Workshop Manual

Audi A4 2008 ➤
Audi A5 Cabriolet 2009 ➤
Audi A5 Coupé 2008 ➤

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

Engine ID	CDN B	CAE B	CDN C	CDZ A	CAE A	CAD A	CFK A	CPM A	

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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

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

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24 – Mixture preparation - injection

1 Safety precautions and rules for cleanliness

Overview

- ⇒ „1.1 General notes on self-diagnosis“, page 1
- ⇒ „1.2 Safety precautions when using testers and measuring instruments during a road test“, page 2
- ⇒ „1.3 Safety precautions for vehicles with start/stop system“, page 2
- ⇒ „1.4 Safety precautions and instructions for working on the fuel system“, page 3
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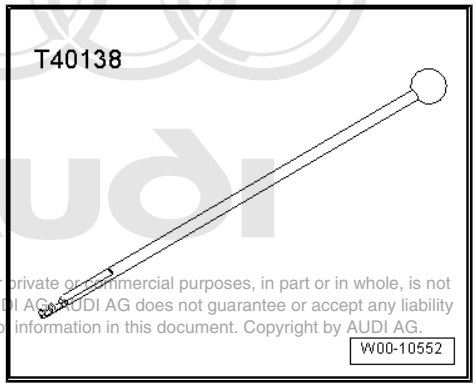
- ⇒ „1.6 Reducing pressure in high-pressure section of injection system“, page 4
- ⇒ „1.7 Checking vacuum system“, page 6

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 .
- Use release tool -T40138- to unplug connectors that cannot be accessed easily.



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

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

WARNING

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

Persons sitting in the front passenger's seat could be injured if the airbag is triggered in an accident.

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

◆ *Test equipment must always be secured on the rear seat with a strap and operated from the rear seat by a second person.*

1.3 Safety precautions for vehicles with start/stop system

WARNING

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

◆ *On vehicles with activated start/stop system (this is indicated by a message in the instrument cluster display), the engine may start automatically on demand.*

◆ *Therefore it is important to ensure that the start/stop system is deactivated when performing repairs (switch off ignition, if required switch on ignition again).*

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1.4 Safety precautions and instructions for working on the fuel system

WARNING

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

- *If the battery is not disconnected, the fuse for the fuel pump control unit -J538- must be removed as a precautionary measure before opening the fuel system because the fuel pump will otherwise be activated by the contact switch on the driver's door.*
- *The fuel system is pressurised. The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening; for procedure see ⇒ page 4 .*
- *The connection must be opened immediately after reducing the pressure; wrap a cloth around the connection and allow the residual pressure (approx. 7 bar) to dissipate.*

Note

Removing the fuse (located in fuse carrier in dash panel on driver's side) will interrupt the power supply from »terminal 30« for the fuel pump control unit -J538- . ⇒ Current flow diagrams, Electrical fault finding and Fitting locations

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

- Carefully clean connection points and the surrounding area with engine cleaner or brake cleaner and dry thoroughly before opening.
- Plug open lines and connections with suitable protective caps immediately.
- Place parts that have been removed on a clean surface and cover them over. Do not use fluffy cloths.
- Only install clean components; replacement parts should only be unpacked immediately prior to installation. Do not use parts that have been previously unpacked and stored away loose (e.g. in toolboxes, etc.).
- When the system is open: Do not work with compressed air. Do not move the vehicle unless absolutely necessary.

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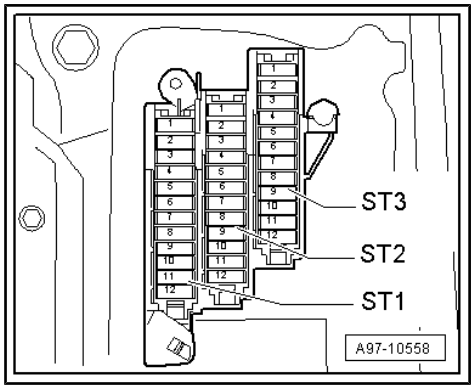
1.5 Safety precautions when working on the ignition system

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



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

Note

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

1.6 Reducing pressure in high-pressure section of injection system

WARNING

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

- ***The injection system consists of a high-pressure section (maximum approx. 140 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 lines or fuel pressure sender -G247-), the fuel pressure in the high-pressure section must be reduced to a residual pressure of approx. 7 bar. The procedure is described below.***

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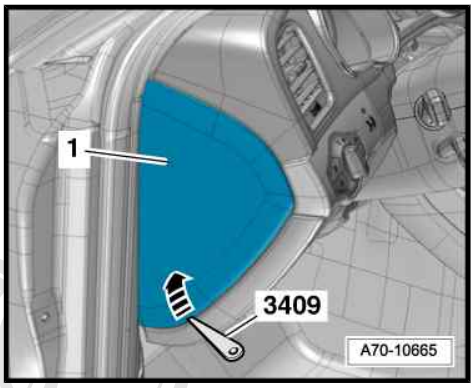
Reducing fuel pressure in high-pressure section

– Connect a ⇒ Vehicle diagnostic tester.

– Start engine and run at idling speed.
– Select „Engine electronics“ in vehicle self-diagnosis.
– Then select „Measured values“.
– Select „Fuel pressure“ from the list.
– Pry off cover -1- on left side/right side of dash panel using removal wedge -3409- -arrow- or similar.



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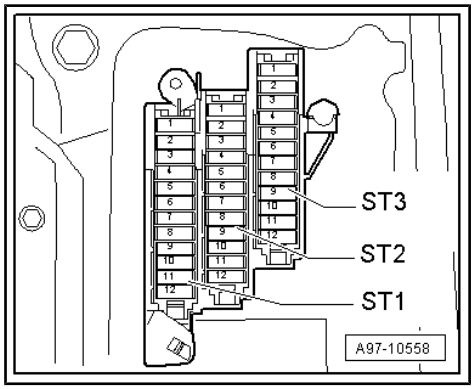
– With engine idling, pull out fuse for fuel pump control unit -J538- ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.



Note

Removing the fuse will interrupt the voltage supply »terminal 30« for the fuel pump control unit -J538- .

– Observe fuel pressure displayed on diagnostic system.

• 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

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

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

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

Note

The pressure will increase again due to the effect of residual heat if the high-pressure system is not opened immediately.

Additional steps required

– Refit fuse.

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

1.7 Checking vacuum system

Special tools and workshop equipment required

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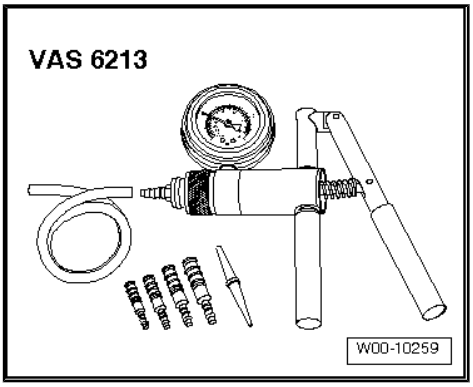
- Hand vacuum pump -VAS 6213-



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Procedure

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

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

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

– If a fault is stored in the event memory, check 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 Injection system

Overview

- ⇒ „2.1 Technical data“, page 8
- ⇒ „2.2 Overview of fitting locations (vehicles with engine codes CDNB, CDNC, CAEB, CDZA, CAEA and CADA)“, page 8
- ⇒ „2.3 Overview of fitting locations (vehicles with engine codes CFKA, CPMA)“, page 18

2.1 Technical data

Engine data		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 according to requirements by electric fuel pump in fuel tank)	3,0 ... 10.5 bar
	Pressure in high-pressure fuel circuit (generated by mechanical single-plunger pump) at a coolant temperature of approx. 85°C.	30 ... 150 bar

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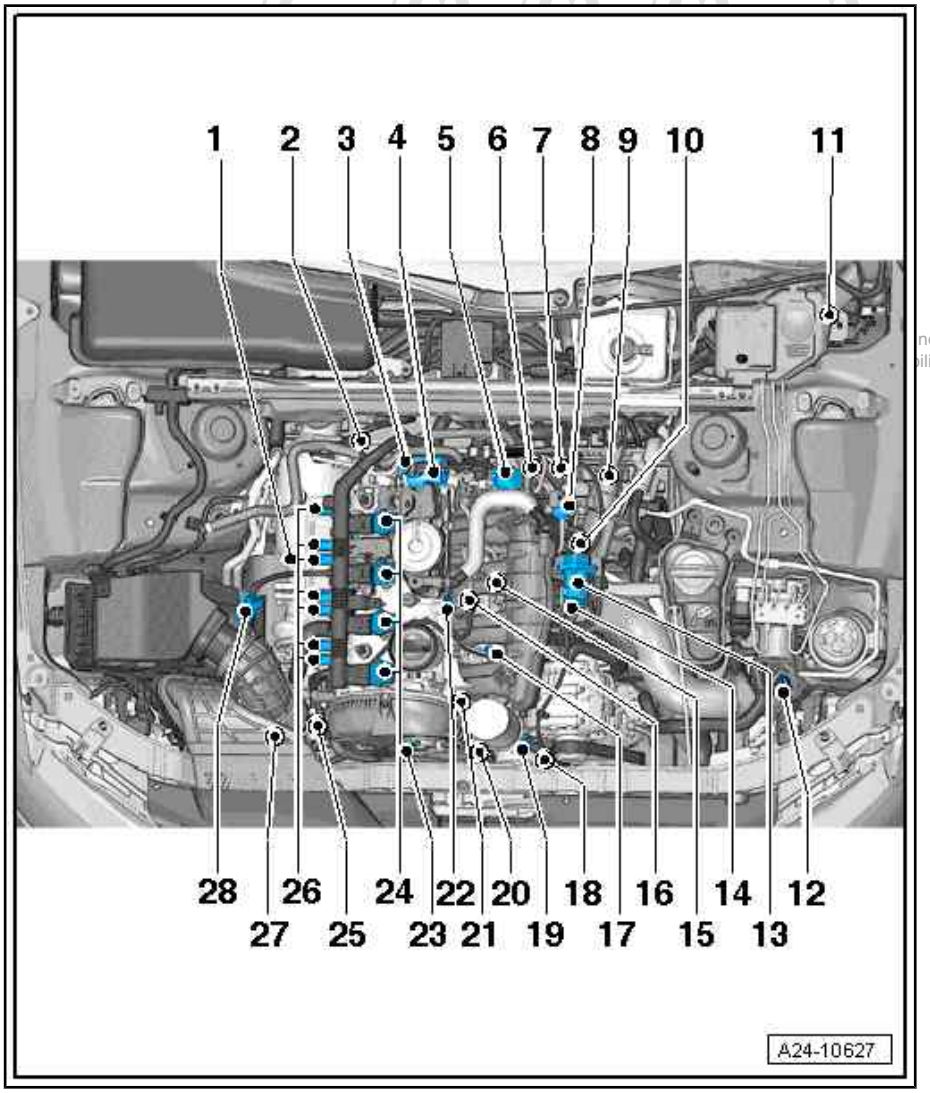
2.2 Overview of fitting locations (vehicles with engine codes CDNB, CDNC, CAEB, CDZA, CAEA and CADA)

Components A to I are not shown in the overview.



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

- ❑ Fitting location ⇒ page 17
- ❑ Removing and installing ⇒ page 74

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

- ❑ Fitting location ⇒ page 17
- ❑ Removing and installing ⇒ page 75

3 - Fuel pressure regulating valve -N276-

- ❑ Fitting location ⇒ page 15

4 - High-pressure pump

- ❑ Removing and installing ⇒ page 15

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

- ❑ Fitting location ⇒ page 14

6 - Intake manifold flap valve -N316-

- ❑ Fitting location ⇒ page 14

7 - Engine speed sender -G28-

- ❑ Fitting location ⇒ page 16
- ❑ 4.5 Nm

8 - Activated charcoal filter solenoid valve 1 -N80-

9 - 6-pin connectors

- ❑ For Lambda probe -G39- and Lambda probe heater -Z19- (black)
- ❑ Lambda probe after catalytic converter -G130- and Lambda probe 1 heater after catalytic converter -Z29- (brown connector)
- ❑ Fitting location ⇒ page 17

10 - Electrical connectors

- ❑ For knock sensor 1 -G61- , intake manifold flap valve -N316- , fuel pressure sender -G247- , intake manifold flap potentiometer -G336- , coolant temperature sender -G62- , Hall sender -G40- and injectors N30...N33
- ❑ Fitting location ⇒ page 15

11 - Engine control unit -J623-

- ❑ Fitting location ⇒ page 12
- ❑ Removing and installing ⇒ page 79

12 - Charge pressure sender -G31-

- ❑ Fitting location ⇒ page 17
- ❑ Removing and installing ⇒ Rep. gr. 21

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

- ❑ Throttle valve drive angle sender 1 -G187- and throttle valve drive angle sender 2 -G188-

- ❑ Throttle valve module -J338- must always be re-adapted to engine control unit -J623- after removal and installation or if it has been renewed
- ❑ Fitting location ⇒ page 16

14 - Intake air temperature sender -G42-

- ❑ Fitting location ⇒ page 16

15 - Knock sensor 1 -G61-

- ❑ To remove, first remove coolant pump with thermostat
- ❑ Tightening torque: 20 Nm
- ❑ Removing and installing ⇒ page 87

16 - Coolant temperature sender -G62-

- ❑ Fitting location ⇒ page 16
- ❑ Removing and installing ⇒ Rep. gr. 19

17 - Fuel pressure sender -G247-

- ❑ Fitting location ⇒ page 14
- ❑ Removing and installing ⇒ page 62

18 - Valve for oil pressure control -N428-

- ❑ Fitting location ⇒ page 13
- ❑ Removing and installing ⇒ Rep. gr. 17

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

- ❑ Fitting location ⇒ page 13
- ❑ Removing and installing ⇒ Rep. gr. 17

20 - Oil pressure switch -F22-

- ❑ Fitting location ⇒ page 13
- ❑ Removing and installing ⇒ Rep. gr. 17

21 - Intake manifold flap potentiometer -G336-

- ❑ Fitting location ⇒ page 15

22 - Hall sender -G40-

- ❑ Fitting location ⇒ page 15

23 - Camshaft control valve 1 -N205-

- ❑ Fitting location ⇒ page 16
- ❑ Removing and installing ⇒ Rep. gr. 15

24 - Ignition coils with output stages

- ❑ Fitting location ⇒ page 14
- ❑ Puller -T40039- is required for removing ignition coils from cylinder head.
- ❑ Removing and installing ⇒ page 85

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25 - Turbocharger air recirculation valve -N249-

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

26 - 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 14
- ❑ Removing and installing ⇒ Rep. gr. 15

27 - Charge pressure control solenoid valve -N75-

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

28 - Air mass meter -G70-

- ❑ Removing and installing ⇒ page 61

A - Diagnostic connector

- ❑ In driver's knee restraint

B - Fuel pump control unit -J538-

- ❑ Fitting location ⇒ page 12
- ❑ Removing and installing ⇒ Rep. gr. 20

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

- ❑ Fitting location ⇒ page 12
- ❑ In footwell on brake pedal
- ❑ Removing and installing ⇒ Rep. gr. 45

D - Clutch position sender -G476-

- ❑ Only fitted on vehicles with manual gearbox
- ❑ Fitting location ⇒ page 12

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

- ❑ Fitting location ⇒ page 12
- ❑ On accelerator pedal (both senders are accommodated in one housing)
- ❑ Removing and installing ⇒ Rep. gr. 20

F - Radiator fan control unit -J293-

- ❑ Incorporated in radiator fan

G - Injectors

- ❑ Injector, cylinder 1 -N30-
- ❑ Injector, cylinder 2 -N31-
- ❑ Injector, cylinder 3 -N32-
- ❑ Injector, cylinder 4 -N33-
- ❑ Removing and installing ⇒ page 56

H - Continued coolant circulation pump -V51-

- ❑ Not installed in all vehicles (only in vehicles for very hot countries)
- ❑ Fitting location ⇒ page 13
- ❑ Removing and installing ⇒ Rep. gr. 19

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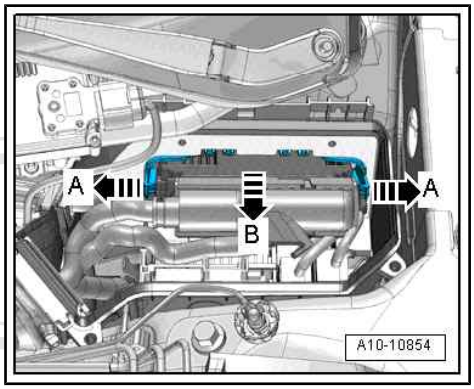
I - Left electrohydraulic engine mounting solenoid valve -N144-

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

Engine control unit -J623-

- In left electronics box in engine compartment



Fuel pump control unit -J538- -1-

Removing and installing ⇒ Rep. gr. 20

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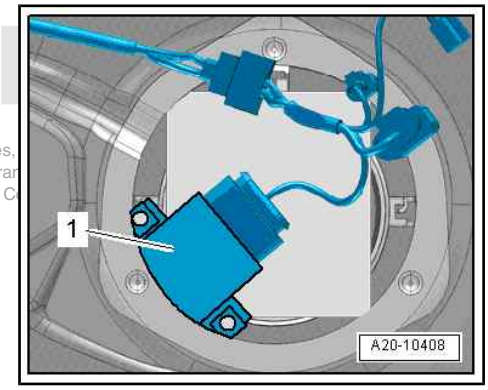
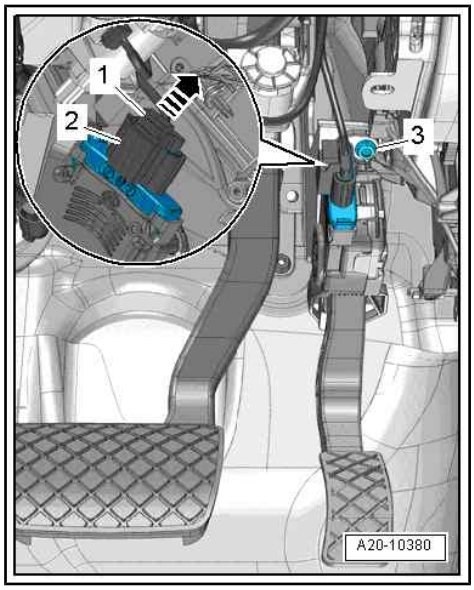


Accelerator position sender -G79- and accelerator position sender 2 -G185-

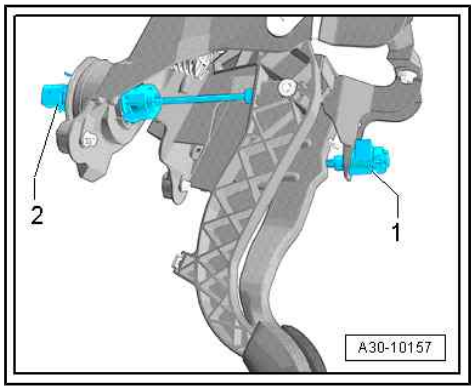
2 - Electrical connector



Clutch position sender -G476- -2-

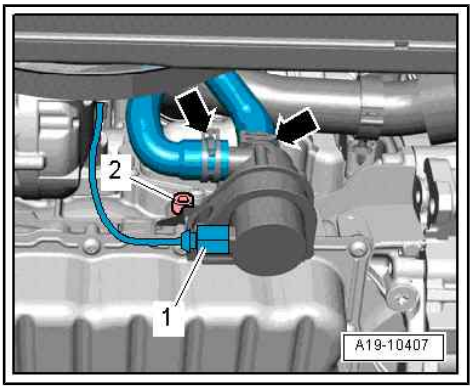
Integrated functions: clutch pedal switch for engine start -F194- and clutch pedal switch -F36- (manual gearbox only)

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



Continued coolant circulation pump -V51-

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



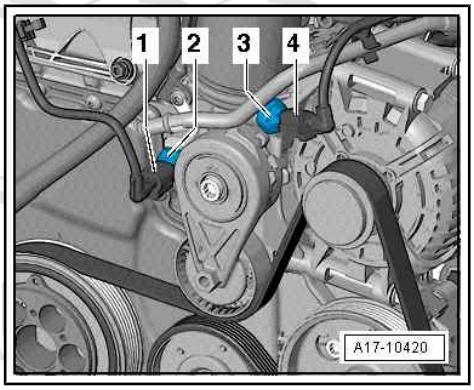
Oil pressure switch

1 - Electrical connector for oil pressure switch -F22-

2 - Oil pressure switch -F22-

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

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



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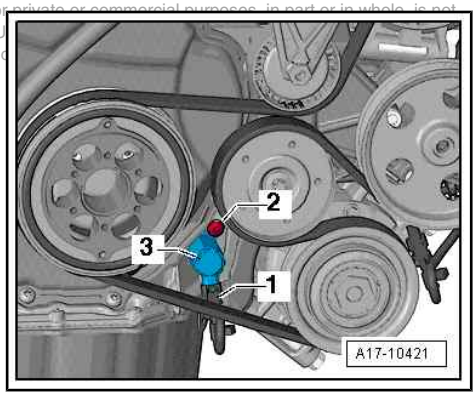
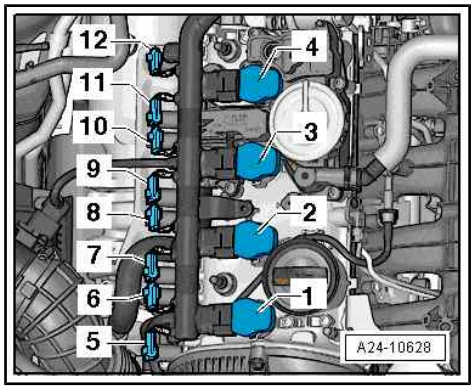
Valve for oil pressure control -N428- -3-



Ignition coils



1 - Ignition coil 1 with output stage -N70-

2 - Ignition coil 2 with output stage -N127-

3 - Ignition coil 3 with output stage -N291-

4 - Ignition coil 4 with output stage -N292-

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)

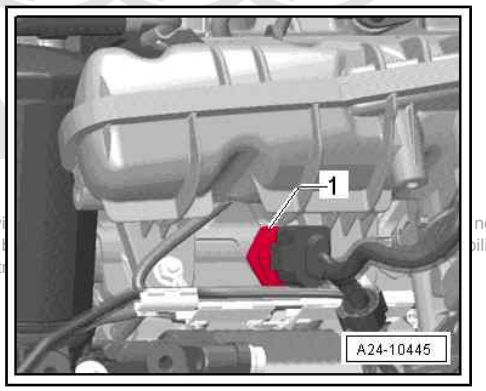
9 - Actuator 6 for camshaft adjustment -F371- (for cylinder No. 3)

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)

Fuel pressure sender -G247- -1-



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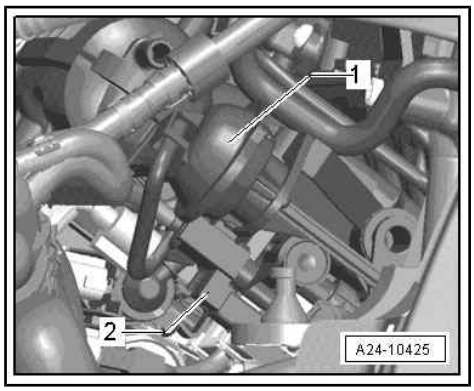
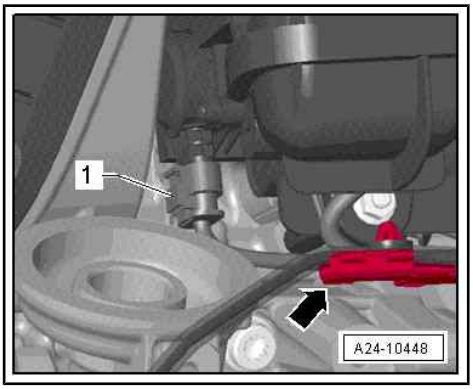
Intake manifold flap valve -N316- -2-

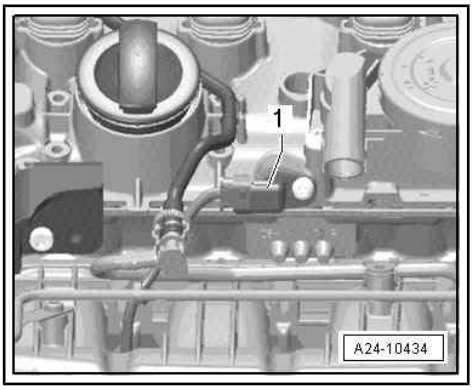


1 - Vacuum unit for intake manifold flaps

Intake manifold flap potentiometer -G336- -1-



Hall sender -G40- -1-



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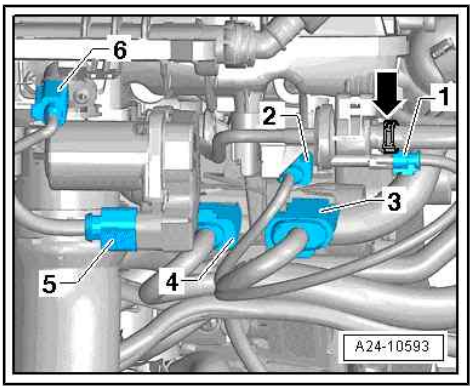
Electrical connectors



1 - From activated charcoal filter solenoid valve 1 -N80-

2 - From knock sensor 1 -G61-

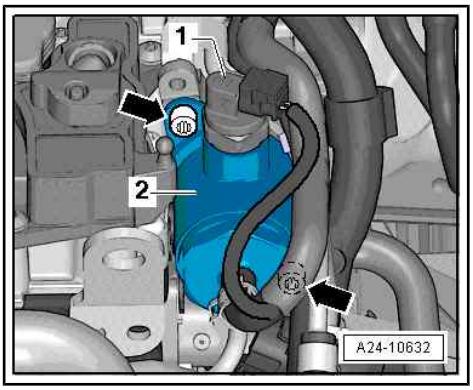
3 - (14-pin) from intake manifold flap valve -N316- , fuel pressure sender -G247- , intake manifold flap potentiometer -G336- , coolant temperature sender -G62- and Hall sender -G40-

4 - (8-pin) from injectors -N30-...-N33-

5 - From throttle valve module -J338-

6 - From intake air temperature sender -G42-

High-pressure pump

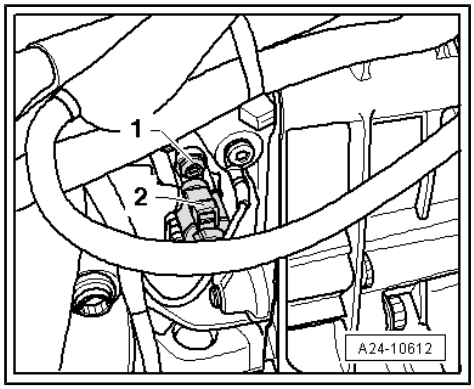


1 - Fuel pressure regulating valve -N276-

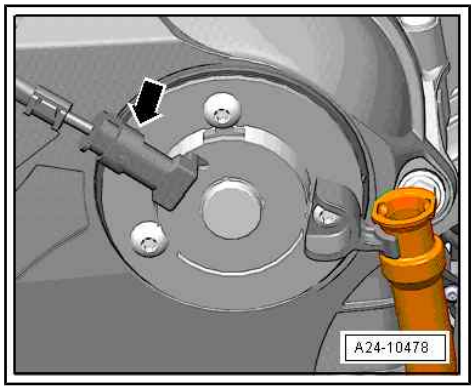
2 - High-pressure pump

- -Arrows- denote securing bolts

Engine speed sender -G28- -2-



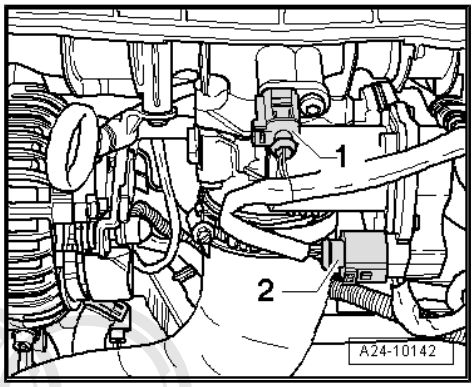
Camshaft control valve 1 -N205- -arrow-



Components

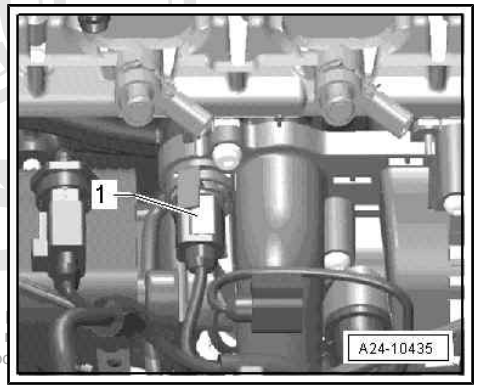
1 - Intake air temperature sender -G42-

2 - Throttle valve module -J338-



Coolant temperature sender -G62- -1-

Fitting location: below intake manifold in coolant pump



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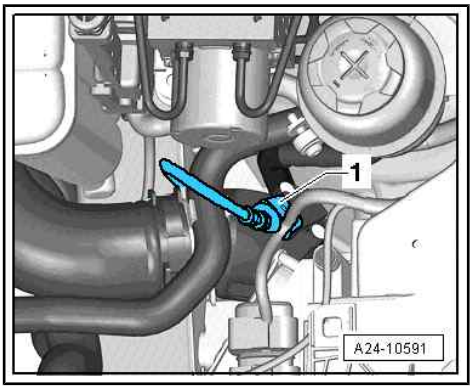
Charge pressure sender -G31- -1-

– Removing and installing ⇒ Rep. gr. 21

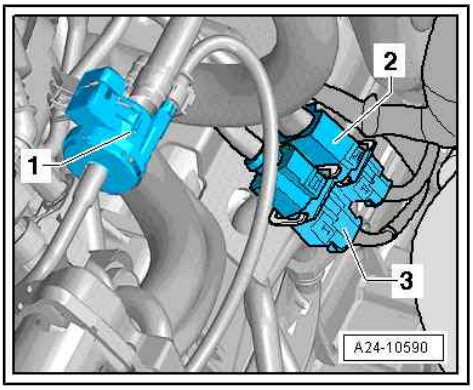


Component and electrical connectors

1 - Activated charcoal filter solenoid valve 1 -N80-

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

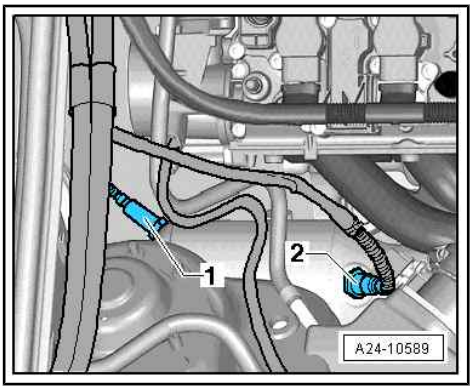
3 - Lambda probe -G39- and Lambda probe heater -Z19-



Lambda probes

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

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



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Components on turbocharger

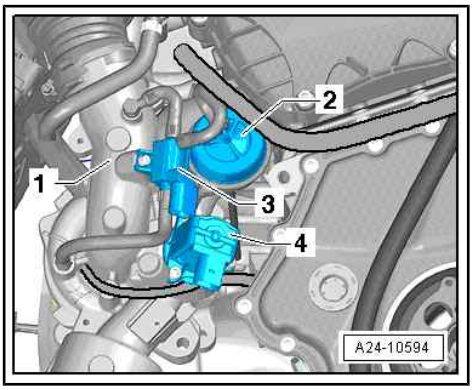
1 - Turbocharger

2 - Vacuum unit for turbocharger; checking, adjusting, removing and installing ⇒ Rep. gr. 21

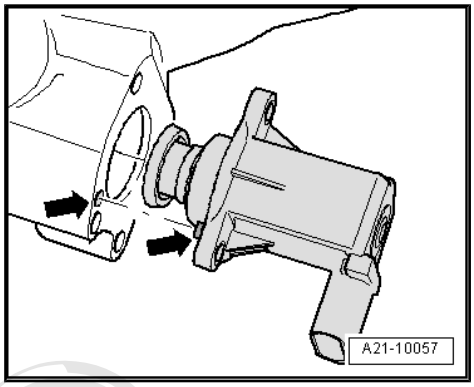
3 - Charge pressure control solenoid valve -N75-

4 - Turbocharger air recirculation valve -N249- (note installation position, refer to next illustration)

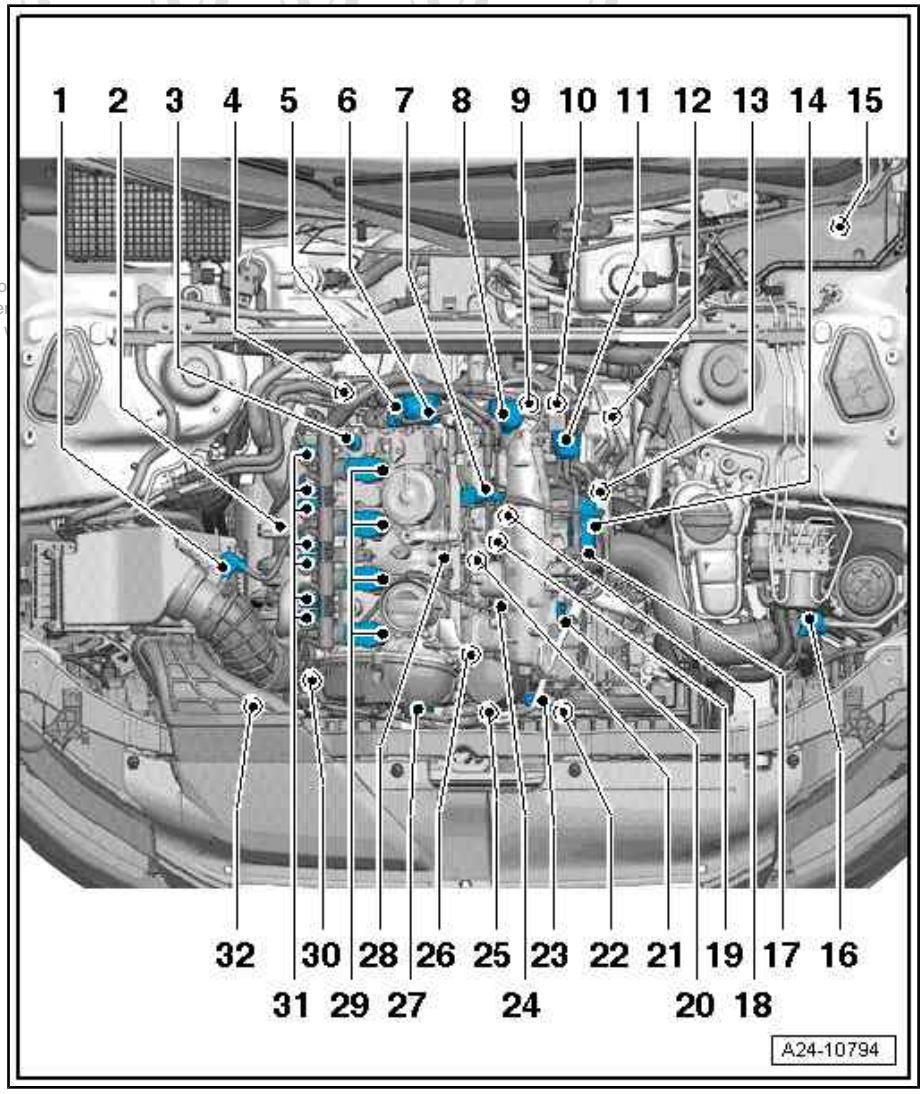
For removing and installing components on turbocharger, refer to ⇒ Rep. gr. 21 .



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



2.3 Overview of fitting locations (vehicles with engine codes CFKA, CPMA)



1 - Air mass meter -G70-

- ❑ Removing and installing ⇒ page 61

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

- ❑ Fitting location ⇒ page 26
- ❑ Removing and installing ⇒ page 74

3 - Electrical connector for Lambda probe -G39-

- ❑ Fitting location ⇒ page 23

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

- ❑ Fitting location ⇒ page 26
- ❑ Removing and installing ⇒ page 75

5 - Fuel pressure regulating valve -N276-

- ❑ Fitting location ⇒ page 24

6 - High-pressure pump

- ❑ Removing and installing ⇒ page 15

7 - Fuel pressure sender for low pressure -G410-

- ❑ Fitting location ⇒ page 25

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

- ❑ Fitting location ⇒ page 23

9 - Intake manifold flap valve -N316-

- ❑ Fitting location ⇒ page 23

10 - Engine speed sender -G28-

- ❑ Fitting location ⇒ page 25
- ❑ 4.5 Nm

11 - Activated charcoal filter solenoid valve 1 -N80-

- ❑ Fitting location ⇒ page 26

12 - 6-pin connector

- ❑ Lambda probe after catalytic converter -G130- and Lambda probe heater 1 after catalytic converter -Z29-
- ❑ Fitting location ⇒ page 26

13 - Electrical connectors

- ❑ For knock sensor 1 -G61- , intake manifold flap valve -N316- , fuel pressure sender -G247- , intake manifold flap potentiometer -G336- , coolant temperature sender -G62- , Hall sender -G40- and injectors N30 ... N33
- ❑ Fitting location ⇒ page 24

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

- ❑ Throttle valve drive angle sender 1 -G187- and throttle valve drive angle sender 2 -G188-
- ❑ Throttle valve module -J338- must always be re-adapted to engine control unit -J623- after removal and installation or if it has been renewed

15 - Engine control unit -J623-

- ❑ Fitting location ⇒ page 21
- ❑ Removing and installing ⇒ page 79

16 - Charge pressure sender -G31-

- ❑ Fitting location ⇒ page 26
- ❑ Removing and installing ⇒ Rep. gr. 21

17 - Vacuum connection at intake manifold

18 - Cold-start valve -N17-

- ❑ Fitting location ⇒ page 26

19 - Knock sensor 1 -G61-

- ❑ To remove, first remove coolant pump with thermostat
- ❑ 20 Nm
- ❑ Removing and installing ⇒ page 87

20 - Intake air temperature sender -G42-

21 - Coolant temperature sender -G62-

- ❑ Fitting location ⇒ page 25
- ❑ Removing and installing ⇒ Rep. gr. 19

22 - Valve for oil pressure control -N428-

- ❑ Fitting location ⇒ page 22
- ❑ Removing and installing ⇒ Rep. gr. 17

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

- ❑ Fitting location ⇒ page 22
- ❑ Removing and installing ⇒ Rep. gr. 17

24 - Fuel pressure sender -G247-

- ❑ Fitting location ⇒ page 23
- ❑ Removing and installing ⇒ page 62

25 - Oil pressure switch -F22-

- ❑ Fitting location ⇒ page 22
- ❑ Removing and installing ⇒ Rep. gr. 17

26 - Intake manifold flap potentiometer -G336-

- ❑ Fitting location ⇒ page 24
- ❑ After intake manifold has been renewed, intake manifold flap potentiometer -G336- must be adapted to engine control unit -J623-

27 - Camshaft control valve 1 -N205-

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

28 - Hall sender -G40-

- Fitting location ⇒ page 24

29 - Ignition coils with output stages

- Fitting location ⇒ page 23
- Puller -T40039- is required for removing ignition coils from cylinder head.
- Removing and installing ⇒ page 85

30 - Turbocharger air recirculation valve -N249-

- Located directly on turbocharger
- Removing and installing ⇒ Rep. gr. 21

31 - 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 23
- Removing and installing ⇒ Rep. gr. 15

32 - Charge pressure control solenoid valve -N75-

- Located directly on turbocharger
- Removing and installing ⇒ Rep. gr. 21

A - Fuel pump control unit -J538-

- Fitting location ⇒ page 21
- Removing and installing ⇒ Rep. gr. 20

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

- Fitting location ⇒ page 22
- In footwell on brake pedal
- Removing and installing ⇒ Rep. gr. 45

C - Clutch position sender -G476-

- Only fitted on vehicles with manual gearbox
- Fitting location ⇒ page 22

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

- Fitting location ⇒ page 21
- On accelerator pedal (both senders are accommodated in one housing)
- Removing and installing ⇒ Rep. gr. 20

E - Radiator fan control unit -J293-

- Incorporated in radiator fan

F - Injectors

- Injector, cylinder 1 -N30-
- Injector, cylinder 2 -N31-
- Injector, cylinder 3 -N32-
- Injector, cylinder 4 -N33-

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- Removing and installing ⇒ page 56

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

G - Continued coolant circulation pump -V51-

- Not installed in all vehicles (only in vehicles for very hot countries)
- Removing and installing ⇒ Rep. gr. 19

H - Left electrohydraulic engine mounting solenoid valve -N144-

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

I - Fuel quality sender -G446-

- Fitting location ⇒ page 27

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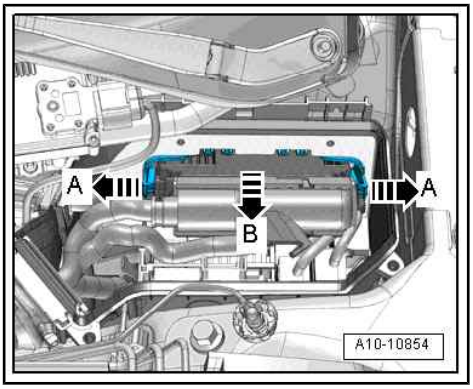
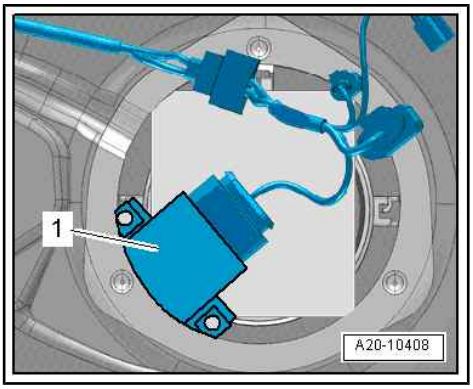
Engine control unit -J623-

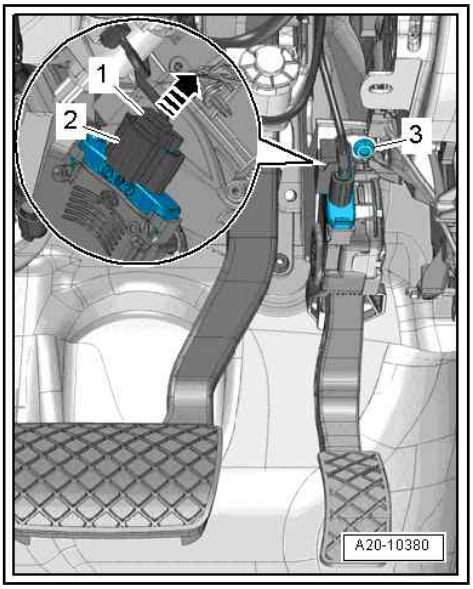


Fuel pump control unit -J538- -1-

Removing and installing ⇒ Rep. gr. 20



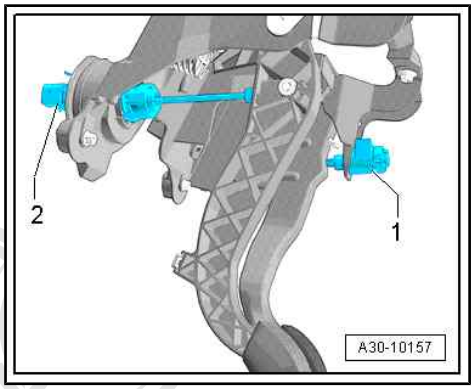
Accelerator position sender -G79- and accelerator position sender 2 -G185-



Clutch position sender -G476- -2-

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

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



Oil pressure switch

1 - Electrical connector for oil pressure switch -F22-

2 - Oil pressure switch -F22-

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

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

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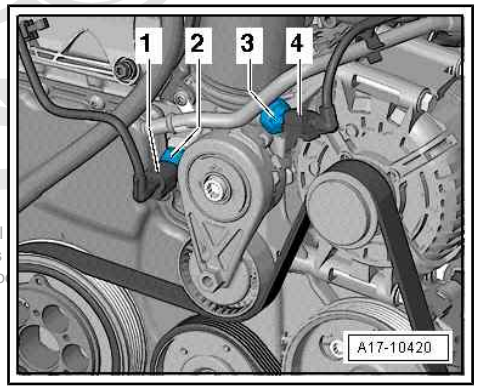
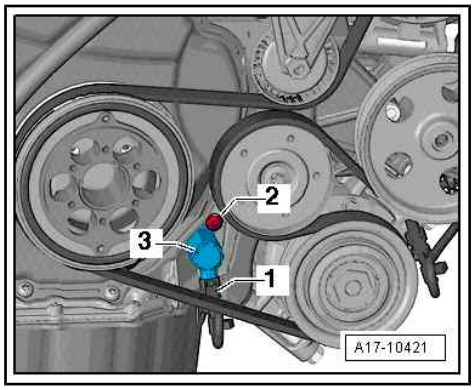
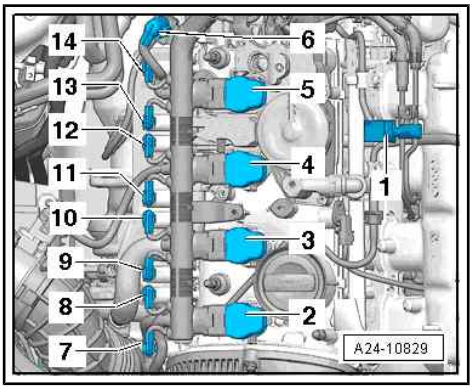


Valve for oil pressure control -N428- -3-



Ignition coils and actuators



1 - Fuel pressure sender for low pressure -G410-

2 - Ignition coil 1 with output stage -N70-

3 - Ignition coil 2 with output stage -N127-

4 - Ignition coil 3 with output stage -N291-

5 - Ignition coil 4 with output stage -N292-

6 - Electrical connector for Lambda probe -G39-

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

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

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

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

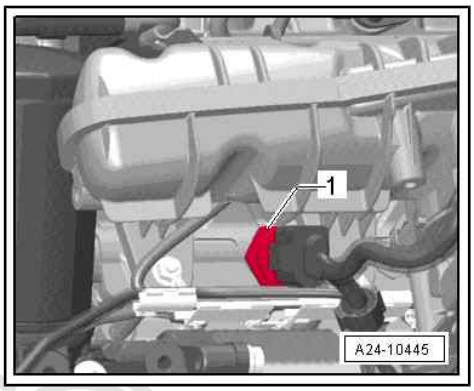
11 - Actuator 6 for camshaft adjustment -F371- (for cylinder No. 3)

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

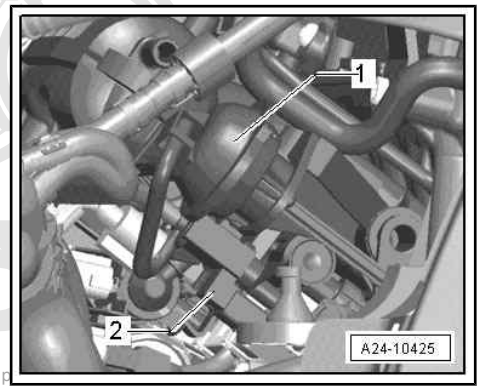
13 - Actuator 7 for camshaft adjustment -F372- (for cylinder No. 4)

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

Fuel pressure sender -G247- -1-



Intake manifold flap valve -N316- -2-



1 - Vacuum unit for intake manifold flaps

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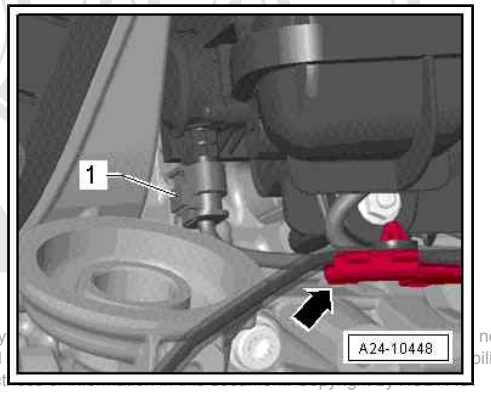
Intake manifold flap potentiometer -G336- -1-



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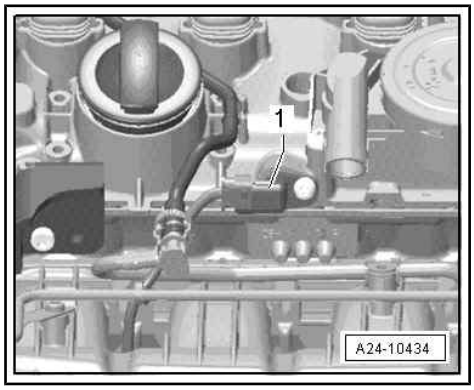
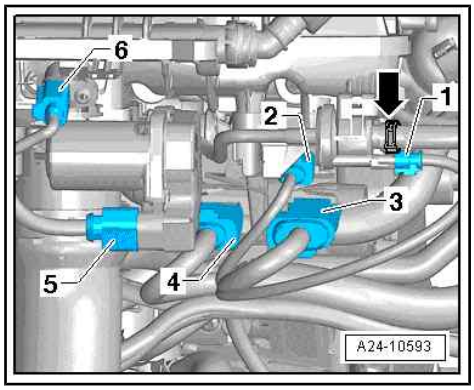
Hall sender -G40- -1-



Electrical connectors



1 - From activated charcoal filter solenoid valve 1 -N80-

2 - From knock sensor 1 -G61-

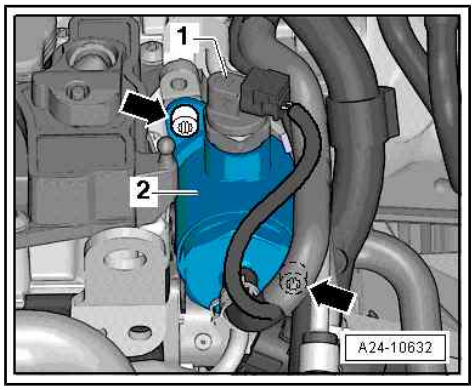
3 - (14-pin) from intake manifold flap valve -N316- , fuel pressure sender -G247- , intake manifold flap potentiometer -G336- , coolant temperature sender -G62- and Hall sender -G40-

4 - (8-pin) from injectors -N30-...-N33-

5 - From throttle valve module -J338-

6 - From intake air temperature sender -G42-

High-pressure pump

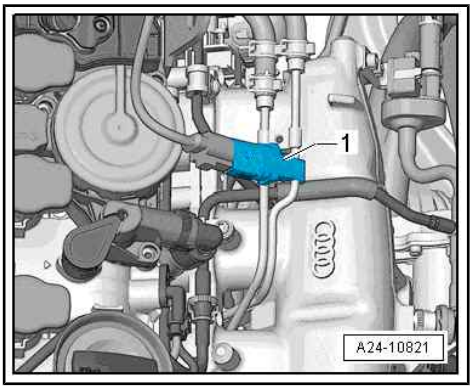


1 - Fuel pressure regulating valve -N276-

2 - High-pressure fuel pump

- -Arrows- denote securing bolts

Fuel pressure sender for low pressure -G410- -1-



Engine speed sender -G28- -2-

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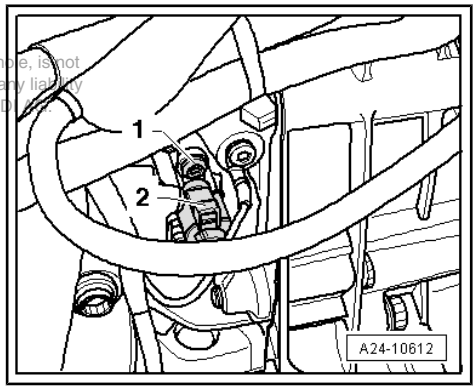
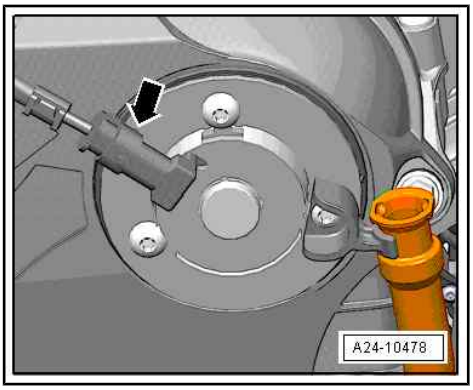
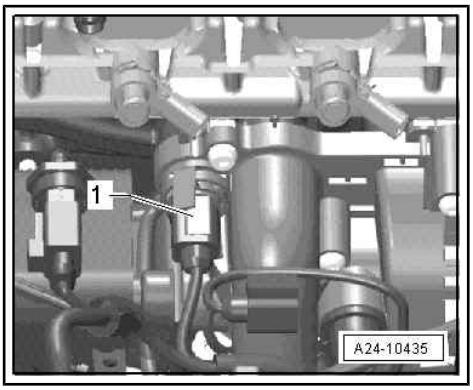


Camshaft control valve 1 -N205- -arrow-



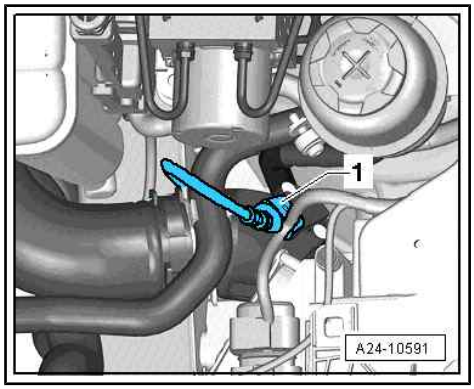
Coolant temperature sender -G62- -1-

Fitting location: below intake manifold in coolant pump

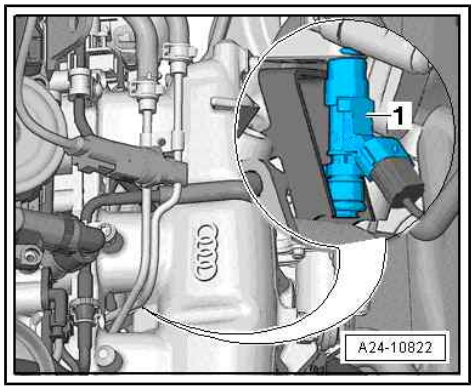


Charge pressure sender -G31- -1-

Removing and installing ⇒ Rep. gr. 21



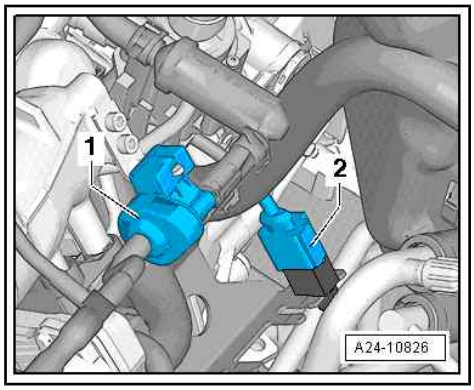
Cold-start valve -N17- -1-



Component and electrical connectors

1 - Activated charcoal filter solenoid valve 1 -N80-

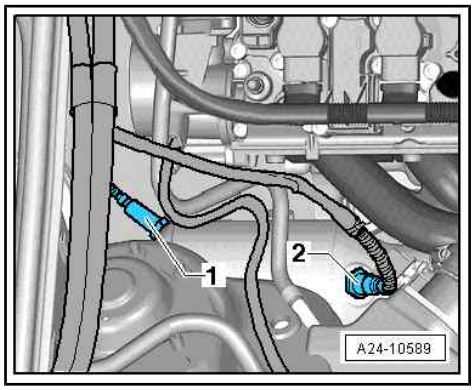
2 - Lambda probe after catalytic converter -G130- and Lambda probe heater 1 after catalytic converter -Z29-



Lambda probes

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

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



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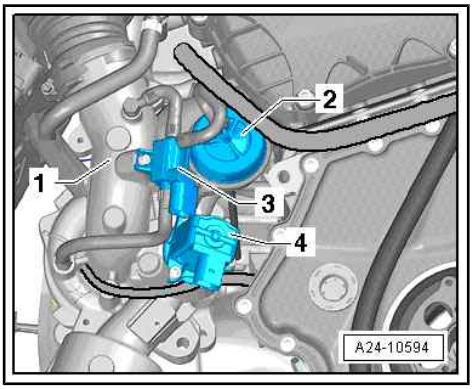
Components on turbocharger



1 - Turbocharger

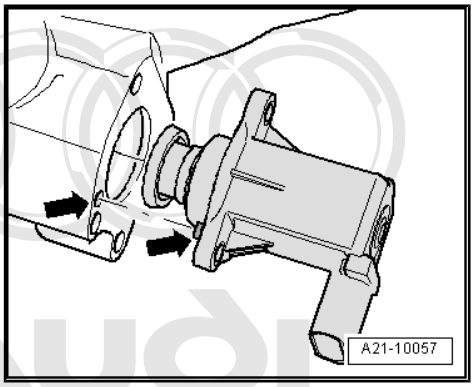
2 - Vacuum unit for turbocharger; checking, adjusting, removing and installing ⇒ Rep. gr. 21

3 - Charge pressure control solenoid valve -N75-

4 - Turbocharger air recirculation valve -N249- (note installation position, refer to next illustration)

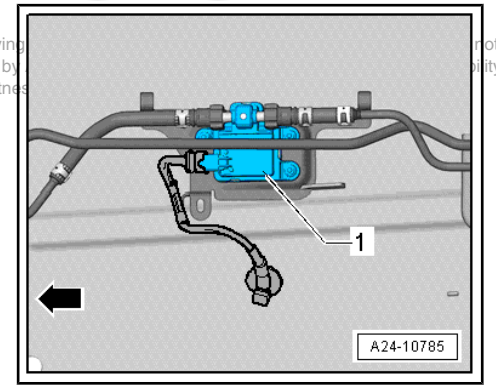
For removing and installing components on turbocharger, refer to ⇒ Rep. gr. 21 .

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



Fuel quality sender -G446- -1-

Fitting location of fuel quality sender -G446- : on underbody, right-side (arrow points in direction of travel)



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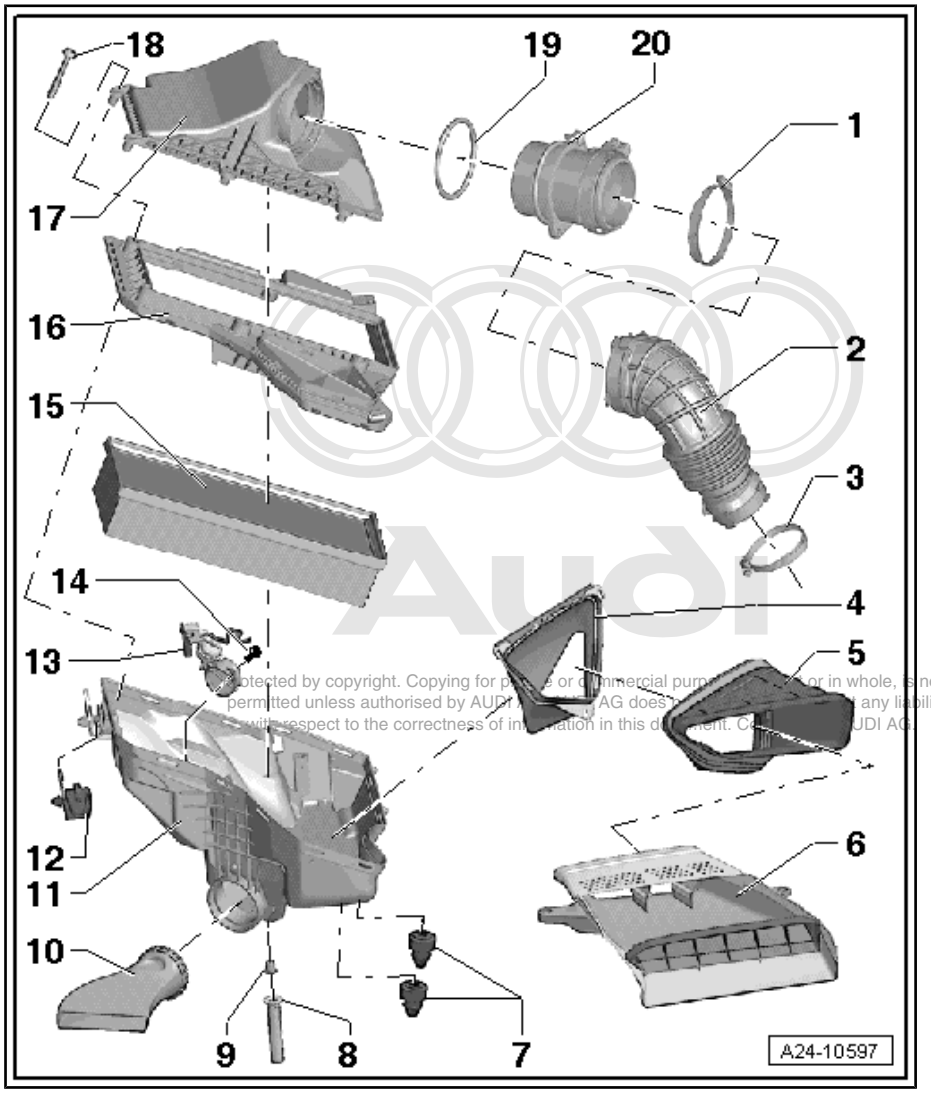
3 Air cleaner

Overview

- ⇒ „3.1 Air cleaner - exploded view“, page 28
- ⇒ „3.2 Removing and installing engine cover panel“, page 29
- ⇒ „3.3 Removing and installing air filter element“, page 29
- ⇒ „3.4 Removing air cleaner housing“, page 31

3.1 Air cleaner - exploded view



1 - Hose clip

2 - Air hose

3 - Hose clip

4 - Air duct
- ❑ Clipped into air cleaner housing
- ❑ Clean dirt and leaves out of air duct

5 - Air duct
- ❑ Clean dirt and leaves out of air duct

6 - Air duct
- ❑ Secure to lock carrier (2 Nm)
- ❑ Clean dirt and leaves out of air duct

7 - Rubber grommet

8 - Water drain hose
- ❑ Clean any leaves and dirt out of water drain hose (important)

9 - Guide for water drain hose

10 - Hot air intake (countries with cold climates only)
- ❑ Slide hot air intake into air cleaner as far as stop; then turn clockwise until it engages noticeably

11 - Air cleaner (bottom section)
- ❑ Clean any salt residue, leaves and dirt out of air cleaner (bottom section)
- ❑ Check for dirt in water drain and clean as required (important)

12 - Retainer for air cleaner (bottom section)
- ❑ Must engage positively
- ❑ Do not use any lubricants

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

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14 - Bolt

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

15 - Air filter element

- ❑ Always use genuine part for air filter element
- ❑ Maintenance intervals for A4 ⇒ Maintenance ; Booklet 812 , A5 ⇒ Maintenance ; Booklet 811 or A5 Cabriolet ⇒ Maintenance ; Booklet 818
- ❑ Removing and installing ⇒ page 29
- ❑ Also clean snow screen (if fitted)

16 - Frame insert for air cleaner (bottom section)

17 - Air cleaner (top section)

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

18 - Bolt

19 - O-ring

- ❑ Renew if damaged

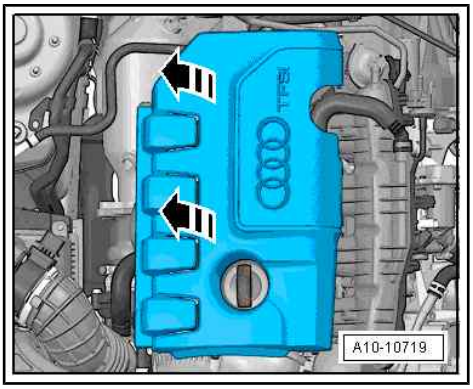
20 - Air mass meter

- ❑ Removing and installing air mass meter -G70- with intake air temperature sender -G42- ⇒ page 61

3.2 Removing and installing engine cover panel

Removing

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



Installing

– To avoid damage, do not strike the engine cover panel with your fist or with any kind of tool.

– Position engine cover panel on engine (note locations of oil filler neck and oil dipstick).

– Press engine cover panel with both hands into the rubber grommets.

3.3 Removing and installing air filter element

Removing air filter element

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

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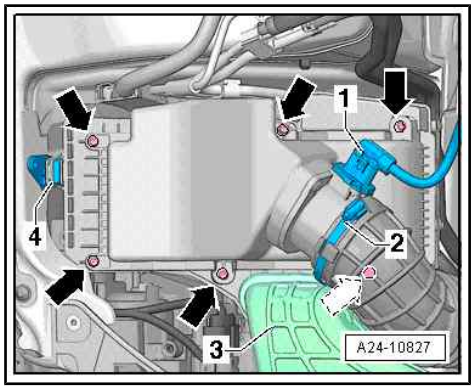
– Release hose clip -2- securing air hose (going to turbocharger) and disconnect hose from air mass meter -G70- .

– Remove all bolts -arrows- from air cleaner (top section) and lift out air cleaner (top section).

– Take out old filter element.



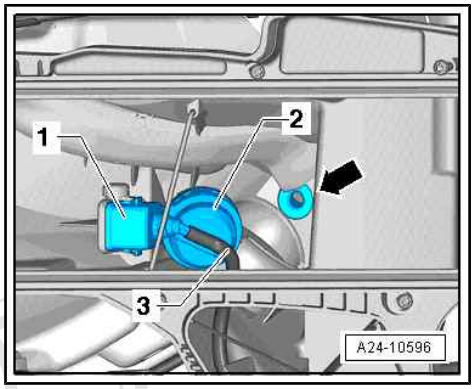
Installing air filter element

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

Note

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

– Blow out water drain -arrow- in air cleaner (bottom section) with compressed air.



Note

Disregard items 1, 2 and 3.

– Clean salt residue, dirt and leaves out of air cleaner housing (top and bottom sections); use a vacuum cleaner if necessary.

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

– Check for dirt and leaves in air duct going from lock carrier to air cleaner housing.

– If fitted, re-connect vacuum hose at variable intake manifold change-over valve -N335- .

– When installing the air filter element, check that it is properly centred in the retainer in the air cleaner (bottom section).

– Fit the top section of the air cleaner carefully on the bottom section, without using force. Make sure the top section of the air cleaner is fitted straight on the air filter element (note position of sealing lip on air filter element).

– Ensure secure fit of intake hose at air mass meter -G70-

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

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3.4 Removing air cleaner housing

Removing

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

– Release hose clip -2- securing air hose (going to turbocharger) and disconnect hose from air mass meter -G70- .

– Remove air duct -3-.

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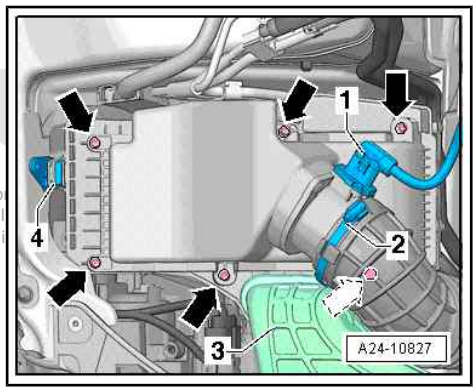
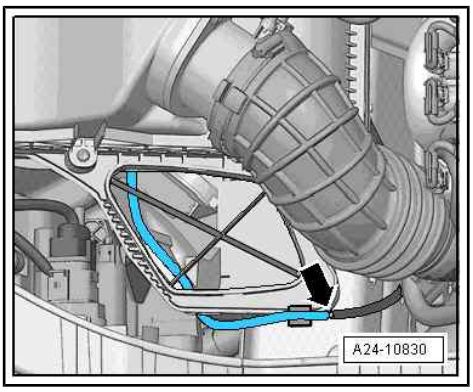
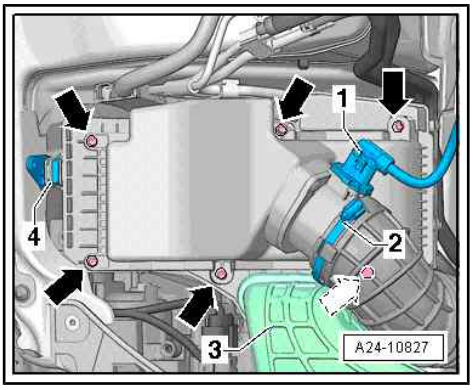


– Detach vacuum hose -arrow- (if fitted).



– Release retainer -4- for bottom section of air cleaner (press in rubber on left and right side and pull upwards).



Note

- *These components (bypass flap with variable intake manifold change-over valve -N335- -1-) are not installed on certain equipment versions or on vehicles for certain export markets.*
- *Do not use lubricant when installing retainer.*

– Disconnect electrical connector at variable intake manifold change-over valve -N335- (if fitted).

– Carefully take out complete air cleaner housing.

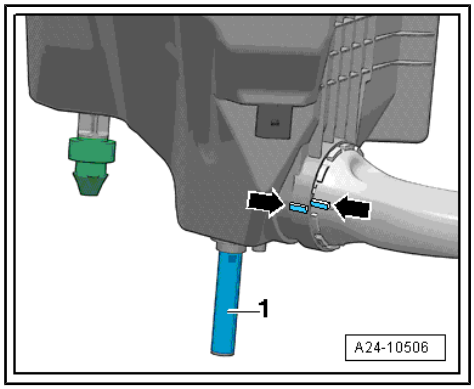
Installing

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

Note

- *Use a silicone-free lubricant when installing the intake hose.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue*

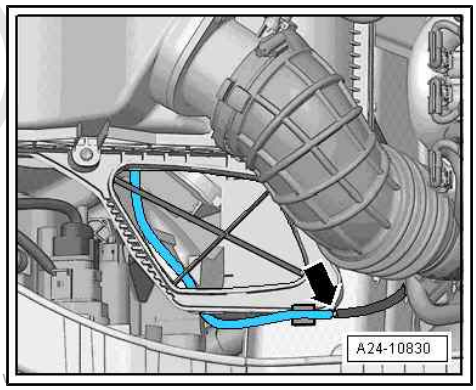
– If hot air intake is fitted (for countries with cold climates only), make sure that air intake connection has engaged properly -arrows- (pay attention to markings).
– Check for salt residue, dirt and leaves in air mass meter and air intake hose (engine intake side).
– Check for dirt in air duct leading to air filter element.
– Re-attach electrical connector at variable intake manifold change-over valve -N335- (if fitted).
– Re-install air cleaner housing.



Note

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

– Re-attach vacuum hose -arrow- (if fitted previously).
– Ensure secure fit of air hose at air mass meter -G70- .
– Re-connect electrical connector at air mass meter -G70- .
– Install air duct.
– The remaining installation steps are carried out in the reverse sequence.



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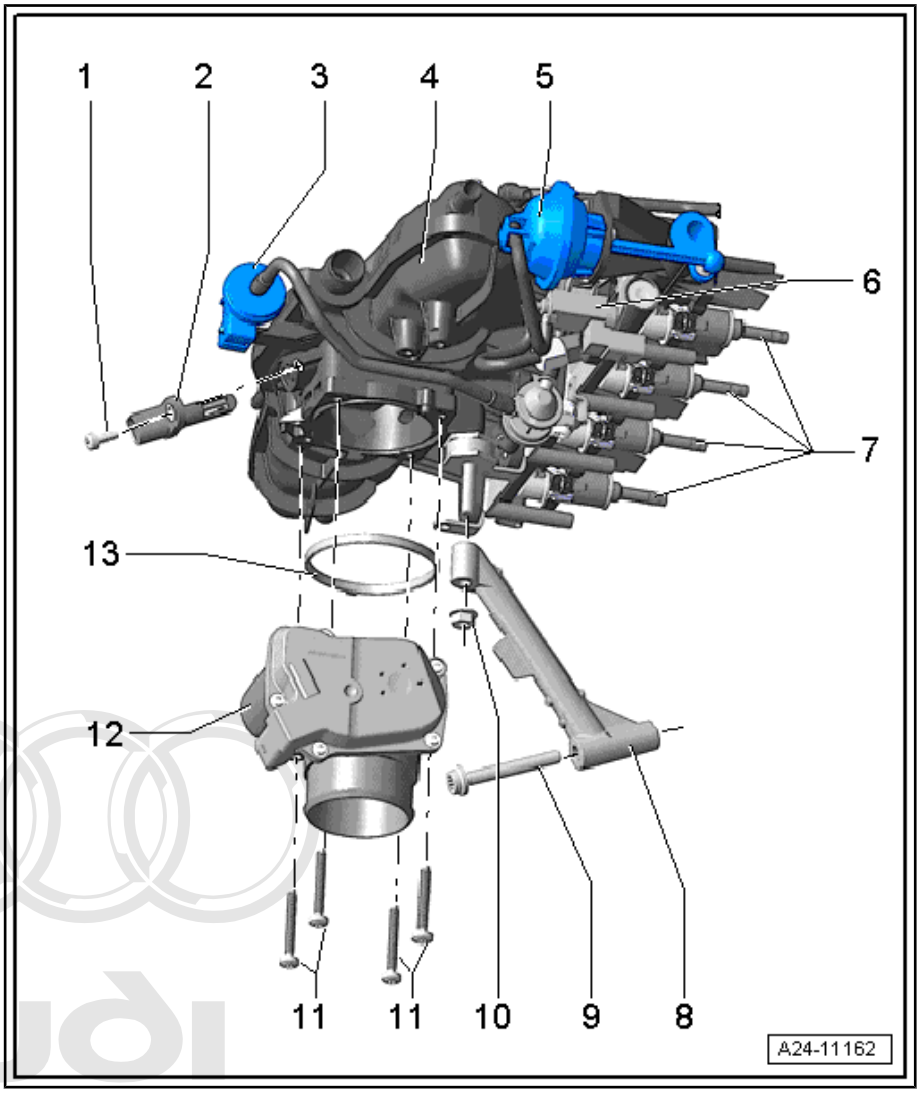
4 Intake manifold (vehicles with engine codes CDNB, CDNC, CAEB, CDZA, CAEA and CADA)

Overview

- ⇒ „4.1 Intake manifold - exploded view“, page 33
- ⇒ „4.2 Fuel rail - exploded view“, page 34
- ⇒ „4.3 Removing and installing intake manifold“, page 35
- ⇒ „4.4 Removing and installing fuel rail“, page 39

4.1 Intake manifold - exploded view



1 - Screw for intake air temperature sender -G42-
- ❑ 9 Nm

2 - Intake air temperature sender -G42-

- Activated charcoal filter solenoid valve 1 -N80-
- ❑ With dual non-return valve; checking ⇒ page 71

4 - Intake manifold
- ❑ Tighten to 9 Nm
- ❑ Removing and installing ⇒ page 35

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

6 - Intake manifold flap valve -N316-

7 - Injectors
- ❑ Renew O-ring and teflon ring
- ❑ Ensure correct installation position.
- ❑ Removing and installing ⇒ page 56

8 - Intake manifold support

9 - Bolt for intake manifold support
- ❑ 23 Nm

10 - Securing nut for intake manifold support
- ❑ 10 Nm

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11 - Bolts for throttle valve module -J338-
- ❑ 10 Nm

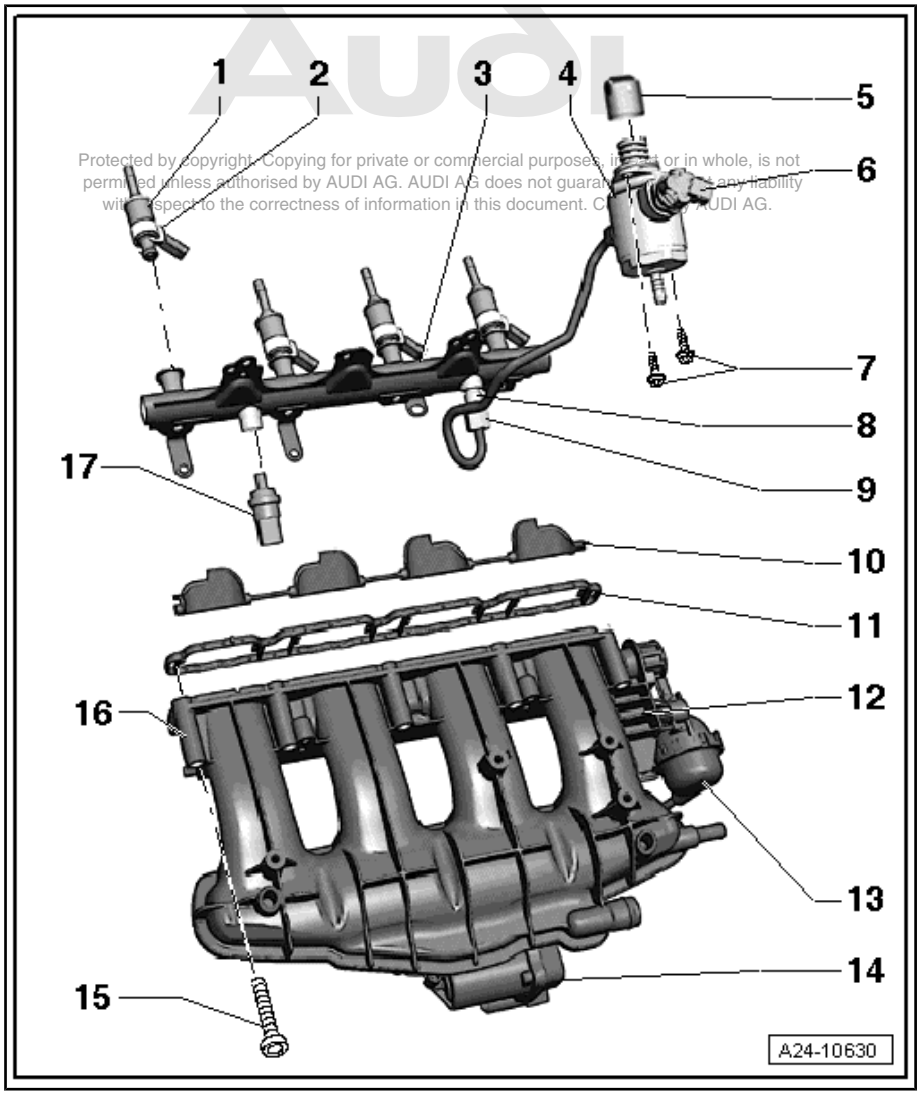
12 - Throttle valve module -J338- , throttle valve drive for electric throttle -G186-
- ❑ Throttle valve drive angle sender 1 for electric throttle -G187- and throttle valve drive angle sender 2 for electric throttle -G188-

- ❑ After throttle valve module -J338- has been renewed, it must be re-adapted to engine control unit -J623- . Use ⇒ Vehicle diagnostic tester

13 - Seal

- ❑ Renew

4.2 Fuel rail - exploded view



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1 - Injector

- ❑ With combustion chamber ring seal (teflon ring seal): always renew
- ❑ Renew O-rings
- ❑ Ensure correct installation position.
- ❑ Removing and installing ⇒ page 56

2 - Support ring

3 - Fuel rail

- ❑ Removing and installing ⇒ page 39

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 lines must be free of tension when installed.
- ❑ Removing and installing ⇒ page 53

5 - Roller tappet

6 - Fuel pressure regulating valve -N276-

7 - Bolts for high-pressure pump

- ❑ Hand-tighten in diagonal sequence, then tighten to 5 Nm and finally tighten to 20 Nm

8 - Connecting piece for fuel supply line at fuel rail

- ❑ Renew
- ❑ 40 Nm

9 - Union nut for fuel supply line

- ❑ 20 Nm

10 - Air flow control flaps (intake manifold flaps)

11 - Gasket

- ❑ Renew

12 - Intake manifold

- ❑ Removing and installing ⇒ page 35

13 - Vacuum unit for air flow control flaps

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

- ❑ Throttle valve drive angle sender 1 for electric throttle -G187- and throttle valve drive angle sender 2 for electric throttle -G188-
- ❑ Throttle valve module -J338- must be re-adapted to engine control unit -J623- after removal and installation or if it has been renewed. Use ⇒ Vehicle diagnostic tester
- ❑ 7 Nm

15 - Bolts for intake manifold

- ❑ 9 Nm

16 - Intake manifold flap potentiometer -G336-

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

17 - Fuel pressure sender -G247-

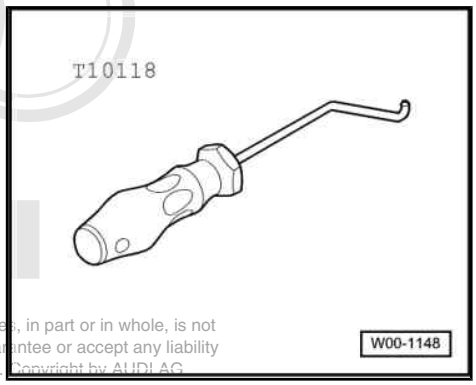
- ❑ 27 Nm
- ❑ Lubricate threads lightly with clean engine oil
- ❑ Always renew connecting piece and tighten to 40 Nm
- ❑ Removing and installing ⇒ page 62

4.3 Removing and installing intake manifold

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.

Special tools and workshop equipment required

- ♦ Assembly tool -T10118-



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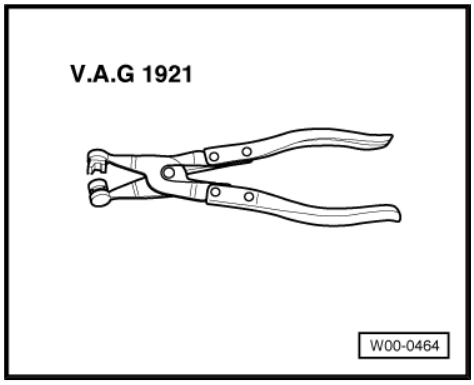
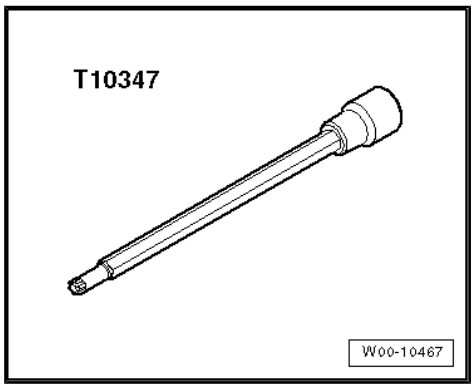
- Hose clip pliers -V.A.G 1921-



- Socket Torx T30 -T10347-



Removing

Note

- *In order to reach the injectors, you must first remove the intake manifold and the fuel rail.*
- *The combustion chamber (teflon) ring seal and the O-ring must always be renewed.*
- *Intake manifold - exploded view ⇒ page 33*
- *Fuel rail - exploded view ⇒ page 34*

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.
– Remove engine cover panel.

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– Disconnect vacuum line -arrow- leading to activated charcoal filter.

– Unplug following electrical connectors:

1 - Activated charcoal filter solenoid valve 1 -N80-

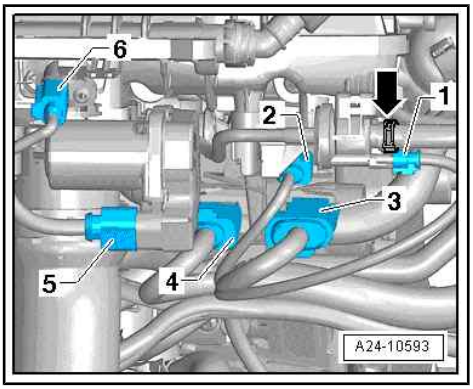
2 - From knock sensor 1 -G61-

3 - From intake manifold flap valve -N316- , fuel pressure sender -G247- and Hall sender -G40-

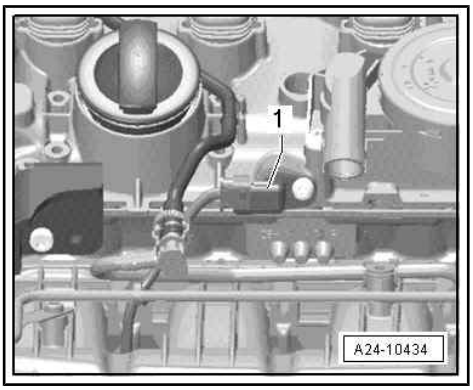
4 - From injectors

5 - Throttle valve module -J338-

6 - Intake air temperature sender -G42-



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



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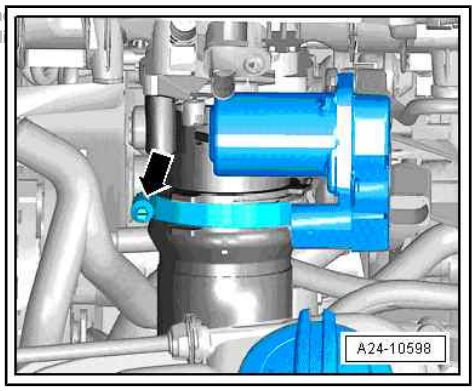
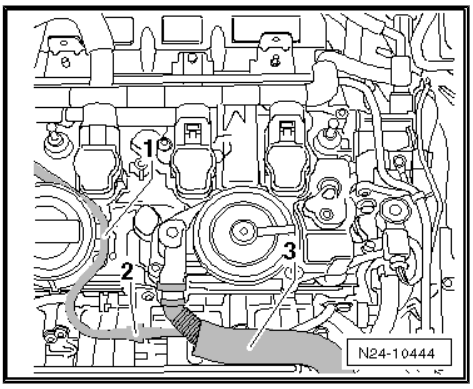
– Open hose clip -arrow- securing air hose and disconnect hose downwards from throttle valve module -J338-.



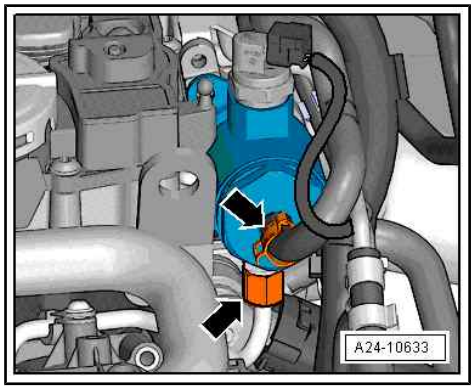
– Disconnect vacuum line -1- at connection -2-.

– Remove crankcase breather hose -3-.

Note



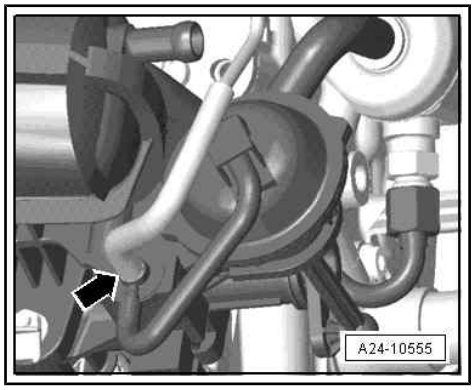
– Release spring-type clip -top arrow- and detach fuel supply hose from high-pressure pump.
– Unscrew union nut for high-pressure fuel line -bottom arrow- at high-pressure pump.



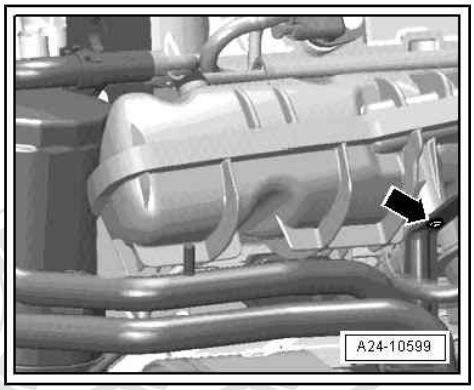
Note

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

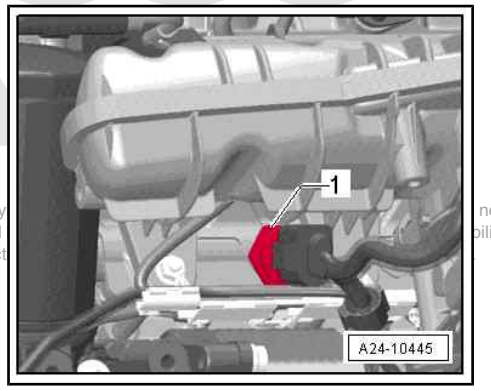
– Disconnect vacuum line -arrow- at intake manifold flap valve -N316- .



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



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



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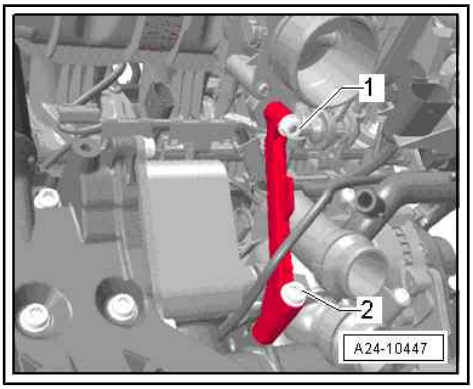
– Slightly loosen securing nut -1- and remove bolt -2-.

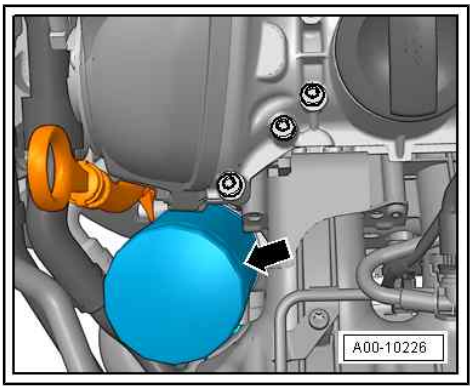


– Loosen oil filter with Hazet strap wrench -2171-1- or with oil filter tool -3417- and remove oil filter.

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

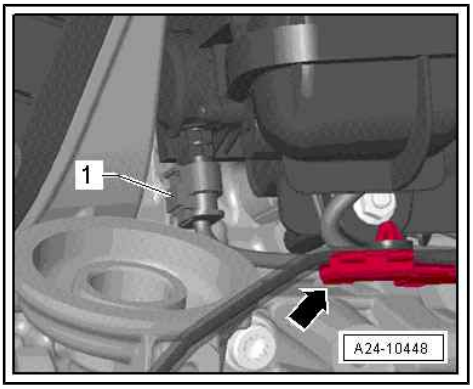
Note

To remove the bolts that cannot be accessed if you do not have socket -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.*

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– Disconnect intake manifold from fuel rail ⇒page 39 .

Installing

Note

Make sure that injectors are installed correctly.

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

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

- Tightening torque: intake manifold - exploded view ⇒ page 33
- Tightening torque: fuel rail - exploded view ⇒ page 34

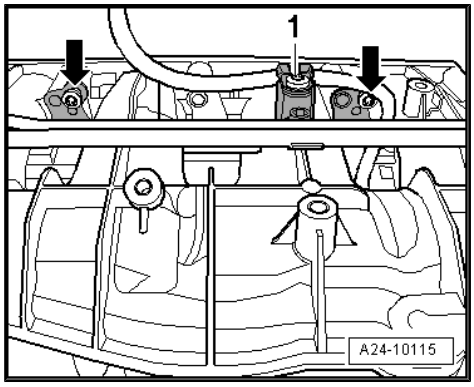
4.4 Removing and installing fuel rail

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

Note

Intake manifold must be removed; refer to ⇒ page 35 for removal procedure.

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



Installing

– Always renew both connecting pieces for fuel supply line.
– Connect fuel line.
– Re-connect electrical connectors.
– Install intake manifold ⇒ page 35 .
• Tightening torque: intake manifold - exploded view ⇒ page 33
• Tightening torque: fuel rail - exploded view ⇒ page 34
– Install in reverse order.

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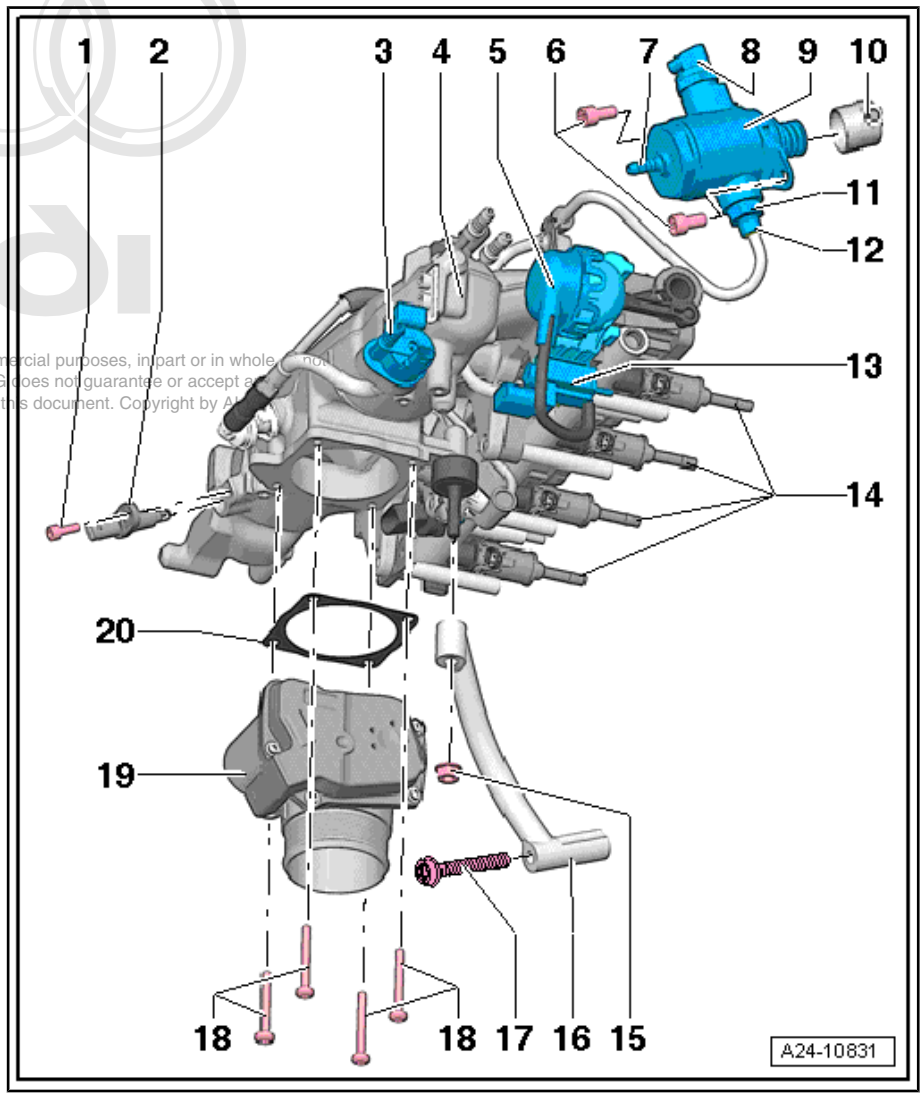
5 Intake manifold (vehicles with engine codes CFKA, CPMA)

Overview

- ⇒ „5.1 Intake manifold - exploded view“, page 41
- ⇒ „5.2 Fuel rail - exploded view“, page 43
- ⇒ „5.3 Removing and installing intake manifold (top section)“, page 44
- ⇒ „5.4 Removing and installing intake manifold (bottom section)“, page 48
- ⇒ „5.5 Removing and installing fuel rail“, page 50
- ⇒ „5.6 Removing and installing cold-start valve N17 “, page 50

5.1 Intake manifold - exploded view



1 - Screw for intake air temperature sender -G42-

- ❑ 9 Nm

2 - Intake air temperature sender -G42-

- Activated charcoal filter solenoid valve 1 -N80-

4 - Intake manifold

- ❑ Tighten to 9 Nm
- ❑ Removing and installing ⇒ page 44

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

6 - Bolts for high-pressure pump

- ❑ Hand-tighten in diagonal sequence, then tighten to 5 Nm and finally tighten to 20 Nm

7 - Connecting piece for fuel supply line

- ❑ 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 lines must be free of tension when installed.

- ❑ Removing and installing ⇒ page 53

10 - Roller tappet

- ❑ May remain lodged inside vacuum pump after removal of high-pressure pump, but can be removed

11 - Connecting piece for fuel supply line

- ❑ Not available as replacement part, part of high-pressure pump
- ❑ Do not loosen
- ❑ An adapter may be fitted between connecting piece and fuel supply line on some versions
- ❑ If fitted, adapter must be renewed; refer to ⇒ Electronic parts catalogue
- ❑ 40 Nm

12 - Union nut for fuel supply line

- ❑ Fuel lines 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 56

15 - Securing nut for intake manifold support

- ❑ 10 Nm

16 - Intake manifold support

17 - Bolt for intake manifold support

- ❑ 23 Nm

18 - Bolts for throttle valve module -J338-

- ❑ 10 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- . Use ⇒ Vehicle diagnostic tester

20 - Gasket

- ❑ Renew

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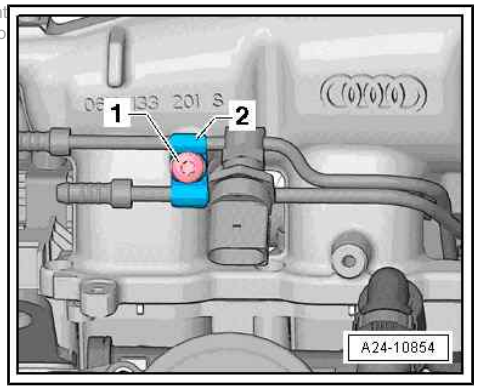
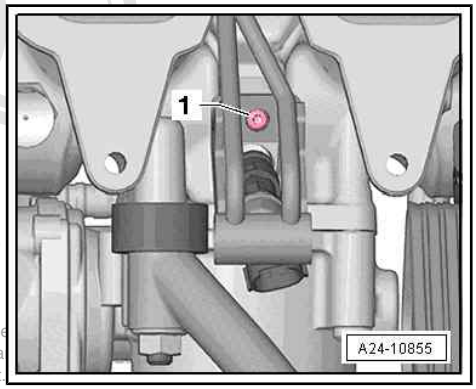
Retaining clip

- Tightening torque: 10 Nm



Cold-start valve -N17-

- Tightening torque: 10 Nm



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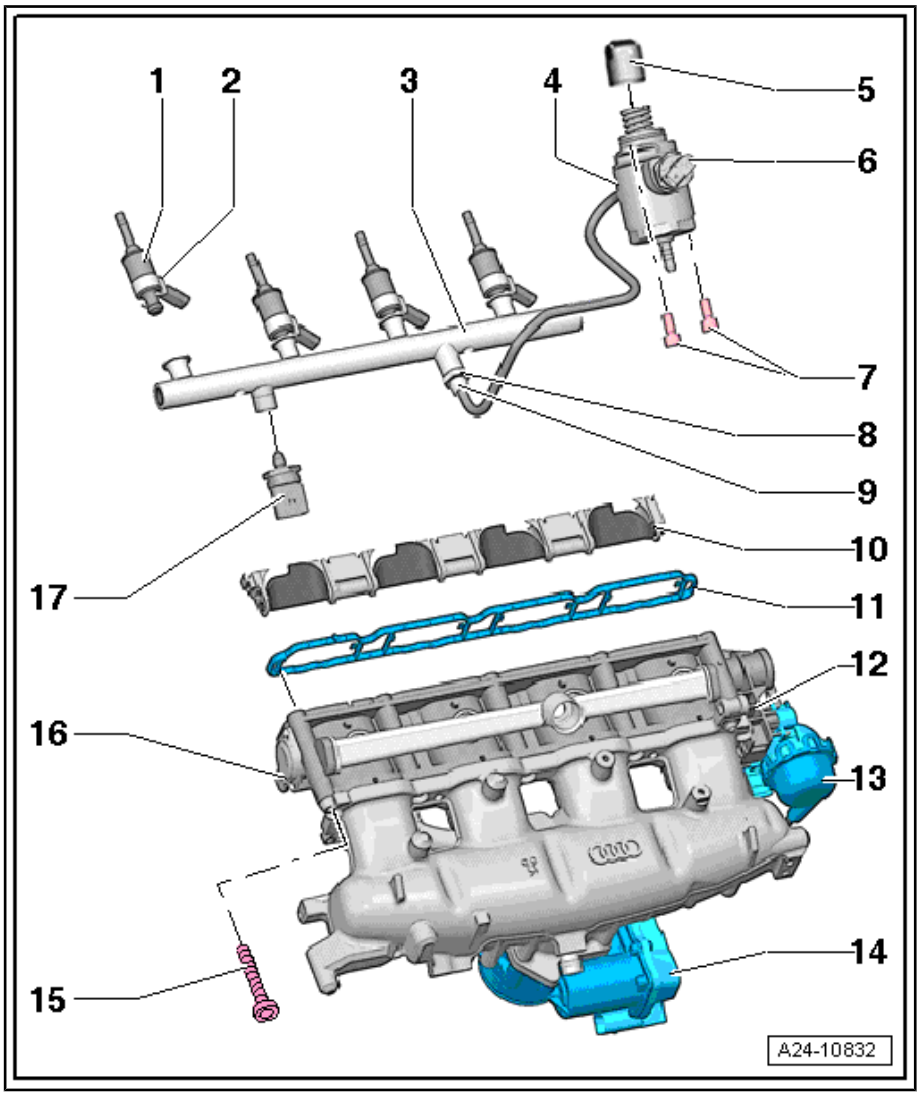
5.2 Fuel rail - exploded view



1 - Injector

- ❑ With combustion chamber ring seal (teflon ring seal): always renew
- ❑ Renew O-rings
- ❑ Ensure correct installation position.
- ❑ Removing and installing ⇒ page 56

2 - Support ring

3 - Fuel rail

- ❑ Removing and installing ⇒ page 48
- ❑ 10 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 lines must be free of tension when installed.
- ❑ Removing and installing ⇒ page 53

5 - Roller tappet

6 - Fuel pressure regulating valve -N276-

7 - Bolts for high-pressure pump

- ❑ Hand-tighten in diagonal sequence, then tighten to 5 Nm and finally tighten to 20 Nm

8 - Connecting piece for fuel supply line at fuel rail

- ❑ Renew
- ❑ 40 Nm

9 - Union nut for fuel supply line

- ❑ 20 Nm

10 - Air flow control flaps (intake manifold flaps)

11 - Gasket

- ❑ Renew

12 - Intake manifold

- ❑ Removing and installing ⇒ page 44

13 - Vacuum unit for air flow control flaps

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

- ❑ Throttle valve drive angle sender 1 for electric throttle -G187- and throttle valve drive angle sender 2 for electric throttle -G188-
- ❑ Throttle valve module -J338- must be re-adapted to engine control unit -J623- each time it is removed, installed or renewed; see „Guided Functions“
- ❑ 7 Nm

15 - Bolts for intake manifold

- ❑ 9 Nm

16 - Intake manifold flap potentiometer -G336-

- ❑ Intake manifold flap potentiometer -G336- must be re-adapted to engine control unit -J623- if it has been renewed; see „Guided Functions“.
- ❑ After intake manifold flap potentiometer -G336- or intake manifold has been removed or installed intake manifold flap potentiometer -G336- must always be adapted to engine control unit -J623- . Use vehicle diagnostic tester to do so.

17 - Fuel pressure sender -G247-

- ❑ 27 Nm
- ❑ Lubricate threads lightly with clean engine oil
- ❑ Always renew connecting piece and tighten to 40 Nm

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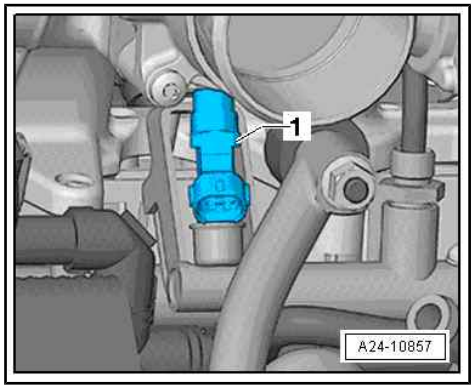
Cold-start valve -N17- -1-

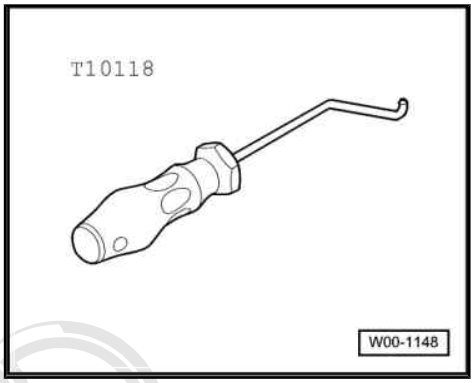
Removing and installing ⇒ page 50



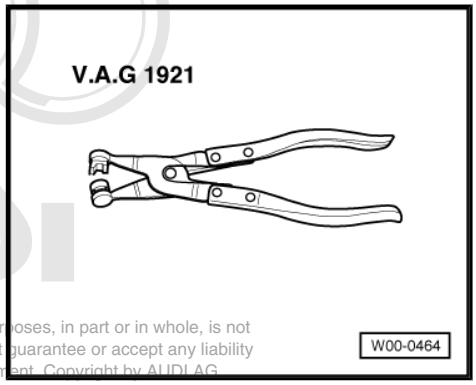
5.3 Removing and installing intake manifold (top section)

Special tools and workshop equipment required

- Assembly tool -T10118-



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



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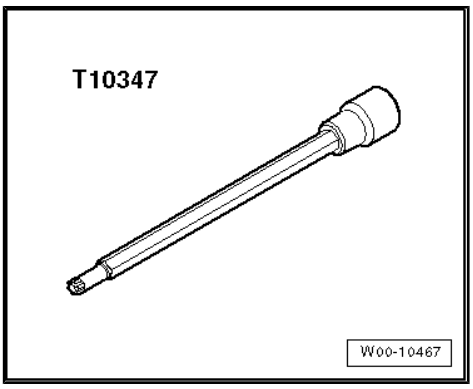
- Socket Torx T30 -T10347-



Removing

Note

- *In order to reach the injectors, first remove the intake manifold with the fuel rail.*
- *The combustion chamber ring seal (teflon) and the O-ring must be renewed.*

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.
– Remove engine cover panel.

– Disconnect vacuum line -arrow- leading to activated charcoal filter.

– Unplug following electrical connectors:

1 - Activated charcoal filter solenoid valve 1 -N80-

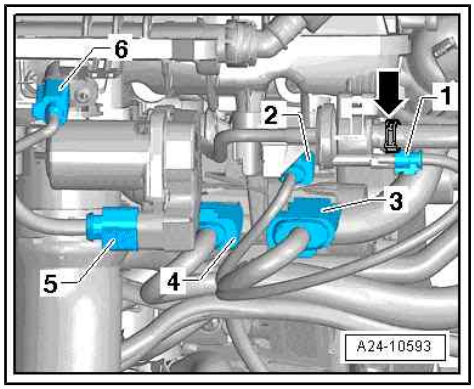
2 - From knock sensor 1 -G61-

3 - From intake manifold flap valve -N316- , fuel pressure sender -G247- and Hall sender -G40-

4 - From injectors

5 - Throttle valve module -J338-

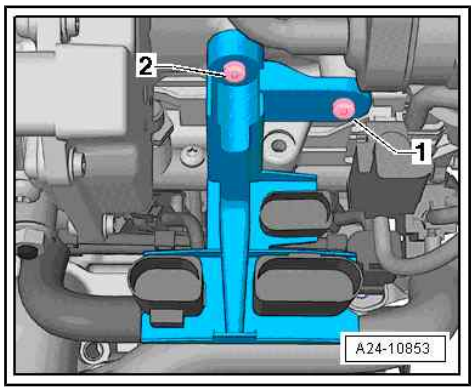
6 - Intake air temperature sender -G42-



Note

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

– Unscrew bolts -1 and 2- and detach bracket for electrical connectors.

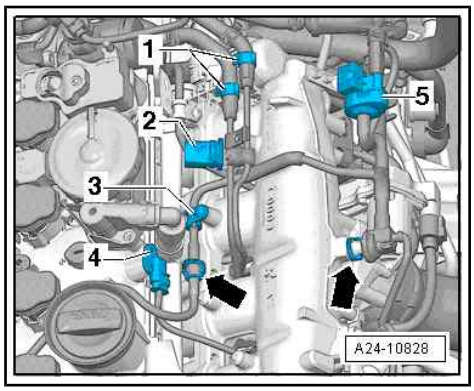


– Unplug electrical connector -2- at fuel pressure sender for low pressure -G410- .

– Unplug electrical connector -4- at Hall sender -G40- .

– Release hose clips -1- and disconnect the two fuel lines.

– Release hose clip -3-.



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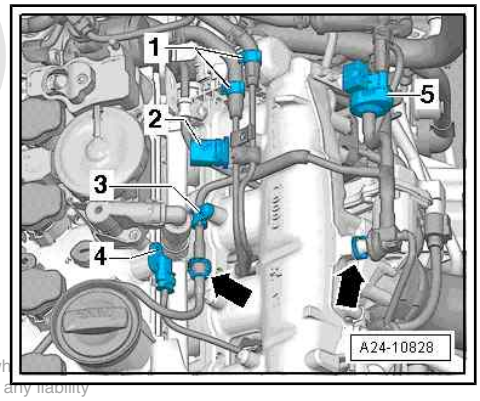
– Detach line for active charcoal filter at intake manifold (top section) and at connection -arrows-.
– Detach activated charcoal filter solenoid valve 1 -N80- -5- from bracket.
– Guide line coming from activated charcoal filter out underneath fuel lines and put to one side.



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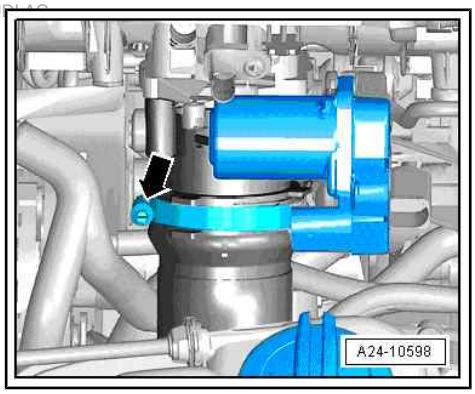
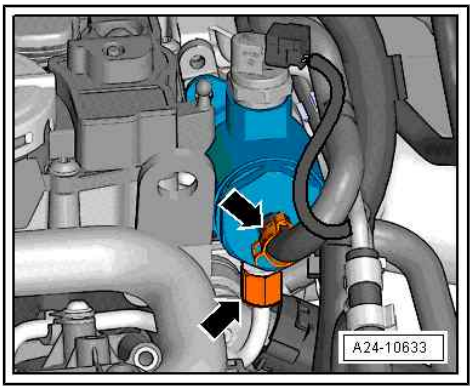
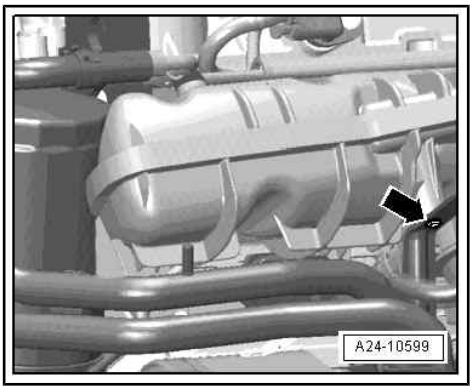
– Open hose clip -arrow- securing air hose and disconnect hose downwards from throttle valve module -J338- .



– Unscrew union nut for high-pressure fuel line -bottom arrow- at high-pressure pump.
– Unscrew union nut and remove high-pressure fuel line from intake manifold (top section).
– Loosen union nut securing high-pressure fuel line to fuel rail.



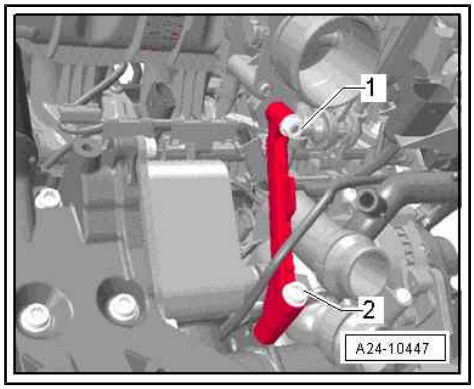
– Remove bolt -arrow- for coolant line from intake manifold (top section).



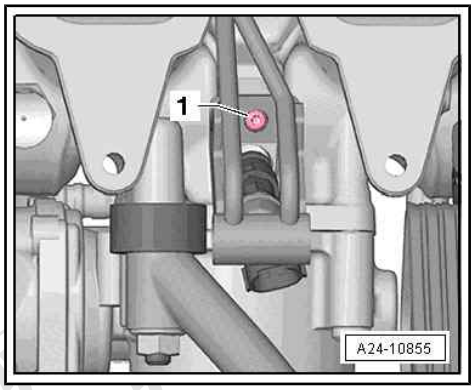
– Remove bolt -2-.

– Unscrew bolts from intake manifold (top section) using socket -T10347- .

– Detach top section from bottom section of intake manifold.



– Unplug electrical connector at cold-start valve -N17- .



Note

Block off intake ports with a clean cloth.

– Remove intake manifold (bottom section) ⇒ page 48 .

Installing

– Renew connecting pieces for high-pressure fuel line at high-pressure fuel pump and at fuel rail.

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

– Tighten union nuts on high-pressure fuel line hand-tight.

– Tighten intake manifold bolts to torque, working from inside to outside.

– Secure high-pressure fuel line (specified torque).

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

• Tightening torque: intake manifold - exploded view ⇒ page 41

• Tightening torque: fuel rail - exploded view ⇒ page 43

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5.4 Removing and installing intake manifold (bottom section)

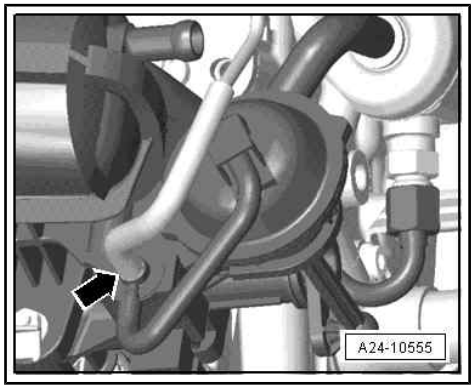
After the intake manifold (bottom section) has been removed or renewed, the intake manifold flap potentiometer -G336- must be adapted to the engine control unit -J623- .

Removing

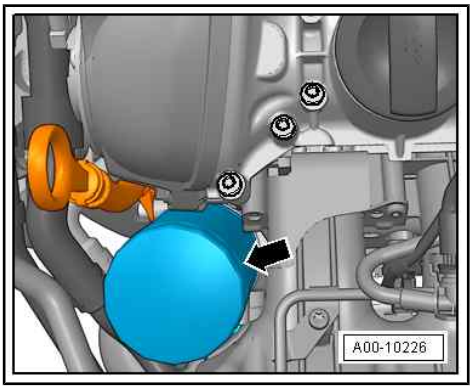
– Remove intake manifold (top section) ⇒ page 44 .

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

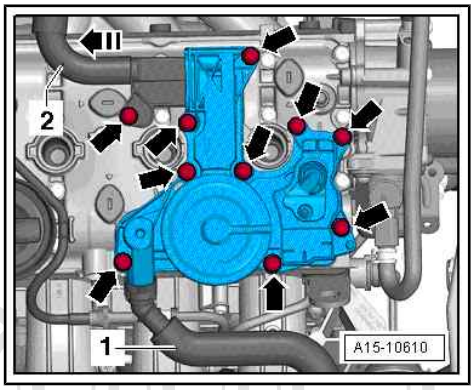
– Detach intake manifold flap valve -N316- from bracket.



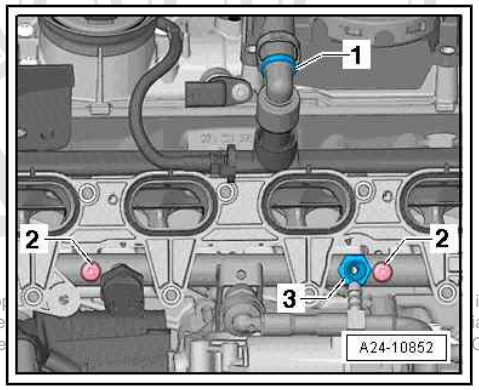
– Loosen oil filter -arrow- with oil filter tool -3417- and remove oil filter.



– Unscrew bolts on crankcase breather several turns -arrows-.



– Detach crankcase breather hose -1-.
– Unscrew hose connection -3-.
– Detach intake manifold (bottom section).



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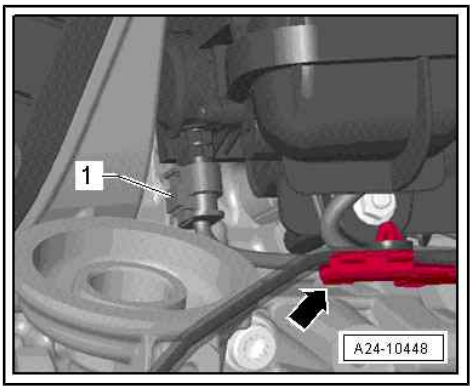
– Then unplug electrical connector -1- at intake manifold flap potentiometer -G336- .



Installing

Note

Make sure that injectors are installed correctly.

– Always renew both connecting pieces for fuel supply line.
– Re-attach electrical connector at intake manifold flap potentiometer -G336- .
– Install intake manifold ⇒ page 35 .
- Tightening torque: intake manifold - exploded view ⇒ page 41
- Tightening torque: fuel rail - exploded view ⇒ page 43
– Install in reverse order.

5.5 Removing and installing fuel rail

Removing

– Remove intake manifold (top section) ⇒ page 44 .

– Remove intake manifold (bottom section) ⇒ page 48 .

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

– Unscrew the two bolts -2- from fuel rail.

– Detach fuel rail.

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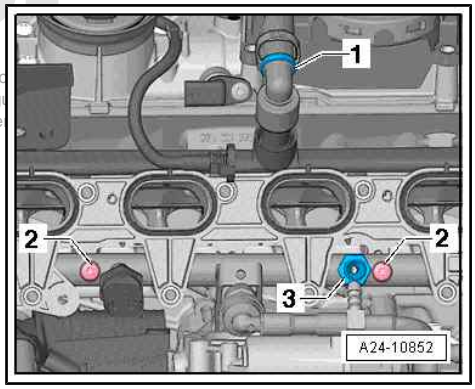


Note

The injectors can remain in the fuel rail.

Installing

Note

Make sure that injectors are installed correctly.

• Tightening torque: fuel rail - exploded view ⇒ page 43

– Install in reverse order.

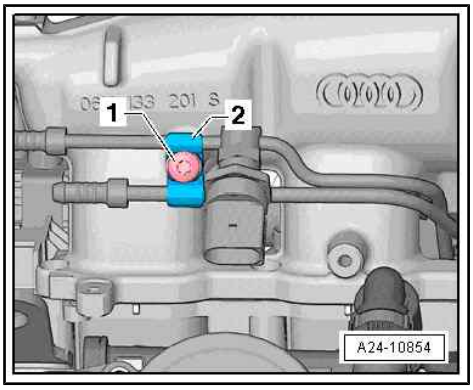
– Install intake manifold ⇒ page 35 .

5.6 Removing and installing cold-start valve -N17-

Removing

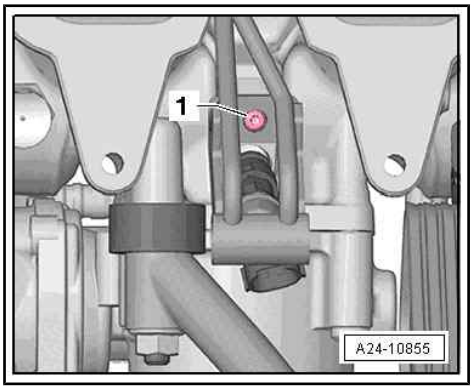
– Remove intake manifold ⇒ page 44 .

– Remove bolt -1- of retaining clip -2- from intake manifold.

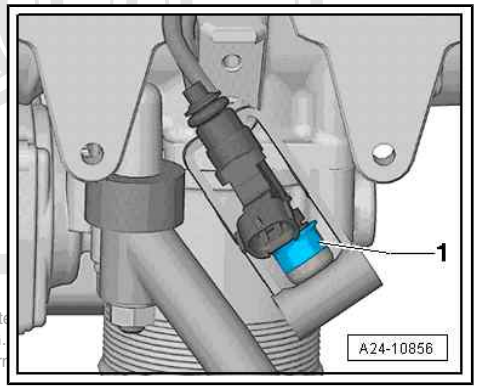


– Remove bolt -1- from cold-start valve -N17- .

– Pull cold-start valve -N17- with retainer out of opening.



– Pull out retaining clip -1-.
– Carefully pull cold-start valve -N17- out of retainer.



Installing

– Install in reverse order.
– Install intake manifold ⇒ page 44 .

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6 High-pressure pump

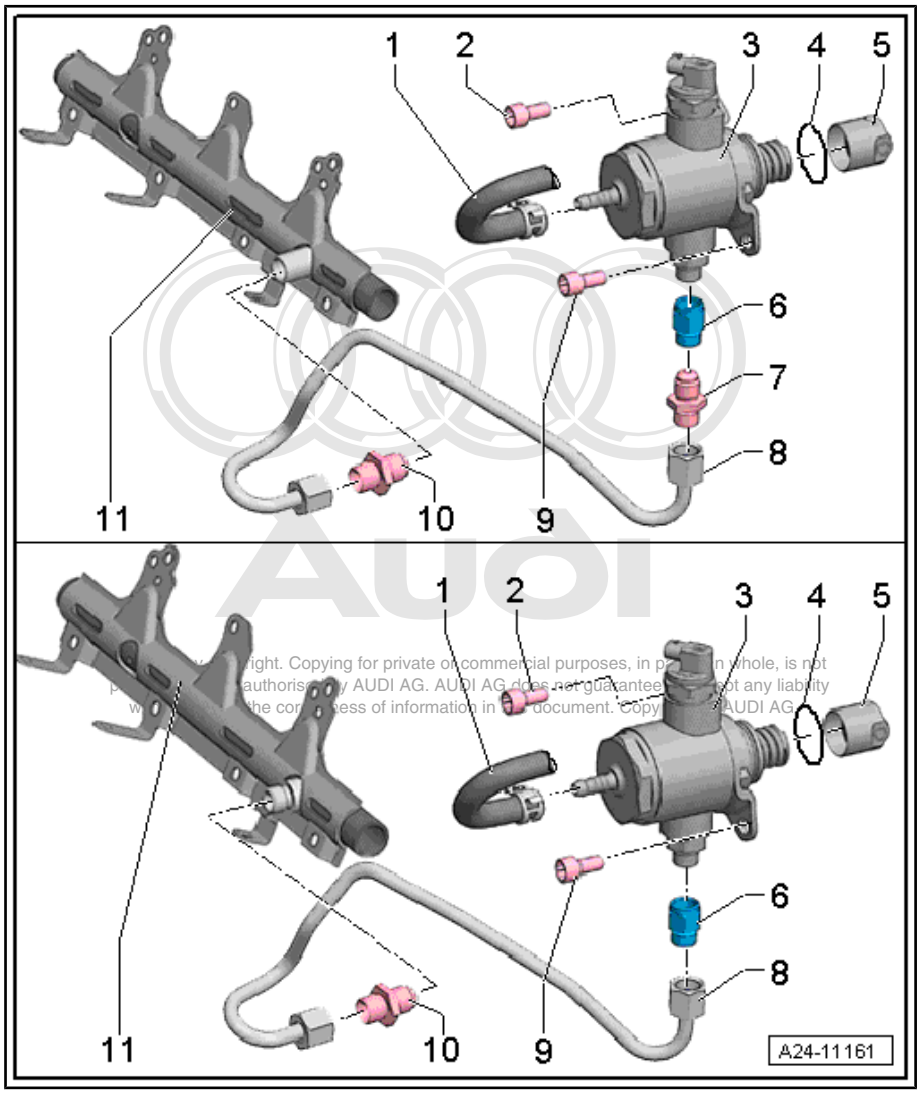
Overview

- ⇒ „6.1 High-pressure pump - exploded view“, page 52
- ⇒ „6.2 Removing and installing high-pressure pump“, page 53

6.1 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 - Fuel supply line from tank

2 - Bolt for high-pressure pump

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

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 when installing the high-pressure pump; procedure for reducing fuel pressure ⇒ page 4
- ❑ Fuel lines must be free of tension when installed.
- ❑ Removing and installing ⇒ page 53

4 - O-ring

- ❑ Renew

5 - Roller tappet

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

6 - Connecting piece

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

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7 - Adapter

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

8 - High-pressure fuel line

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

9 - Bolt for high-pressure pump

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

10 - Connecting piece for fuel supply line at fuel rail

- ❑ Renew
- ❑ 40 Nm

11 - Fuel rail

- ❑ Removing and installing ⇒ page 39

6.2 Removing and installing high-pressure pump

WARNING

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

Note

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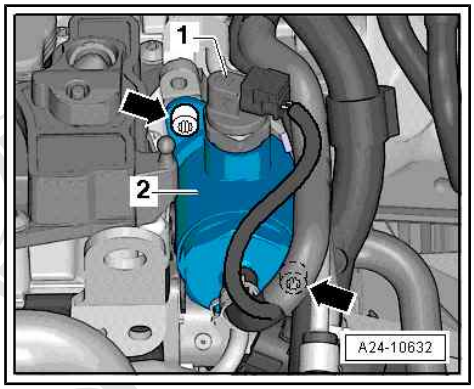
- ♦ *The high-pressure fuel pump should only be removed when the engine is cold.*
- ♦ *When installing the high-pressure fuel pump, it is essential to ensure that no dirt enters the fuel system.*
- ♦ *Use a cloth to catch escaping fuel.*
- ♦ *The O-ring must always be renewed.*
- ♦ *Always ensure that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

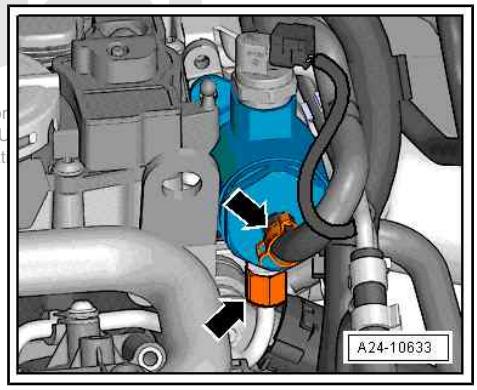
Removing

– Remove engine cover panel.

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



– Disconnect both fuel lines -arrows-.



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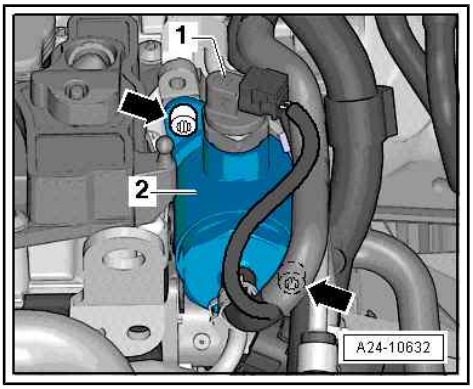
– Remove 2 bolts -arrows-.

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



Installing

– Renew O-ring for high-pressure pump.

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

Note

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

♦ *If the old high-pressure pump is re-installed, or if a used pump is installed, the connecting piece for the fuel supply line (high-pressure section of the system) must be renewed. Refer to high-pressure pump - exploded view (item 11)* ⇒ page 52 *.*

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

– Fit high-pressure pump in vacuum pump and secure in position.

– Tighten bolts hand-tight.

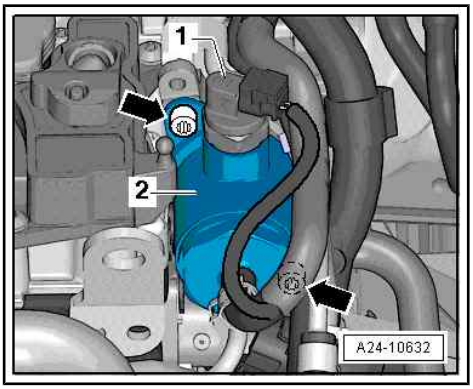
– Renew connecting piece at high-pressure pump.

• Tightening torque: refer to exploded view of high-pressure pump ⇒ page 52 .

– Now tighten bolts in diagonal sequence to specified torque, refer to high-pressure pump - exploded view ⇒ page 52 .

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

• Tightening torque for fuel supply line (union nut): Intake manifold - exploded view ⇒ page 33 .



– Re-attach electrical connector -1- for fuel pressure regulating valve -N276- .

– Put back fuse if it has been removed.

Note

Check fuel system for leaks.

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7 Injectors

- ⇒ „7.1 Removing and installing injectors“, page 56
- ⇒ „7.1.1 Renewing combustion chamber ring seal (teflon ring seal)“, page 57
- ⇒ „7.2 Cleaning injectors“, page 59

7.1 Removing and installing injectors

Special tools and workshop equipment required

- Tool kit with puller -T10133-

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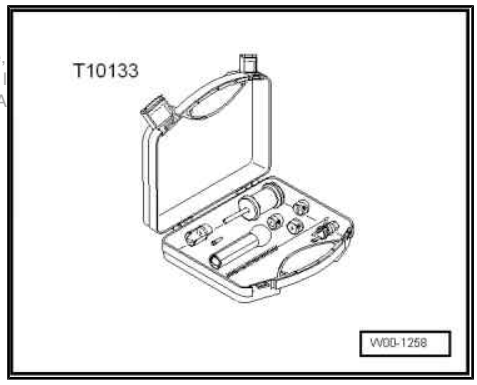


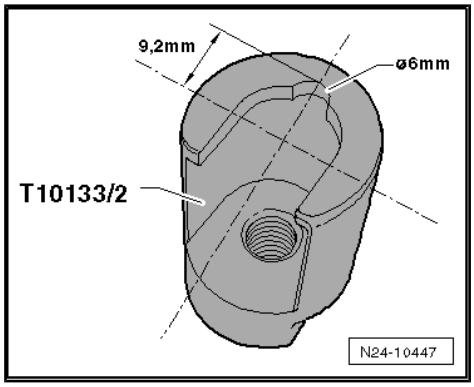
Note

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

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

– 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 (engine codes CDNB, CDNC, CAEB, CDZA, CAEA, CADA ⇒ page 35).

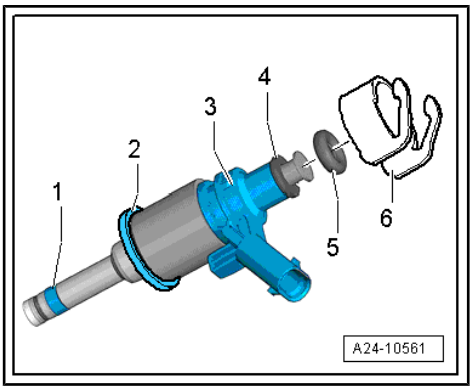
– Remove intake manifold and fuel rail (engine codes CFKA, CMPA ⇒ page 44).

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 57

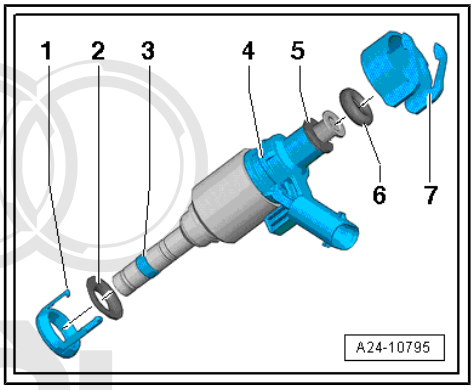
3 - Injector

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 - Intermediate ring (renew)

2 - Retainer

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

4 - Injector

5 - Spacer ring (renew if damaged)

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

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

– Cover open inlet ports with a clean cloth.

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

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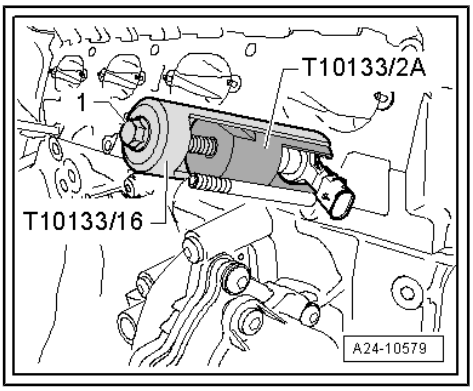
– Guide puller -T10133/2A- into groove on injector.

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



Note

The combustion chamber ring seal must always be renewed prior to reinstalling the injector ⇒ page 57 .

7.1.1 Renewing combustion chamber ring seal (teflon ring seal)

Note

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

Renewing combustion chamber ring seal

– Remove injector ⇒ page 56 .

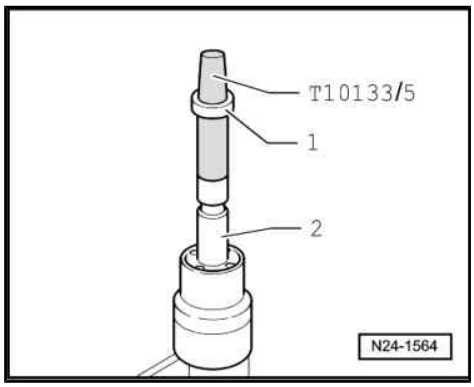
– Carefully remove old combustion chamber ring seal using suitable tools (e.g. cut open ring using razor blade, or prise open ring with small screwdriver and then pull off forwards). It is important to ensure that the groove and the continuous ridge in the bottom of the groove are not damaged.

Note

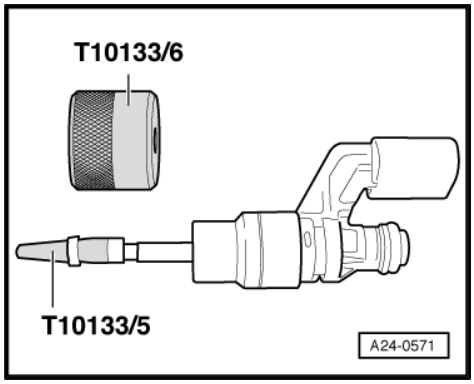
The injector must be renewed if the groove is damaged.

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

– Fit assembly cone -T10133/5- with new combustion chamber ring seal -1- onto injector -2-.



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

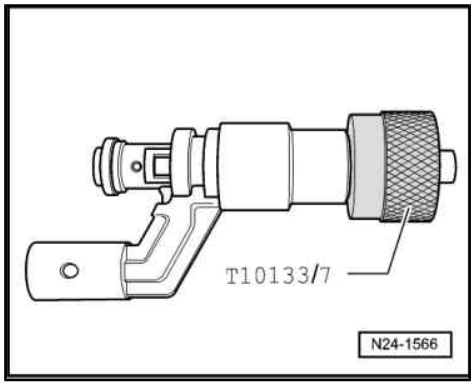


Note

The combustion chamber ring seal is widened when it is pushed onto the injector. After pushing it on, it therefore has to be compressed again. This is done in two stages, as described below.

– Push calibration sleeve -T10133/7- onto injector as far as it will go and simultaneously turn it slightly (approx. 180°).

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



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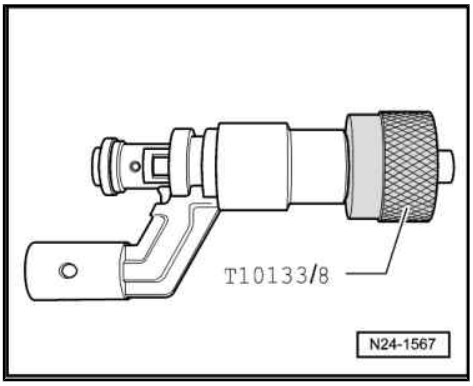
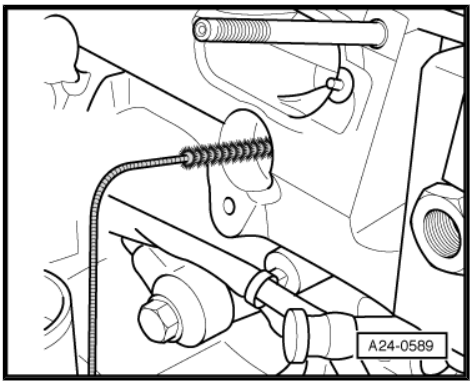
– Push calibration sleeve -T10133/8- onto injector as far as it will go and simultaneously turn it slightly (approx. 180°).
– Pull calibration sleeve -T10133/8- off again by turning it in the opposite direction.
– Fit new O-ring on injector. Lubricate O-ring lightly with clean engine oil before installing.



Note

Make sure there is no cleaning fluid or oil in the cylinder head bores when installing the injectors.

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



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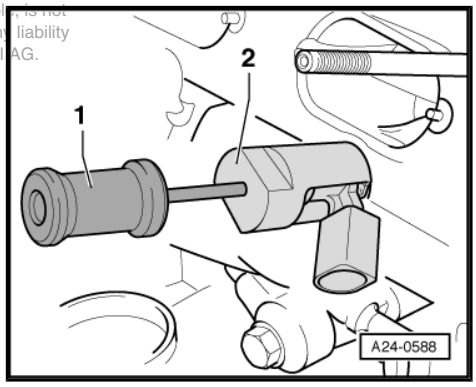
Note

- *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 the injector.*



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

Important: the following points must always be observed.

- Coat O-rings of injector 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 35 .

7.2 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 56 .

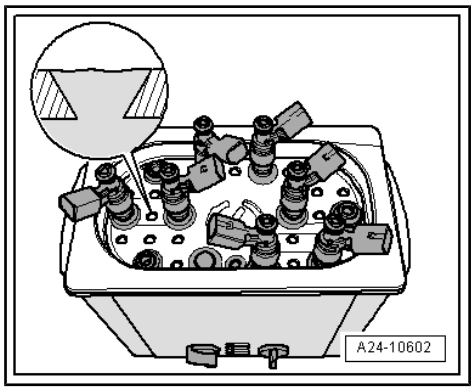
Note

Observe safety precautions and operating instructions for ultrasonic unit.

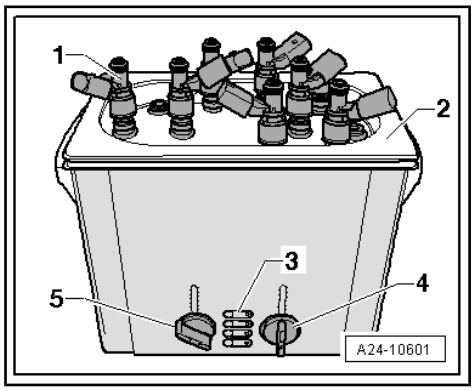
– Ultrasonic unit must be filled with cleaning fluid.

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-.
– 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 57 .
– Then re-install injectors ⇒ page 56 .

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8 Senders and sensors

Overview

- ⇒ „8.1 Removing and installing air mass meter G70 “, page 61
- ⇒ „8.2 Removing and installing fuel pressure sender G247 “, page 62
- ⇒ „8.3 Checking fuel pressure sender G247 “, page 63
- ⇒ „8.4 Checking residual pressure in fuel system (up to high-pressure pump)“, page 65
- ⇒ „8.5 Removing and installing throttle valve module J338 “, page 68
- ⇒ „8.6 Cleaning throttle valve module J338 “, page 68
- ⇒ „8.7 Checking intake manifold change-over function“, page 69
- ⇒ „8.8 Checking dual non-return valve“, page 71

8.1 Removing and installing air mass meter -G70-

Removing

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

– Release hose clip -2- securing air hose (going to turbocharger) and disconnect hose from air mass meter -G70- .

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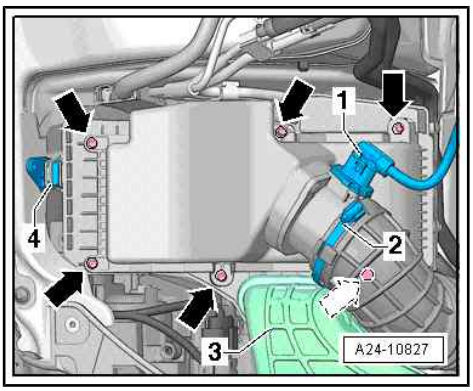
– Unscrew both bolts from air mass meter -G70- .

– Then carefully pull air mass meter -G70- out of guide on air cleaner housing.



Installing

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

Note

- *If the air filter element is very dirty or wet, dirt or water could reach the air mass meter -G70- and affect the air mass value. This would lead to loss of power, since a smaller injection quantity is calculated.*
- *Always use genuine part for air filter element.*
- *Use a silicone-free lubricant when installing the 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).

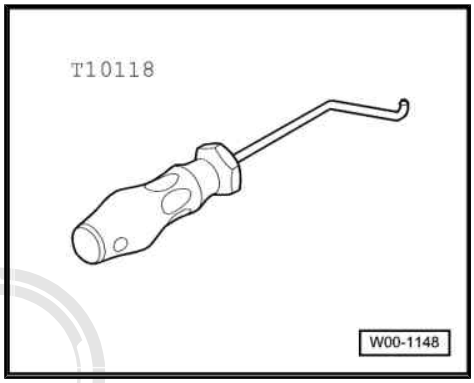
– Check for dirt in air duct leading to air filter element. If necessary, clean salt residue, dirt and leaves out of air cleaner housing (top and bottom sections); wash out or use a vacuum cleaner as required. Removing and installing air cleaner ⇒ page 29 .

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

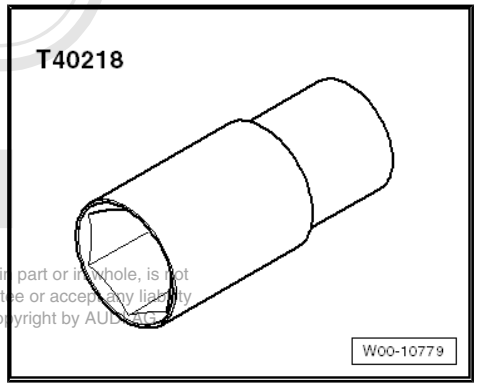
8.2 Removing and installing fuel pressure sender -G247-

Special tools and workshop equipment required

- Assembly tool -T10118-



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



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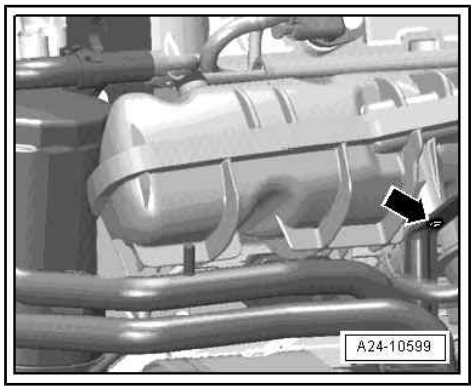
Removing

– Carefully pull off engine cover panel.

WARNING

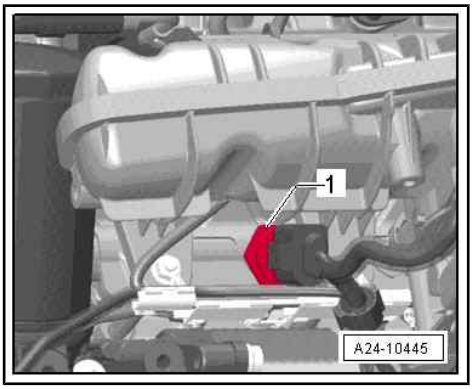
The fuel system is pressurised. The fuel pressure in the high-pressure part of the injection system must be reduced to a residual pressure prior to opening; for procedure see ⇒ page 4 .

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



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

– Unscrew fuel pressure sender -G247- using bit, 27mm - T40218- .



Installing

– Install in reverse order.

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

- Tightening torque for connecting piece: Fuel rail - exploded view ⇒ page 34
- Tightening torque for fuel pressure sender -G247- : Fuel rail - exploded view ⇒ page 34

8.3 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.

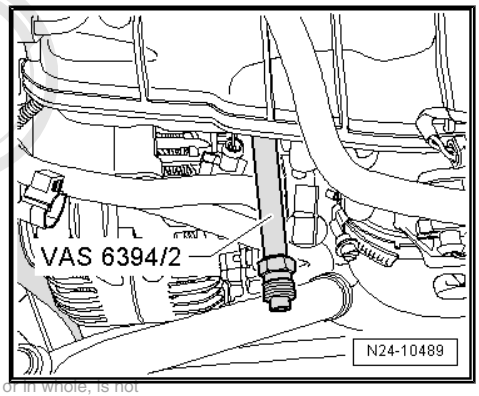
WARNING

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 62 .

– 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 34



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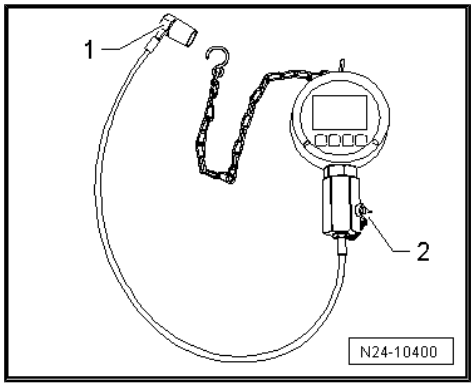
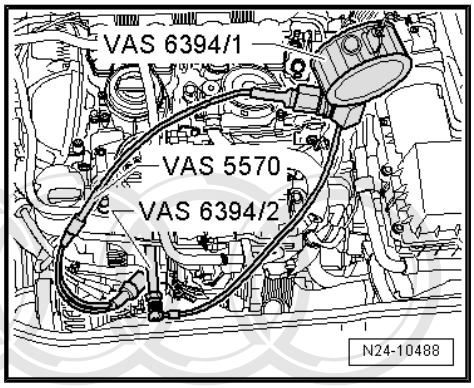
– Unscrew plug -2- on pressure sensor tester -VAS 6394- and screw in the removed fuel pressure sender -G247- . Tighten to torque normally specified for fuel pressure sender.



– 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 „Measured values“.
– Select „Fuel pressure“ from the list.

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

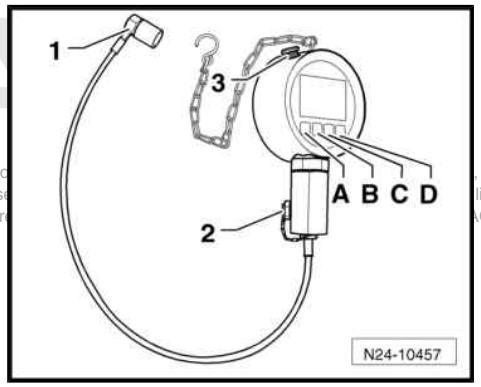


– Switch on pressure sensor tester -VAS 6394- by pressing button -A- once briefly.

Note

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

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



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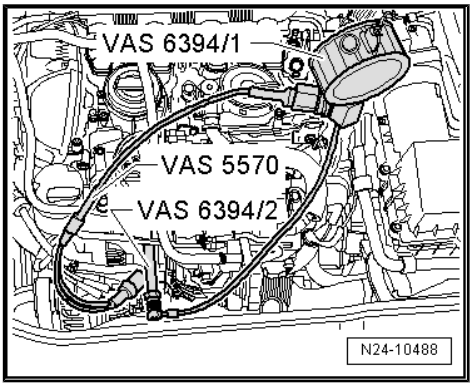
– Connect pressure line of pressure sensor tester -VAS 6394- to adapter -VAS 6394/2- .

– 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- .



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WARNING

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

– 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.

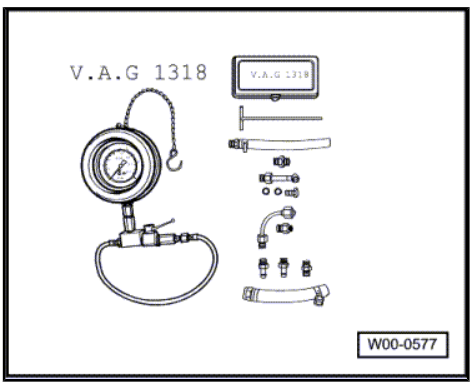
If the values agree:

– Install new fuel pressure sender -G247- .

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

Special tools and workshop equipment required

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



♦ 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.

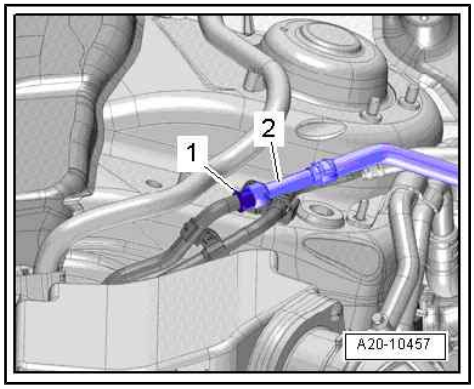
- Ignition off.

Checking fuel pressure

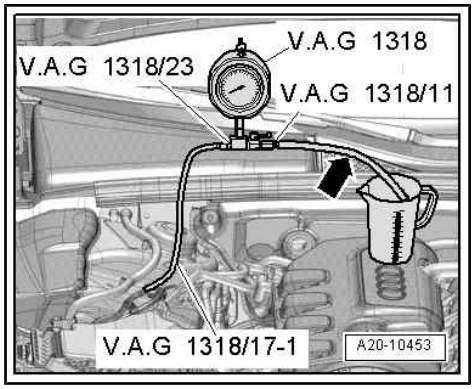
WARNING

- *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.*

– Disconnect fuel line -2- by pulling release ring -1-.



– Screw connector -V.A.G 1318/23- and adapter -V.A.G 1318/17-1- onto K-Jetronic pressure tester -V.A.G 1318- .
– Fit adapter -V.A.G 1318/17-1- onto disconnected fuel supply line.
– Screw adapter -V.A.G 1318/11- onto K-Jetronic pressure tester -V.A.G 1318- .
– Fit auxiliary hose -arrow- onto pressure tester and hold it in a container.



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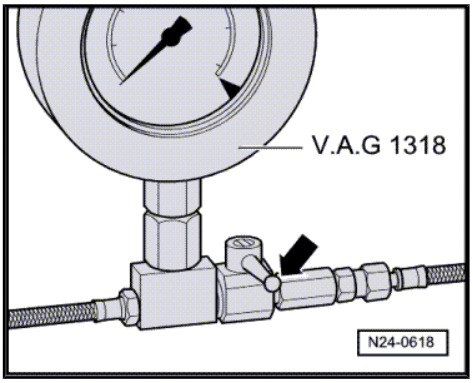

– Close cut-off valve on K-Jetronic pressure tester -V.A.G 1318- . Lever is at right angle to direction of flow -arrow-.
– Connect a ⇒ Vehicle diagnostic tester.
– Select „Engine electronics“ in vehicle self-diagnosis.
– Then select „Final control diagnosis“.
– Select „Fuel pump electronics“ from list and press „start“.

Note

This function activates the fuel pump.

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

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

If specification is not obtained:

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

Checking residual pressure

– Check system for leaks and check residual pressure by watching the drop in pressure on the 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 line for leaks.
♦ Check K-Jetronic pressure tester -V.A.G 1318- for leaks.
♦ Check fuel lines and their connections for leaks.
♦ Check delivery rate of fuel pump ⇒ Rep. gr. 20 .
♦ 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 tester, release fuel pressure by opening cut-off valve. Hold a container under the connection.

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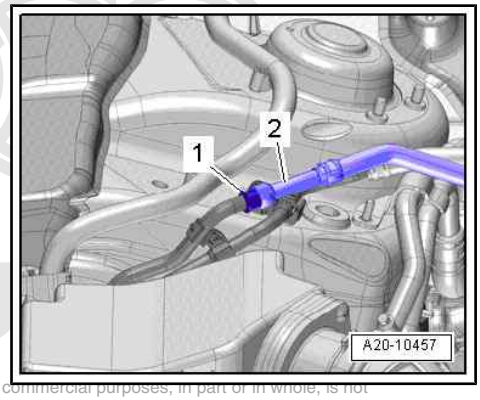
– Reconnect fuel supply line -arrow- (make sure that all parts are clean).



Note

Check fuel system for leaks.

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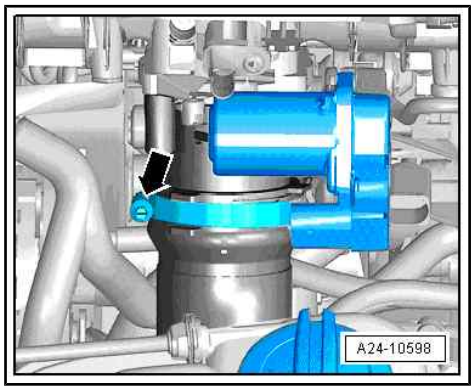
8.5 Removing and installing throttle valve module -J338-

Removing

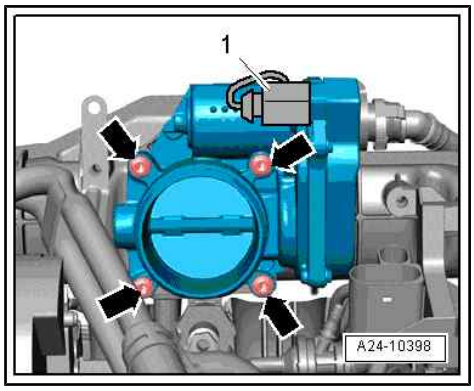
– Remove engine cover panel.

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

– 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 33 .

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

8.6 Cleaning throttle valve module -J338-

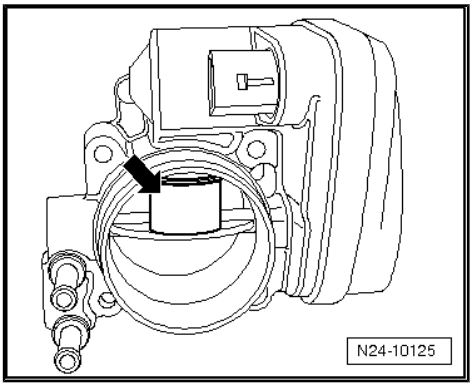
Note

♦ *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 68 .

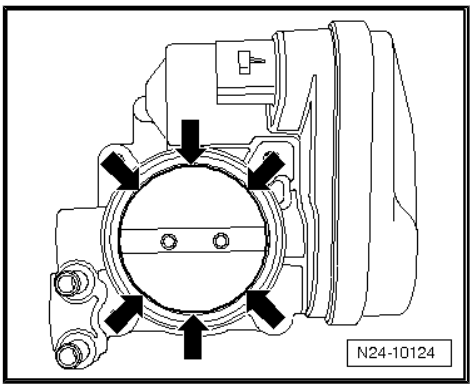
– Open throttle valve by hand and block it in the open position with a suitable object (e.g. plastic or wooden wedge) -arrow-.



WARNING

Acetone is highly flammable. Please observe all accident prevention regulations and safety precautions when handling flammable liquids. Do not use compressed air when cleaning the throttle valve. Wear safety goggles and protective clothing to avoid possible injury and skin contact.

– Clean throttle valve housing thoroughly, especially around the points -arrows- where the throttle valve closes, using commercially available acetone and a small brush.



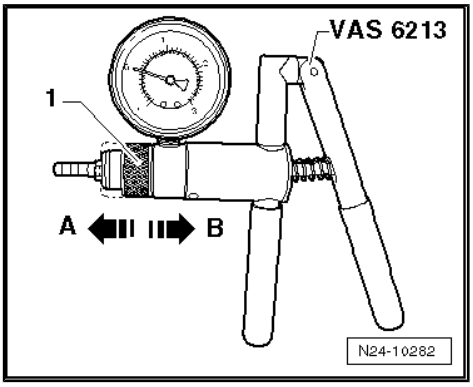
– Wipe out throttle valve housing with a lint-free cloth.
– Allow acetone to evaporate completely and re-install throttle valve module after cleaning.
– Erase learnt values and adapt engine control unit -J623- to throttle valve module using ⇒ Vehicle diagnostic tester.

8.7 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.

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- The vacuum unit should pick up -arrow-.

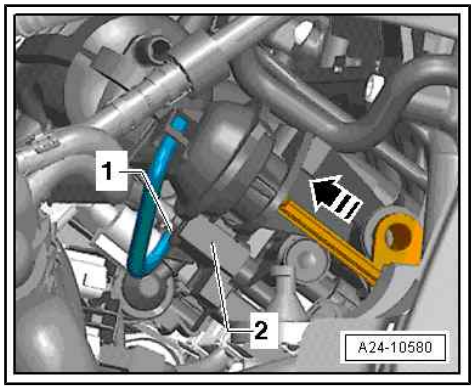
If the change-over does not operate as described:

– Check vacuum system for leaks.

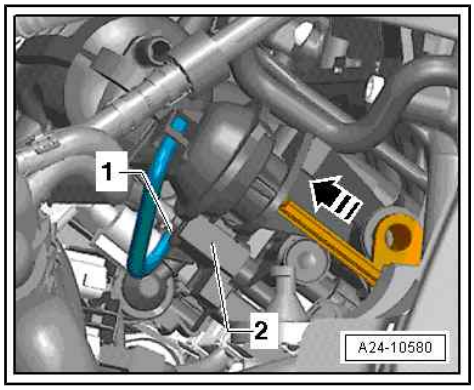
– Check that change-over mechanism moves freely by operating linkage manually.

– Check proper connection of vacuum lines.

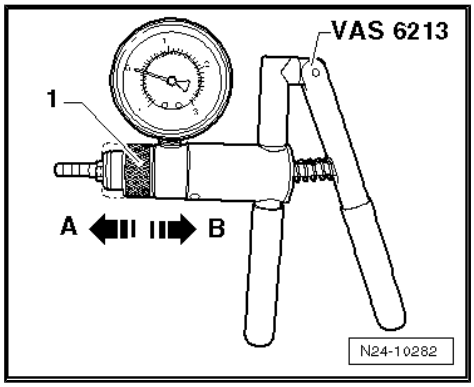
– Check vacuum hoses for porosity.



– 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".

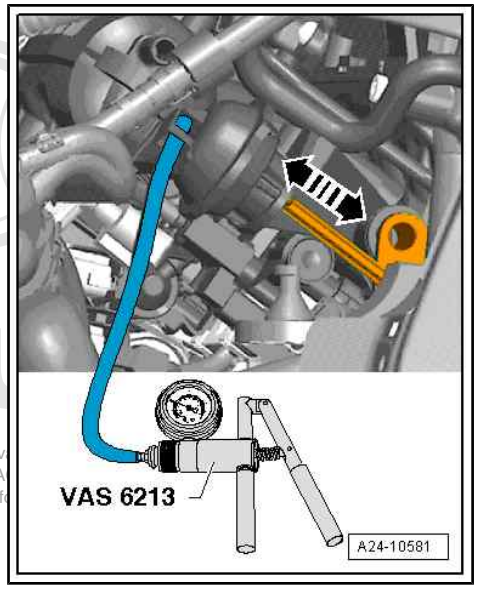


– Connect hand vacuum pump -VAS 6213- to vacuum unit for intake manifold flap valve -N316- .

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

The vacuum unit should move -arrows-.

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



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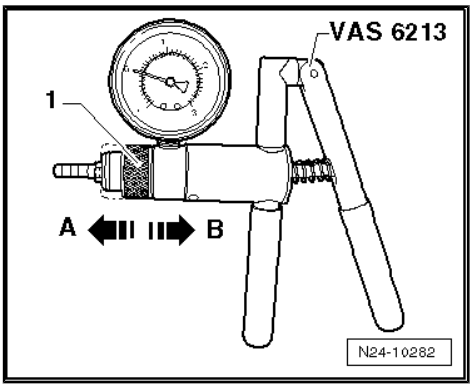
8.8 Checking dual non-return valve

Special tools and workshop equipment required

- Hand vacuum pump -VAS 6213-



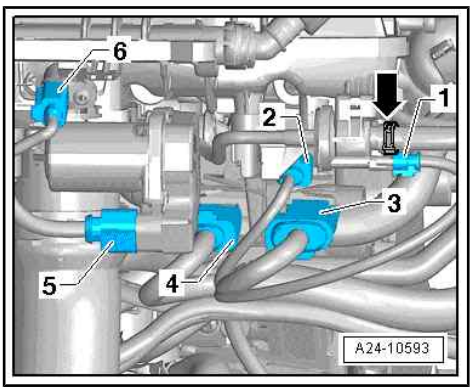
- Auxiliary measuring set -V.A.G 1594C-

Test condition:

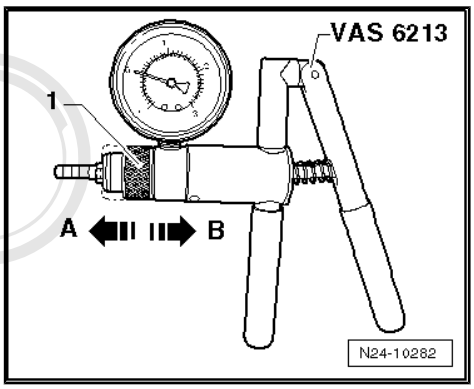
- Activated charcoal filter solenoid valve 1 -N80- has been checked with ⇒ Vehicle diagnostic tester and is OK.

– Carefully pull off engine cover panel.

– Unplug connector -1- and detach breather hose -arrow- from activated charcoal filter solenoid valve 1 -N80- .



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



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– Connect hand vacuum pump -VAS 6213- to 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.

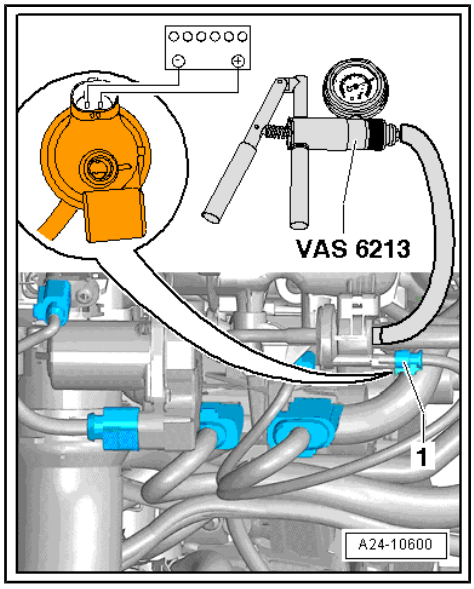
• Vacuum should build up.

– 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.



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9 Lambda probes

Overview

- ⇒ „9.1 Lambda probes - overview“, page 73
- ⇒ „9.2 Removing and installing Lambda probe G39 and Lambda probe heater Z19 before catalytic converter“, page 74
- ⇒ „9.3 Removing and installing Lambda probe after catalytic converter G130 and Lambda probe 1 heater after catalytic converter Z29 “, page 75

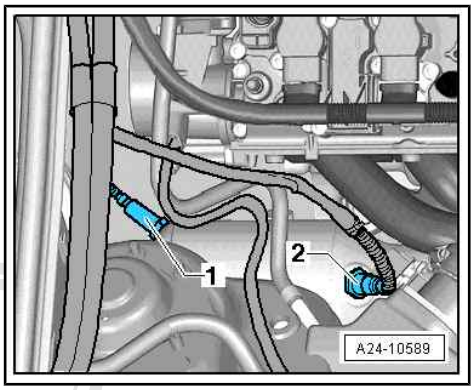
9.1 Lambda probes - overview

Lambda probes

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

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

- Tightening torque: 55 Nm



Electrical connectors for Lambda probes (engine codes CDNB, CDNC, CAEB, CDZA, CAEA, CADA)

1 - Activated charcoal filter solenoid valve 1 -N80-

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

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

Fitting location for engine codes CFKA, CPMA

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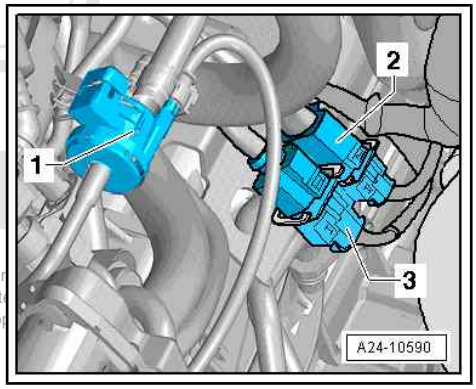
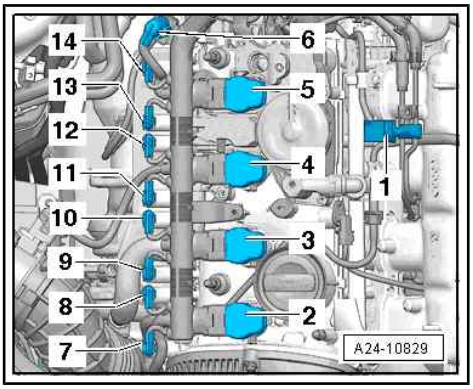
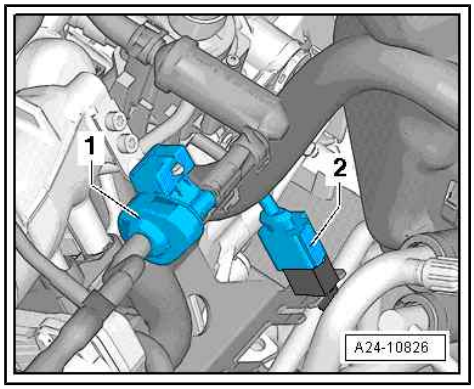


Electrical connector for Lambda probe -G39-

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



Component and electrical connectors



1 - Activated charcoal filter solenoid valve 1 -N80-

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

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, it is important to re-attach the Lambda probe wiring at the same locations to prevent it from coming into contact with the exhaust pipe.*

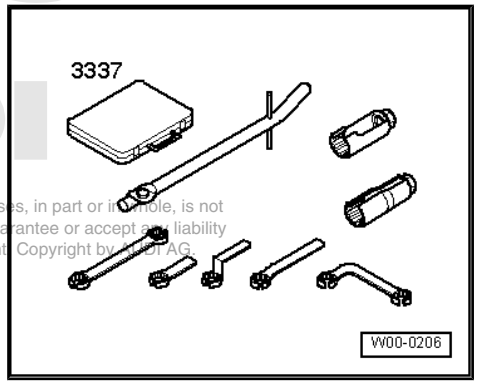
Removing and installing Lambda probe -G39- and Lambda probe heater -Z19-
⇒ „9.2 Removing and installing Lambda probe G39 and Lambda probe heater Z19 before catalytic converter“, page 74 .

Removing and installing Lambda probe after catalytic converter -G130- and Lambda probe 1 heater after catalytic converter -Z29-
⇒ „9.3 Removing and installing Lambda probe after catalytic converter G130 and Lambda probe 1 heater after catalytic converter Z29 “, page 75

9.2 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-



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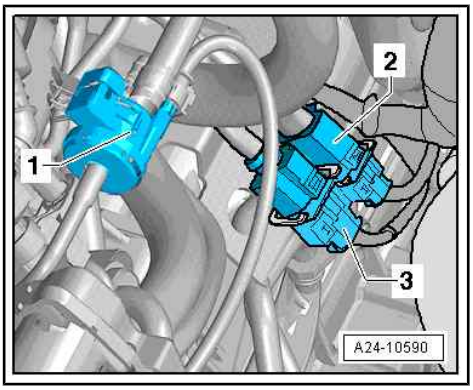
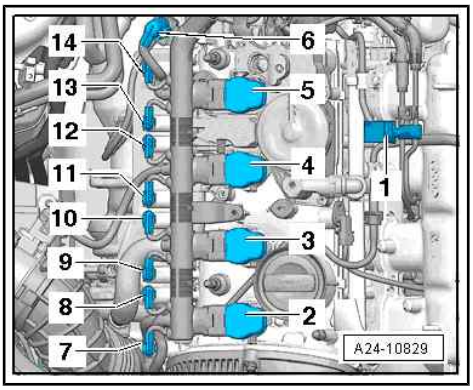
Removing

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

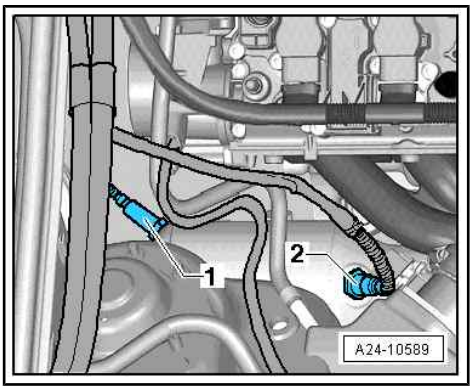


Note

Fitting location of electrical connector for Lambda probe -G39- -6- (vehicles with engine codes CFKA, CPMA)



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



Installing

When installing, note the following:

Note

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

- Tightening torque: refer to overview of Lambda probes ⇒ page 73 .

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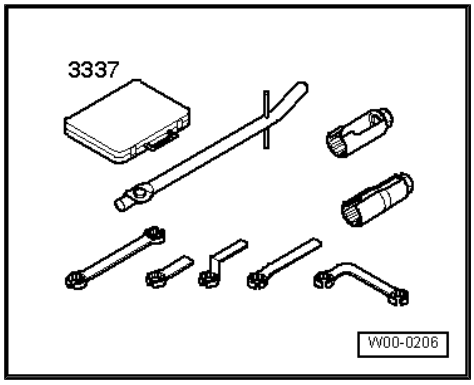
9.3 Removing and installing Lambda probe after catalytic converter -G130- and Lambda probe 1 heater after catalytic converter -Z29-

Special tools and workshop equipment required

♦ Lambda probe open ring spanner set -3337-



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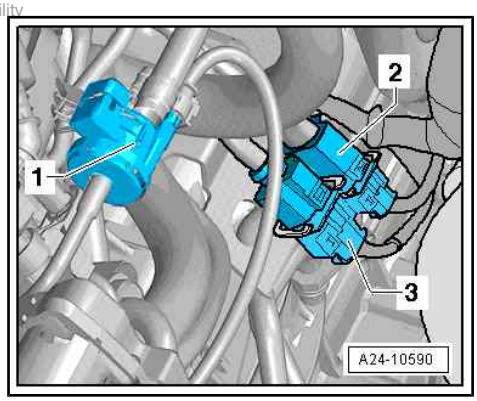
Removing

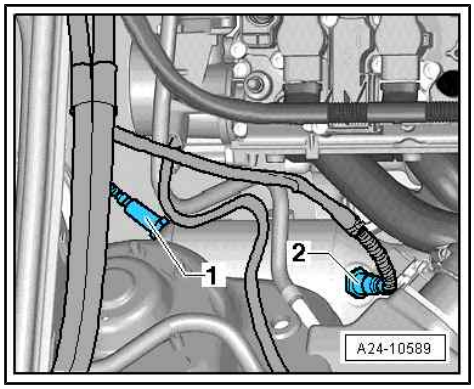
– Unplug electrical connector -2- for Lambda probe after catalytic converter -G130- and Lambda probe 1 heater after catalytic converter -Z29- .



Note

Item -3- is not installed on vehicles with engine code CFKA or CPMA.

– 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, it is important to re-attach the Lambda probe wiring at the same locations to prevent it from coming into contact with the exhaust pipe.*

• Tightening torque: refer to overview of Lambda probes ⇒ page 73 .

10 Engine control unit

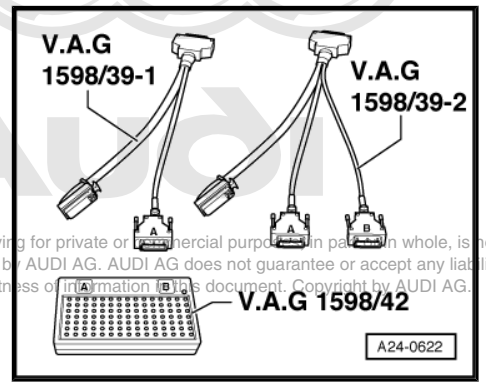
Overview

- ⇒ „10.1 Wiring and component check with test box V.A.G 1598/42 “, page 77
- ⇒ „10.2 Renewing engine control unit J623 “, page 79

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

Special tools and workshop equipment required

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



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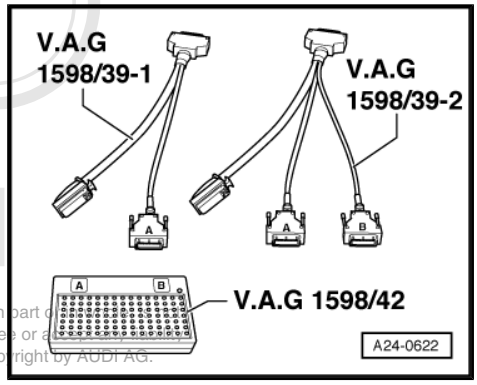

Note

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

WARNING

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

– The engine control unit has to be removed before multi-pin connectors can be unplugged from engine control unit ⇒ page 79 .
– Connect 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.

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The procedure required after connecting the new engine control unit is described in the Guided Fault Finding or Guided Functions.

Note

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

10.2 Renewing engine control unit -J623-

Note

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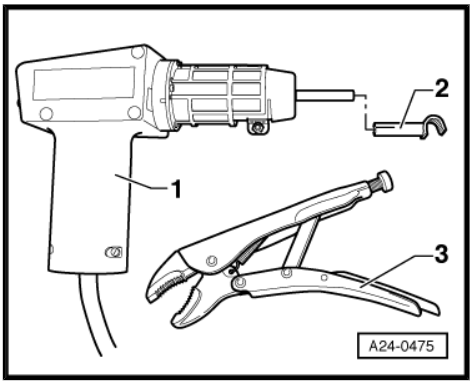
Not every engine control unit is bolted to a protective housing. Whether a protective housing is fitted depends on the engine/ gearbox combination.

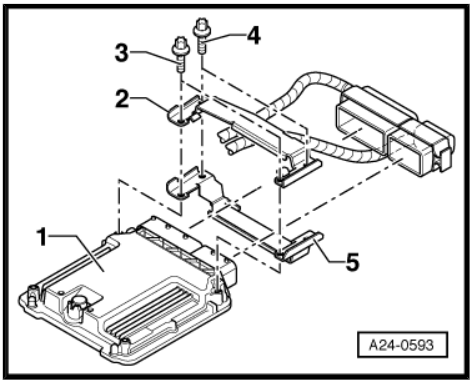
Special tools and workshop equipment required

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



Note

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

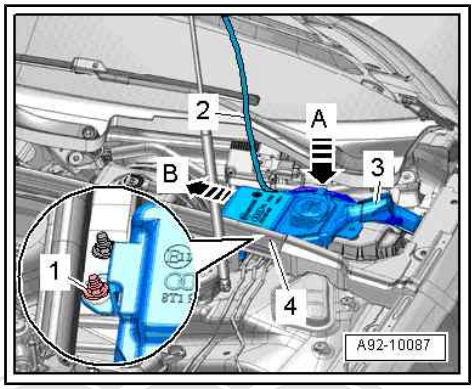


Removing

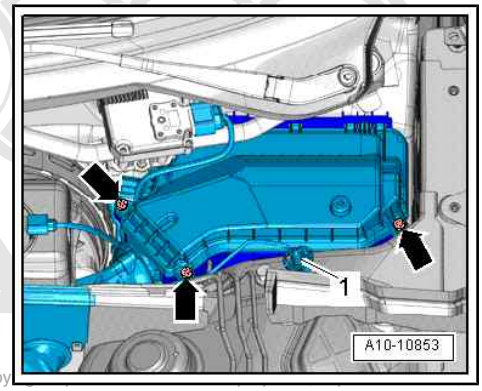
– When renewing engine control unit, select diagnosis object „Replace engine control unit“ in „Guided Functions“.

– Switch off ignition and remove ignition key.

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



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



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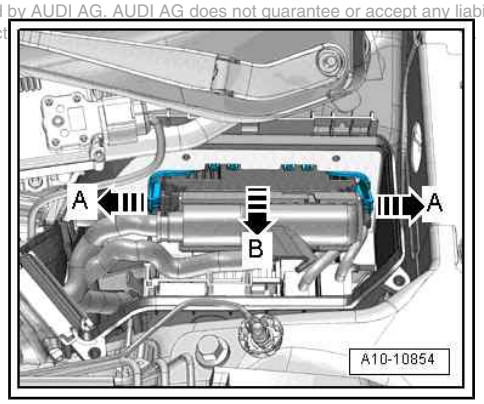
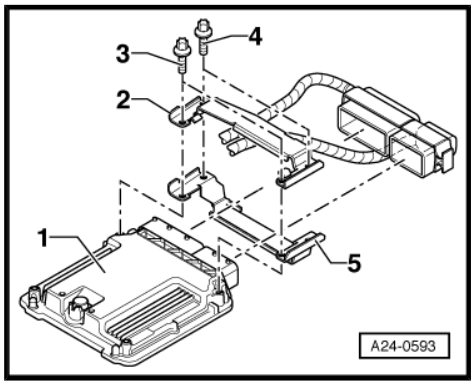
– Release retainers -arrows A- and pull out engine control unit -J623- -arrow B-.

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

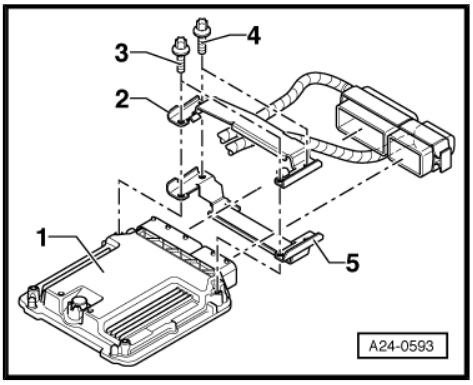


To help prevent unauthorised access to the connectors on the engine control unit, the engine control unit -1- is bolted to a metal casing -5- by means of shear bolts -3 and 4- and a locking plate -2-.

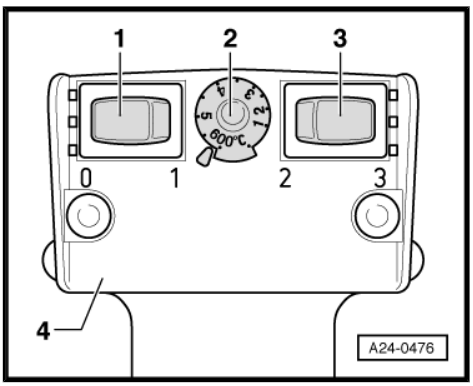
The threads of the two shear bolts -4- which are not screwed into the engine control unit are secured with locking fluid. To unscrew these two bolts, the threads must therefore be heated with the hot air blower.



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.

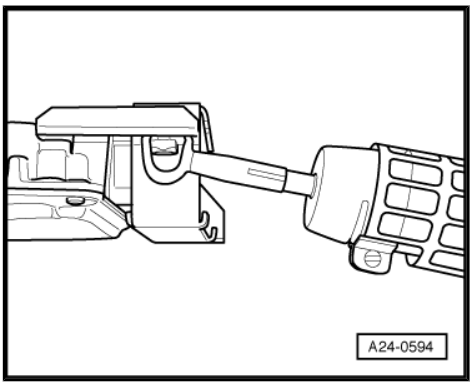


WARNING

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 for approx. 25 to 30 seconds.

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



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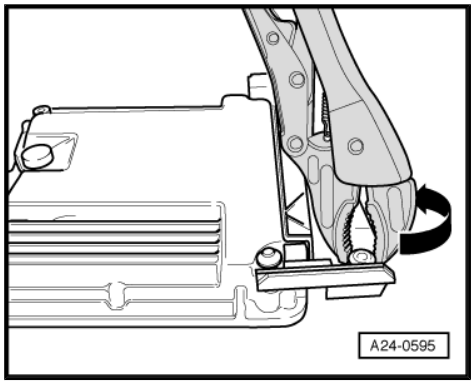

– The two shear bolts screwed into the engine control unit do not need to be heated. They should be removed without being heated.
– Detach metal locking plate from control unit connectors.
– Release connectors on engine control unit -J623- and unplug connectors.
– Take out old engine control unit -J623-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

Installing

Installation is performed in the reverse sequence.

– Make sure you fit protective housing (if fitted) back on engine control unit.
– Clean threaded holes for shear bolts to remove any residue from locking fluid. This can be done using a thread tap.
– Always use new shear bolts.
◆ Tightening torque for bolts securing cover of electronics box: 3.5 Nm.

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

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

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28 – Ignition system

1 General notes and safety precautions

Overview

- ⇒ „1.1 General notes on ignition system“, page 83
- ⇒ „1.2 Safety precautions“, page 83

1.1 General notes on ignition system

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

1.2 Safety precautions

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

WARNING

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

Persons sitting in the front passenger's seat could be injured if the airbag is triggered in an accident.

- ***The use of test equipment while driving causes distraction.***
- ***There is an increased risk of injury if test equipment is not secured.***
- ***Test equipment must always be secured on the rear seat with a strap and operated from the rear seat by a second person.***

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

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

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2 Servicing ignition system

Overview

- ⇒ „2.1 Test data“, page 84
- ⇒ „2.2 Ignition system - exploded view“, page 85
- ⇒ „2.3 Removing and installing ignition coils with output stages“, page 85
- ⇒ „2.4 Removing knock sensor 1 G61 “, page 87
- ⇒ „2.5 Removing and installing engine speed sender G28 “, page 87

2.1 Test data

Engine data	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

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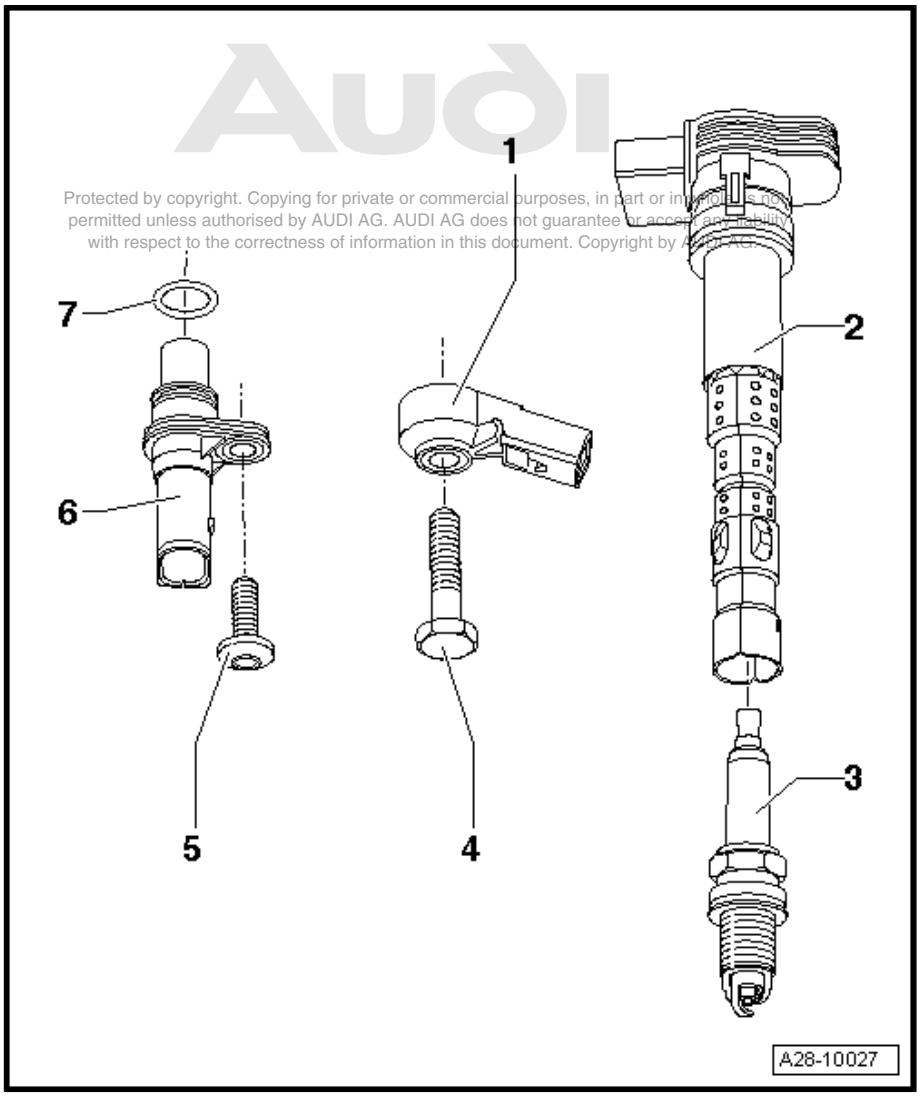
2.2 Ignition system - exploded view



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1 - Knock sensor 1 -G61-

- ❑ Contacts gold-plated
- ❑ Removing and installing ⇒ page 87

2 - Ignition coil with output stage

- ❑ Ignition coil 1 with output stage -N70-
- ❑ Ignition coil 2 with output stage -N127-
- ❑ Ignition coil 3 with output stage -N291-
- ❑ Ignition coil 4 with output stage -N292-
- ❑ Removing and installing ⇒ page 85
- ❑ Use puller -T40039- for removal

3 - Spark plug

- ❑ 30 Nm
- ❑ Removing and installing, refer to: A4 ⇒ Maintenance ; Booklet 812 , A5 ⇒ Maintenance ; Booklet 811 or A5 Cabriolet ⇒ Maintenance ; Booklet 818

4 - Bolt

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

5 - Bolt

- ❑ 10 Nm

6 - Hall sender -G40-

- ❑ Contacts gold-plated

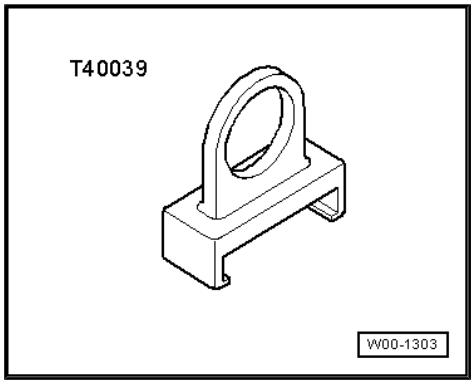
7 - O-ring

- ❑ Renew O-Ring if damaged

2.3 Removing and installing ignition coils with output stages

Special tools and workshop equipment required

♦ Puller -T40039-



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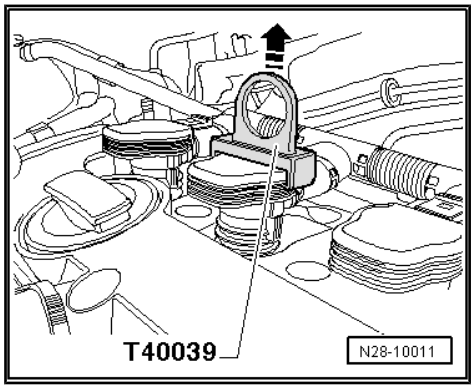
Removing

– Remove engine cover.

– Unscrew two bolts on connector rail.

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

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

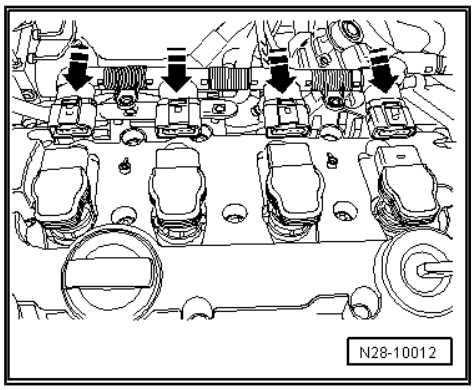


Installing

– Fit all ignition coils loosely into spark plug holes.

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

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

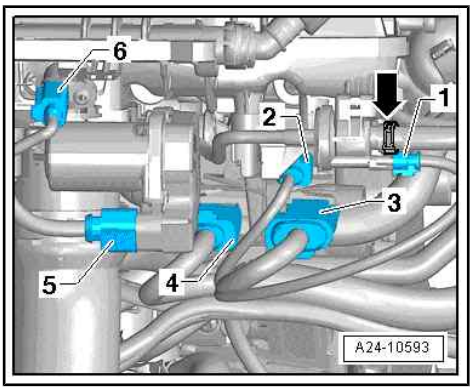


2.4 Removing knock sensor 1 -G61-

Removing

– Unplug electrical connector -2- at knock sensor 1 -G61- .

– Remove coolant pump with thermostat ⇒ Engine, mechanics; Rep. gr. 19 .



Note

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

– Unscrew knock sensor 1 -G61- .

Installing

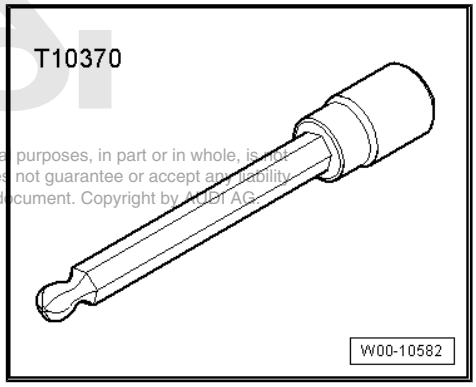
– Install in reverse order.

• Tightening torque: refer to exploded view of ignition system ⇒ page 85 .

2.5 Removing and installing engine speed sender -G28-

Special tools and workshop equipment required

♦ Socket (4 mm) -T10370-



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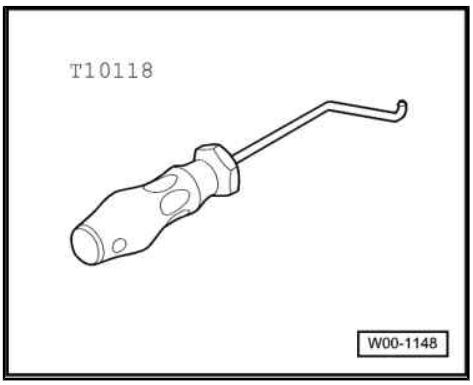
♦ Assembly tool -T10118-



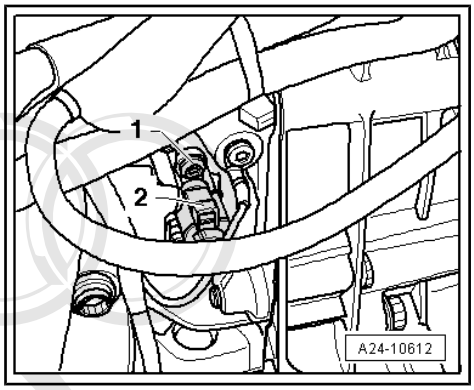
Removing

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

Note

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

– Unscrew securing bolt -1- using socket, AF 4 mm -T10370- .



Installing

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

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

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