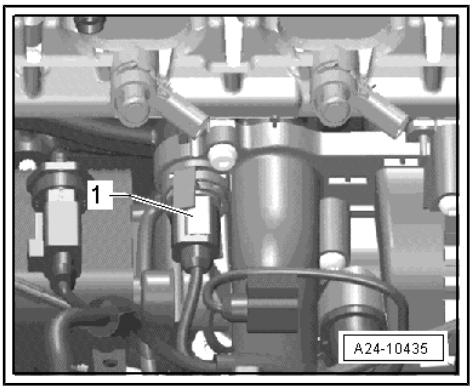
2 - From knock sensor 1 -G61-

3 - 8-pin connector for injectors

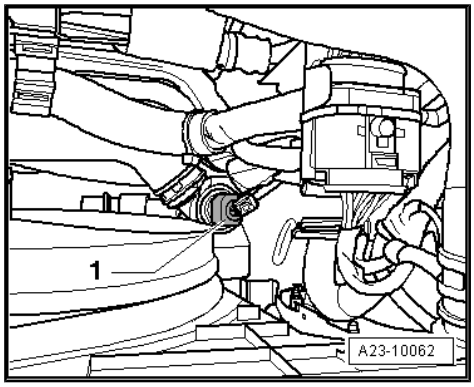


Coolant temperature sender -G62- -1-

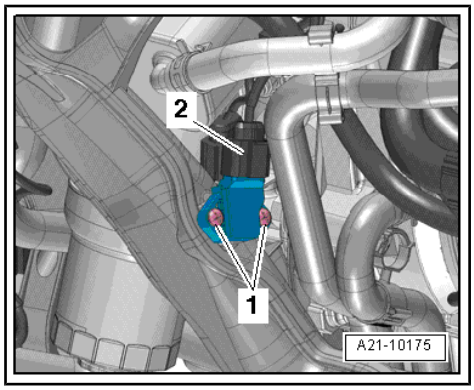
Fitting location: below intake manifold in coolant pump



Radiator outlet coolant temperature sender -G83- -1-

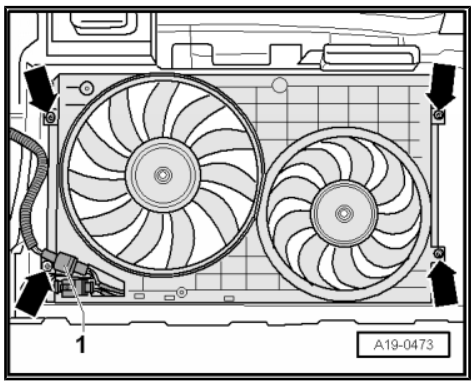


Charge pressure sender -G31- -2-



Radiator fan control unit -J293-

1 - Connector for radiator fan control unit -J293-

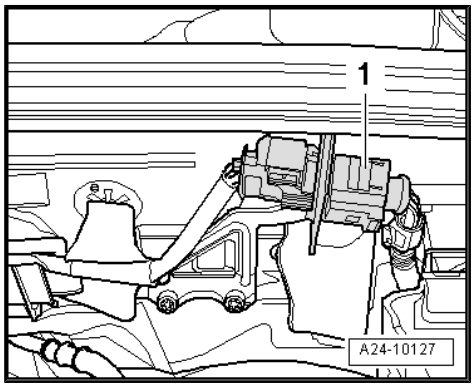


Note

- *The radiator fan control unit -J293- is integrated into the radiator fan -V7- .*
- *The fan shown in the illustration on the left is the radiator fan -V7- .*
- *The fan shown in the illustration on the right is the radiator fan on right of radiator -V35- .*

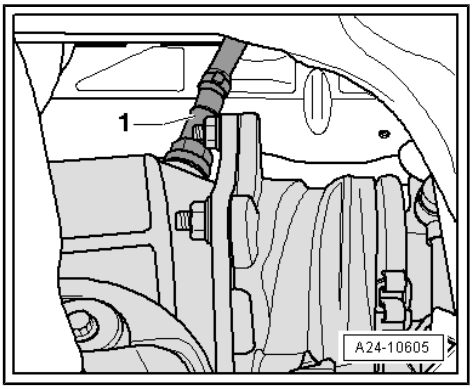
Electrical connector

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

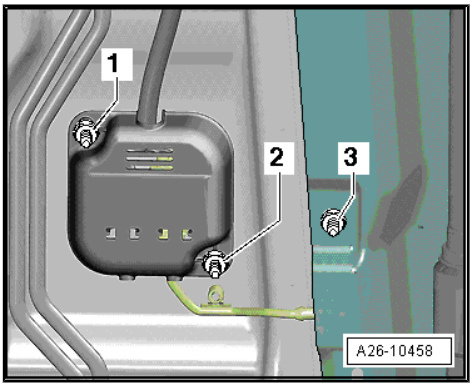


Fitting location of Lambda probe

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

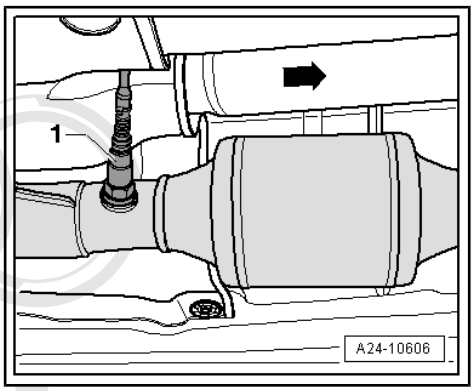


Electrical connector (behind cover) for Lambda probe after catalytic converter -G130- and Lambda probe 1 heater after catalytic converter -Z29-



Fitting location of Lambda probe

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



Note

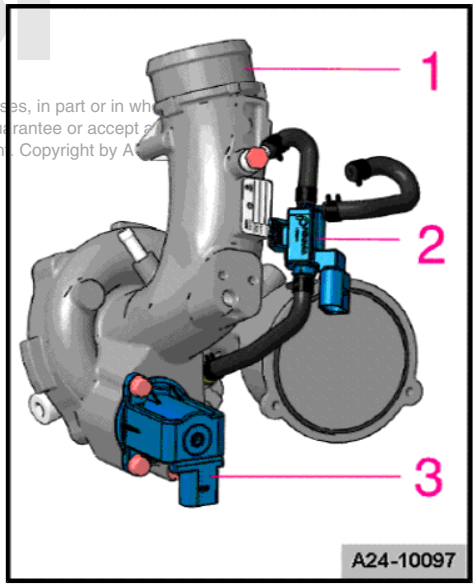
The arrow in the illustration points in the direction of travel.

Components on turbocharger

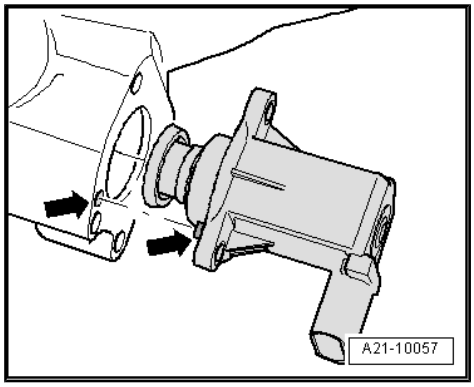
1 - Removing and installing turbocharger ⇒ Rep. Gr. 21

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)

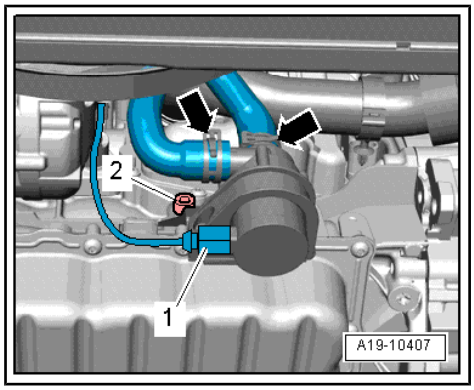


Pay attention to installation position of turbocharger air recirculation valve -N249-

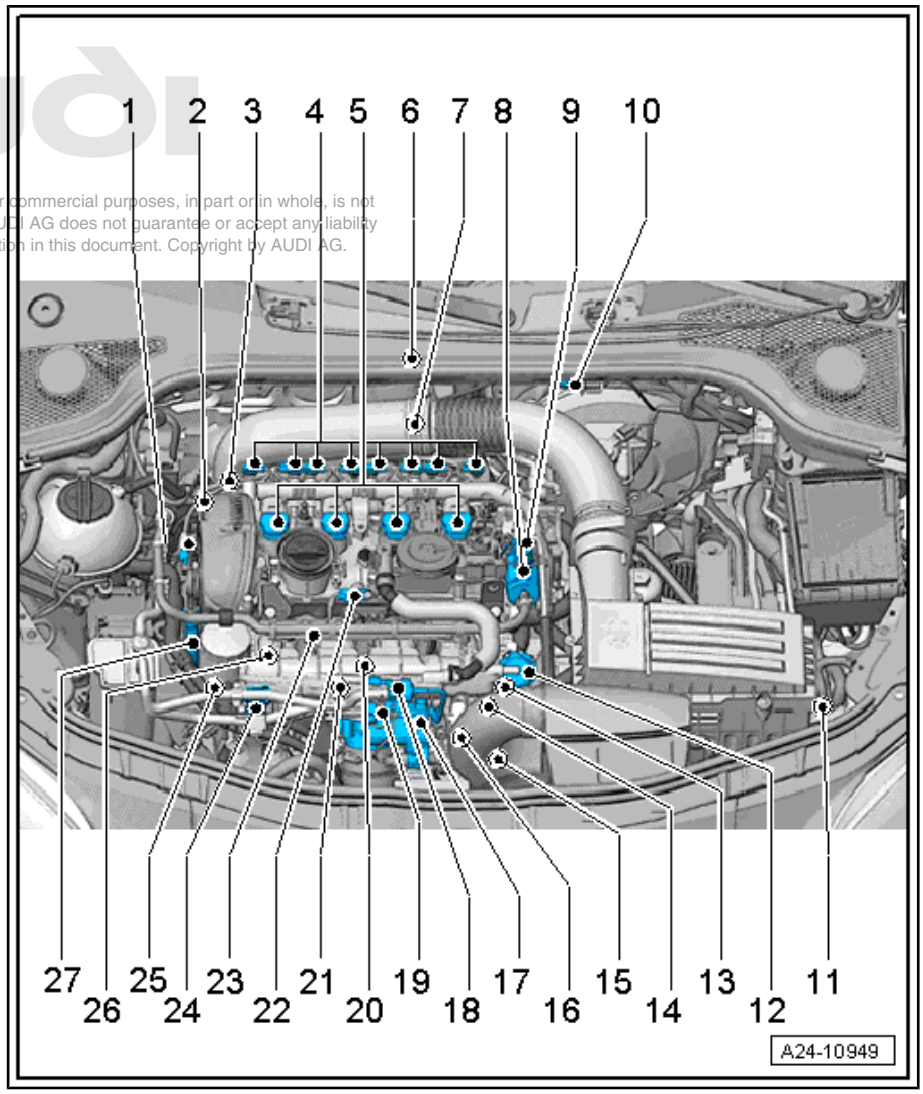


Continued coolant circulation pump -V51-

Removing and installing ⇒ Rep. Gr. 19



3.2 Overview - fitting locations (engine codes CESA and CETA)



1 - Camshaft control valve 1 - N205-

- ❑ Fitting location ⇒ page 25
- ❑ Removing and installing ⇒ Rep. Gr. 15

2 - Charge pressure control solenoid valve -N75-

- ❑ Located directly on turbocharger ⇒ page 29
- ❑ Removing and installing ⇒ Rep. Gr. 21

3 - Turbocharger air recirculation valve -N249-

- ❑ Located directly on turbocharger ⇒ page 29
- ❑ Removing and installing ⇒ Rep. Gr. 21

4 - Actuators for camshaft adjustment

- ❑ Actuator 1 for camshaft adjustment -F366-
- ❑ Actuator 2 for camshaft adjustment -F367-
- ❑ Actuator 3 for camshaft adjustment -F368-
- ❑ Actuator 4 for camshaft adjustment -F369-
- ❑ Actuator 5 for camshaft adjustment -F370-
- ❑ Actuator 6 for camshaft adjustment -F371-
- ❑ Actuator 7 for camshaft adjustment -F372-
- ❑ Actuator 8 for camshaft adjustment -F373-
- ❑ Fitting location ⇒ page 26
- ❑ Removing and installing ⇒ Rep. Gr. 15

5 - Ignition coils with output stages

- ❑ Removing and installing ⇒ page 84
- ❑ 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.

6 - Engine control unit -J623-

- ❑ Fitting location ⇒ page 22
- ❑ Removing and installing ⇒ page 77

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

- ❑ Fitting location ⇒ page 28
- ❑ Lambda probes - overview ⇒ page 71

8 - High-pressure pump

- ❑ Fitting location ⇒ page 23
- ❑ Removing and installing ⇒ page 50

9 - Fuel pressure regulating valve -N276-

- ❑ Fitting location ⇒ page 23

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

- ❑ Fitting location ⇒ page 28

11 - Radiator outlet coolant temperature sender -G83-

- ❑ Fitting location ⇒ page 27

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

- ❑ Fitting location ⇒ page 24

13 - Intake manifold flap valve -N316-

- ❑ Fitting location ⇒ page 24

14 - Engine speed sender -G28-

- ❑ Fitting location ⇒ page 26
- ❑ Removing and installing ⇒ page 85
- ❑ 4.5 Nm

15 - Charge pressure sender -G31-

- ❑ Fitting location ⇒ page 27

16 - Electrical connectors

- ❑ From knock sensor 1 -G61- , fitting location ⇒ page 27
- ❑ From Hall sender -G40- , fitting location ⇒ page 27
- ❑ For injectors, fitting location ⇒ page 15

17 - 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- using a vehicle diagnostic tester

18 - Activated charcoal filter solenoid valve 1 -N80-

- ❑ Fitting location ⇒ page 23

19 - Intake air temperature sender -G42-

20 - Knock sensor 1 -G61-

- ❑ Fitting location ⇒ page 24
- ❑ 20 Nm
- ❑ Removing and installing ⇒ page 85

21 - Coolant temperature sender -G62-

- ❑ Fitting location ⇒ page 27
- ❑ Removing and installing ⇒ Rep. Gr. 19

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

23 - Fuel pressure sender -G247-

- ❑ 27 Nm
- ❑ Fitting location ⇒ page 24
- ❑ Removing and installing ⇒ page 59

24 - Intake manifold pressure sender -G71-

- ❑ Fitting location ⇒ page 24

25 - Oil pressure switch

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

- ❑ Oil pressure switch -F22-
- ❑ Fitting location ⇒ page 25
- ❑ Removing and installing ⇒ Rep. Gr. 17

26 - Intake manifold flap potentiometer -G336-

- ❑ Fitting location ⇒ page 25

27 - Valve for oil pressure control -N428-

- ❑ Fitting location ⇒ page 25
- ❑ Removing and installing ⇒ Rep. Gr. 17

A - Diagnostic connector

- ❑ In driver's knee restraint

B - Fuel pump control unit -J538-

- ❑ Fitting location ⇒ page 22

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

- ❑ Fitting location ⇒ page 23
- ❑ Removing and installing ⇒ Rep. Gr. 45

D - Clutch position sender -G476-

- ❑ Only fitted on vehicles with manual gearbox
- ❑ Fitting location ⇒ page 23
- ❑ Removing and installing, see Power transmission, clutch ⇒ Rep. Gr. 30

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

- ❑ Fitting location ⇒ page 22
- ❑ 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

F - Radiator fan control unit -J293-

- ❑ Fitting location ⇒ page 28

G - Injectors

- ❑ Removing and installing ⇒ page 53
- ❑ Injector, cylinder 1 -N30-
- ❑ Injector, cylinder 2 -N31-
- ❑ Injector, cylinder 3 -N32-
- ❑ Injector, cylinder 4 -N33-

H - Continued coolant circulation pump -V51-

- ❑ Fitting location ⇒ page 29
- ❑ Removing and installing ⇒ Rep. Gr. 19

I - Exhaust flap 1 valve -N321-

- ❑ Fitting location ⇒ page 30

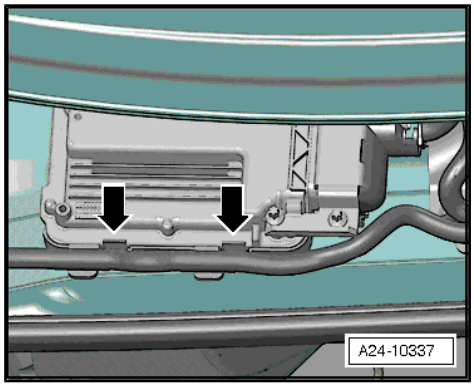
J - Lambda probe after catalytic converter -G130- and Lambda probe heater 1 after catalytic converter -Z29-

- ❑ Fitting location ⇒ page 29
- ❑ Lambda probes - overview ⇒ page 71

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

- ❑ Fitting location ⇒ page 28

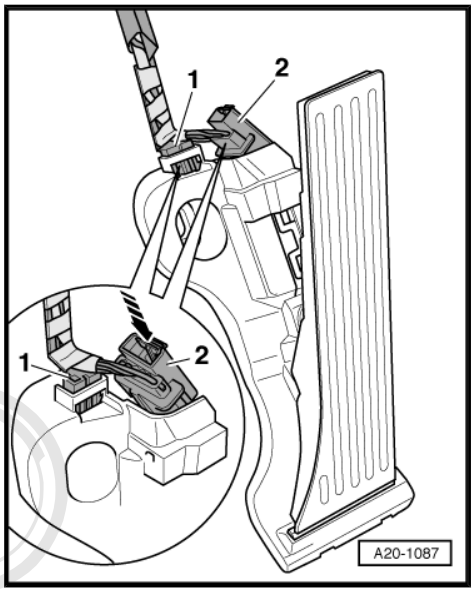
Engine control unit -J623-



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

2 - Electrical connector for accelerator pedal module

Removing and installing ⇒ Rep. Gr. 20

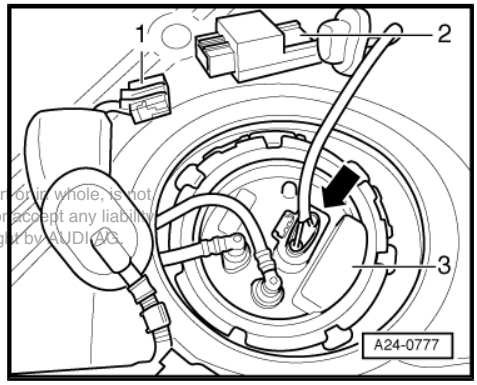


Fuel pump control unit -J538- -2-

1 - Connector for fuel pump control unit -J538-

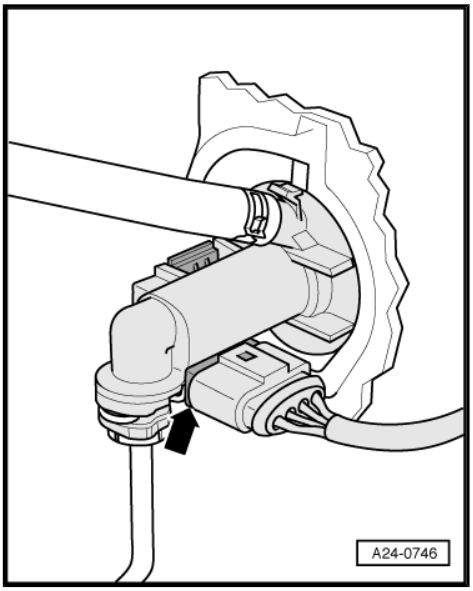
2 - Fuel pump control unit -J538-

3 - Fuel system pressurisation pump -G6-



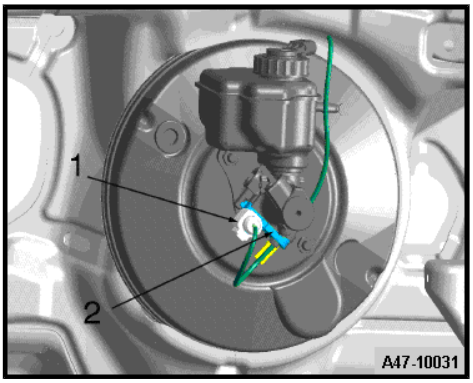
Clutch position sender -G476-

Removing and installing ⇒ Rep. Gr. 30



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

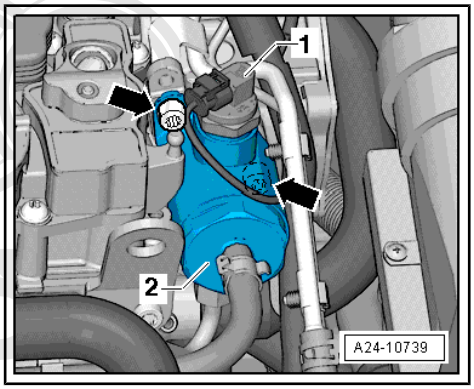
Removing and installing ⇒ Rep. Gr. 45



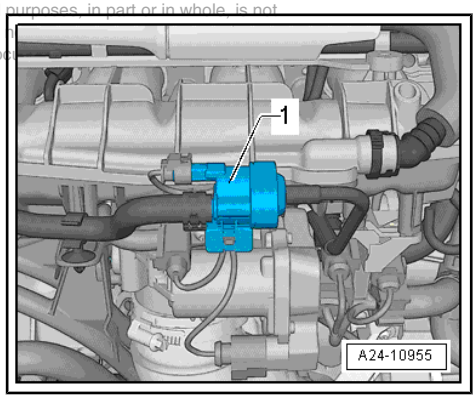
High-pressure pump

1 - Fuel pressure regulating valve -N276-

2 - High-pressure pump



Activated charcoal filter solenoid valve 1 -N80- -1-

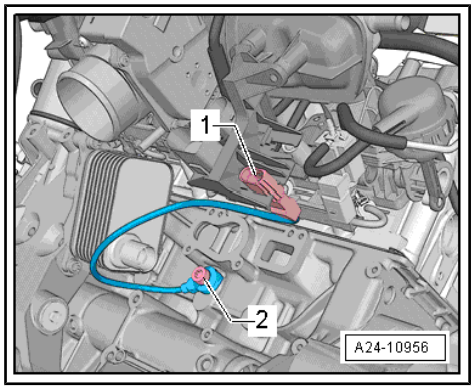


Fitting location of knock sensor 1 -G61-

1 - Electrical connector for knock sensor 1 -G61-

2 - Knock sensor 1 -G61-

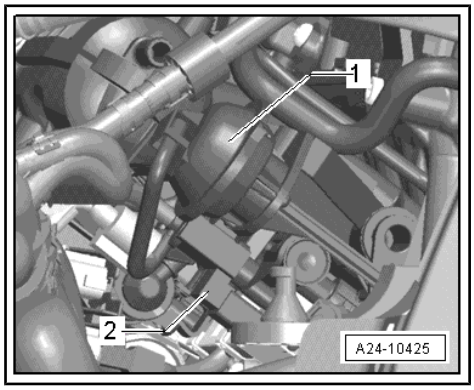
Fitting location: below intake manifold and coolant pump



Intake manifold flap valve -N316-

1 - Vacuum unit for intake manifold flaps

2 - Intake manifold flap valve -N316-



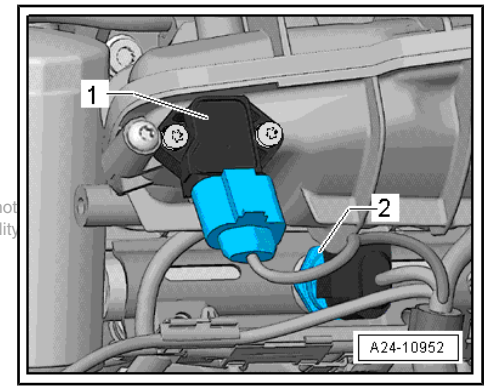
Note

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

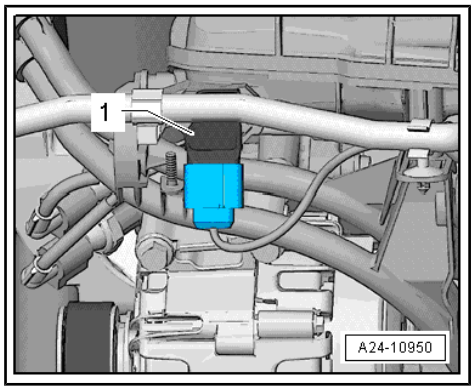
Intake manifold pressure sender -G71- -1- and fuel pressure sender -G247- -2-

1 - Intake manifold pressure sender -G71-

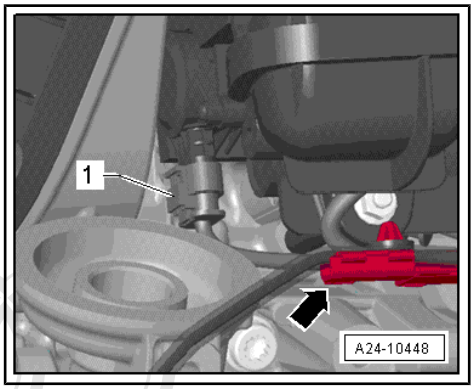
2 - Fuel pressure sender -G247-



Intake manifold pressure sender -G71- -1-



Intake manifold flap potentiometer -G336- -1-



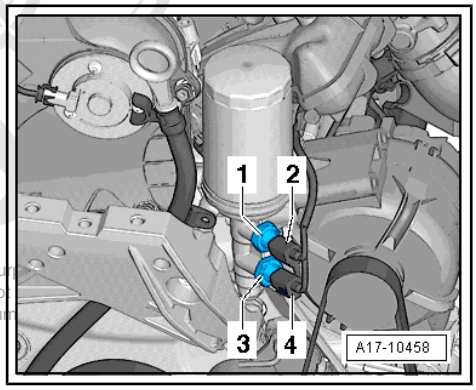
Oil pressure switch

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

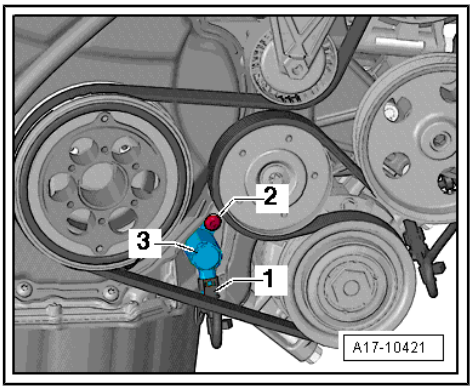
2 - Electrical connector for oil pressure switch for reduced oil pressure -F378-

3 - Oil pressure switch -F22-

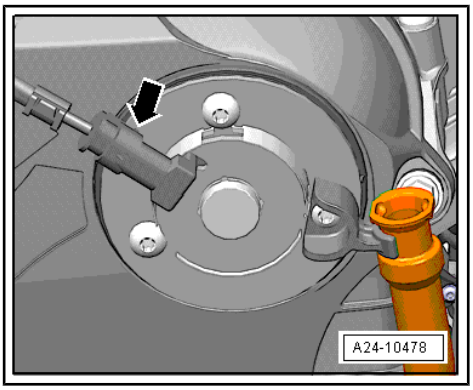
4 - Electrical connector for oil pressure switch -F22-



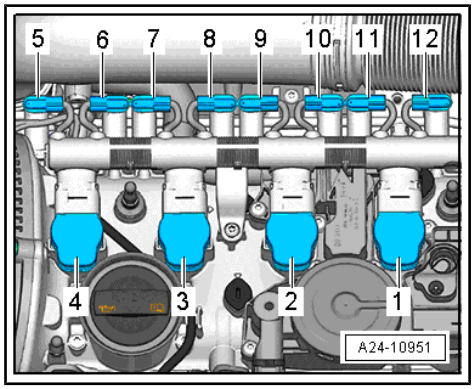
Valve for oil pressure control -N428- -3-



Camshaft control valve 1 -N205- -arrow-



Ignition coils



1 - Ignition coil 1 with output stage -N70-

2 - Ignition coil 2 with output stage -N127-

3 - Ignition coil 3 with output stage -N291-

4 - Ignition coil 4 with output stage -N292-

5 - Actuator 2 for camshaft adjustment -F367- (for cylinder No. 1)

6 - Actuator 1 for camshaft adjustment -F366- (for cylinder No. 1)

7 - Actuator 3 for camshaft adjustment -F368- (for cylinder No. 2)

8 - Actuator 4 for camshaft adjustment -F369- (for cylinder No. 2)

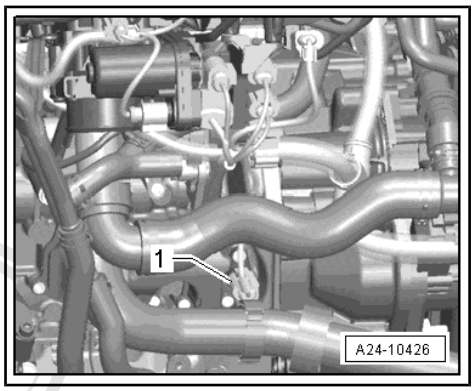
9 - Actuator 6 for camshaft adjustment -F371- (for cylinder No. 3)

10 - Actuator 5 for camshaft adjustment -F370- (for cylinder No. 3)

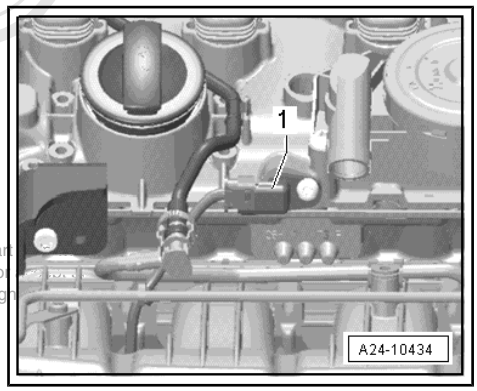
11 - Actuator 7 for camshaft adjustment -F372- (for cylinder No. 4)

12 - Actuator 8 for camshaft adjustment -F373- (for cylinder No. 4)

Engine speed sender -G28- -1-



Hall sender -G40- -1-

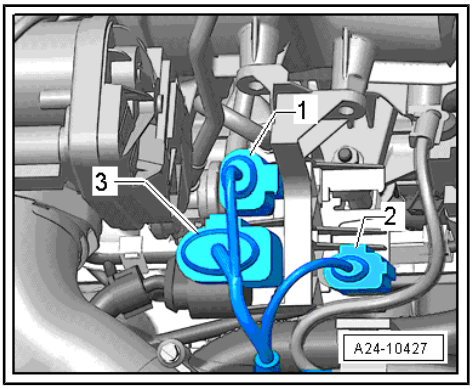


Electrical connectors

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

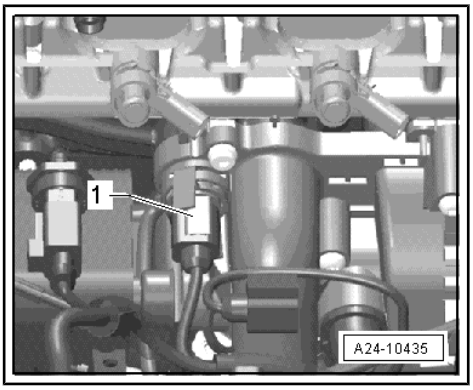
2 - From knock sensor 1 -G61-

3 - 8-pin connector for injectors

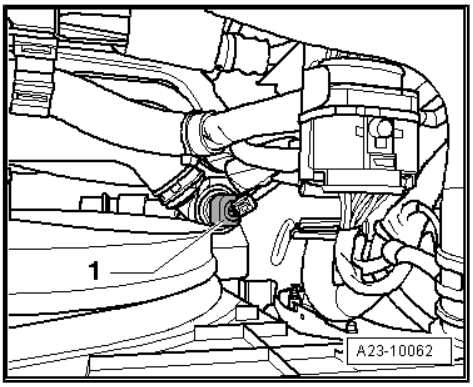


Coolant temperature sender -G62- -1-

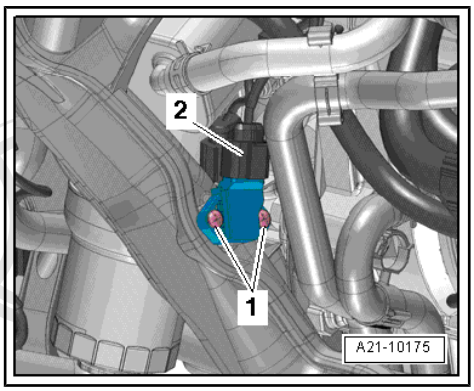
Fitting location: below intake manifold in coolant pump



Radiator outlet coolant temperature sender -G83- -1-

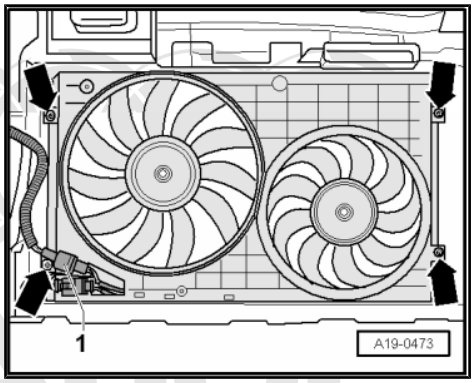


Charge pressure sender -G31- -2-



Radiator fan control unit -J293-

1 - Connector for radiator fan control unit -J293-

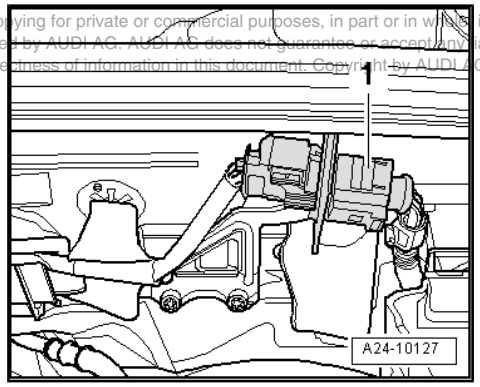


Note

- *The radiator fan control unit -J293- is integrated into the radiator fan -V7- .*
- *The fan shown in the illustration on the left is the radiator fan -V7- .*
- *The fan shown in the illustration on the right is the radiator fan on right of radiator -V35- .*

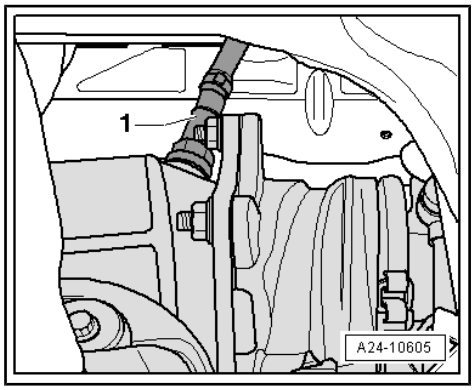
Electrical connector

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

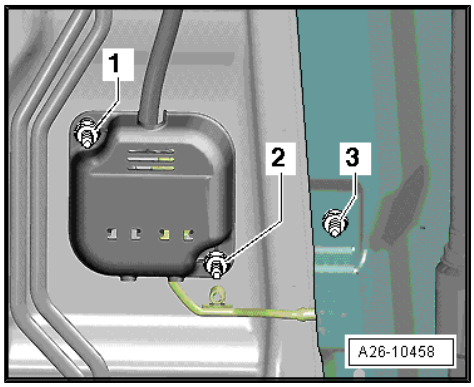


Fitting location of Lambda probe

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

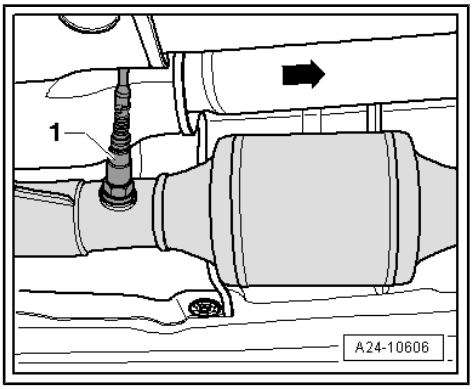


Electrical connector (behind cover) for Lambda probe after catalytic converter -G130- and Lambda probe 1 heater after catalytic converter -Z29-



Fitting location of Lambda probe

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



Note

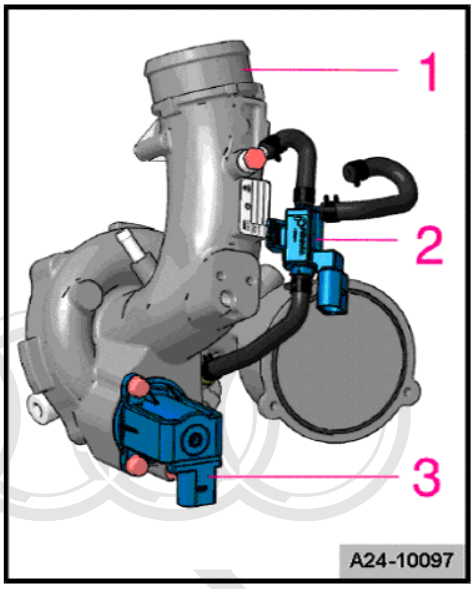
The arrow in the illustration points in the direction of travel.

Components on turbocharger

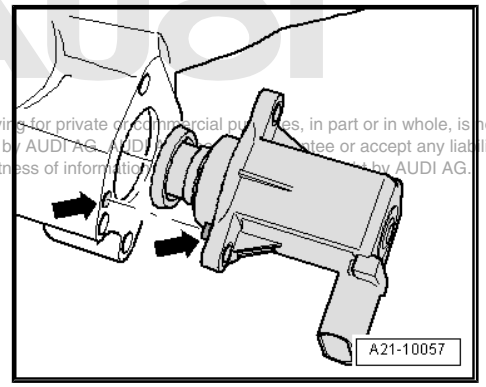
1 - Removing and installing turbocharger ⇒ Rep. Gr. 21

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)

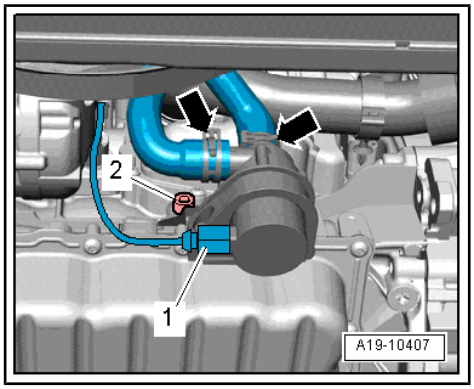


Pay attention to installation position of turbocharger air recirculation valve -N249-

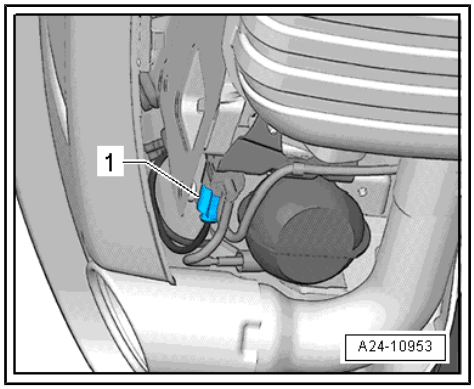


Continued coolant circulation pump -V51-

Removing and installing ⇒ Rep. Gr. 19

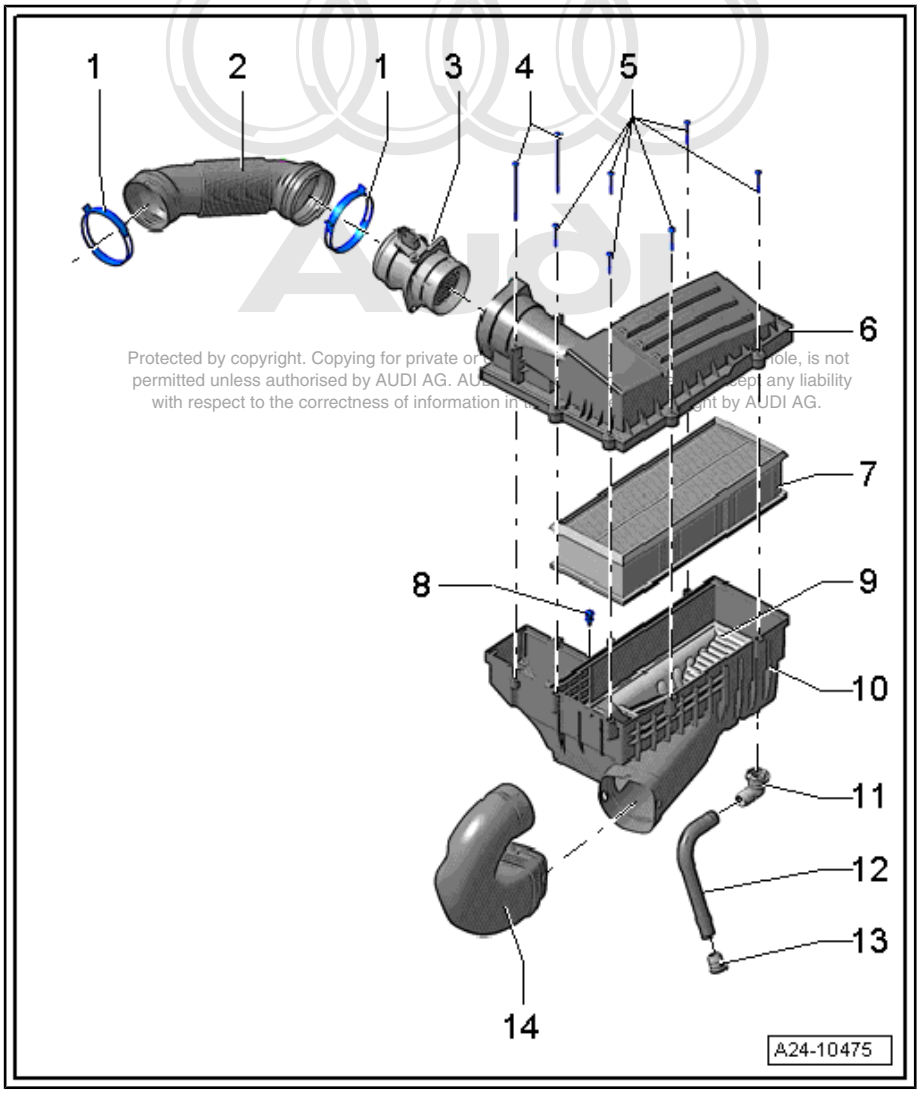


Exhaust flap 1 valve -N321- -1-



4 Air cleaner

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 65

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 32
- ❑ Observe change intervals ⇒ Maintenance ; Booklet 810

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

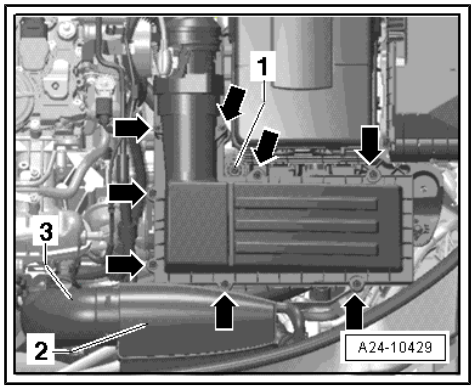
– Press engine cover panel back carefully into its retainers.

– 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

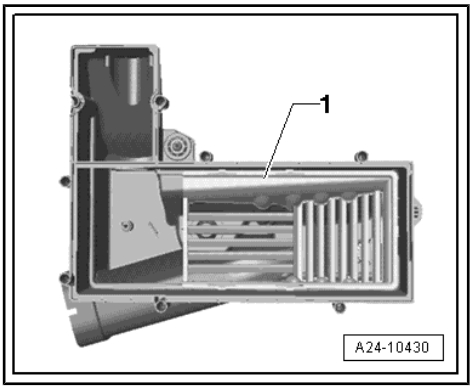
Note

- *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.

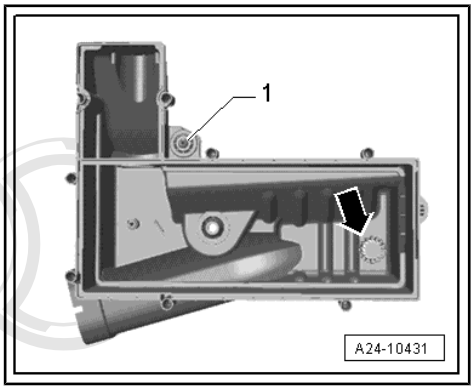
– Remove snow screen -1- and clean it.



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).

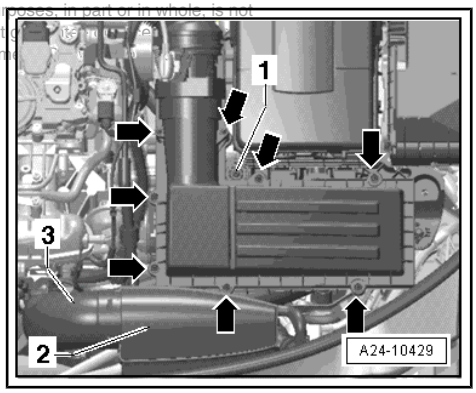


The remaining installation steps are carried out in the reverse sequence.

4.4 Removing and installing air cleaner housing

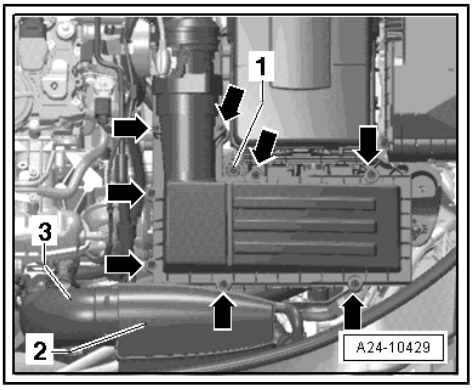
Removing

– 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-.

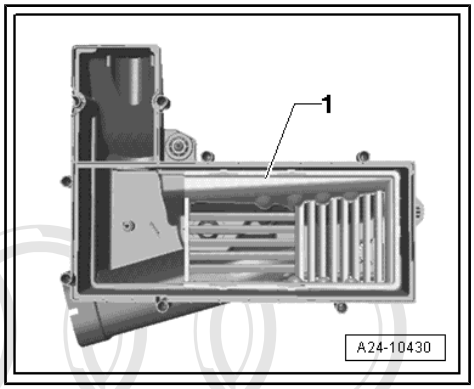


– Slacken bolt -1-.
– Carefully lift air cleaner (bottom section).

Installing



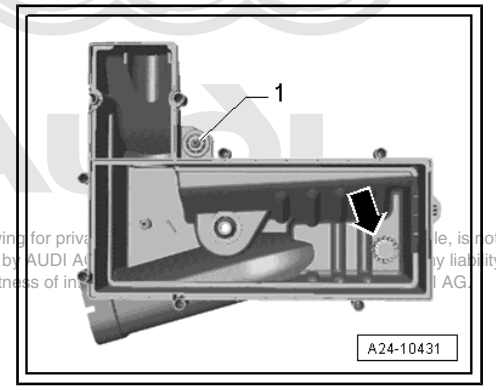
– Remove snow screen -1- and clean it.



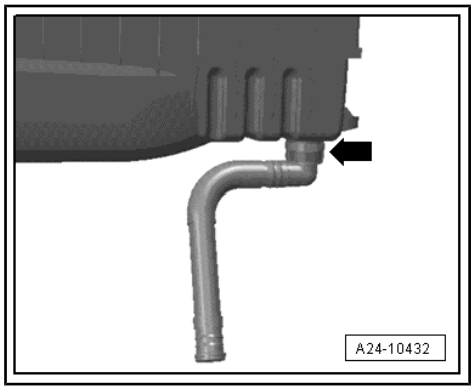
Note

The snow screen is not fitted on all vehicles.

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



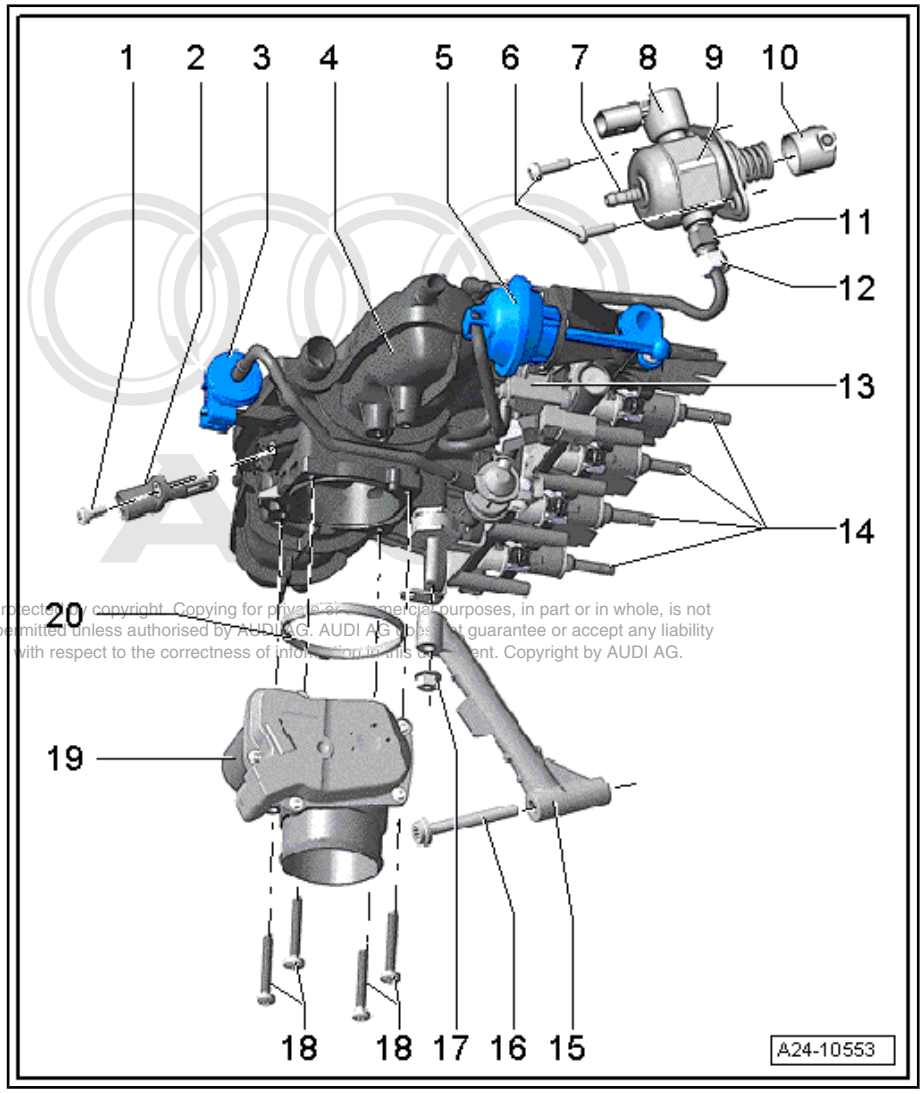
– Disconnect water drain hose -arrow- from air cleaner (bottom section) and clean any dirt or leaves out of connection and hose.
– When installing the air filter element, check that it is properly centred in the retainer in the air cleaner (bottom section).
– Fit the top section of the air cleaner carefully on the bottom section, without using force. Make sure the top section of the air cleaner 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 (engine codes CDAA, CCZA and CCTA)

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 68

4 - Intake manifold

- ❑ Removing and installing ⇒ page 42

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

6 - Bolts for high-pressure pump

- ❑ 10 Nm (engine code CDAA, 1.8 ltr.)
- ❑ 20 Nm (engine codes CCZA and CCTA, 2.0 ltr.)

7 - Connecting piece for fuel supply pipe

- ❑ From fuel tank

8 - Fuel pressure regulating valve -N276-

9 - 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 installed.
- ❑ Removing and installing ⇒ page 50

10 - Roller tappet

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

11 - Connecting piece for fuel supply pipe to fuel rail

- ❑ Renew
- ❑ 25 Nm

12 - High-pressure fuel pipe

- ❑ Fuel pipes must be free of tension when installed.

- ❑ 20 Nm

13 - Intake manifold flap valve -N316-

14 - Injectors

- ❑ Renew O-ring and teflon ring
- ❑ Ensure correct installation position.
- ❑ Removing and installing ⇒ page 53

15 - Intake manifold support

16 - Bolt for intake manifold support

- ❑ 20 Nm

17 - Securing nut for intake manifold support

- ❑ 10 Nm

18 - Bolts for throttle valve module -J338-

- ❑ 5 Nm

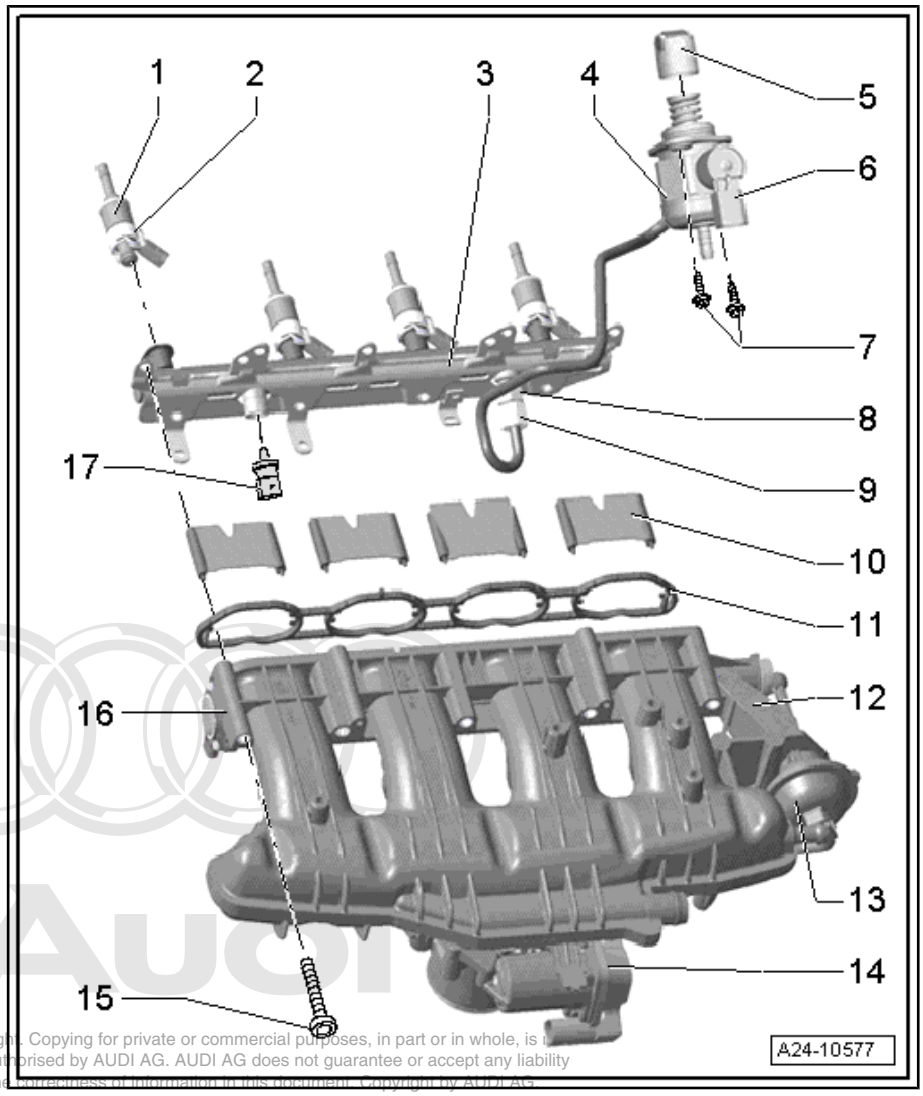
19 - Throttle valve module -J338- , throttle valve drive for electric throttle -G186-

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

20 - 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 53

2 - Support ring

3 - Fuel rail

- ❑ Removing and installing ⇒ page 42
- ❑ Tighten to 8 Nm

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 installed.
- ❑ Removing and installing ⇒ page 50

5 - Roller tappet

6 - Fuel pressure regulating valve -N276-

7 - Bolts for high-pressure pump

- ❑ 10 Nm (engine code CDAA, 1.8 ltr.)
- ❑ 20 Nm (engine codes CCZA and CCTA, 2.0 ltr.)

8 - Connecting piece for fuel supply pipe

- ❑ Renew
- ❑ 25 Nm

9 - Union nut for fuel supply pipe

- ❑ 20 Nm

10 - Air flow control flaps (intake manifold flaps)

11 - Gasket

- ❑ Renew

12 - Intake manifold

- ❑ Removing and installing ⇒ page 42

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

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

- ❑ Throttle valve drive angle sender 1 for electric throttle -G187- and throttle valve drive angle sender 2 for electric throttle -G188-
- ❑ After throttle valve module -J338- has been renewed, it must be re-adapted to engine control unit -J623- using a vehicle diagnostic tester
- ❑ 7 Nm

15 - Bolts for intake manifold

- ❑ 9 Nm

16 - Intake manifold flap potentiometer -G336-

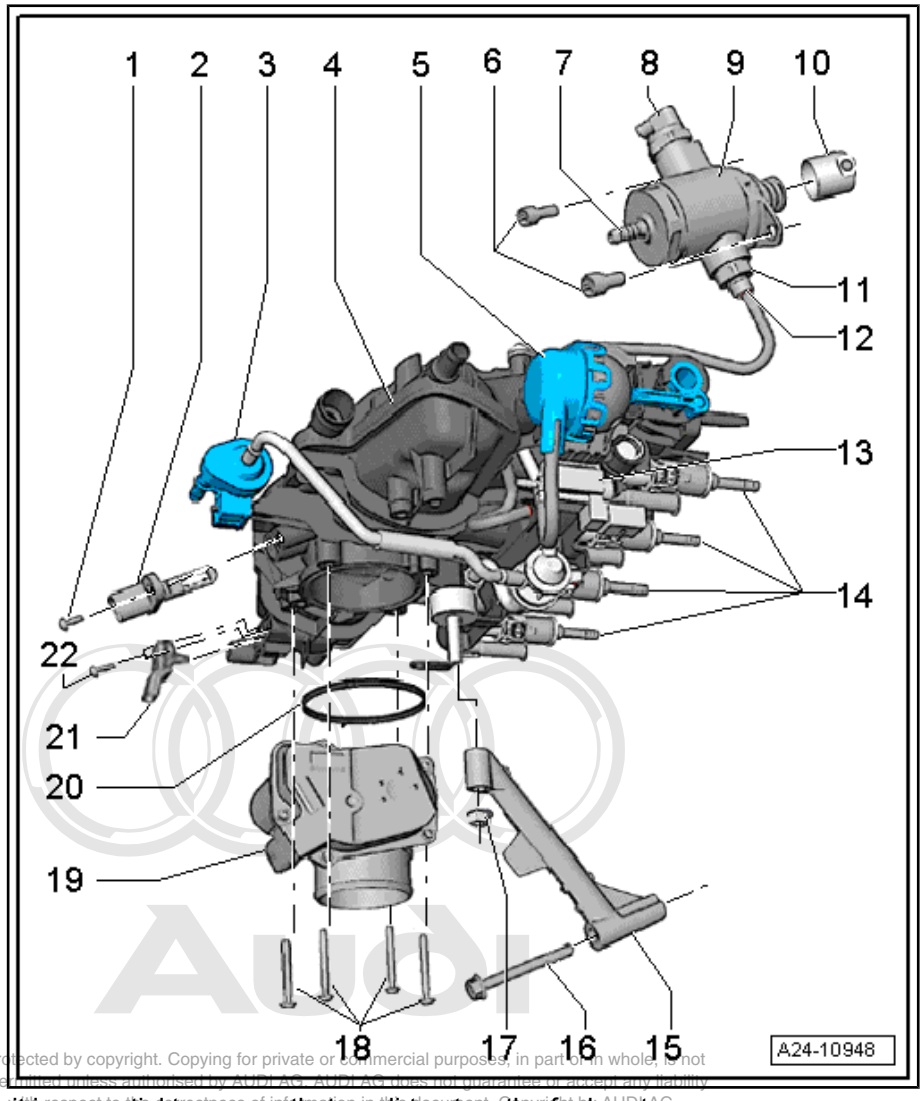
- ❑ Intake manifold flap potentiometer -G336- must be re-adapted to engine control unit -J623- if it has been renewed. Use vehicle diagnostic tester to do so.

17 - Fuel pressure sender -G247-

- ❑ 27 Nm
- ❑ Lubricate threads lightly with clean engine oil
- ❑ Fitting location ⇒ page 13
- ❑ Removing and installing ⇒ page 59

6 Intake manifold (engine codes CESA and CETA)

6.1 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 68

4 - Intake manifold

- ❑ Removing and installing ⇒ page 42

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

6 - Bolts for high-pressure pump

- ❑ 20 Nm

7 - Connecting piece for fuel supply pipe

- ❑ From fuel tank

8 - Fuel pressure regulating valve -N276-

9 - 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 installed.
- ❑ Removing and installing ⇒ page 50

10 - Roller tappet

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

11 - Connecting piece for fuel supply pipe to fuel rail

- ❑ Renew
- ❑ 25 Nm

12 - High-pressure fuel pipe

- ❑ Fuel pipes must be free of tension when installed.
- ❑ 20 Nm

13 - Intake manifold flap valve -N316-

14 - Injectors

- ❑ Renew O-ring and teflon ring
- ❑ Ensure correct installation position.
- ❑ Removing and installing ⇒ page 53

15 - Intake manifold support

16 - Bolt for intake manifold support

- ❑ 20 Nm

17 - Securing nut for intake manifold support

- ❑ 10 Nm

18 - Bolts for throttle valve module -J338-

- ❑ 5 Nm

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

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

20 - Seal

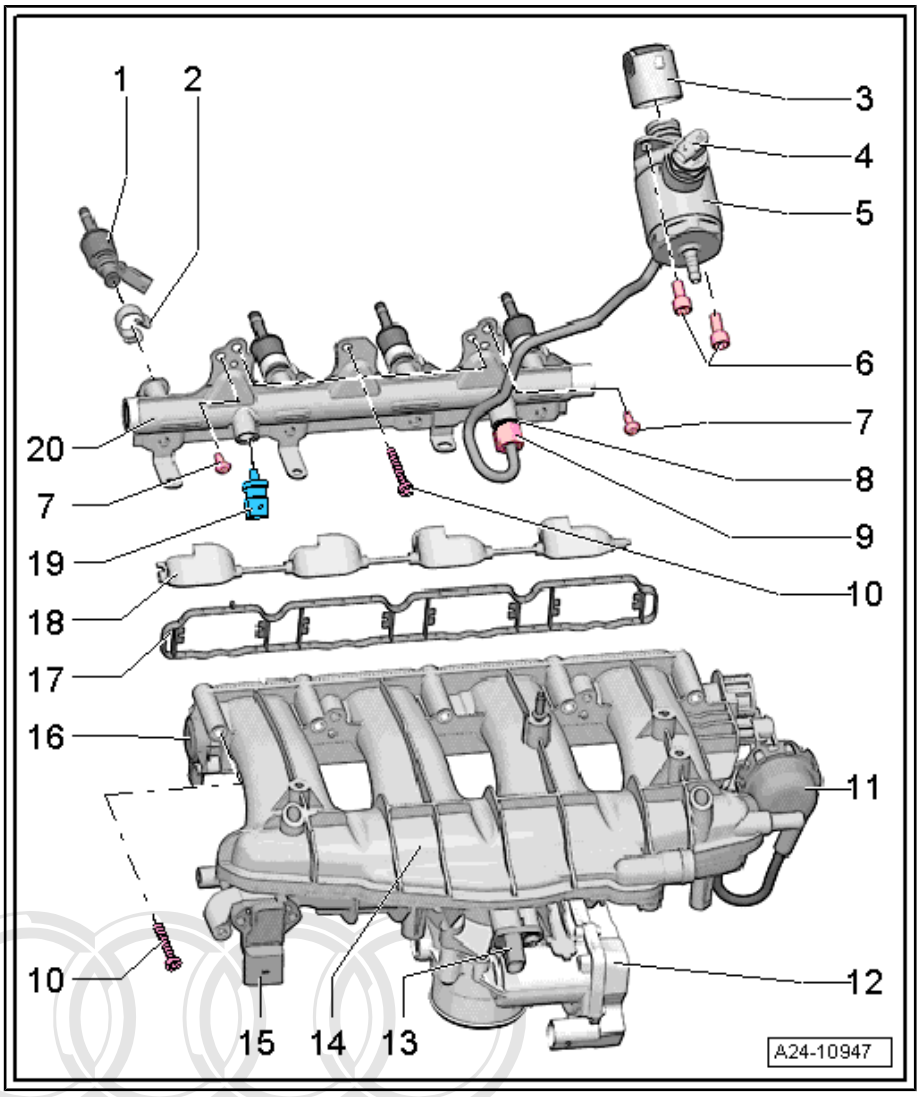
- ❑ Renew

21 - Intake manifold pressure sender -G71-

22 - Bolts for intake manifold pressure sender -G71-

- ❑ 5 Nm

6.2 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 53

2 - Support ring

3 - Roller tappet

4 - Fuel pressure regulating valve -N276-

5 - 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 installed.
- Removing and installing ⇒ page 50

6 - Bolts for high-pressure pump

- 20 Nm

7 - Bolts

- 9 Nm

8 - Connecting piece for fuel supply pipe

- Renew
- 25 Nm

9 - Union nut for fuel supply pipe

- 20 Nm

10 - Bolts

- 9 Nm

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

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- using a vehicle diagnostic tester
- ❑ 7 Nm

13 - Intake air temperature sender -G42-

- ❑ Tighten to 5 Nm

14 - Intake manifold

- ❑ Removing and installing ⇒ page 42

15 - Intake manifold pressure sender -G71-

- ❑ Tighten to 5 Nm

16 - Intake manifold flap potentiometer -G336-

- ❑ Intake manifold flap potentiometer -G336- must be re-adapted to engine control unit -J623- if it has been renewed. Use vehicle diagnostic tester to do so.

17 - Gasket

- ❑ Renew

18 - Air flow control flaps (intake manifold flaps)

19 - Fuel pressure sender -G247-

- ❑ 27 Nm
- ❑ Lubricate threads lightly with clean engine oil
- ❑ Fitting location ⇒ page 13
- ❑ Removing and installing ⇒ page 59

20 - Fuel rail

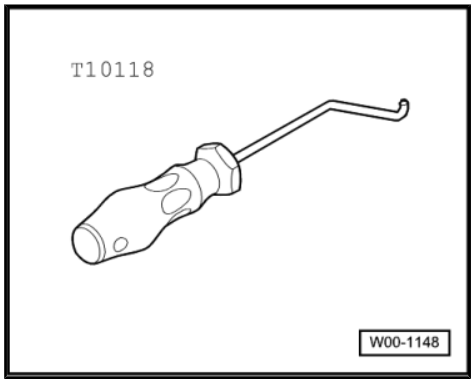
- ❑ Removing and installing ⇒ page 42
- ❑ Tighten to 8 Nm

6.3 Removing and installing intake manifold with fuel rail

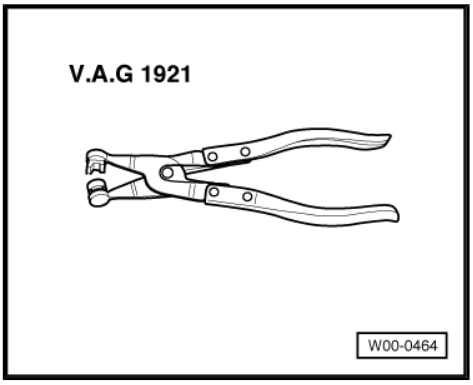
After the fuel rail has been removed or renewed, intake manifold flap potentiometer -G336- must be adapted to engine control unit -J623- . Use vehicle diagnostic tester to do so.

Special tools and workshop equipment required

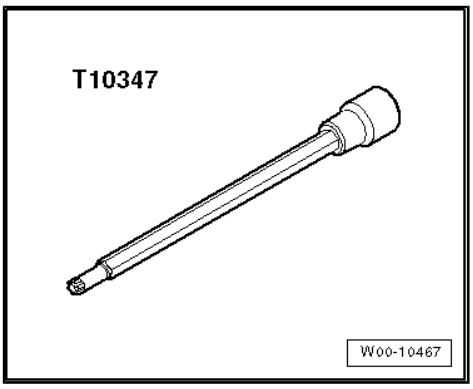
- ♦ Assembly tool -T10118-



- Hose clip pliers -V.A.G 1921-



- Socket Torx T30 -T10347-



- Oil filter tool -3417-

Removing

– Remove engine cover panel.

Note

- *The combustion chamber (teflon) ring seal and the O-ring must always be renewed.*
- *Intake manifold - exploded view ⇒ page 35*
- *Fuel rail - exploded view ⇒ page 37*

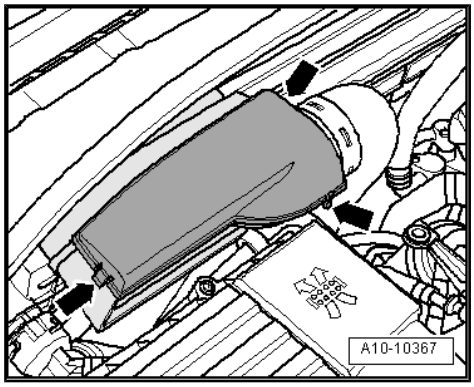
WARNING

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 .

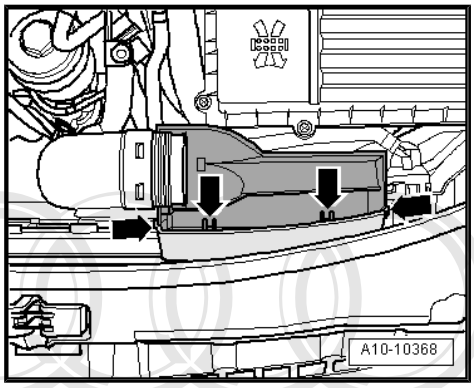
– Disconnect negative terminal from battery.

– 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.

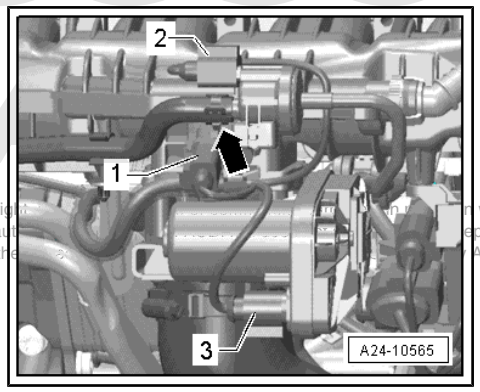


– Disconnect vacuum line -arrow- leading to activated charcoal filter.
– Unplug following electrical connectors:

1 - Intake air temperature sender -G42-

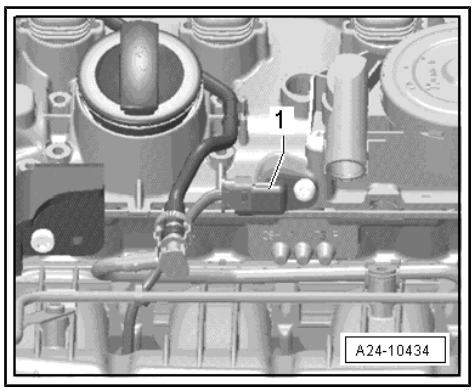
2 - Activated charcoal filter solenoid valve 1 -N80-

3 - Throttle valve module -J338-

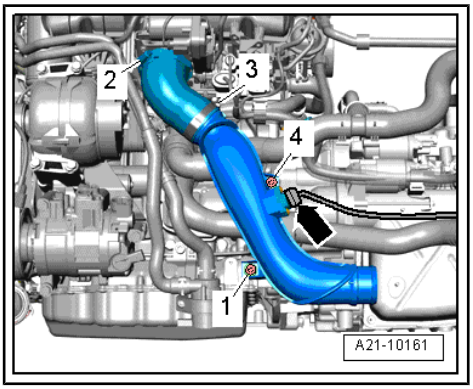


Unplug electrical connector -1- at Hall sender -G40- .

– Remove noise insulation ⇒ Rep. Gr. 66 .



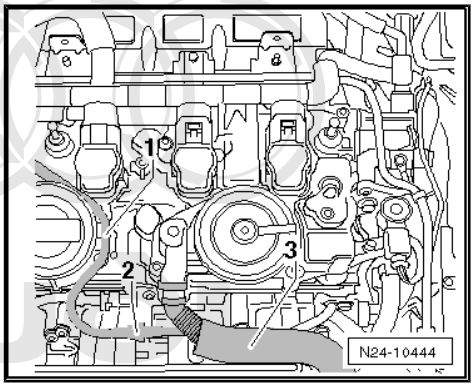
– Release hose clips -2- on air pipe.
– Unplug electrical connector -arrow-.
– Unscrew bolts -1 and 4- and remove air hose from throttle valve module -J338- downwards.
– Pull out air hose.



– Disconnect vacuum line -1- at position marked -2- and remove crankcase breather hose -3-.
– Unclip fuel supply hose from intake manifold.

Note

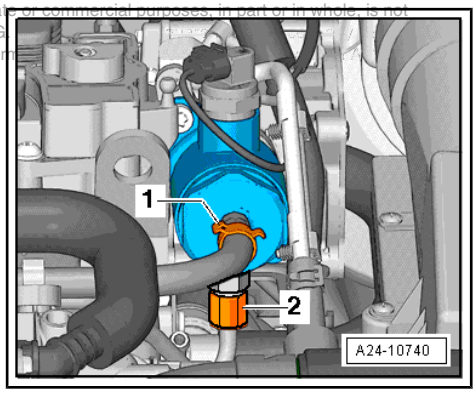
- *The fuel system must not be under pressure.*
- *Use a clean cloth to catch escaping fuel.*



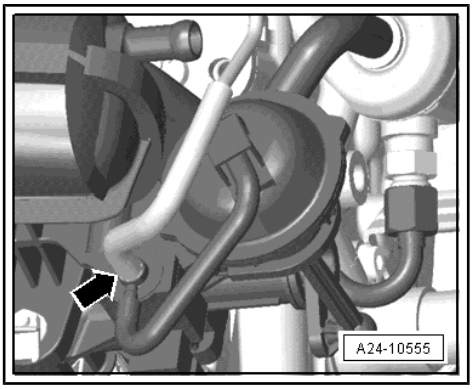
– Release spring-type clip -1- and detach fuel supply hose from high-pressure pump.
– Unscrew union nut for high-pressure fuel pipe -2- at high-pressure pump.

Note

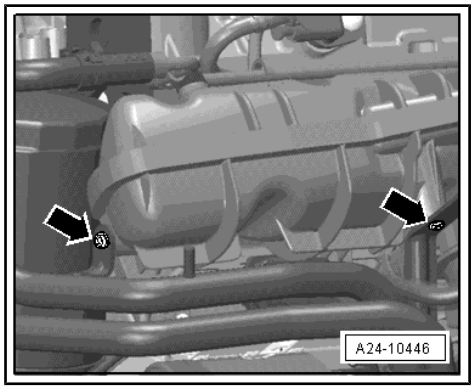
Seal off open connections with clean caps. It is essential to ensure that no dirt enters the fuel system.



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



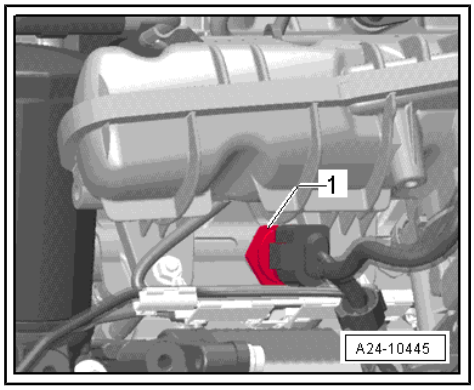
– Remove two bolts -arrows- for coolant line from intake manifold.



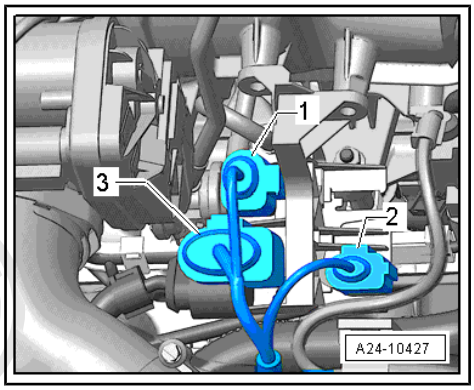
Note

On vehicles with engine codes CESA and CETA, also unplug electrical connector at intake manifold pressure sender -G71- .

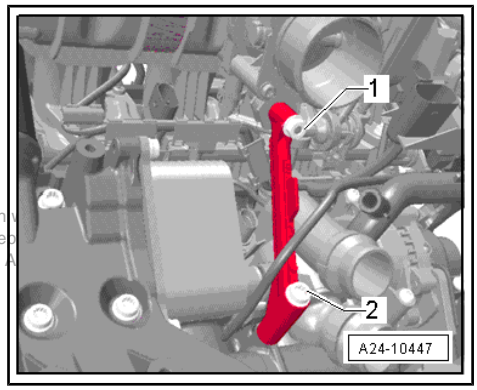
– Unplug electrical connector at fuel pressure sender -G247- -1-.



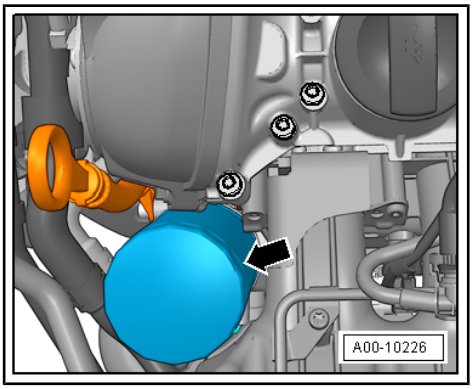
– Unplug electrical connectors -1- and -3- and detach connectors from retainer towards one side.



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

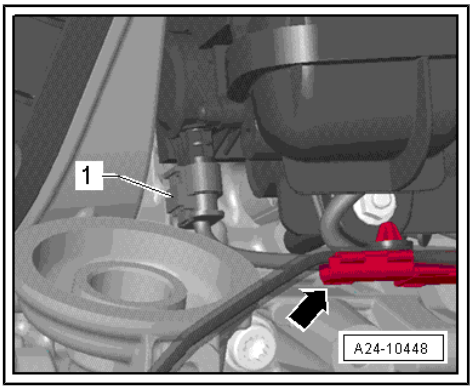


– Loosen oil filter -arrow- with oil filter tool -3417- and remove oil filter.



– Open cable retainer -arrow- and move wiring clear.

– Unscrew bolts from intake manifold using socket Torx T30 - T10347- .

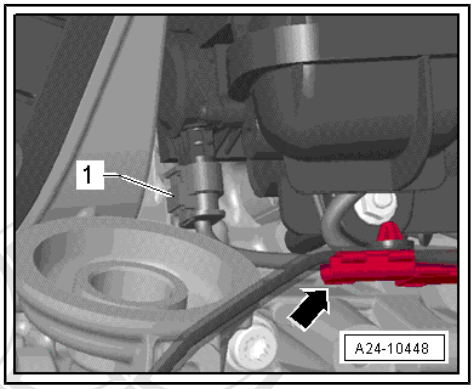


Note

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 47 .

Installing

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

Note

Make sure that injectors are installed correctly.

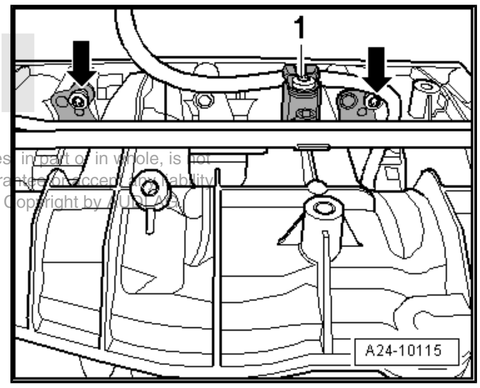
– The remaining installation steps are carried out in the reverse sequence.

- Tightening torque: intake manifold - exploded view ⇒ page 35
- Tightening torque: fuel rail - exploded view ⇒ page 37

6.3.1 Removing and installing fuel rail

Note

Intake manifold must be removed; removing intake manifold ⇒ page 42 .



- 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 pipe.

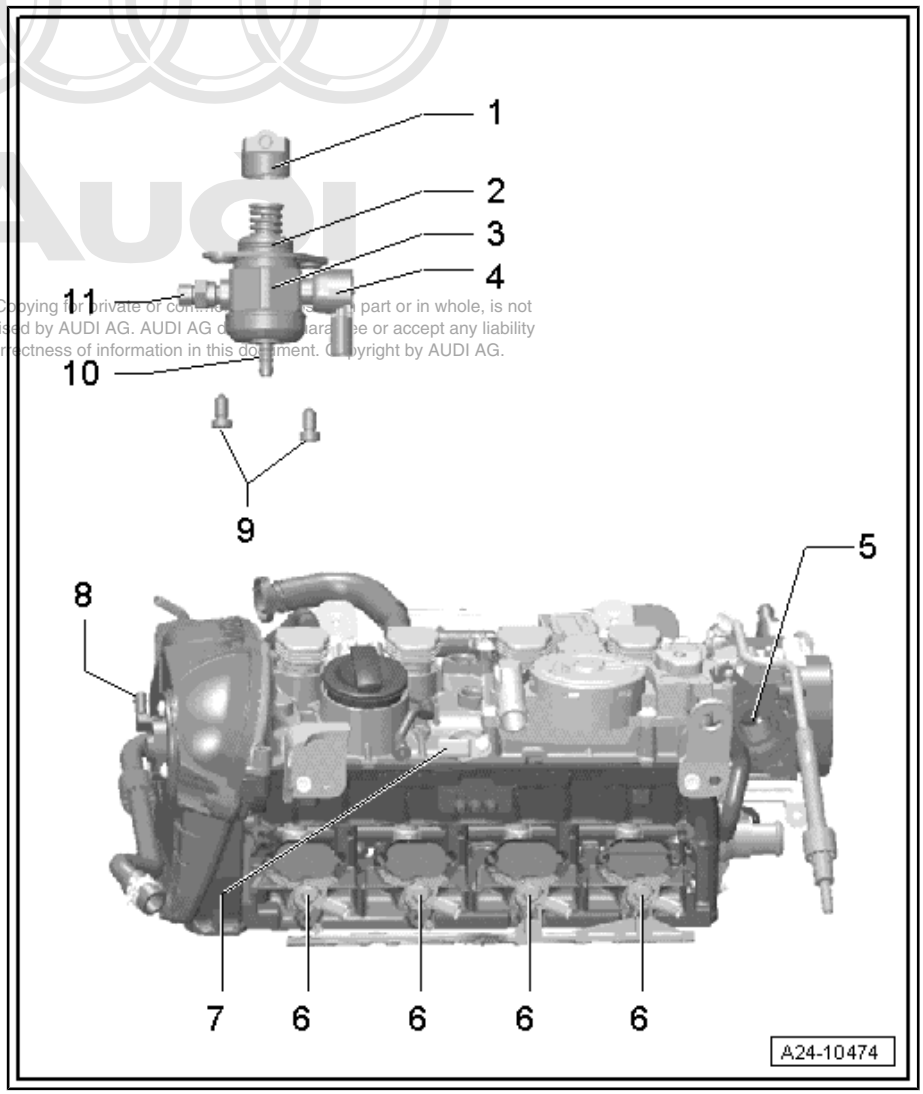
- Connect fuel pipe.
- The remaining installation steps are carried out in the reverse sequence.
- Re-connect electrical connectors.
- Install intake manifold ⇒ page 42 .

7 High-pressure pump

7.1 High-pressure pump - exploded view

WARNING

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



1 - Roller tappet

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

2 - O-ring

- ❑ Renew

3 - High-pressure pump

- ❑ An electric fuel pump (fitted in fuel tank) supplies fuel to the mechanical high-pressure pump
- ❑ When installing the high-pressure fuel pump, it is essential to ensure that no dirt enters the fuel system.
- ❑ The fuel system must not be under pressure; procedure for reducing fuel pressure ⇒ page 4
- ❑ Fuel pipes must be free of tension when installed.
- ❑ Removing and installing ⇒ page 50

4 - Fuel pressure regulating valve -N276-

5 - Aperture in exhauster pump for high-pressure pump

6 - Injectors

- ❑ Renew O-ring and teflon ring
- ❑ Ensure correct installation position.
- ❑ Removing and installing ⇒ page 53

7 - Hall sender -G40-

8 - Camshaft control valve 1 -N205-

9 - Bolts for high-pressure pump

- ❑ 10 Nm (engine code CDAA, 1.8 ltr.)
- ❑ 20 Nm (engine codes CCZA, CCTA, CESA, CETA, 2.0 ltr.)

10 - Connecting piece for fuel supply pipe from fuel tank

11 - Connecting piece for fuel supply pipe to fuel rail

- ❑ Renew
- ❑ Connecting piece: 25 Nm
- ❑ 25 Nm (engine code CDAA, 1.8 ltr.)
- ❑ 40 Nm (engine codes CCZA, CCTA, CESA, CETA, 2.0 ltr.)
- ❑ Tightening torque for union nut for fuel supply pipe: 20 Nm (engine code CDAA, 1.8 ltr.)
- ❑ Tightening torque for union nut for fuel supply pipe: 20 Nm (engine codes CCZA, CCTA, CESA, CETA, 2.0 ltr.)
- ❑ Fuel supply pipe must be free of tension when installed (make sure all parts are clean)

7.2 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

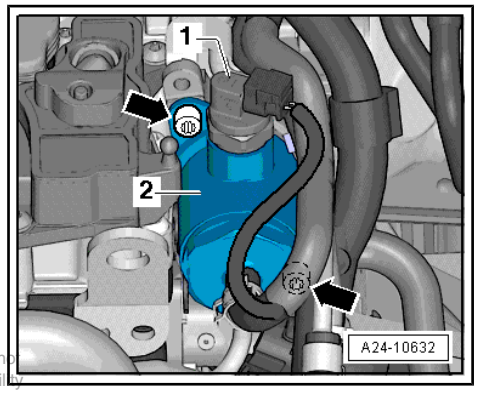
Fuel system operates under high pressure. Always dissipate fuel pressure prior to opening fuel system. For procedure, refer to ***⇒ page 4***

– Remove engine cover panel.

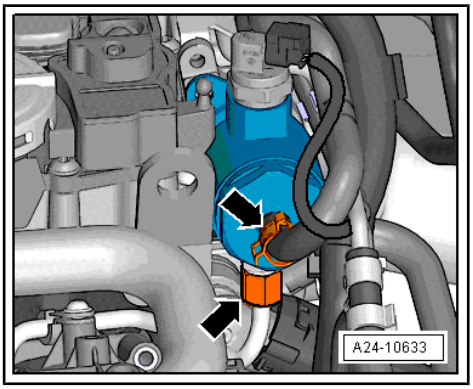
– Detach electrical connector at fuel pressure regulating valve - N276- -1-.

Note

Illustration shows pump of 2.0 ltr. engine.

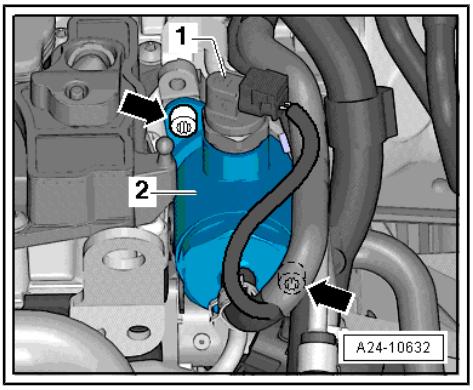


– Disconnect both fuel lines -arrows-.



– Remove 2 bolts -arrows-.

– Carefully pull out high-pressure fuel pump. It is possible that the roller tappet may remain lodged in the exhauster pump.



Installing

– Renew O-ring for high-pressure pump.

– Fit roller tappet in exhauster pump (check roller tappet for damage first).

Note

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

♦ *If the old high-pressure pump is re-installed, or if a used pump is installed, the connecting piece for the fuel supply pipe (high-pressure section of the system) must be renewed. Refer to high-pressure pump - exploded view (item 11)* ⇒ page 49 .

– Turn crankshaft until roller tappet is positioned at lowest point.

– Fit high-pressure pump in exhauster pump.

– Tighten bolts hand-tight.

– Renew connecting piece at high-pressure pump.

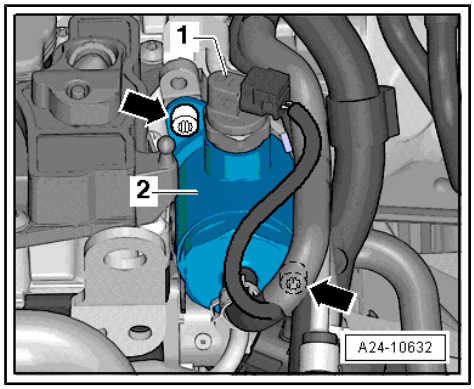
• Tightening torque: refer to exploded view of high-pressure pump ⇒ page 49 .

– Now tighten bolts in diagonal sequence to specified torque, refer to high-pressure pump exploded view ⇒ page 49 .

– Tighten union nut on fuel supply pipe hand-tight. Align so that parts are free of tension.

• Tightening torque for fuel supply pipe (union nut): intake manifold - exploded view ⇒ page 35 .

– Re-attach electrical connector for fuel pressure regulating valve -N276- -1-.
– Put back fuse if it has been removed.



Note

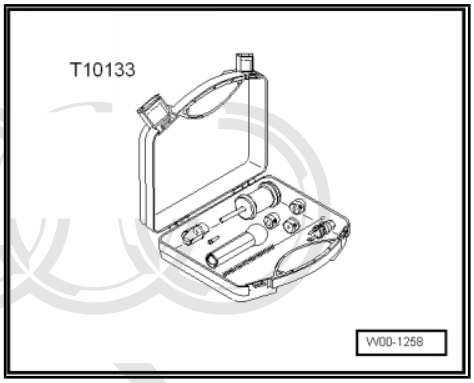
Check fuel system for leaks.

8 Injectors

8.1 Removing and installing injectors

Special tools and workshop equipment required

- Tool kit with puller -T10133-



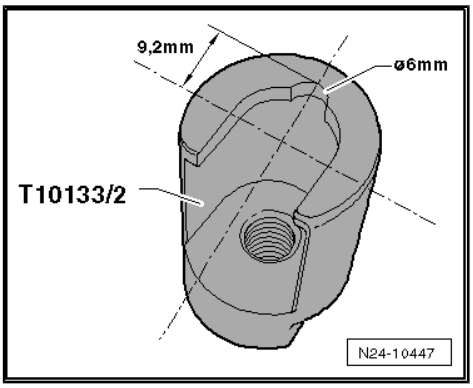
Note

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

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

– File out a semi-circular recess as shown in the illustration. The recess allows the tool to be pushed further onto the injector so the contact surface is increased.

– For identification purposes, mark the modified tool with the letter “A” after the tool number.



Special tools and workshop equipment required

- Round file, approx. 6 mm

Removing

– Remove engine cover panel.

– Remove intake manifold and fuel rail ⇒ page 42 .

Removing injectors (from fuel rail)

Carefully pull injectors out of fuel rail.

Removing injectors (from cylinder head)

Injector (old version)

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

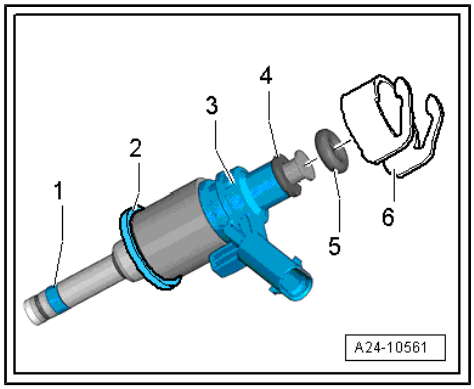
2 - Support ring is replaced by intermediate ring; see next illustration ⇒ page 54

3 - Injector

4 - Spacer ring (renew if damaged)

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

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



Injector (new version)

1 - Renew intermediate ring

2 - Retainer

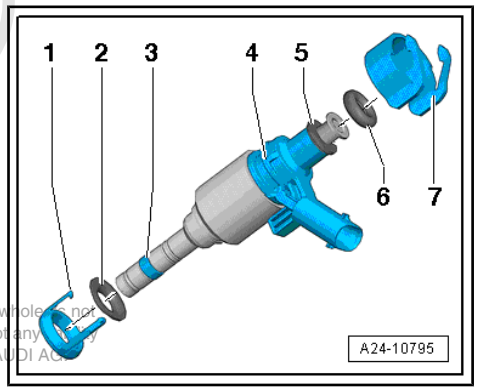
3 - Combustion chamber ring seal (teflon ring seal) - renew; when fitting, do not grease ring or use any other lubricant

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)

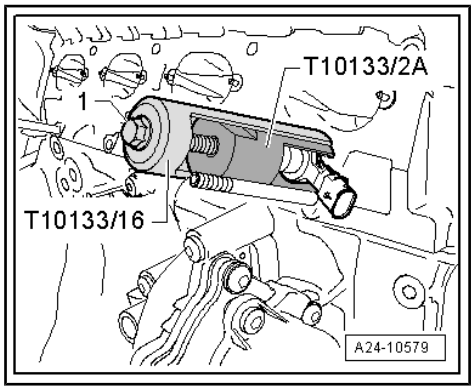


– Cover open inlet ports with a clean cloth.

– Unplug electrical connector at injector that is to be removed.

– Apply puller -T10133/2A- to groove on injector.

– Then attach removal tool -T10133/16- and pull out injector by turning bolt -1-.



Note

The combustion chamber ring seal must always be renewed prior to reinstalling the injector ⇒ page 54 .

8.1.1 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 en-

sure that the groove and the continuous ridge in the bottom of the groove are not damaged.

Note

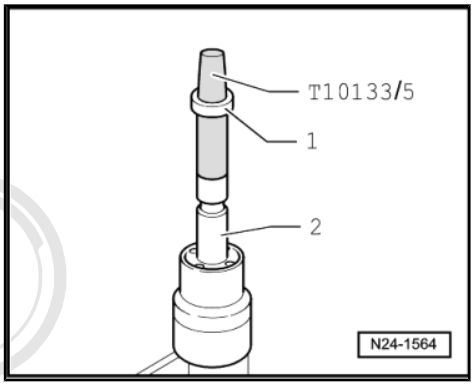
The injector must be renewed if the groove is damaged.

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

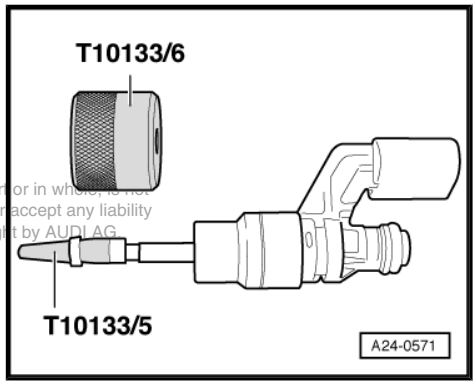
Note

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- .

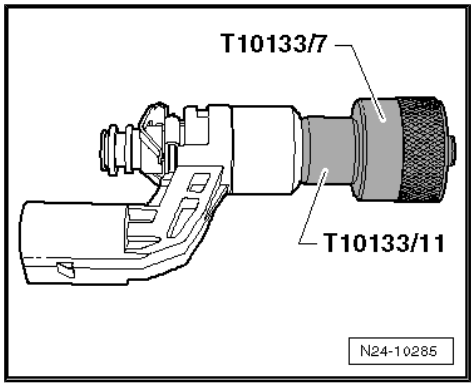
– Fit spacer sleeve -T10133/11- onto body of injector.

– Push calibration sleeve -T10133/7- over teflon ring until it makes contact with spacer sleeve -T10133/11- by pressing lightly and turning approx. 180°.

– Pull calibration sleeve -T10133/7- off again by turning it in the opposite direction.

Use calibration sleeve -T10133/8- for step 2 of the calibration of the teflon ring.

– Push calibration sleeve -T10133/8- over teflon ring until it makes contact with spacer sleeve -T10133/11- by pressing lightly and turning approx. 180°.

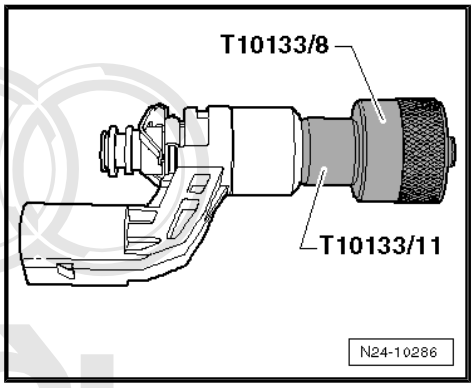


– Pull calibration sleeve -T10133/8- off again by turning it in the opposite direction.

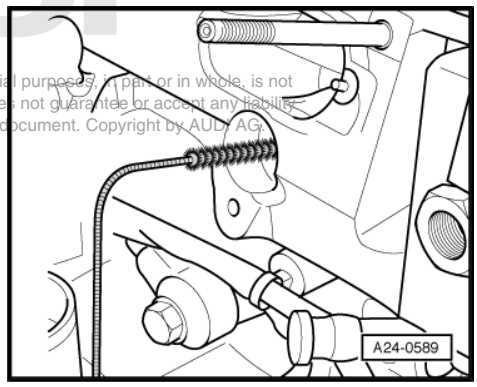
The teflon ring is now installed in the correct position.

– The teflon ring must not be lubricated.

– Fit new O-ring on injector. Lubricate O-ring lightly with clean engine oil before installing.



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



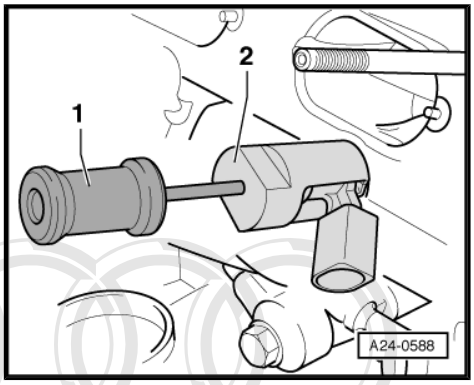
Note

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

– 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 injector easily. If necessary wait until the combustion chamber ring 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 injector.*



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

Important: the following points must always be observed:

- Coat O-rings of high-pressure injectors with clean engine oil to facilitate insertion into fuel rail.
- Renew all seals.
- Fuel rail must be positioned on injectors and pressed in evenly.
- Install intake manifold with fuel rail ⇒ page 42 .

8.2 Cleaning injectors

Special tools and workshop equipment required

- Ultrasonic cleaning unit -VAS 6418-
- Mounting plate for injection modules -VAS 6418/1-
- For cleaning fluid refer to electronic parts catalogue.

Cleaning

– Remove injectors ⇒ page 53 .

Note

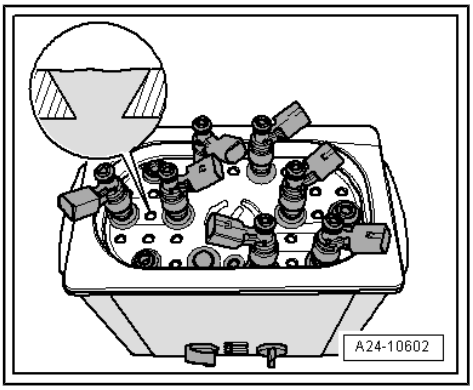
Observe safety precautions and operating instructions for ultrasonic unit.

– Ultrasonic unit must be filled with cleaning fluid.

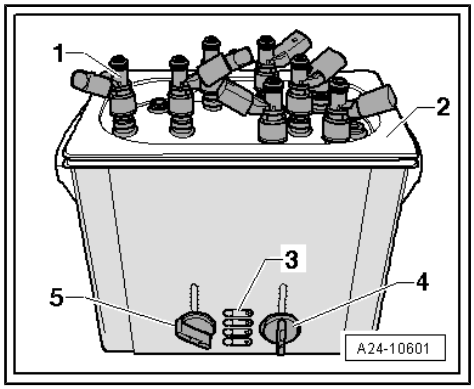
Note

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.

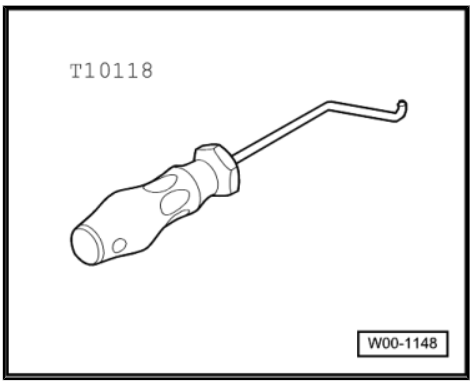
– After cleaning, renew combustion chamber ring seal (teflon ring seal) for each injector ⇒ page 54 .
– Then re-install injectors ⇒ page 53 .

9 Components of injection system

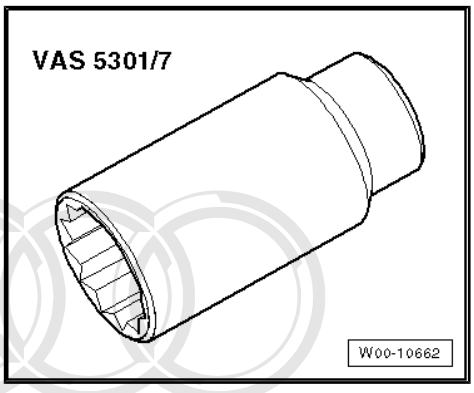
9.1 Removing and installing fuel pressure sender -G247-

Special tools and workshop equipment required

- Assembly tool -T10118-



- Double hexagon socket 1/2", 27 mm -VAS 5301/7- or commercially available socket (27 mm)



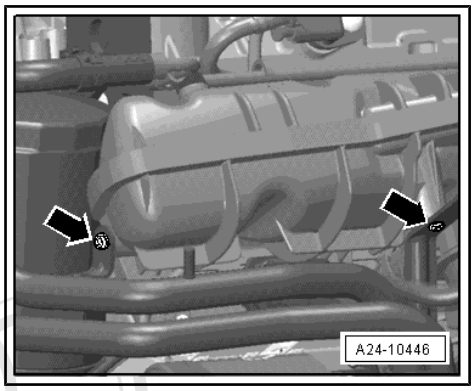
Removing

– Pull off top engine cover panel carefully.

WARNING

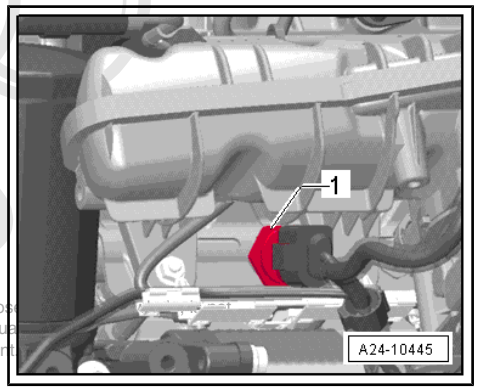
The fuel system is pressurised. The fuel pressure in the high-pressure part of the injection system must be reduced to a residual pressure prior to opening; for procedure see ⇒ page 4 .

– Detach coolant pipe from intake manifold -arrows-.



– Release connector on fuel pressure sender -G247- using assembly tool -T10118- .

– Unscrew fuel pressure sender -G247- using double hexagon socket, 1/2", 27 mm -VAS 5301/7- .



Installing:

– Install in reverse order.

– Make sure that connecting piece is tightened to specified torque before installing fuel pressure sender -G247- .

- Tightening torque for connecting piece: Fuel rail - exploded view ⇒ page 37
- Tightening torque for fuel pressure sender -G247- : Fuel rail - exploded view ⇒ page 37

9.2 Checking fuel pressure sender -G247-

Special tools and workshop equipment required

- Pressure sensor tester -VAS 6394-
- Adapter -VAS 6394/2-
- Test instrument adapter -VAS 5570-
- Torque wrench -V.A.G 1331-
- Vehicle diagnostic tester

Procedure

– Remove engine cover panel ⇒ page 32 .

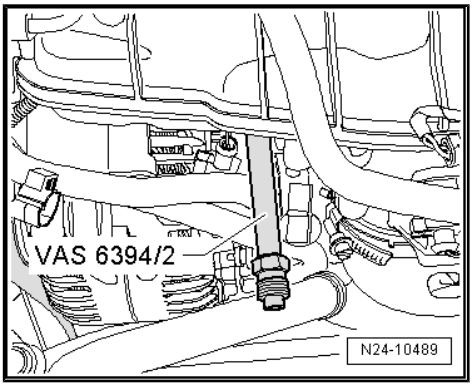
WARNING

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 .

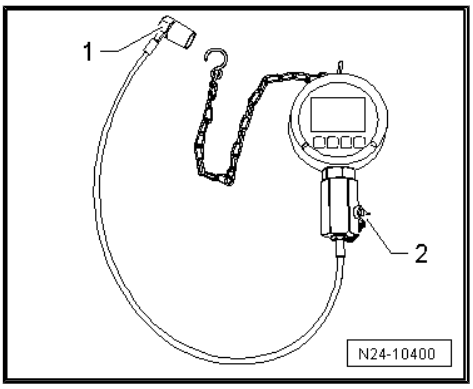
– Remove fuel pressure sender -G247- ⇒ page 59 .

– Screw in adapter -VAS 6394/2- 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 37

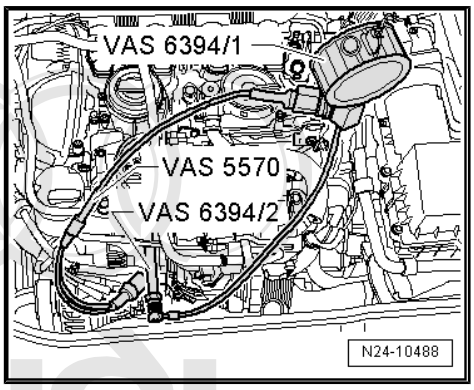


– Unscrew plug -2- on pressure sensor tester -VAS 6394- and screw in the removed fuel pressure sender -G247- . Tighten to torque normally specified for fuel pressure sender.

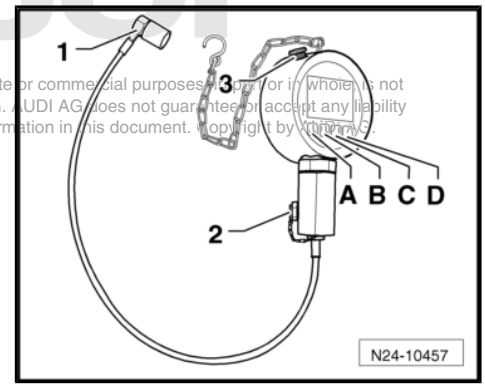


– Use test instrument adapter -VAS 5570- to make electrical connection between vehicle and fuel pressure sender -G247- .
– Connect a vehicle diagnostic tester.
– Switch on ignition.
– Select “Engine electronics” in vehicle self-diagnosis.
– Then select function read “Measured values”.
– Select measured 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 sensor tester -VAS 6394- 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 sensor tester -VAS 6394- should indicate 0 bar. If this is not the case, press button -C- once briefly to zero the tester.

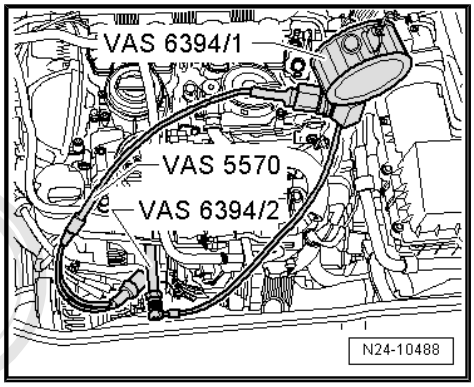
– Connect pressure line of pressure sensor tester -VAS 6394- to adapter -VAS 6394/2- .

– Start engine.

– Compare the pressure indicated by pressure sensor tester -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.

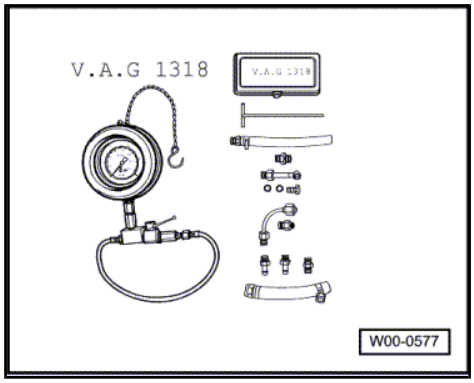
If the values agree:

– Install the new fuel pressure sender -G247- ⇒ page 59 .

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

Special tools and workshop equipment required

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



♦ Fuel-resistant measuring container

♦ Protective gloves

Test conditions:

• Battery voltage at least 12.5 V.

• Fuel filter OK.

• Fuel tank at least $^1/_4$ full.

• Fuel pump control unit -J538- OK (check)

- Ignition off.

Checking fuel pressure

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

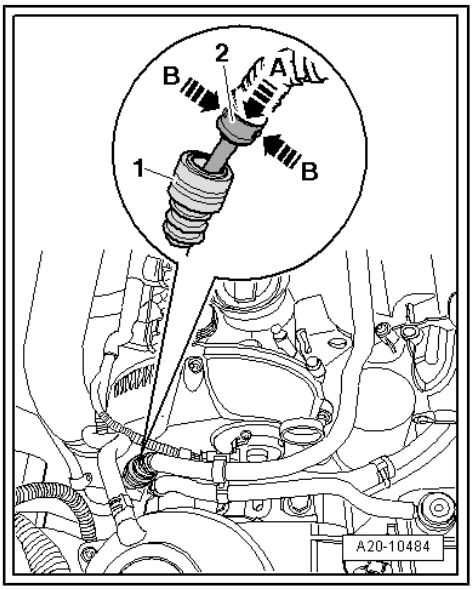
WARNING

- *The pressure in the high-pressure part of the injection system must be reduced to a residual pressure prior to opening the system ⇒ page 4 .*
- *A clean cloth must then be wrapped around the connection and the residual pressure dissipated by carefully loosening the connection.*

– Push down protective sleeve -1- and disconnect fuel supply pipe.

– First press hose connector -2- downwards -arrow A-, then press release tabs -arrow B-.

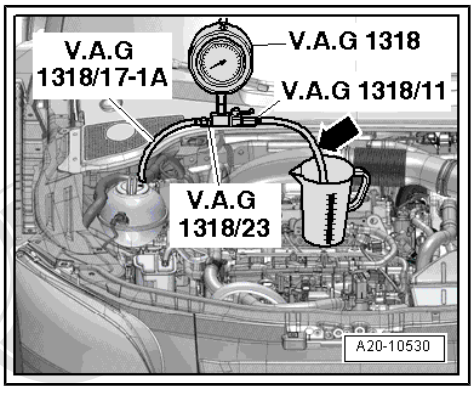
– Pull off hose connector, keeping release tabs depressed.



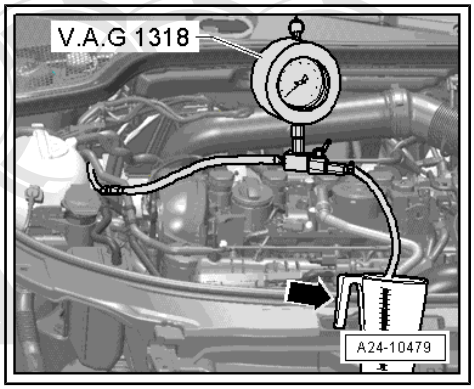
– Screw connector -V.A.G 1318/23- and adapter set -V.A.G 1318/17A- onto K-Jetronic pressure tester -V.A.G 1318- .

– Fit adapter set -V.A.G 1318/17-1A- onto disconnected fuel supply pipe.

– Screw adapter -V.A.G 1318/11- onto K-Jetronic tester -V.A.G 1318- .



– Run test hose into measuring glass -arrow-.



– Close cut-off valve on K-Jetronic pressure tester -V.A.G 1318- .

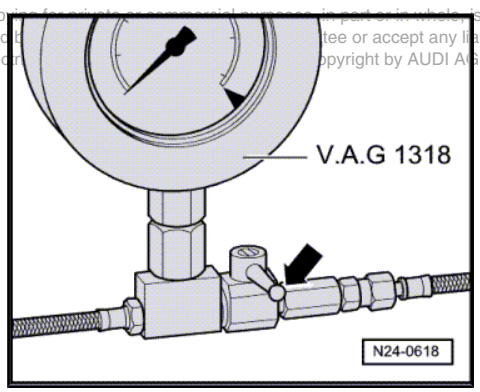
• Lever is at right angle to direction of flow -arrow-.

– Connect a vehicle diagnostic tester.

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

– Then select “Final control diagnosis”.

– The fuel pump should start running.



Note

This function actuates the fuel pump.

– Read off fuel pressure on K-Jetronic pressure tester -V.A.G 1318- .

• Specification: approx. 5 bar (3 ... 6 bar).

– End this function when fuel pressure stops rising on K-Jetronic pressure tester -V.A.G 1318- .

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

• After 10 minutes pressure should still be at least 3 bar.

If the residual pressure drops below 3 bar:

♦ Check union between K-Jetronic pressure tester -V.A.G 1318- and fuel supply pipe for leaks.

♦ Check K-Jetronic pressure tester -V.A.G 1318- 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.

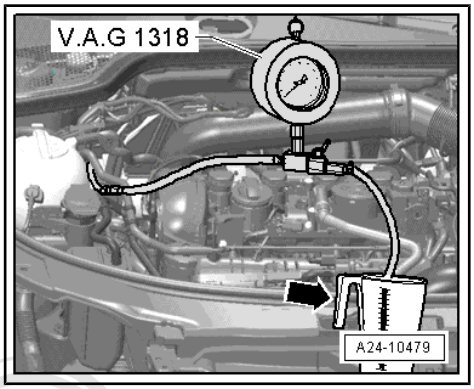
♦ If fuel filter is OK, renew fuel pump ⇒ Fuel supply system, petrol engines; Rep. Gr. 20 .

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

– The ignition must be switched off.

Note

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



– Re-attach fuel supply pipe (make sure that all parts are clean).

Note

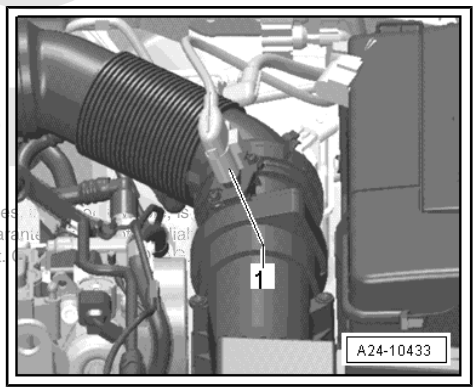
Check fuel system for leaks.

9.4 Removing and installing air mass meter -G70-

Removing

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

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



Installing

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

Note

- *If the air filter element is very dirty or wet, dirt or water could reach the air mass meter -G70- and affect the air mass value. This would lead to loss of power, since a smaller injection quantity is calculated.*
- *Always use genuine part for air filter element.*
- *Use a silicone-free lubricant when installing the air hose.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue*

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

– Check for dirt in air duct leading to air filter element. If necessary, clean salt residue, dirt and leaves out of air cleaner housing (top and bottom sections); wash out or use a vacuum cleaner as required. Removing and installing air cleaner ⇒ page 32

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

9.5 Removing and installing throttle valve module -J338-

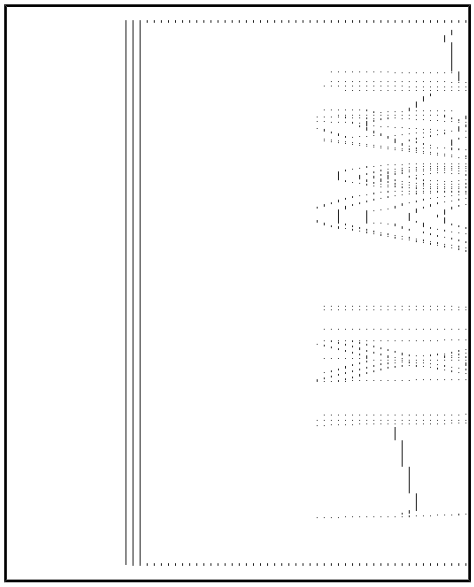
Removing

– Remove engine cover panel ⇒ page 32 .

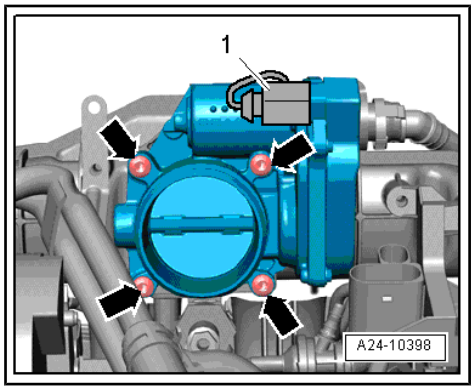
– Remove noise insulation ⇒ Rep. Gr. 66 .

– Unscrew bolts and clips -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 35 .

– After throttle valve module -J338- has been renewed, it must be re-adapted to engine control unit -J623- using a vehicle diagnostic tester.

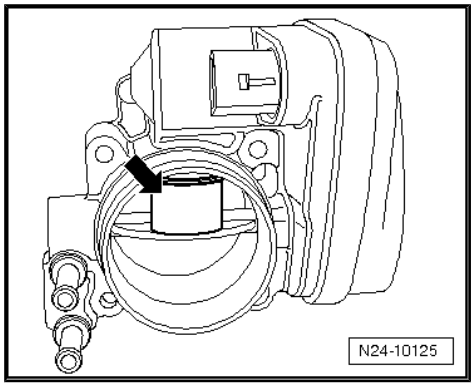
9.6 Cleaning throttle valve module -J338-

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 65 .

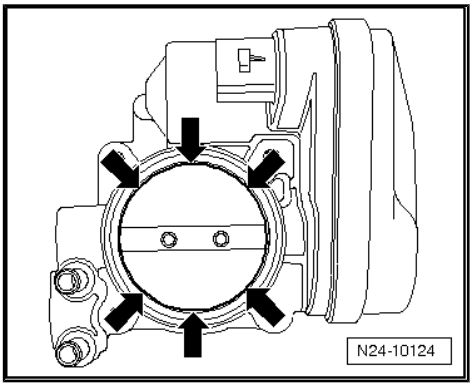
– Open throttle valve by hand and block it in the open position with a suitable object (e.g. plastic or wooden wedge) -arrow-.



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, especially around the points -arrows- where the throttle valve closes, using commercially available acetone (DIN 53247) 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 using a vehicle diagnostic tester.

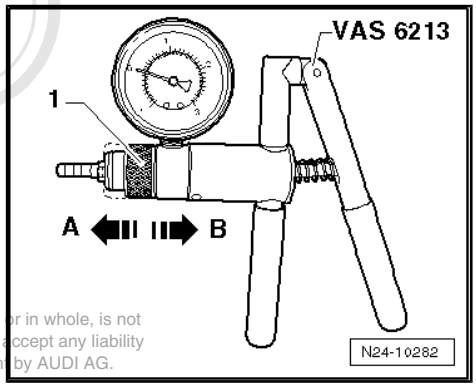


9.7 Checking intake manifold change-over function

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

Special tools and workshop equipment required

♦ Hand vacuum pump -VAS 6213-



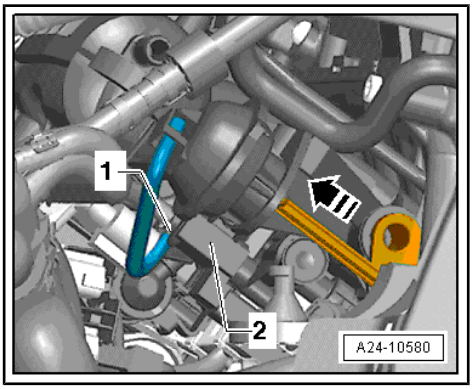
Test condition:

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

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

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

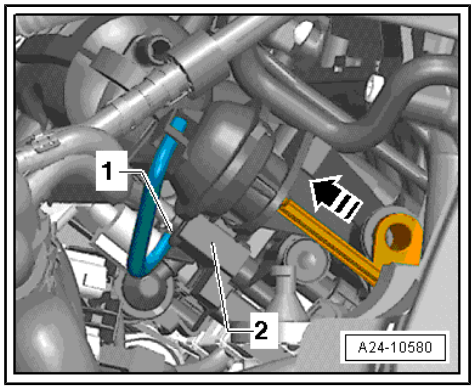
• The vacuum unit should pick up -arrow-.



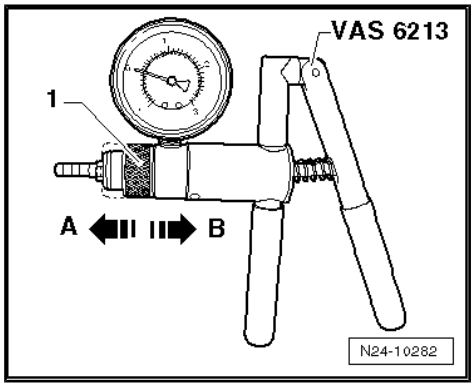
If the change-over does not operate as described:

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

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



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

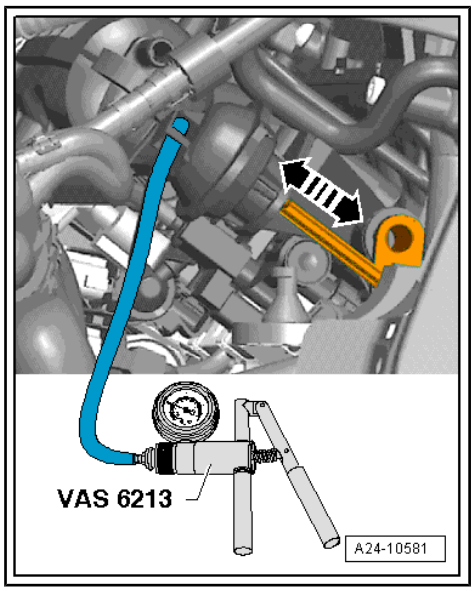


– Connect hand vacuum pump -VAS 6213- to vacuum unit for intake manifold flap valve -N316- .

– Operate the hand vacuum pump -VAS 6213- several times.

The vacuum unit should move -arrows-.

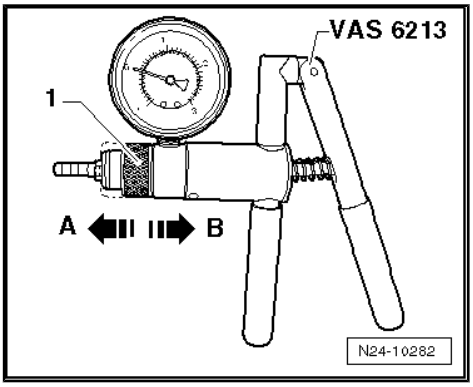
– If vacuum unit does not move, renew vacuum unit.



9.8 Checking dual non-return valve of activated charcoal filter solenoid valve 1 - N80-

Special tools and workshop equipment required

♦ Hand vacuum pump -VAS 6213-



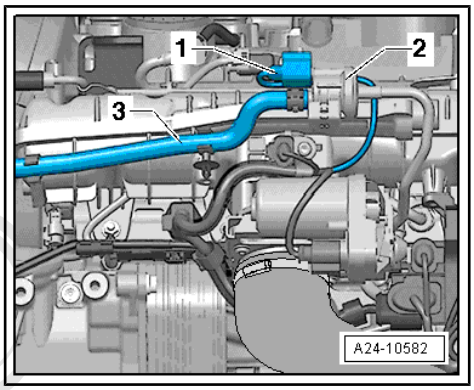
♦ Auxiliary measuring set -V.A.G 1594C-

Test condition:

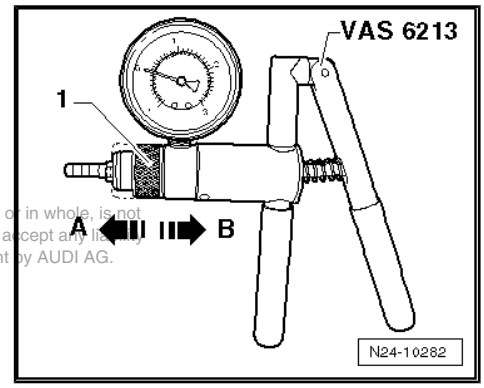
- Activated charcoal filter solenoid valve 1 -N80- has been checked with a vehicle diagnostic tester and is OK.

– 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- .

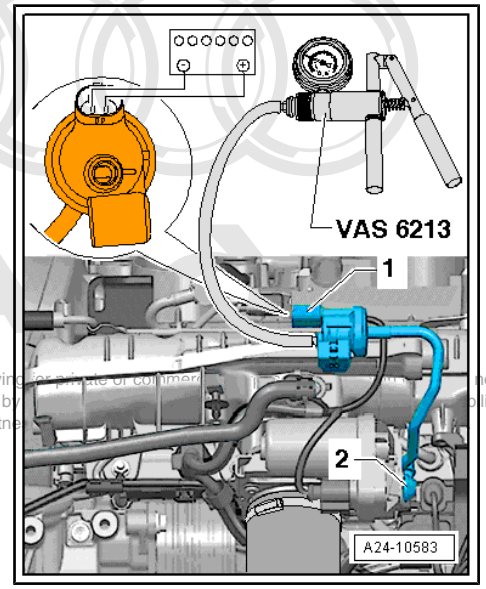
Then immediately operate hand vacuum pump -VAS 6213- several times.

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

If vacuum does not build up:

– Renew dual non-return valve -1-.

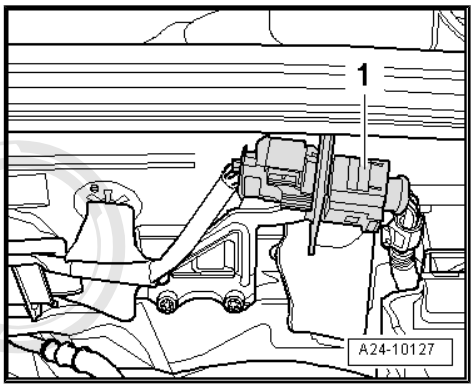
Dual non-return valve, activated charcoal filter solenoid valve 1 -N80- and plastic hoses are combined as one unit and can only be renewed together.



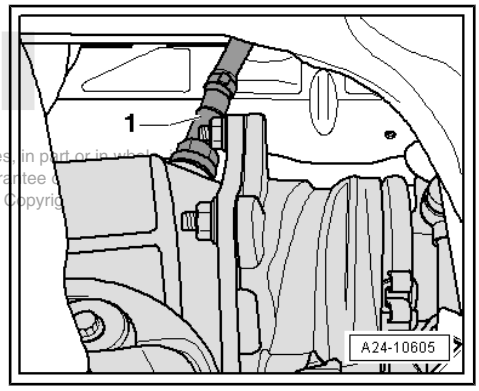
10 Lambda probes

10.1 Lambda probes - overview

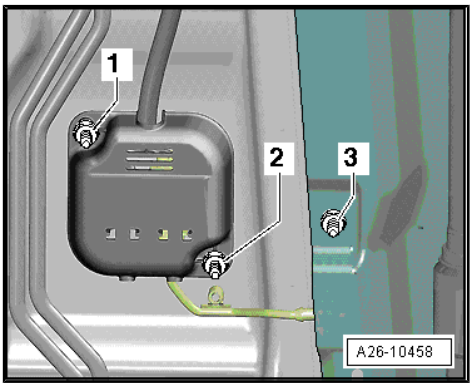
Electrical connector -1- for Lambda probe -G39- and Lambda probe heater -Z19-



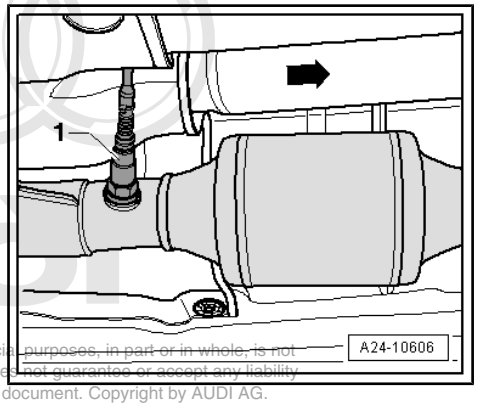
Lambda probe -G39- and Lambda probe heater -Z19- -1-



Electrical connector for Lambda probe after catalytic converter - G130- and Lambda probe 1 heater after catalytic converter -Z29- (behind cover)



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



Note

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

- Tightening torque: 55 Nm

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.*

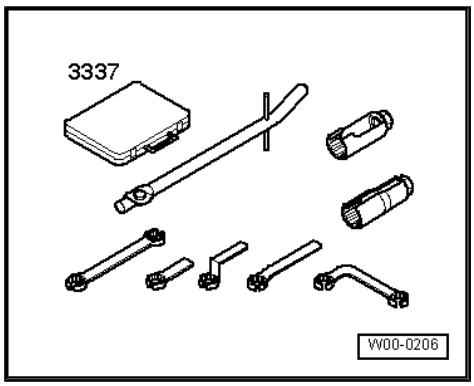
Removing and installing Lambda probe -G39- and Lambda probe heater -Z19- before catalytic converter
⇒ “10.2 Removing and installing Lambda probe G39 and Lambda probe heater Z19 before catalytic converter”, page 72 .

Removing and installing Lambda probe after catalytic converter -G130- and Lambda probe 1 heater after catalytic converter -Z29-
⇒ “10.3 Removing and installing Lambda probe after catalytic converter G130 and Lambda probe 1 heater after catalytic converter Z29 ”, page 73

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

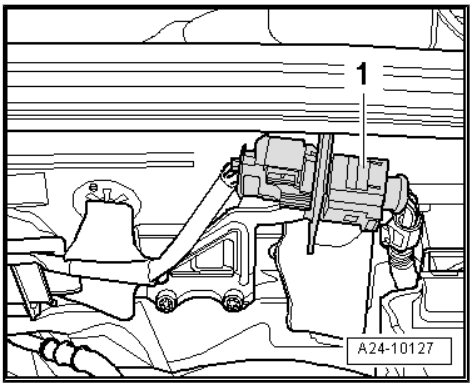
Special tools and workshop equipment required

- Lambda probe open ring spanner set -3337-

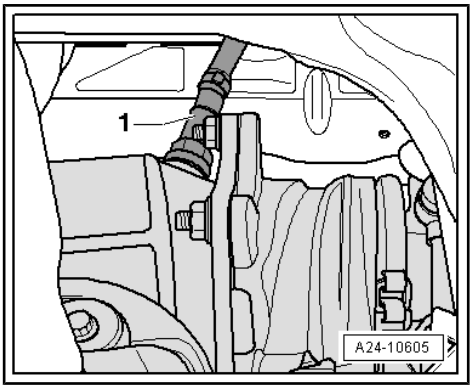


Removing

– 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

When installing, note the following:

Note

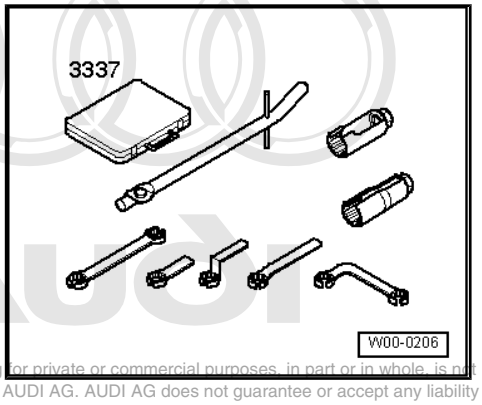
- *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. High-temperature 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 71

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

Special tools and workshop equipment required

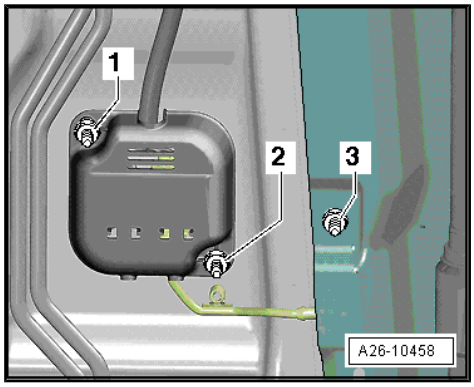
- Lambda probe open ring spanner set -3337-



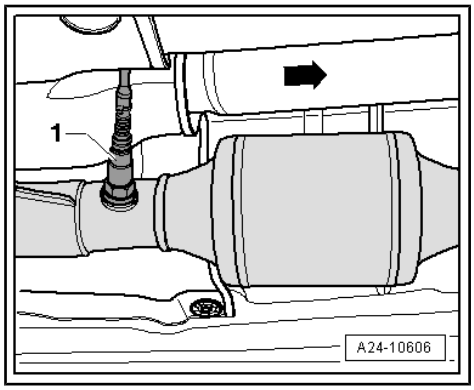
Removing

– Remove right-side cover from underbody.

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



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



Installing

When installing, note the following:

Note

- *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the 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.*

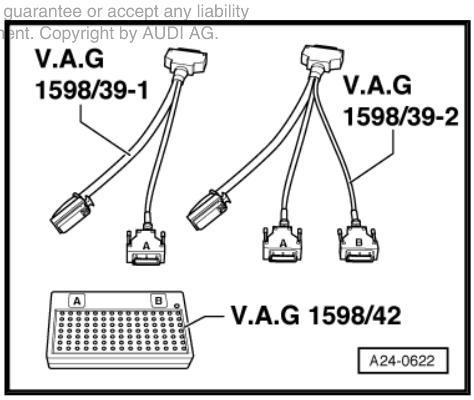
- Tightening torque: Lambda probe - overview ⇒ page 71

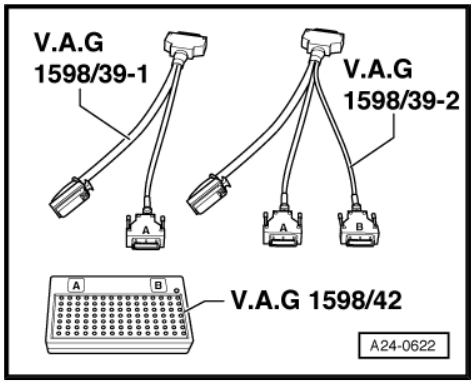
11 Engine control unit

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

Special tools and workshop equipment required

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





Note

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

WARNING

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

The engine control unit has to be removed before multi-pin connectors can be unplugged from engine control unit ⇒ page 77 .

– Connect the test box -V.A.G 1598/42- to wiring harness with adapter cable -V.A.G 1598/39-1- or adapter cable -V.A.G 1598/39-2- . Connect earth clip of test box to negative terminal of battery. The instructions for performing the individual tests indicate whether or not the engine control unit itself also needs to be connected to the test box.

– Carry out test as described in appropriate repair procedures.

Installing engine control unit

Installation is performed in the reverse sequence.

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

– Clean threaded holes for shear bolts to remove any residue from locking fluid. This can be done using a thread tap.

– Always use new shear bolts.

Perform the following after reconnecting engine control unit:

– Interrogate event memory.

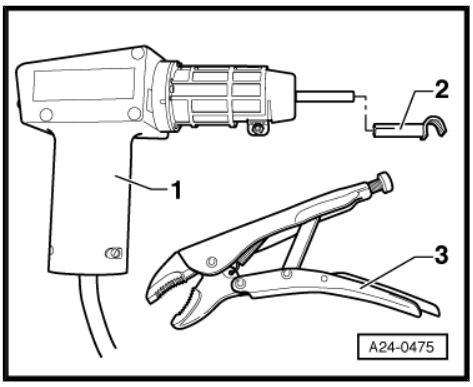
11.2 Renewing engine control unit -J623-

Note

Not every engine control unit is bolted to a protective housing. Whether a protective housing is fitted depends on the engine/ gearbox combination.

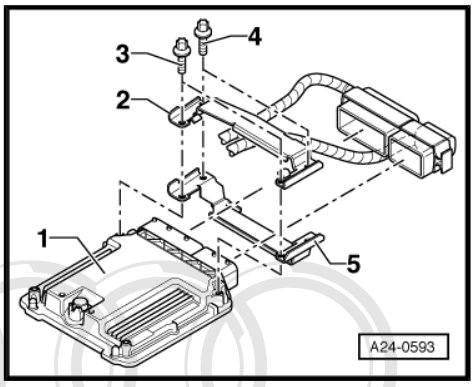
Special tools and workshop equipment required

- Hot air blower -VAS 1978/14A- -item 1- with nozzle attachment -2- from wiring harness repair set -VAS 1978 B-
- Small, commercially available vice grip pliers -3-



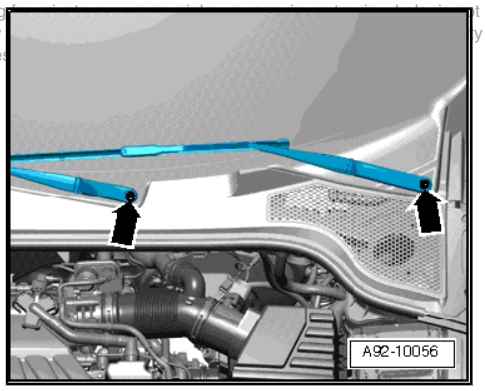
Note

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



Removing

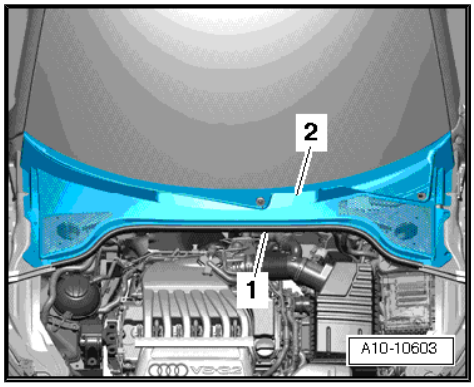
– When renewing engine control unit, select diagnosis object “Replace engine control unit” in “Guided Functions”.
– Switch off ignition and remove ignition key.
– Lever off caps on windscreen wiper arms with a screwdriver.
– Loosen hexagon nuts -arrows- several turns.
– Loosen wiper arms from wiper shafts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



Note

If necessary, use puller -T10369- or a commercially available puller to remove wiper arms.

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



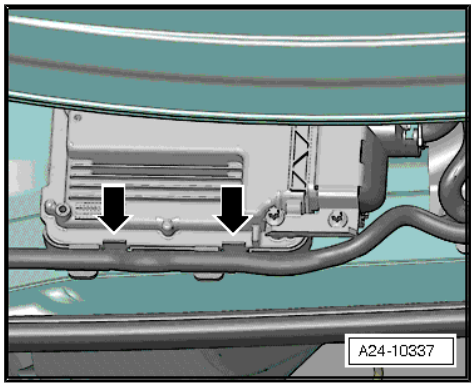
Note

- *Risk of damage to plenum chamber cover.*
- *Apply a small quantity of soap solution to transition between windscreen and plenum chamber cover -2-. Then, starting at edge of windscreen, carefully pull plenum chamber cover upwards off retainer at windscreen.*

– Detach plenum chamber cover -2- by pulling it carefully off retainer at windscreen.

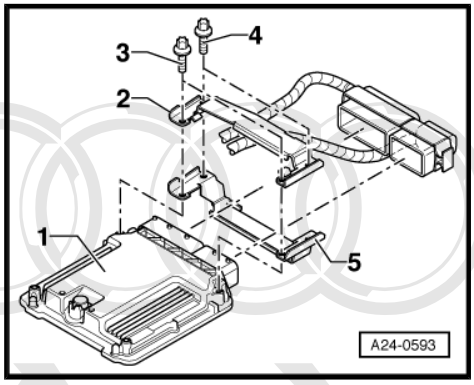
– Move clear engine wiring harness at rear of plenum chamber partition panel.

– Release clips -arrows- and remove engine control unit -J623- .

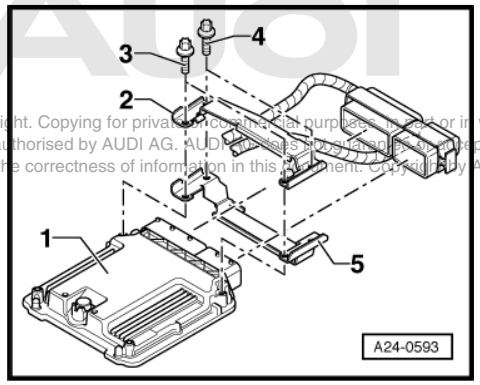


Perform the following work steps if a protective housing is fitted:

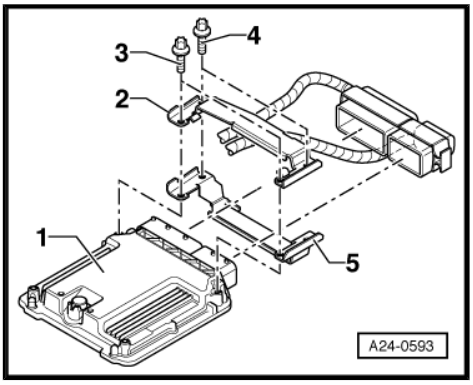
To help prevent unauthorised access to the connectors on the engine control unit, the control unit is secured by means of shear bolts to a locking plate and a metal casing.



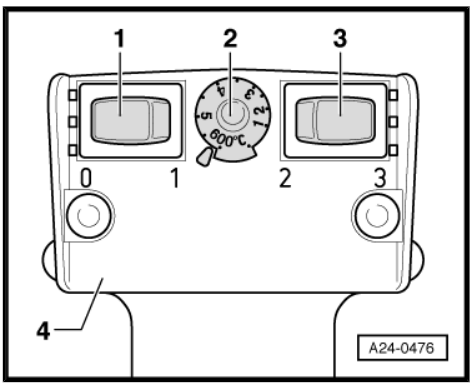
The threads of the two shear bolts -4- which are not screwed into the engine control unit are secured with locking fluid. To unscrew these two bolts, the threads must therefore be heated with the hot air blower.



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.

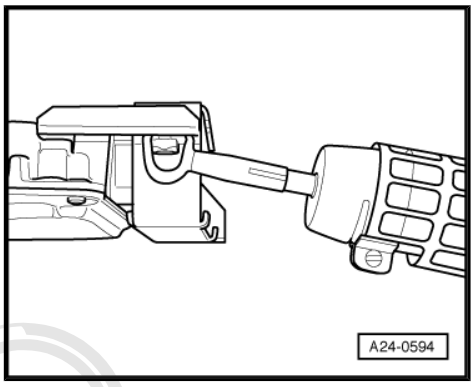


WARNING

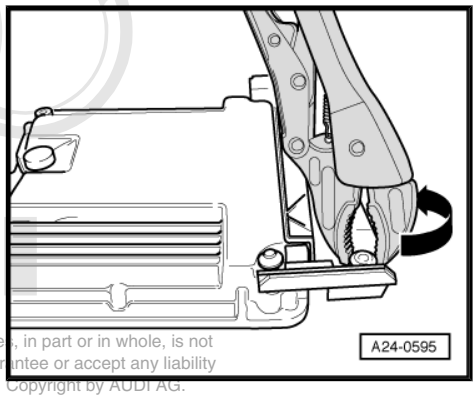
Heating the thread of the locking plate also heats up the shear bolts and parts of the metal housing. Take care to avoid burns. It is also important to ensure that only the thread is heated and none of the surrounding components if at all possible. These should be covered if necessary.

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

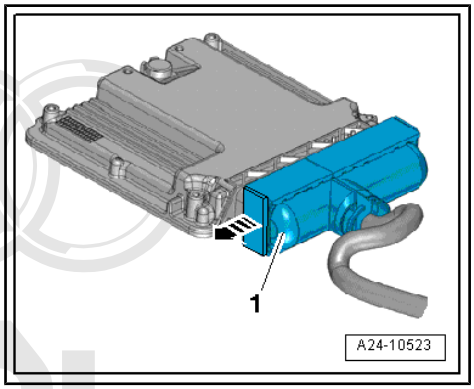
Switch on the hot air blower and heat the bolt for approximately 20 ... 30 seconds.



- 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 can be removed without heating.
- Detach metal locking plate from connectors.
- Unscrew two bolts securing retainers for 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.

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

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”.

28 – Ignition system

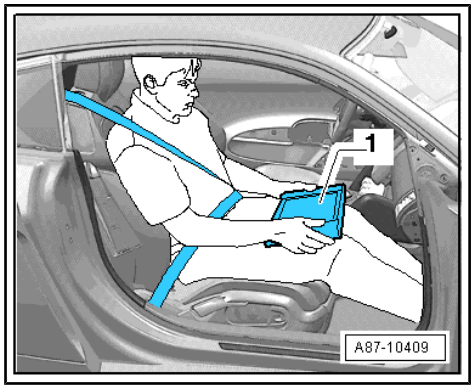
1 General notes and safety precautions

1.1 General notes on ignition system

- The engine control unit has a self-diagnosis capability.
- A voltage of at least 11.5 V is required for proper operation of the electrical components.
- Certain tests may lead to a fault being detected by the control unit and stored. The 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 immobiliser 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:



WARNING

Accidents can be caused if the driver is distracted by test equipment while road-testing, or if test equipment is not properly secured.

Injuries can also be caused if the passenger's airbag is triggered in a collision.

- *The use of test equipment while driving causes distraction.*
- *There is an increased risk of injury if test equipment is not secured.*

◆ *Move the passenger's seat back as far as it will go.*

◆ *Use only vehicle diagnosis and service information system -VAS 5052 A- or diagnosis system -VAS 5053- .*

◆ *The test equipment -1- must rest flat on the passenger's thighs (as shown in illustration) and must be operated by the passenger.*

Caution

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

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

– Disconnect battery ⇒ Rep. Gr. 27 .

To prevent injuries to persons and/or 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. After completing the work, interrogate and erase the event memory.
- ◆ Always switch off the ignition before cleaning the engine.

2 Servicing ignition system

2.1 Test data

Engine data	1.8 ltr. and 2.0 ltr. turbo FSI engine
Idling speed is not adjustable; controlled by the idling speed stabilisation	640...800 rpm
Engine speed limiter (deactivates injectors/closes throttle valve)	approx. 6,500 rpm
Ignition timing is determined by the control unit. Ignition timing cannot be adjusted.	
Ignition system	Multi-coil ignition system with 4 ignition coils (integrated output stages) connected directly to spark plugs via spark plug connectors; ignition coils can be pulled out of cylinder head using puller - T40039 -
Firing order	1-3-4-2

2.2 Ignition system - exploded view

1 - Knock sensor 1 -G61-
- ❑ Contacts gold-plated

2 - Knock sensor 2 -G66-
- ❑ Contacts gold-plated

3 - Ignition coil with output stage -(N70, N127, N291, N292)-
- ❑ Removing and installing ⇒ page 84
- ❑ Use puller -T40039- for removal

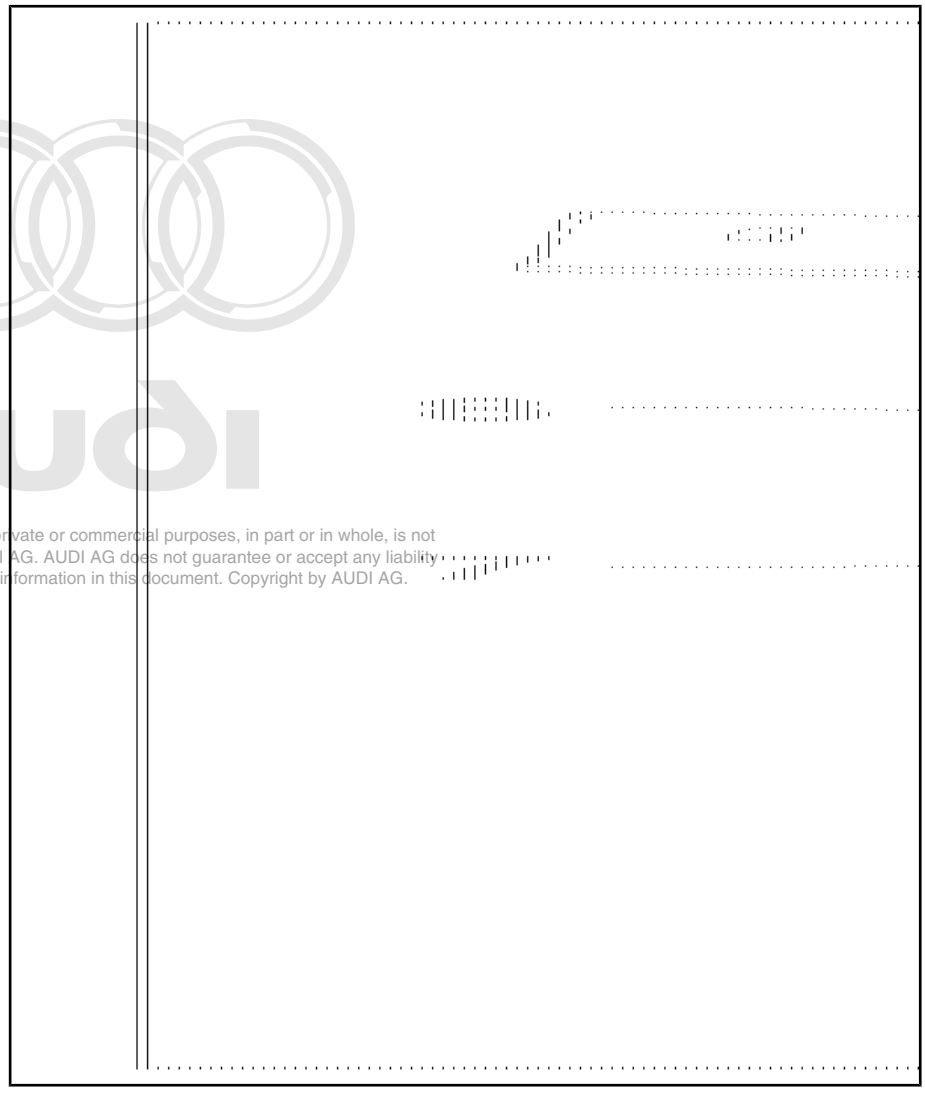
4 - Spark plug
- ❑ 30 Nm
- ❑ Use spark plug socket and extension -3122 B- for removal
- ❑ Removing and installing ⇒ Maintenance ; Booklet 810

5 - Bolt
- ❑ 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 dam-

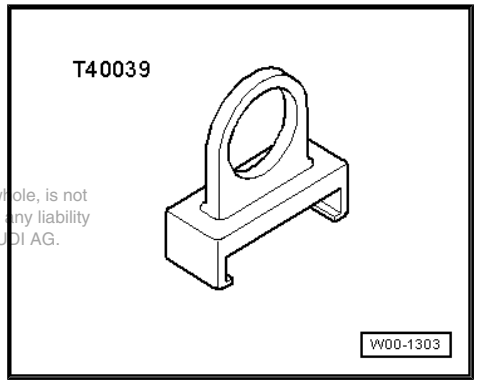


aged

2.3 Removing and installing ignition coils with output stages

Special tools and workshop equipment required

- Puller -T40039-

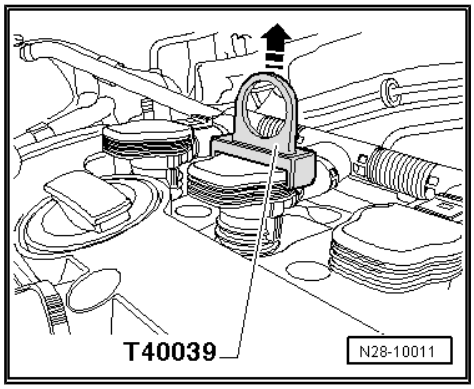


Removing

– Remove engine cover panel.

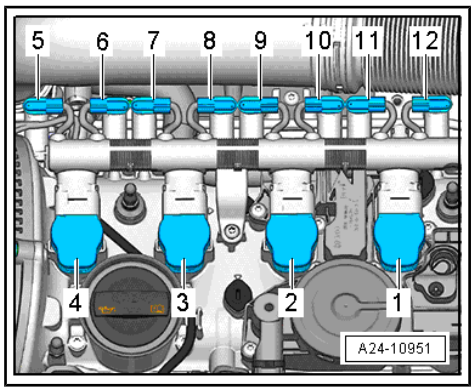
– Unscrew two bolts on connector rail.

– Pull all ignition coils approx. 30 mm out of spark plug holes using puller -T40039- .

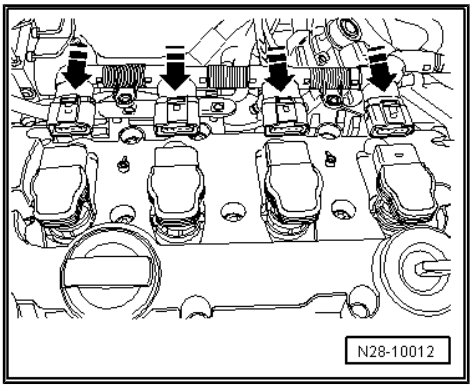


The following step is only required on vehicles with engine codes CESA and CETA.

– Release electrical connectors -5 to 12- at all camshaft adjustment actuators.



– Release connectors and unplug all connectors from the ignition coils at the same time.



Installing

– Fit all ignition coils loosely into spark plug holes.

– Align the ignition coils with the connectors and attach all connectors onto ignition coils simultaneously.

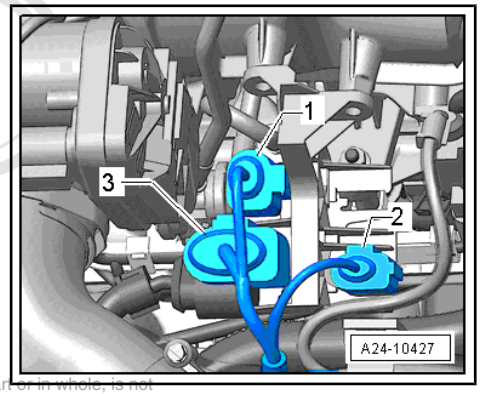
– Press ignition coils onto spark plugs by hand with uniform pressure (do not use tool).

2.4 Removing 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

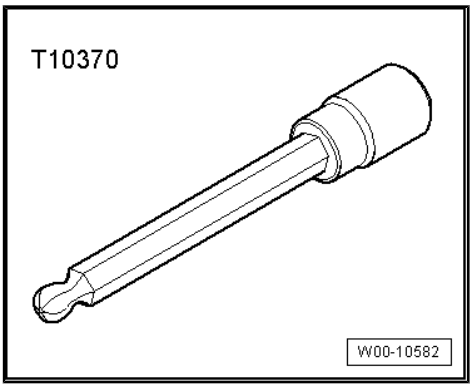
– Install in reverse order.

• Tightening torque: refer to exploded view of ignition system ⇒ page 83 .

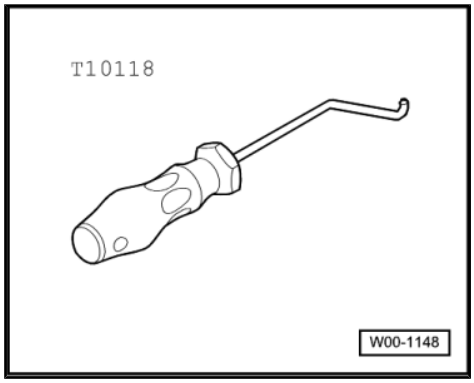
2.5 Removing and installing engine speed sender -G28-

Special tools and workshop equipment required

♦ Socket (4 mm) -T10370-



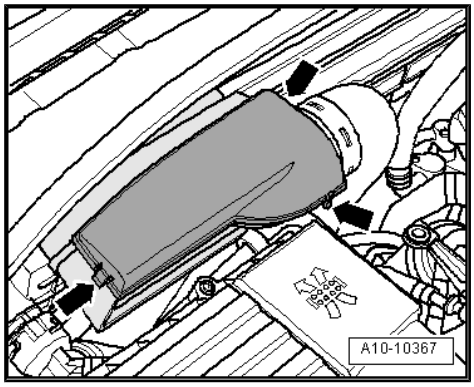
♦ Assembly tool -T10118-



Removing

– Remove engine cover panel.

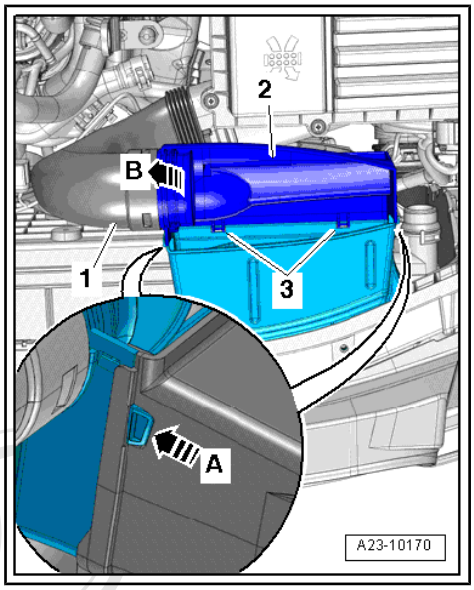
– Pull cover off air duct (release clips on sides) -arrows-.



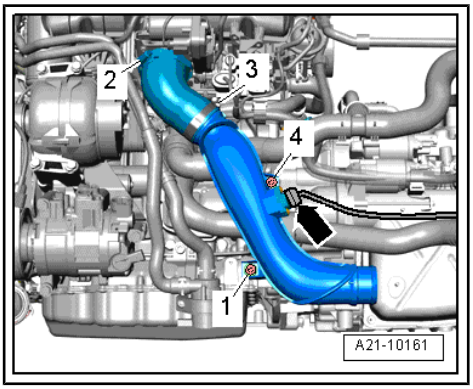
– Remove air pipe -1-.

Note

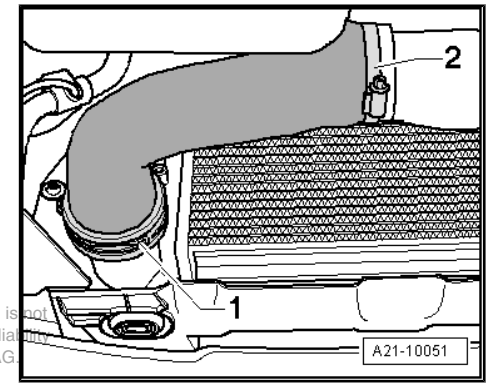
The air duct -item 2- does not have to be removed.



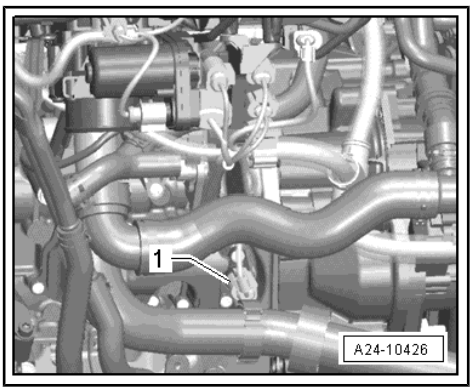
– Release hose clip -2- on air pipe.
– Unplug electrical connector -arrow-.
– Remove noise insulation ⇒ Rep. Gr. 66 .
– Unscrew bolts -1 and 4- and remove air hose from throttle valve module -J338- downwards.



– Disconnect air hose -1- from charge air cooler and remove air pipe downwards.



– Unplug electrical connector -1- at engine speed sender -G28- .
– Unscrew securing bolt for engine speed sender -G28- .



Installing

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

- Tightening torque: refer to overview of fitting locations ⇒ page 8 .