

Workshop Manual

Audi A4 2008 ➤ ,
Audi A5 Cabriolet 2009 ➤ ,
Audi A5 Coupé 2008 ➤ ,
Audi A5 Sportback 2010 ➤ ,
Audi S5 Cabriolet 2010 ➤ ,
Audi S5 Coupé 2008 ➤

Simos direct petrol injection and ignition system (6-cyl.
3.0 ltr. TFSI 4-valve)

Engine ID	CAK A	CCB A	CMU A	CGW C	CGX C	CHM B	CTU B		
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Edition 09.2013



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List 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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Audi A4 2008 ➤ , Audi A5 Cabriolet 2009 ➤ , Audi A5 Coupé 2008 ➤ , Audi ...

Simos direct petrol injection and ignition system (6-cyl. 3.0 ltr. TFSI 4-valve) - Edition 09.2013



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24 – Mixture preparation - injection

1 Safety precautions and rules for cleanliness

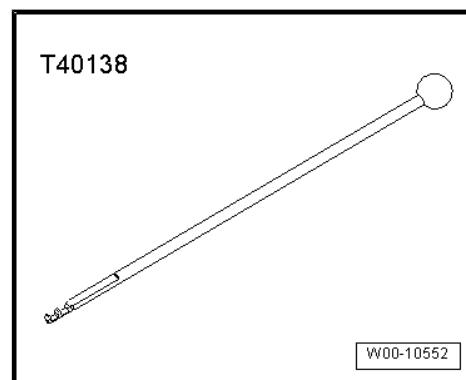
(ARL003493; Edition 09.2013)

Overview

- ◆ ⇒ [“1.1 General notes on self-diagnosis”, page 1](#)
- ◆ ⇒ [“1.2 Safety precautions”, page 2](#)
- ◆ ⇒ [“1.3 Rules for cleanliness and instructions for working on fuel system”, page 3](#)
- ◆ ⇒ [“1.4 Reducing pressure in high-pressure section of injection system”, page 3](#)
- ◆ ⇒ [“1.5 Checking for leaks in the fuel system”, page 5](#)
- ◆ ⇒ [“1.6 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.
- ◆ Use release tool - T40138- to unplug connectors that cannot be accessed easily.



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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.*



Caution

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

When working on the fuel system note the following warnings:



WARNING

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

- ◆ *The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening the system ⇒ **page 3** .*
- ◆ *Wrap a clean cloth around the connection and carefully loosen the connection to allow the residual pressure to dissipate.*

- Procedure before opening high-pressure section of injection system ⇒ **page 3** .

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

- ◆ Persons wearing a cardiac pacemaker must at all times maintain a safe distance from high-voltage components such as the ignition system and xenon headlights.
- ◆ Always switch off the ignition before connecting or disconnecting electrical wiring for the injection or ignition system or tester cables.
- ◆ Do not open any fuel line connections while the engine is running.
- ◆ Always switch off ignition before washing engine.
- ◆ Certain tests may lead to faults being stored in the engine control unit. The event memory must be interrogated after completing all tests and repair work. If faults are stored:

1.3 Rules for cleanliness and instructions for working on fuel system

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

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

1.4 Reducing pressure in high-pressure section of injection system



Caution

- ◆ *The injection system consists of a high-pressure section (maximum approx. 120 bar) and a low-pressure section (approx. 6 bar).*
- ◆ *The fuel pressure in the high-pressure section must be reduced to a residual pressure of approx. 6 bar prior to opening the system. The procedure is described below.*

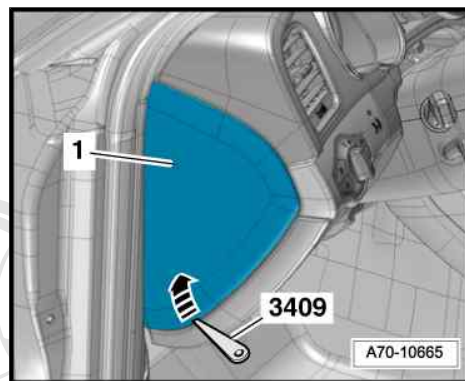
Reducing fuel pressure in high-pressure section

- Connect a ⇒ Vehicle diagnostic tester.
- Start engine and run at idling speed.
- Select “Engine electronics” in vehicle self-diagnosis.
- Then select “Measured values”.
- Select “Fuel pressure” from the list.
- Specification: between 35 and 45 bar

Audi



- 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- in fuse carrier in dash panel (driver's side) ⇒ 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 in display zone.
- The fuel pressure will decrease very quickly because the mechanical high-pressure pump is no longer being supplied with fuel by the fuel system pressurisation pump - G6- .
- Switch off ignition as soon as fuel pressure has dropped to approx. 8 bar.



Note

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

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



WARNING

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

- ◆ *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.

- Wrap a clean cloth around the connections and catch escaping fuel.

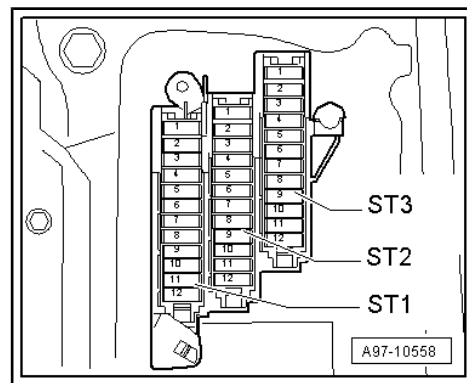
Additional steps required

- Refit fuse.
- Install dash panel end trim ⇒ Rep. gr. 70 .
- Erase event memory and generate readiness code in engine control unit in "Guided Functions" mode.

1.5 Checking for leaks in the fuel system

Proceed as follows:

- Allow engine to run for several minutes at moderate rpm.

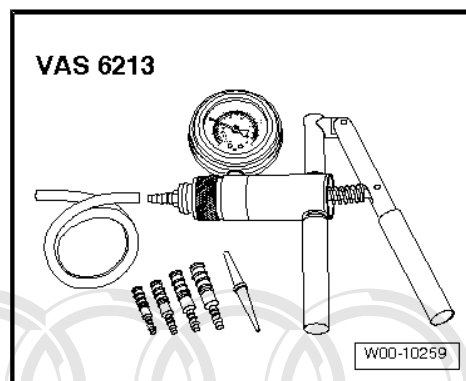


- Switch off ignition.
- Check complete fuel system for leaks.
- If leaks are found although the connections have been tightened to the correct torque, the relevant component must be renewed.
- Road-test vehicle and accelerate with full throttle at least once.
- Then inspect high-pressure section again for leaks.

1.6 Checking vacuum system

Special tools and workshop equipment required

- ◆ Hand vacuum pump - VAS 6213-



Procedure

- Check all vacuum lines in the complete vacuum system for:
 - ◆ Cracks
 - ◆ Traces of animal bites
 - ◆ Kinked or crushed lines
 - ◆ Lines porous or leaking
- Check vacuum line to solenoid valve and from solenoid valve to corresponding component.
- If an entry is stored in the event memory, check the vacuum lines leading to the corresponding component and also check the other 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.

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2 Injection system

2.1 Test data

3.0 ltr. TFSI engine	
Idling speed	Cannot be adjusted; regulated by idling speed stabilisation
Fuel pressure before high-pressure pump	3.0 ... 6.0 bar
Fuel pressure after high-pressure pump	30 ... 125 bar

2.2 Overview of fitting locations

Engine compartment (right-side)

1 - Ignition coils for cylinder bank 1

- ☐ Ignition coil 1 with output stage - N70-
- ☐ Ignition coil 2 with output stage - N127-
- ☐ Ignition coil 3 with output stage - N291-
- ☐ Removing and installing
⇒ [page 60](#)

2 - Lambda probe - G39- with Lambda probe heater - Z19-

- ☐ Fitting location
⇒ [page 17](#)
- ☐ Fitting location of connector ⇒ [page 16](#)
- ☐ Removing and installing
⇒ [page 42](#)
- ☐ 55 Nm

3 - Camshaft control valve 1 - N205-

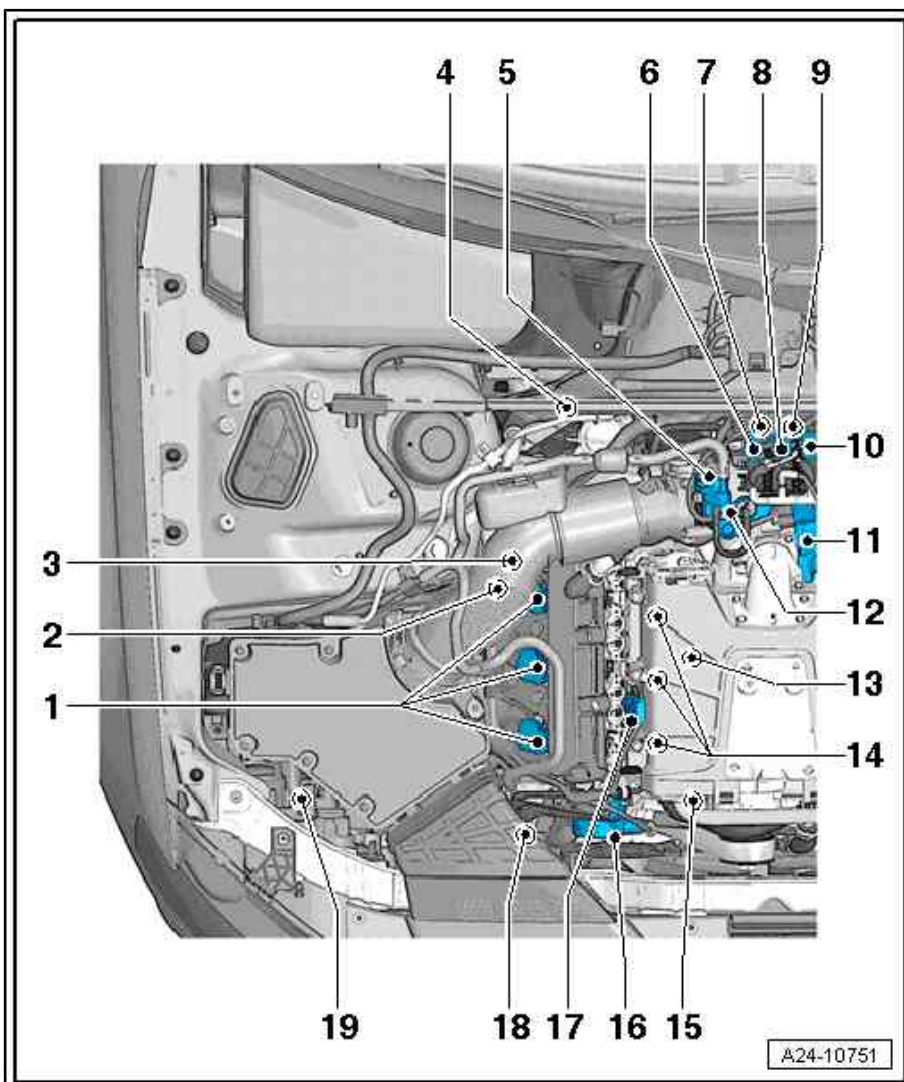
- ☐ Fitting location
⇒ [page 13](#)

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

- ☐ Fitting location
⇒ [page 17](#)
- ☐ Fitting location of connector ⇒ [page 16](#)
- ☐ Removing and installing
⇒ [page 44](#)
- ☐ 55 Nm

5 - Sender 1 for secondary air pressure - G609-

- ☐ Only on USA models
- ☐ Fitting location ⇒ Rep. gr. 26



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6 - Secondary air inlet valve - N112-

- ☐ Fitting location ⇒ [page 12](#)

7 - Intake air temperature sender - G42- / intake manifold pressure sender - G71-

8 - Intake manifold flap valve - N316-

- ☐ Fitting location ⇒ [page 12](#)

9 - Activated charcoal filter solenoid valve 1 - N80-

- ☐ Fitting location ⇒ [page 12](#)

10 - Secondary air inlet valve 2 - N320-

- ☐ Fitting location ⇒ [page 12](#)

11 - Regulating flap control unit - J808-

- ☐ Fitting location ⇒ [page 13](#)
- ☐ After renewing regulating flap control unit - J808- , perform **Adaption** in **Guided Functions** ⇒ vehicle diagnostic tester
- ☐ Removing and installing ⇒ [page 27](#)

12 - Throttle valve module - J338-

- ☐ Fitting location ⇒ [page 13](#)
- ☐ After renewing throttle valve module - J338- , perform **Adaption** in **Guided Functions** ⇒ vehicle diagnostic tester .
- ☐ Removing and installing ⇒ [page 25](#)

13 - Knock sensor 1 - G61-

- ☐ Fitting location ⇒ [page 14](#)
- ☐ Fitting location of connector ⇒ [page 12](#)

14 - Injectors, cylinder bank 1

- ☐ Injector, cylinder 1 - N30-
- ☐ Injector, cylinder 2 - N31-
- ☐ Injector, cylinder 3 - N32-
- ☐ Removing and installing ⇒ [page 27](#)

15 - Intake manifold flap potentiometer - G336-

- ☐ Fitting location ⇒ [page 15](#)

16 - Hall sender - G40-

- ☐ Fitting location ⇒ [page 13](#)

17 - Charge pressure sender - G31- / intake manifold temperature sender - G72-

- ☐ Fitting location ⇒ [page 16](#)

18 - High-pressure pump

- ☐ With fuel metering valve - N290-
- ☐ With fuel pressure sender for low pressure - G410-
- ☐ Fitting location ⇒ [page 15](#)
- ☐ Removing and installing ⇒ [page 39](#)

19 - Secondary air pump motor - V101-

- ☐ Fitting location ⇒ [page 17](#)

Engine compartment (left-side)

1 - Fuel pressure sender - G247-

- ☐ Fitting location
⇒ [page 14](#)
- ☐ 22 Nm
- ☐ Lubricate threads

2 - Knock sensor 2 - G66-

- ☐ Fitting location
⇒ [page 14](#)
- ☐ Fitting location of connector ⇒ [page 12](#)

3 - Injectors, cylinder bank 2

- ☐ Injector, cylinder 4 - N33-
- ☐ Injector, cylinder 5 - N83-
- ☐ Injector, cylinder 6 - N84-
- ☐ Removing and installing
⇒ [page 27](#)

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

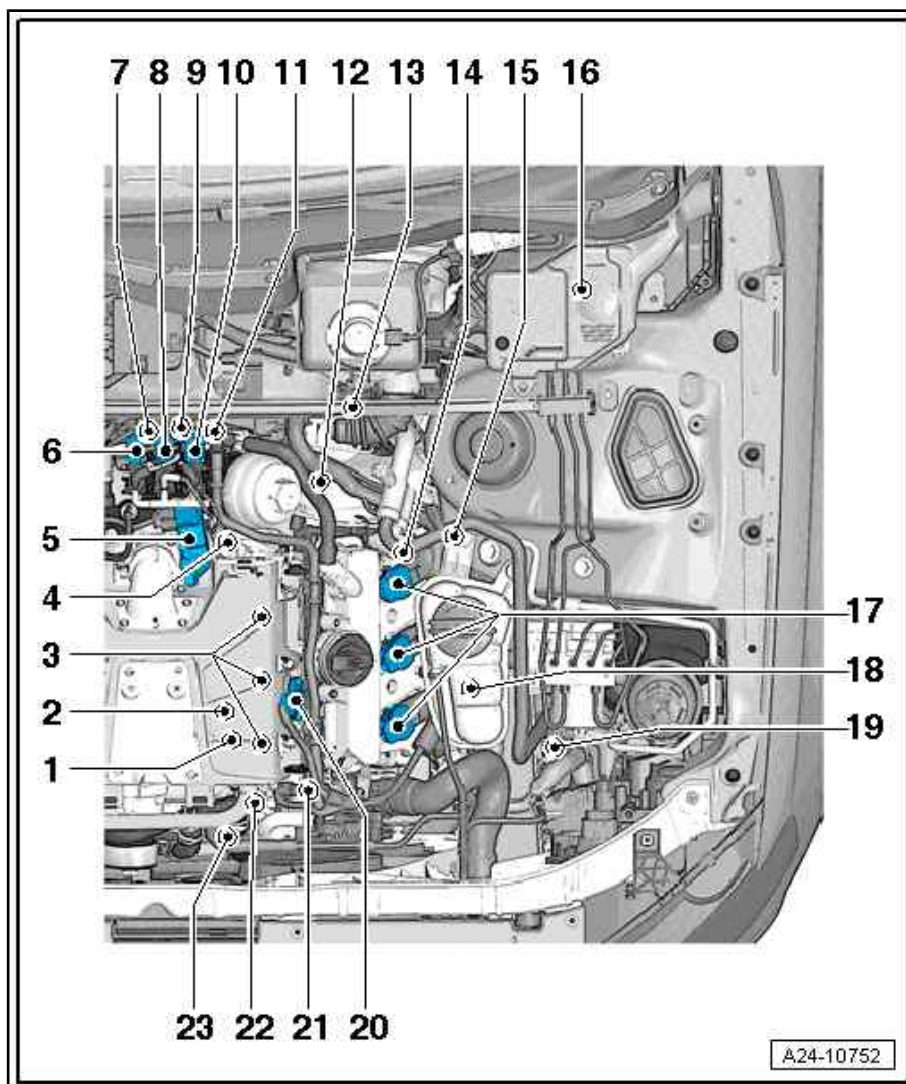
- ☐ Fitting location
⇒ [page 14](#)

5 - Regulating flap control unit - J808-

- ☐ Fitting location
⇒ [page 13](#)
- ☐ Removing and installing
⇒ [page 27](#)

- After renewing regulating flap control unit - J808-, perform **Adap-**

tion in **Guided Functions** ⇒ vehicle diagnostic tester .



6 - Secondary air inlet valve - N112-

- ☐ Fitting location ⇒ [page 12](#)

7 - Intake air temperature sender - G42- / intake manifold pressure sender - G71-

- ☐ Fitting location ⇒ [page 12](#)

8 - Intake manifold flap valve - N316-

- ☐ Fitting location ⇒ [page 12](#)

9 - Activated charcoal filter solenoid valve 1 - N80-

10 - Secondary air inlet valve 2 - N320-

- ☐ Fitting location ⇒ [page 12](#)

11 - Oil pressure switch - F22-

- ☐ Fitting location ⇒ [page 11](#)

12 - Engine speed sender - G28-

- ☐ Fitting location ⇒ [page 15](#)
- ☐ Removing and installing ⇒ [page 64](#)
- ☐ 9 Nm



13 - Lambda probe 2 after catalytic converter - G131- with Lambda probe 2 heater after catalytic converter - Z30-

- ☐ Fitting location ⇒ [page 17](#)
- ☐ Fitting location of connector ⇒ [page 16](#)
- ☐ Removing and installing ⇒ [page 48](#)
- ☐ 55 Nm

14 - Camshaft control valve 2 - N208-

Fitting location ⇒ [page 13](#)

15 - Lambda probe 2 - G108- with Lambda probe heater 2 - Z28-

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- ☐ Fitting location ⇒ [page 17](#)
- ☐ Fitting location of connector ⇒ [page 16](#)
- ☐ Removing and installing ⇒ [page 46](#)
- ☐ 55 Nm

16 - Engine control unit - J623-

- ☐ Fitting location ⇒ [page 11](#)
- ☐ Removing and installing ⇒ [page 53](#)
- After renewing, perform **Adaption** in **Guided Functions** ⇒ vehicle diagnostic tester .

17 - Ignition coils for cylinder bank 2

- ☐ Ignition coil 4 with output stage - N292-
- ☐ Ignition coil 5 with output stage - N323-
- ☐ Ignition coil 6 with output stage - N324-
- ☐ Removing and installing ⇒ [page 60](#)

18 - Valve for oil pressure control - N428-

- ☐ Fitting location ⇒ [page 14](#)

19 - Continued coolant circulation pump - V51-

- ☐ Not installed on certain equipment versions or on vehicles for certain export markets
- ☐ Fitting location ⇒ [page 17](#)

20 - Intake manifold temperature sender 2 - G430- / charge pressure sender 2 - G447-

- ☐ Fitting location ⇒ [page 16](#)

21 - Hall sender 2 - G163-

- ☐ Fitting location ⇒ [page 13](#)

22 - Intake manifold flap potentiometer 2 - G512-

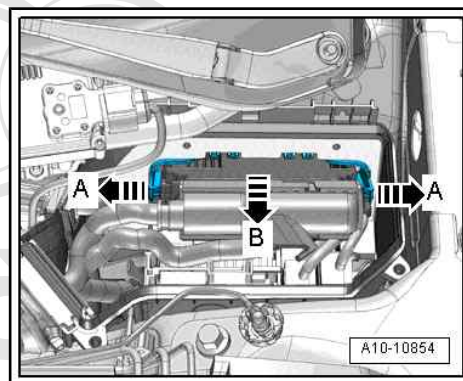
- ☐ Fitting location ⇒ [page 15](#)
- ☐ After renewing, perform **Adaption** in **Guided Functions** ⇒ vehicle diagnostic tester

23 - Coolant temperature sender - G62-

- ☐ Fitting location ⇒ [page 15](#)

Fitting location of engine control unit - J623-

- ◆ In left electronics box in engine compartment



Fitting location of accelerator position sender - G79- / accelerator position sender 2 - G185-

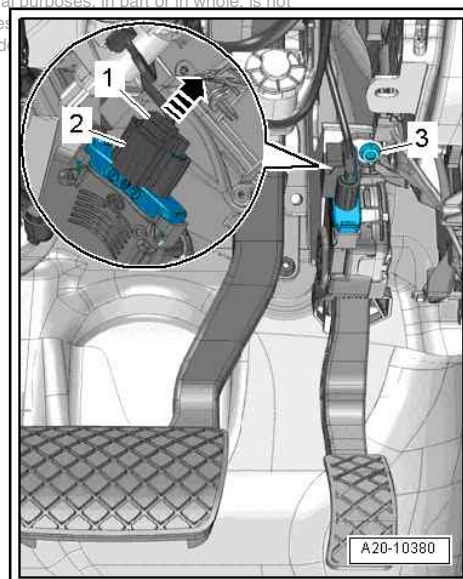
- 2 - Electrical connector



Note

The accelerator position sender - G79- and accelerator position sender 2 - G185- are integrated in the accelerator pedal module and cannot be renewed individually.

Removing and installing ⇒ Rep. gr. 20



Fitting location on pedal bracket

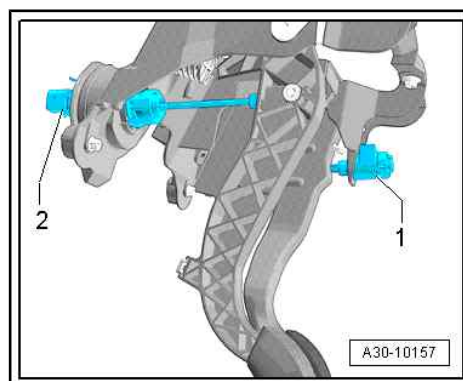
- 1 - Brake light switch - F- / brake pedal switch - F47-
- 2 - Integrated functions in clutch position sender - G476- : clutch pedal switch for engine start - F194- and clutch pedal switch - F36-



Note

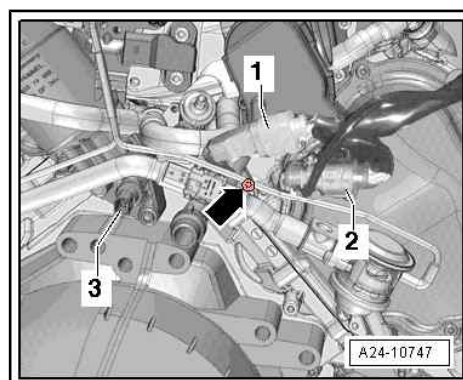
Switches must not be installed more than once, otherwise they may not fit securely.

Removing and installing ⇒ Rep. gr. 46



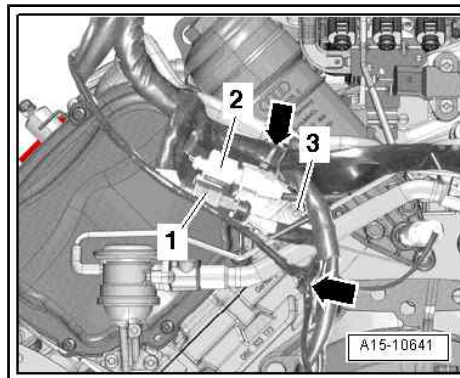
Fitting locations at rear of engine

- 1 - To knock sensor 1 - G61-
- 2 - To injectors on cylinder bank 1
- 3 - Oil pressure switch - F22-



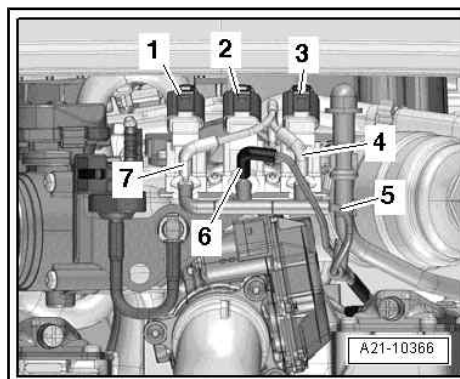
Electrical connectors at rear left of engine

- 1 - To injectors on cylinder bank 2 and to fuel pressure sender - G247-
- 2 - To knock sensor 2 - G66-



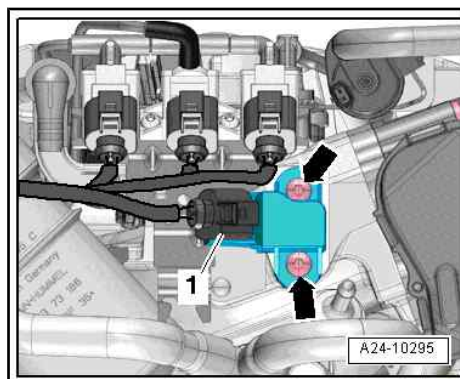
Fitting location at rear of engine

- 1 - Secondary air inlet valve - N112-
 - 2 - Intake manifold flap valve - N316-
 - 3 - Secondary air inlet valve 2 - N320-
- ♦ At rear of supercharger with charge air cooler

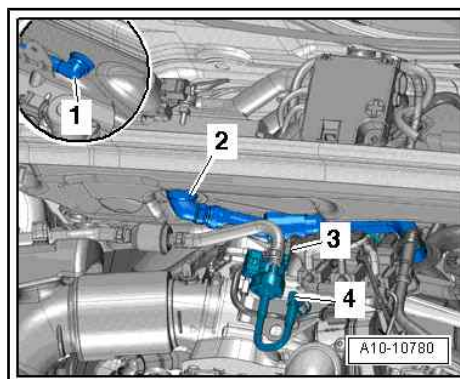


Fitting location at rear of engine

- 1 - Intake air temperature sender - G42- / intake manifold pressure sender - G71-
- ♦ At rear of supercharger with charge air cooler



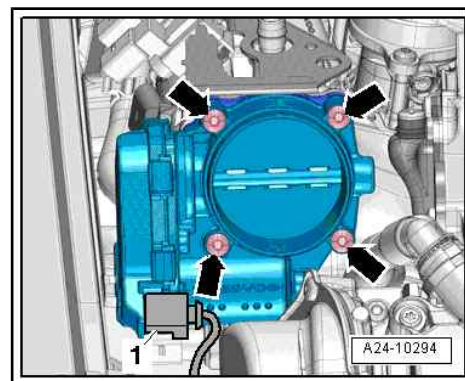
Electrical connector for activated charcoal filter solenoid valve 1 - N80- -3-



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Fitting location of throttle valve module - J338-

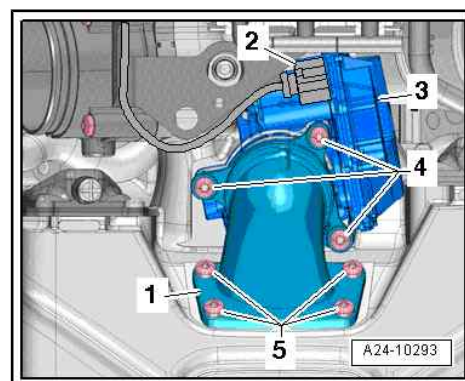
- ◆ At rear of supercharger



Fitting location of regulating flap control unit - J808-

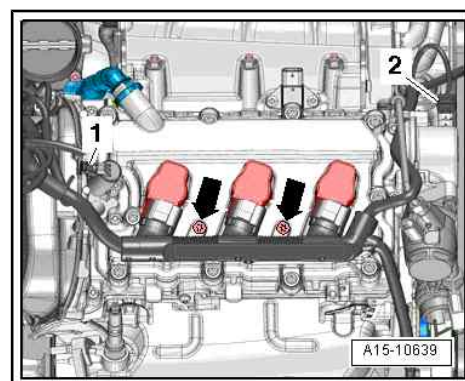
- 3 - Regulating flap control unit - J808-

- ◆ At rear of supercharger



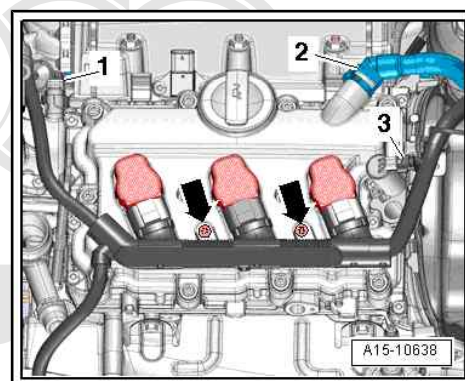
Hall sender and camshaft control valve on cylinder bank 1 (right-side)

- 1 - Camshaft control valve 1 - N205-
- 2 - Hall sender - G40-



Hall sender and camshaft control valve on cylinder bank 2 (left-side)

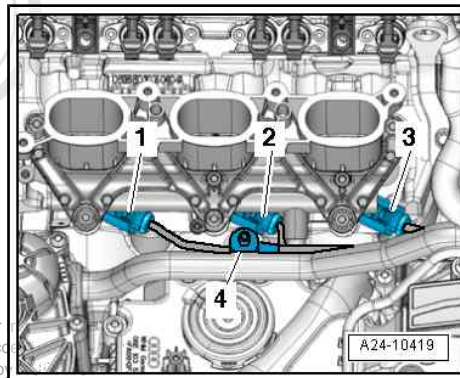
- 1 - Hall sender 2 - G163-
- 3 - Camshaft control valve 2 - N208-



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Fitting locations below intake manifold on cylinder bank 1 (right-side)

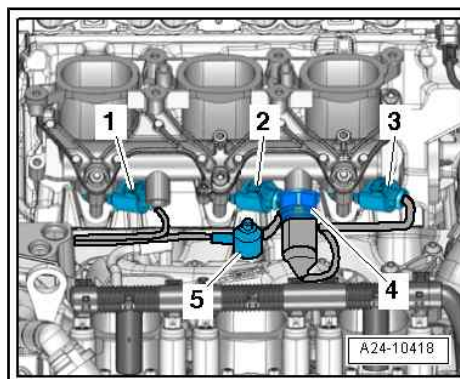
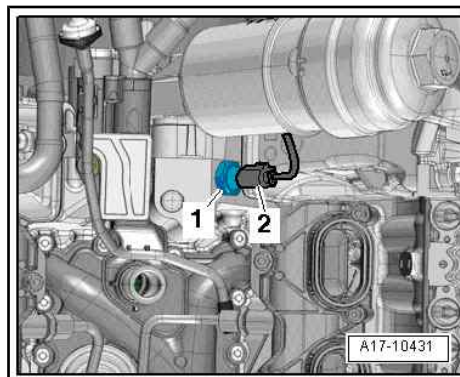
- 1 - Injector, cylinder 1 - N30-
- 2 - Injector, cylinder 2 - N31-
- 3 - Injector, cylinder 3 - N32-
- 4 - Knock sensor 1 - G61-



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Fitting locations below intake manifold on cylinder bank 2 (left-side)

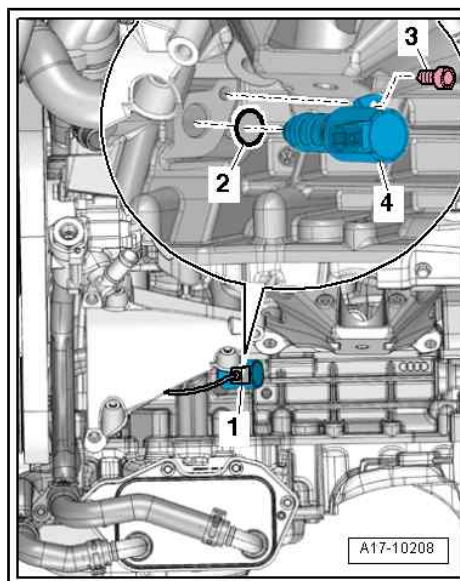
- 1 - Injector, cylinder 6 - N84-
- 2 - Injector, cylinder 5 - N83-
- 3 - Injector, cylinder 4 - N33-
- 4 - Fuel pressure sender - G247-
- 5 - Knock sensor 2 - G66-


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

Fitting location of valve for oil pressure control - N428-

- 4 - Valve for oil pressure control - N428-

◆ On engine (bottom left)

Removing and installing ⇒ Rep. gr. 17



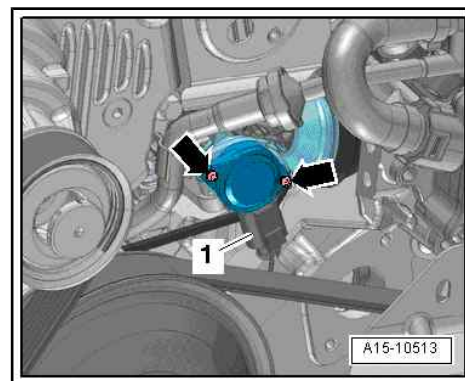
Fitting location of intake manifold flap potentiometer 2 - G512-

- ◆ At front of intake manifold (bottom section, left-side)



Note

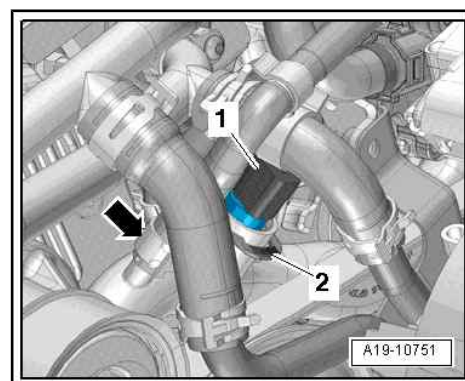
The intake manifold flap potentiometer - G336- is located symmetrically reversed.



Fitting location of coolant temperature sender - G62-

- 1 - Coolant temperature sender - G62-

- ◆ At front of engine

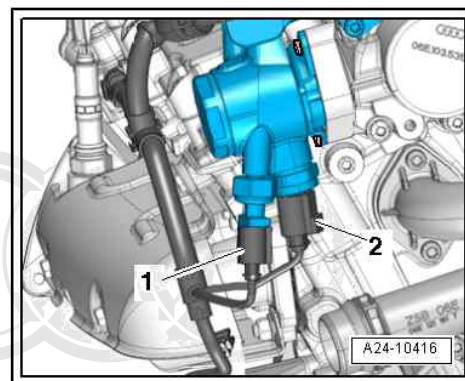


Fitting locations at high-pressure pump

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

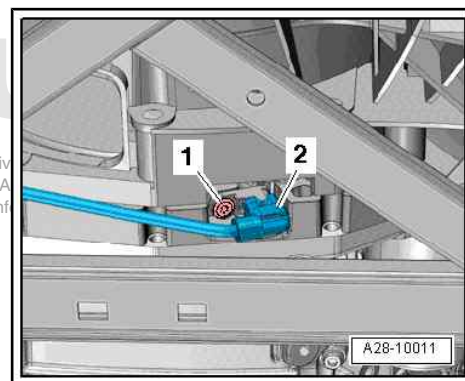
- 2 - Fuel metering valve - N290-

- ◆ On right side of cylinder head



Fitting location of engine speed sender - G28-

- ◆ Bolted into gearbox housing from below.



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Fitting location of charge pressure sender - G31- / intake manifold temperature sender - G72-

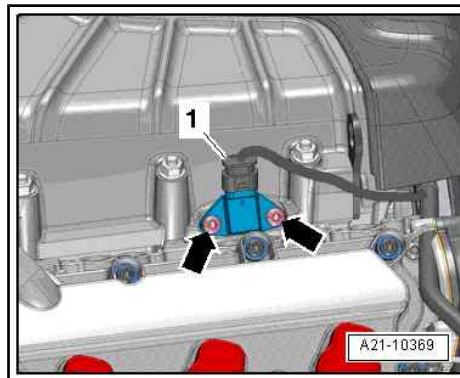
- ◆ At right side of supercharger with charge air cooler



Note

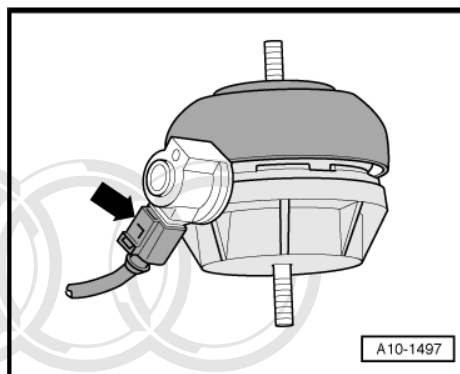
Intake manifold temperature sender 2 - G430- / charge pressure sender 2 - G447- are located symmetrically reversed.

Removing and installing ⇒ Rep. gr. 21



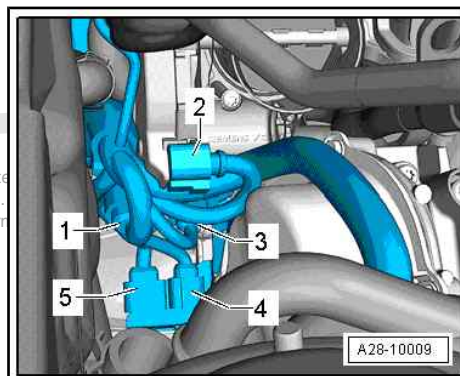
Fitting location of left electrohydraulic engine mounting solenoid valve - N144- and right electrohydraulic engine mounting solenoid valve - N145-

- ◆ At engine mountings (left and right) -arrow-.



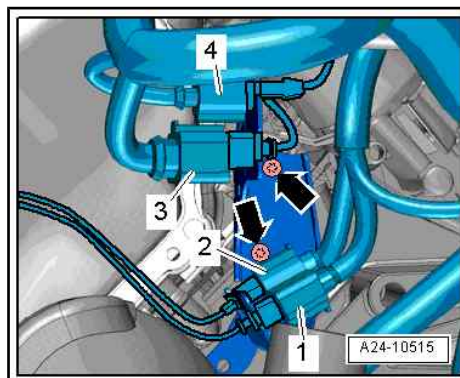
Connectors of Lambda probes (cylinder bank 1)

- 1 - For injectors (cylinder bank 1)
- 2 - Throttle valve module - J338-
- 3 - Knock sensor 1 - G61-
- 4 - For Lambda probe - G39- with Lambda probe heater - Z19-
- 5 - For Lambda probe after catalytic converter - G130- with Lambda probe 1 heater after catalytic converter - Z29-



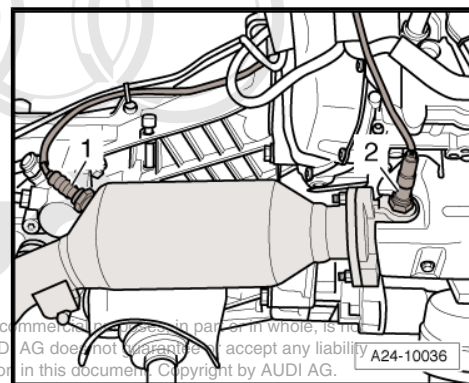
Connectors of Lambda probes (cylinder bank 2)

- 1 - For Lambda probe 2 after catalytic converter - G131- with Lambda probe 2 heater after catalytic converter - Z30-
- 2 - For Lambda probe 2 - G108- with Lambda probe heater 2 - Z28-
- 3 - For injectors (cylinder bank 2) and for fuel pressure sender - G247-
- 4 - For knock sensor 2 - G66-



Fitting location of Lambda probes on cylinder bank 1 (right-side)

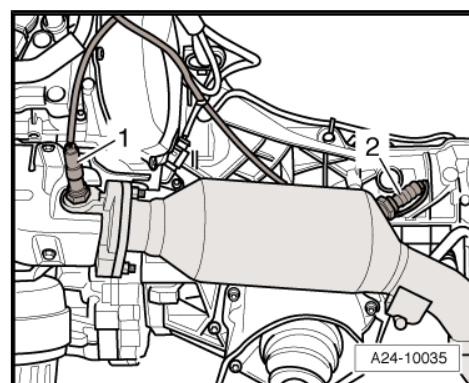
- 1 - Lambda probe after catalytic converter - G130- with Lambda probe 1 heater after catalytic converter - Z29-
- 2 - Lambda probe - G39- with Lambda probe heater - Z19-



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Fitting location of Lambda probes on cylinder bank 2 (left-side)

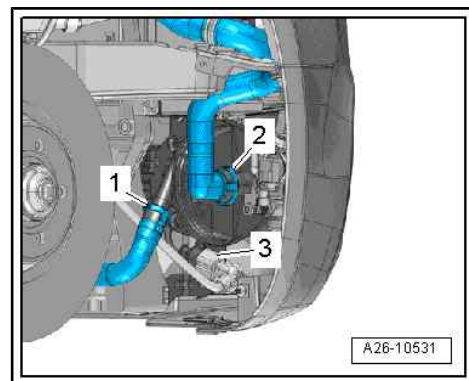
- 1 - Lambda probe 2 - G108- with Lambda probe heater 2 - Z28-
- 2 - Lambda probe 2 after catalytic converter - G131- with Lambda probe 2 heater after catalytic converter - Z30-



Fitting location of secondary air pump motor - V101-

- ◆ Beneath headlight (right-side)

Removing and installing ⇒ Rep. gr. 26



Fitting location of continued coolant circulation pump - V51-

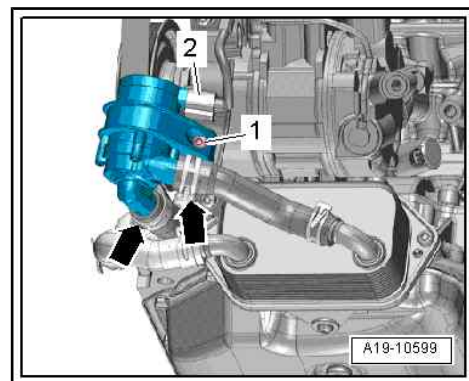
- ◆ At front left of engine



Note

Continued coolant circulation pump - V51- is not installed on certain equipment versions or on vehicles for certain export markets; only installed on vehicles for very hot countries.

Removing and installing ⇒ Rep. gr. 19



2.3 Air cleaner - exploded view

1 - Hose clip
2 - Air hose

- ☐ To throttle valve module - J338-
- ☐ Pay attention to marking when installing (arrow points towards bolt of throttle valve module - J338-)

3 - Air filter element

- ☐ Always use genuine part for air filter element
- ☐ Maintenance intervals
⇒ Maintenance ; Booklet 812 and ⇒ Maintenance ; Booklet 818
- ☐ Removing and installing
⇒ [page 19](#)
- ☐ Also clean snow screen (if fitted)

4 - Air duct

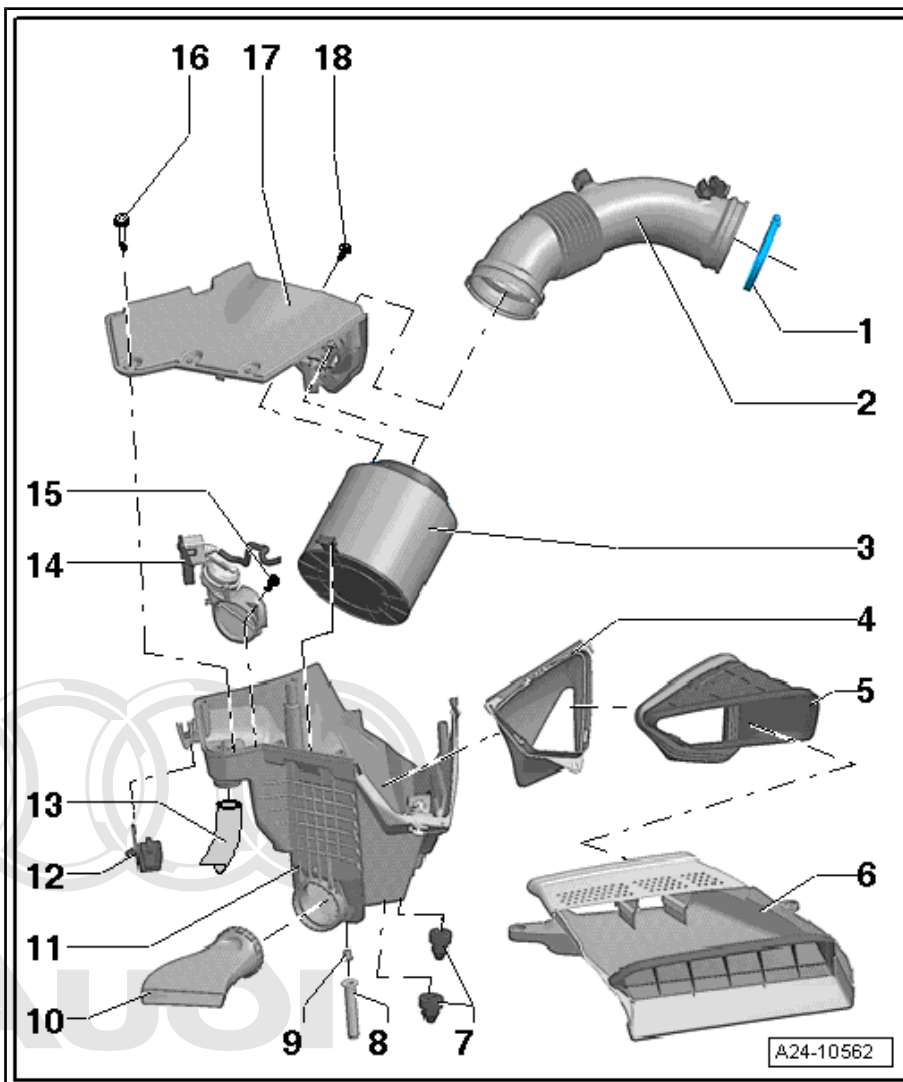
- ☐ Clipped into air cleaner (top section)
- ☐ Clean dirt and leaves out of air duct

5 - Air duct

- ☐ Clean dirt and leaves out of air duct

6 - Air duct

- ☐ To lock carrier
- ☐ Clean dirt and leaves



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out of air duct

7 - Rubber grommet

8 - Water drain hose

- ☐ Clean any leaves and dirt out of water drain hose

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

12 - Retainer for air cleaner (bottom section)

13 - Intake hose for secondary air pump

- ☐ Not installed in all vehicles

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

- ☐ Not installed in all vehicles
- ☐ Valve installed: without function

15 - Bolt

- ☐ For variable intake manifold change-over valve - N335-

16 - Bolt

17 - Air cleaner (top section)

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

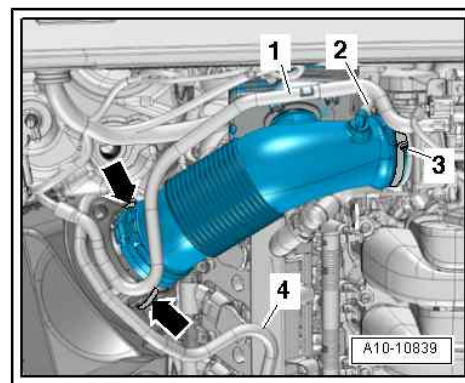
18 - Bolt

- ☐ For securing air filter element

2.4 Removing and installing air filter element

Removing

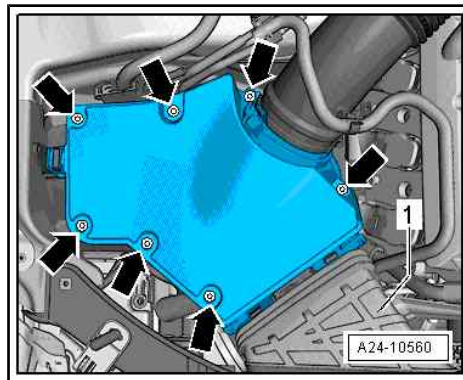
- Release clamps -arrows- and pull air hose out of air cleaner housing.



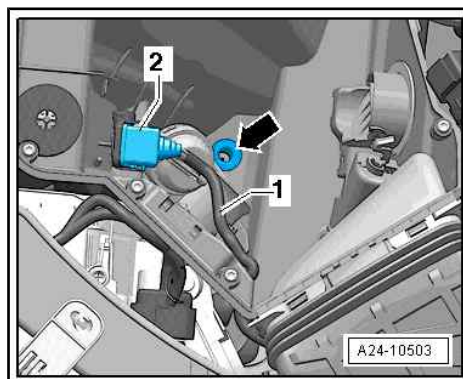
- Remove bolts -arrows- from air cleaner (top section) and lift out air cleaner (top section).


Note

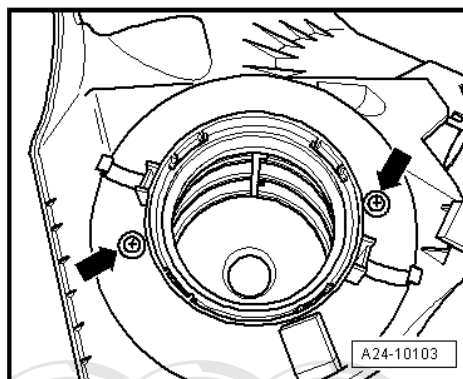
- ◆ *Always use genuine part for air filter element.*
- ◆ *Use a silicone-free lubricant when installing the air hose.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue*



- Check water drain hose -arrow- in air cleaner (bottom section) for dirt and other obstructions (clean if necessary).
- Clean salt residue, dirt and leaves out of air cleaner housing (top and bottom sections); use a vacuum cleaner if necessary.
- Check for dirt in air duct leading to air filter element.
- When installing air filter element, check that it is properly centred in retainer in air cleaner (top section).



- Screw air cleaner (top section) onto new air filter element.

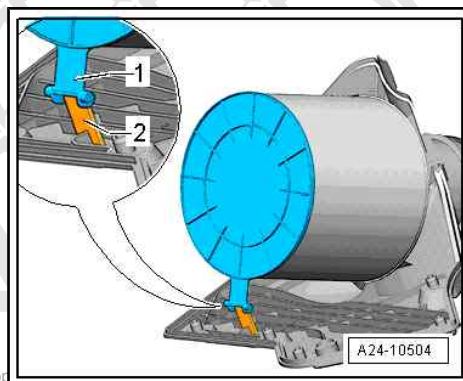


- Lug on air filter element -1- must make contact with lug on air cleaner housing -2-.
- Fit the top section of the air cleaner carefully on the bottom section, without using force.


Note

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

- Then screw top section of air cleaner back onto bottom section.
- Make sure that air hose is securely fitted.
- The remaining installation steps are carried out in the reverse sequence.



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2.5 Intake manifold (bottom section) - exploded view

1 - Bolts

- ☐ 2.5 Nm

2 - Intake manifold flap potentiometer

- ☐ Left side: intake manifold flap potentiometer 2 - G512-, right side: intake manifold flap potentiometer - G336-

3 - Seal

- ☐ Renew if damaged
- ☐ When renewing lever out with screwdriver
- ☐ Press in by hand

4 - Sleeve

5 - Fuel pressure sender - G247-

- ☐ 22 Nm
- ☐ Lubricate threads

6 - Bracket

7 - Bolt

- ☐ 9 Nm

8 - High-pressure pipes



WARNING

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

The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening the system ⇒ [page 3](#).

- ☐ Reducing fuel pressure in high-pressure section of injection system ⇒ [page 3](#)
- ☐ Connections must not be damaged
- ☐ Do not alter shape
- ☐ Removing and installing ⇒ [page 37](#)
- ☐ To loosen and tighten fuel pipe, counterhold at fuel pipe connection
- ☐ Re-tighten connection for fuel pipe before installing fuel pipe
- ☐ 27 Nm

9 - Bolt

- ☐ 9 Nm

10 - Nut

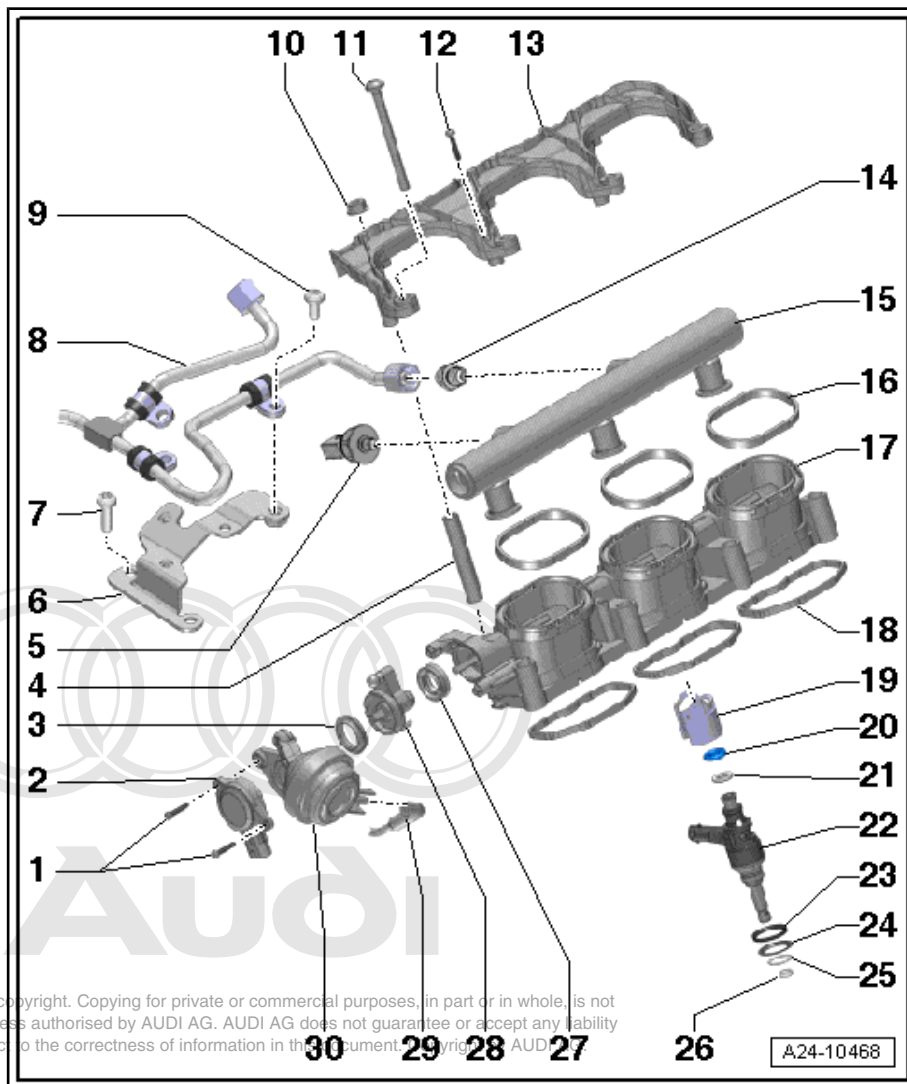
- ☐ 9 Nm

11 - Bolt

- ☐ 9 Nm

12 - Bolt

- ☐ 2.5 Nm





13 - Retainer for fuel rail

14 - Threaded connection

- ☐ 40 Nm

15 - Fuel rail

16 - Seal

- ☐ Renew

17 - Intake manifold (bottom section)

- ☐ Removing and installing ⇒ [page 23](#)
- ☐ When installing intake manifold (bottom section), intake manifold flaps must be in output position (intake channel fully open)

18 - Seal

- ☐ Renew

19 - Support ring

- ☐ Make sure it is correctly seated
- ☐ Via this support ring, the fuel rail exerts the force which holds the injector in the cylinder head.

20 - O-ring

- ☐ Renew
- ☐ Lubricate lightly with clean engine oil

21 - Spacer ring

- ☐ Renew if damaged

22 - Injector

Removing and installing ⇒ [page 27](#)

23 - Sealing element (top)

24 - Sealing element (bottom)

25 - Circlip

26 - Combustion chamber ring seal

- ☐ Renewing ⇒ [“2.9 Removing and installing injectors”, page 27](#)

27 - Seal

- ☐ Renew if damaged
- ☐ When renewing lever out with screwdriver
- ☐ Press in by hand

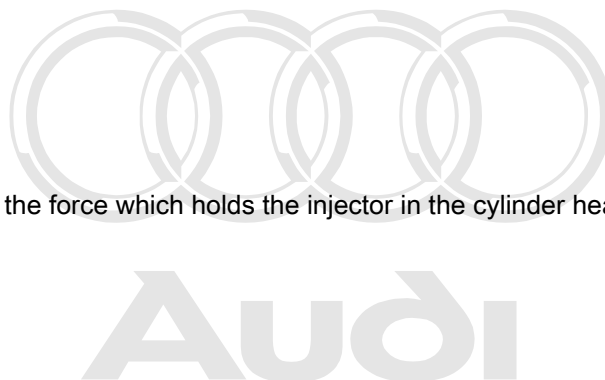
28 - Operating lever

- ☐ For vacuum unit

29 - Vacuum hose

- ☐ To intake manifold flap valve - N316-

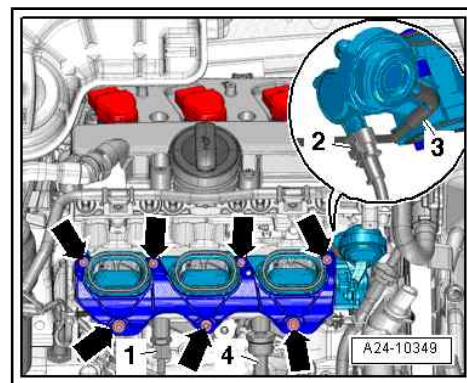
30 - Vacuum unit for actuating intake manifold flaps



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Intake manifold (bottom section) - tightening torque

- Tighten bolts and nuts -arrows- for intake manifold (bottom section) in diagonal sequence and in stages.
- 10 Nm



2.6 Removing and installing intake manifold (bottom section) with fuel rail

Special tools and workshop equipment required

- ◆ Torque wrench - V.A.G 1331-

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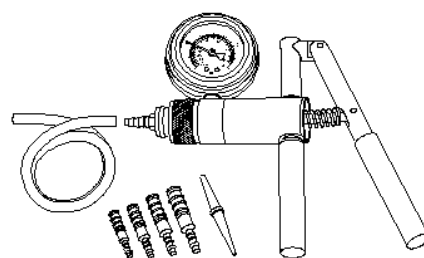
V.A.G 1331



W00-0427

- ◆ Tool inserts - V.A.G 1331/2-
- ◆ Hand vacuum pump - VAS 6213-

VAS 6213



W00-10259

Removing



Note

The following description shows the removal and installation of the bottom section of the intake manifold (left-side). The procedure for the other side is more or less identical.

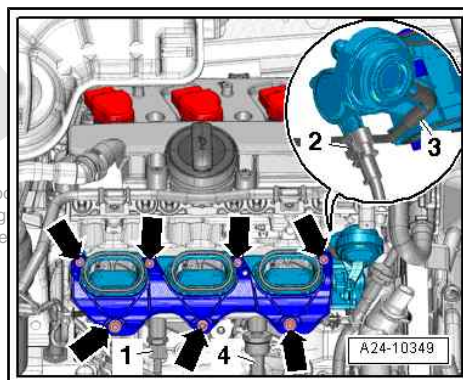


WARNING

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

- ♦ *The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening the system ➔ [page 3](#).*

- Reduce fuel pressure in high-pressure section of injection system ➔ [page 3](#).
- Remove supercharger ➔ Rep. gr. 21.
- Push vacuum hoses to one side.
- Unplug electrical connector -4- at fuel pressure sender - G247-.
- Unscrew union nut -1- (counterhold threaded connection).
- Remove bolts and nuts -arrows- and detach intake manifold (bottom section) with fuel rail.
- Unplug electrical connector -2- at intake manifold flap potentiometer and pull off vacuum hose -3-.



Caution

Risk of irreparable damage to engine.

- ♦ *Block off the intake ports with clean cloths to prevent small objects from dropping into the engine through the intake ports in the cylinder heads.*

Installing

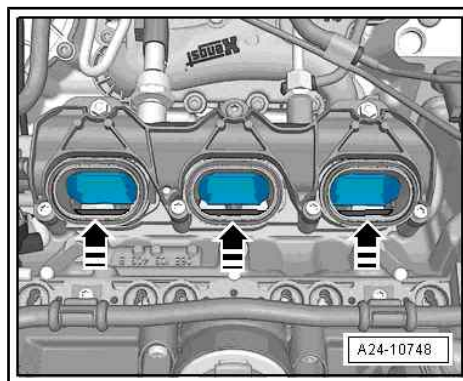
Installation is carried out in the reverse order; note the following:



Note

- ♦ *If an injector has been pulled out of the cylinder head, the teflon ring seal must be renewed.*
- ♦ *Renew gaskets and O-rings.*
- ♦ *Lubricate O-rings of injectors lightly with clean engine oil.*

When installing intake manifold (bottom section) move intake manifold flaps in direction of -arrow-.



- Connect hand vacuum pump - VAS 6213- to vacuum unit for actuating intake manifold flaps as shown in illustration.
- Use hand vacuum pump to generate vacuum.
- This will cause the intake manifold flaps to open.

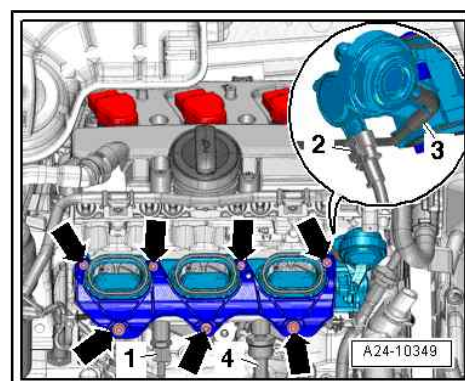
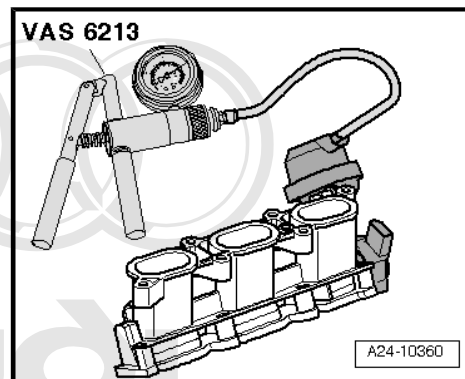


Note

If the intake manifold flaps are not opened, they can catch on the guide plates in the cylinder head when the intake manifold (bottom section) is installed.

- Then press intake manifold (bottom section) evenly onto injectors.
- Tighten bolts and nuts for intake manifold (bottom section) in diagonal sequence to specified torque.
- Tightening torque for intake manifold (bottom section)
⇒ [page 23](#)
- Disconnect hand vacuum pump from vacuum unit for actuating intake manifold flaps.

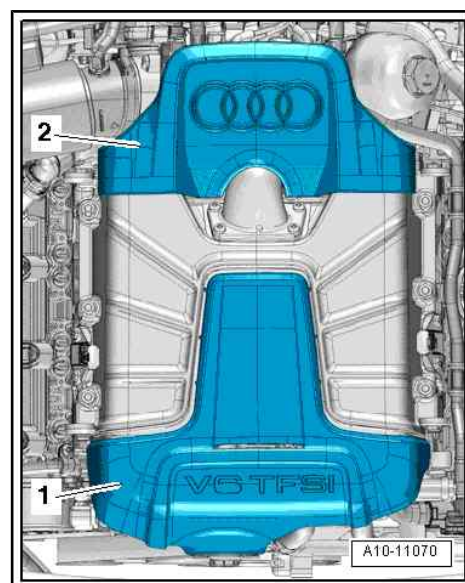
- Plug in electrical connector -4- at fuel pressure sender - G247- .
- Tighten union nut -1- (counterhold threaded connection).
- Tightening torque: intake manifold (bottom section) - exploded view ⇒ [page 20](#)
- Ensure that high-pressure pipe is not under tension.
- Install supercharger ⇒ Rep. gr. 21 .



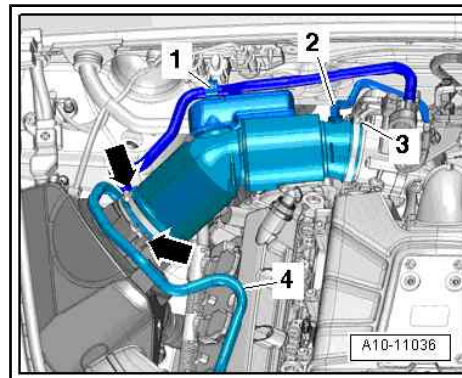
2.7 Removing and installing throttle valve module - J338-

Removing

- Lift off engine cover panel (rear) -2-.



- Move clear fuel line -4- and line -1- from activated charcoal filter on air cleaner housing and air pipe.
- Detach vacuum hose -2- from connection on air hose.
- Remove air pipe. To do so, release hose clip -3- and clamps -arrows-.



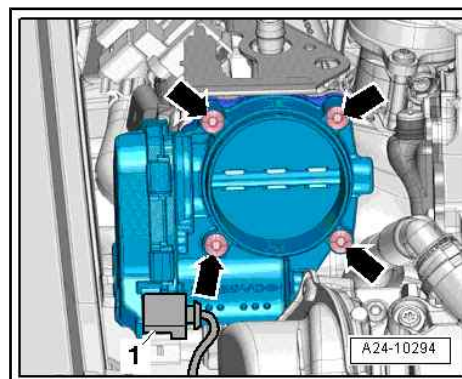
- Unplug electrical connector -1-.
- Remove bolts -arrows- and detach throttle valve module - J338- with intermediate flange.



Caution

Risk of irreparable damage to engine.

- ◆ **Block off the intake port with a clean cloth to prevent small items from dropping into the supercharger.**



Installing

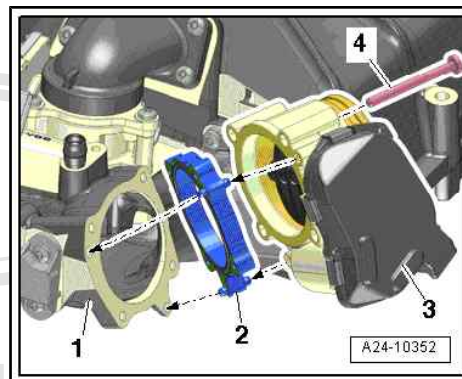
Installation is carried out in the reverse order; note the following:



Note

Fit new O-rings.

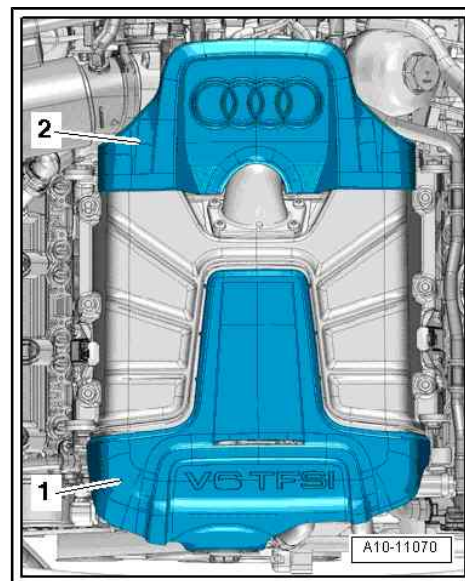
- Insert intermediate flange -2- with O-rings into supercharger -1- -left arrows-.
- Fit throttle valve module - J338- -item 3- on intermediate flange -right arrows-.
- Tightening torque: 10 Nm
- After renewing throttle valve module - J338- , perform Adap-
tion in Guided Functions ⇒ vehicle diagnostic tester .



2.8 Removing and installing regulating flap control unit - J808-

Removing

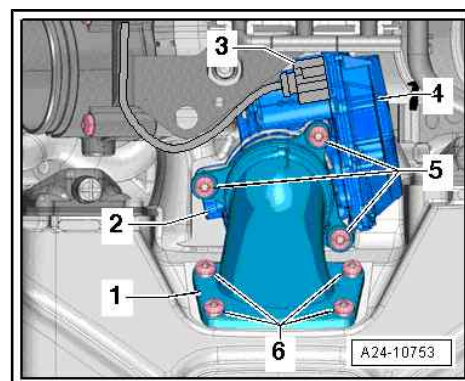
- Lift off engine cover panel (rear) -2-.



- Unplug electrical connector -3- at regulating flap control unit - J808- .
- Remove bolts -5- and -6-.
- Take out bypass elbow -1- with adapter (intermediate flange) -2- and regulating flap control unit - J808- -4-.

Installing

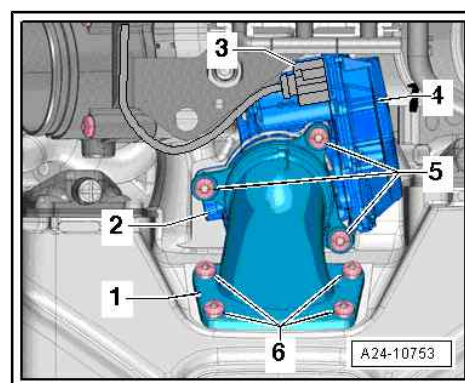
Installation is carried out in the reverse order; note the following:



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Fit new O-rings.

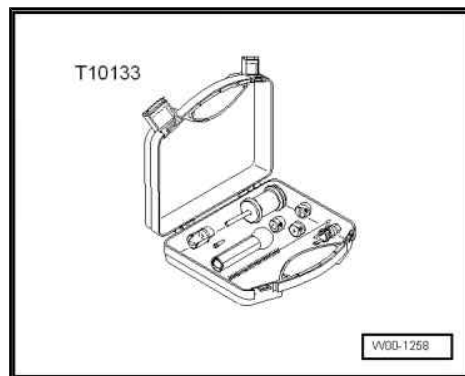
- Install bypass elbow -1- with adapter (intermediate flange) -2- and regulating flap control unit - J808- -4- using new O-rings.
- Screw in bolts -5- and -6- hand-tight.
- Then first tighten bolts -6- to specified torque.
 - Tightening torque: 10 Nm
- Then tighten bolts -5- to the same specified torque.
- Re-attach electrical connector -3-.
- After renewing regulating flap control unit - J808- , perform Adaption in Guided Functions ⇒ vehicle diagnostic tester .



2.9 Removing and installing injectors

Special tools and workshop equipment required

◆ Tool set for FSI engines - T10133-



Removing

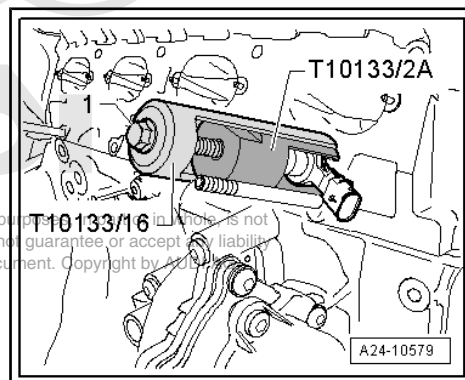


WARNING

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

- ◆ *The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening the system ➔ [page 3](#) .*

- Reduce fuel pressure in high-pressure section of injection system ➔ [page 3](#) .
- Remove supercharger ➔ Rep. gr. 21 .
- Remove corresponding intake manifold (bottom section) ➔ [page 23](#) .
- Apply puller -T10133/2A- to groove on injector.
- Then attach removal tool -T10133/16- and pull out injector by turning bolt -1-.



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Dismantling injector

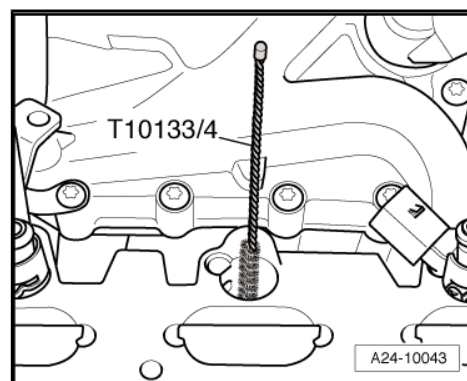
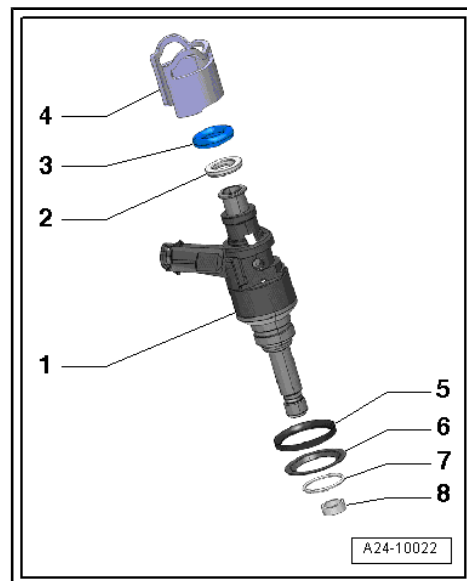
- Pull support ring -4-, O-ring -3- and spacer ring -2- off injector -1-.
- Detach circlip -7-, sealing element (top) -5- and sealing element (bottom) -6-.
- Carefully remove old combustion chamber ring seal -8-. To do so, cut open combustion chamber ring seal using knife or prise open with small screwdriver and then pull off forwards.
- Take care not to damage groove on injector. The injector must be renewed if the groove is damaged.

Installing

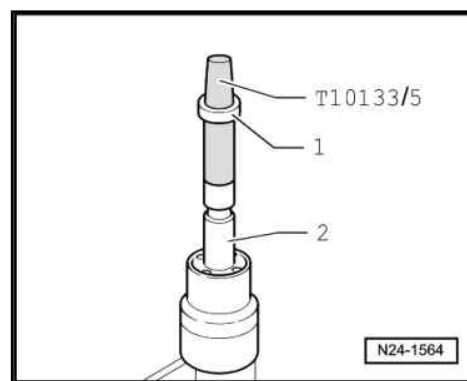


Note

- ◆ *Renew combustion chamber ring seal and O-ring.*
- ◆ *Renew spacer ring if damaged.*
- ◆ *Lightly lubricate O-rings for injectors with clean engine oil.*
- ◆ *The injector pipes must be re-installed on the same cylinders.*
- Clean bore in cylinder head with nylon cylinder brush - T10133/4- .

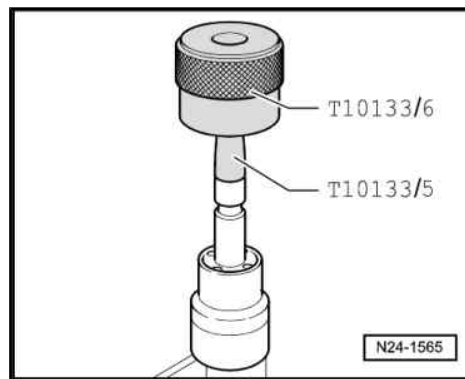


- Fit assembly cone -T10133/5- with new combustion chamber ring seal -1- from repair set onto injector -2-.



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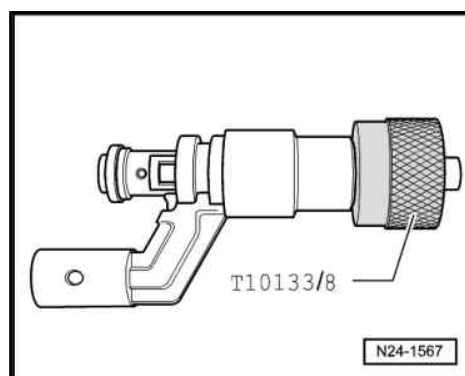
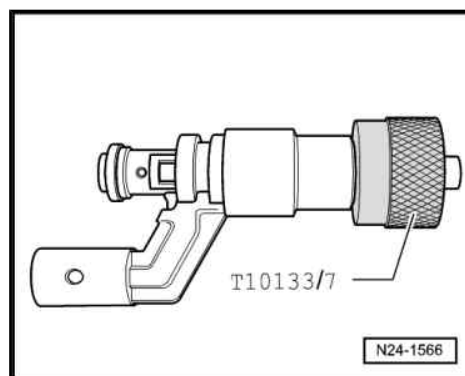
- Push combustion chamber ring seal onto assembly cone - T10133/6- as far as it will go using assembly sleeve - T10133/5- .
- Turn assembly sleeve -T10133/6- upside down and push combustion chamber ring seal into sealing ring groove.



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.
- 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 parts from repair set onto injector -1-:
- 2 - Spacer ring
- 3 - O-ring
- 4 - Support ring
- 5 - Sealing element (top) - note installation position
- 6 - Sealing element (bottom) - note installation position
- 7 - Circlips - take care not to stretch
- Lubricate new O-ring lightly with clean engine oil before installing.

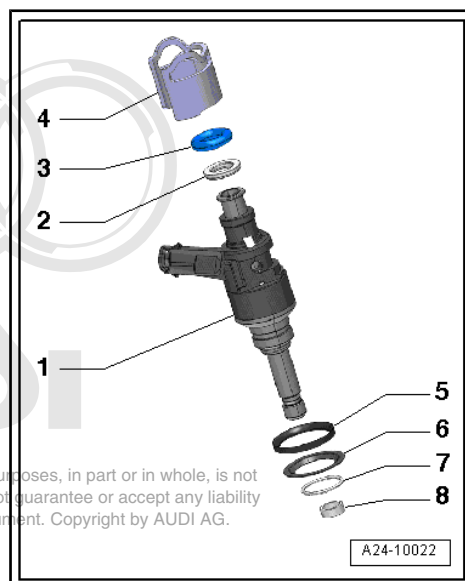


Note

The combustion chamber ring seal -8- must not be lubricated.

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- Push injector by hand as far as it will go into aperture in cylinder head (do not use oil or grease). Ensure that the injector is properly seated in the cylinder head.





Note

- ◆ *It should be possible to insert the injector easily. If necessary, wait until the seal has contracted sufficiently.*
- ◆ *Note correct installation position and ensure that injectors are properly seated in cylinder head.*
- ◆ *If the injector cannot be pushed in by hand, use puller - T10133/2A- -2- with striker - T10133/3- to insert the injector.*
- Electrical connector of injector must engage in recess in cylinder head.
- Coat O-ring of high-pressure injector with clean engine oil to facilitate insertion into fuel rail.
- Renew all seals.

Perform further installation in reverse order, paying attention to the following:

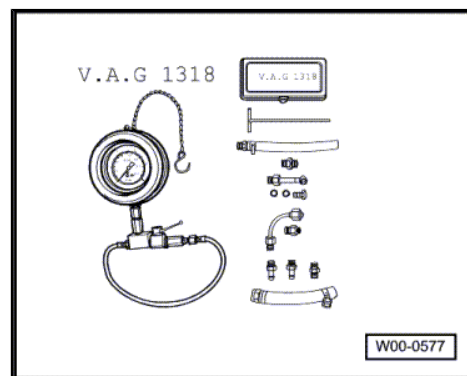
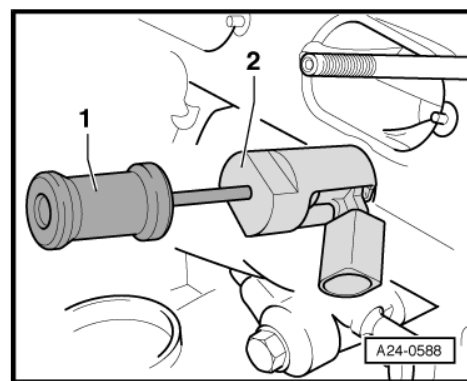
- Install intake manifold (bottom section) ➔ [page 23](#) .
- Install supercharger ➔ Rep. gr. 21 .

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

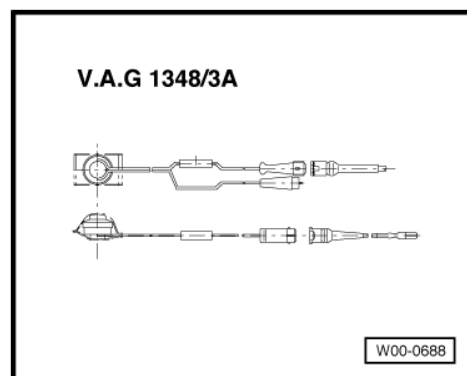
Special tools and workshop equipment required

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

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- ◆ Adapter set - V.A.G 1318/10-12-
- ◆ Auxiliary measuring set - V.A.G 1594C-
- ◆ Remote control - V.A.G 1348/3A- for V.A.G 1348 with adapter cable -V.A.G 1348/3-3-



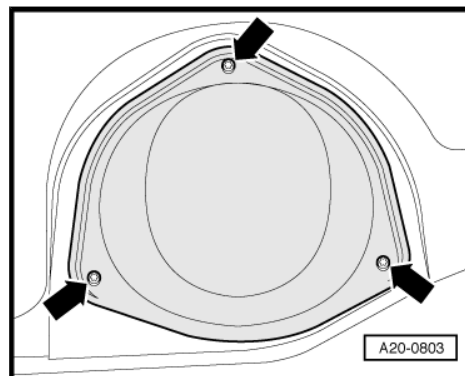
- ◆ Fuel-resistant measuring container

Test conditions

- Battery voltage at least 12.5 Volt.
- Fuel filter OK.
- Fuel tank at least $\frac{1}{4}$ full.
- Fuel pump control unit - J538- OK; checking ⇒ Rep. gr. 20 .
- Ignition off.

Checking fuel pressure

- Remove rear seat bench ⇒ Rep. gr. 72 .
- Unbolt cover from flange -arrows-.



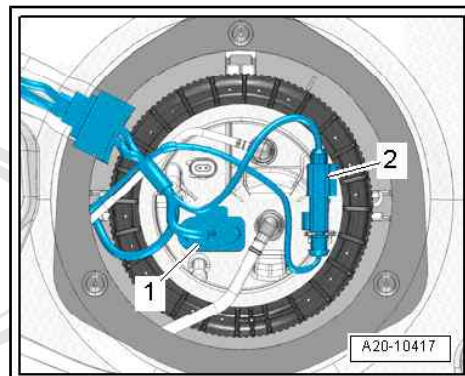
- Unplug electrical connector -1- at flange.



Note

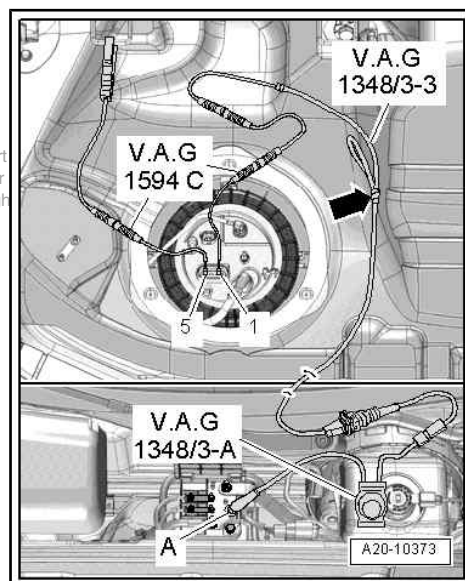
Disregard -item 2-.

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



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

- Move switch of remote control - V.A.G 1348/3A- for V.A.G 1348 to front of engine compartment.

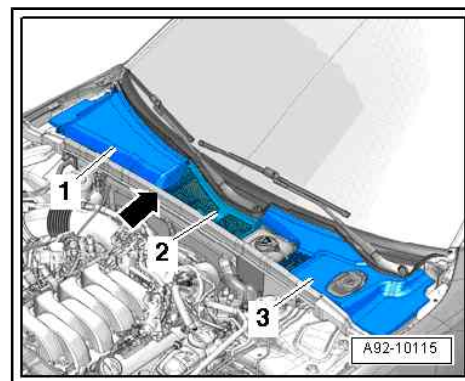


- Remove seal -arrow-.
- Unclip plenum chamber cover -2- and remove.

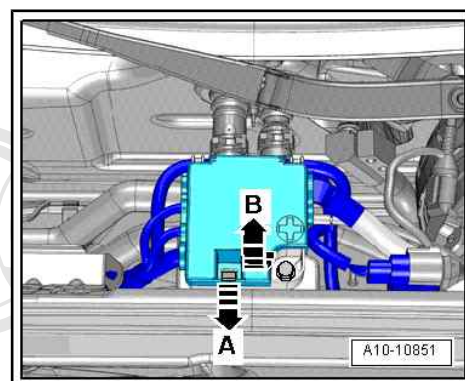


Note

Disregard -items 1 and 3-.

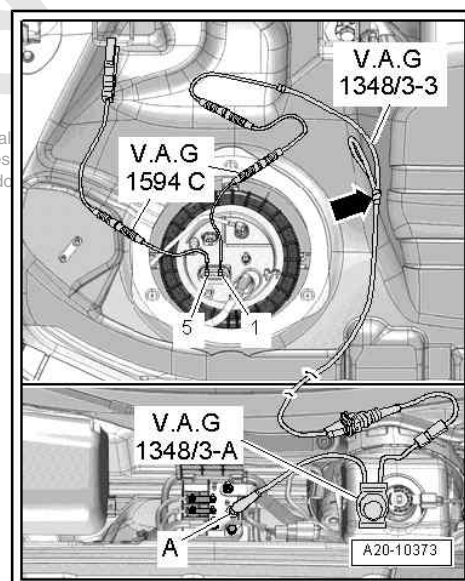


- Release retainer -arrow A- and open cover -arrow B-.



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

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- Remove bolts -arrows-, detach air ducts -1- and -2-.

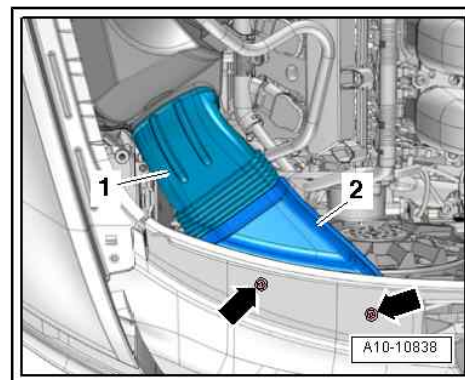


WARNING

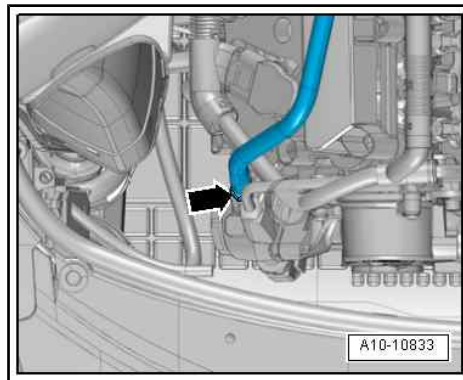
The fuel system operates at extremely high pressure. This can cause injury.

- ◆ *The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening the system ➔ [page 3](#) .*

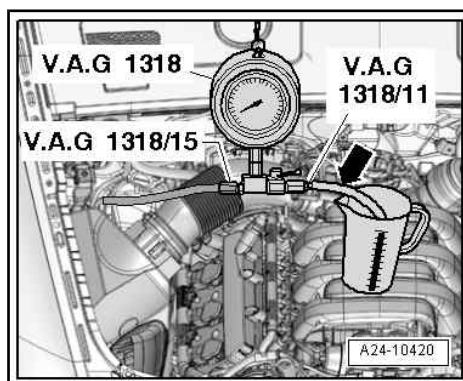
- Reduce fuel pressure in high-pressure section of injection system ➔ [page 3](#) .



- Detach fuel supply hose from high-pressure pump -arrow- and move clear.



- Connect K-Jetronic pressure tester - V.A.G 1318- with adaptors -V.A.G 1318/11- and -V.A.G 1318/15- to fuel line.
- Connect extension hose -arrow- to pressure tester and hold end of hose in measuring container.
- Open cut-off valve on pressure tester.
- Lever points in direction of flow.
- Bleed fuel system by pressing remote control briefly.



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- Close cut-off valve on pressure tester.
- Lever is at right angle to direction of flow -arrow-.
- Press switch on remote control until pressure tester shows no further increase in pressure.
- Specification: approx. 6 bar
- If specification is not attained, check delivery rate of fuel pump
⇒ Rep. gr. 20 .

Checking residual pressure

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

If the residual pressure drops below 3 bar:

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

Assembling

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



WARNING

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

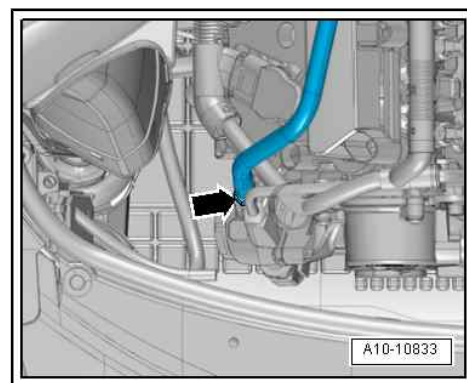
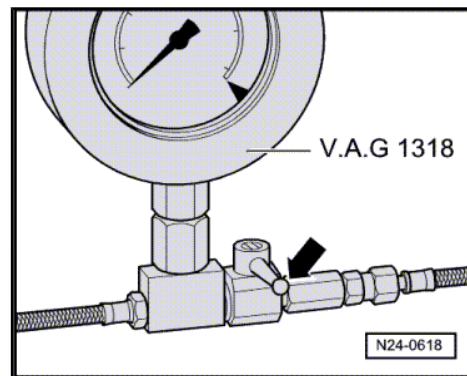
- ◆ ***Before removing the pressure tester, release the fuel pressure by opening the cut-off valve. Hold a container under the connection.***

- Re-attach fuel supply hose -arrow- to high-pressure pump (make sure that all parts are clean).
- Tightening torque: refer to exploded view of high-pressure pump ⇒ [page 35](#) .
- Install rear seat bench ⇒ Rep. gr. 72 .

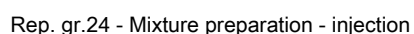


Note

Check fuel system for leaks.



2.11 High-pressure pump - exploded view



14 - Nut

- ☐ 9 Nm

15 - Centre hex stud

- ☐ 9 Nm

16 - Roller tappet

- ☐ Can only be installed in one position
- ☐ Lubricate lightly with clean engine oil before installing

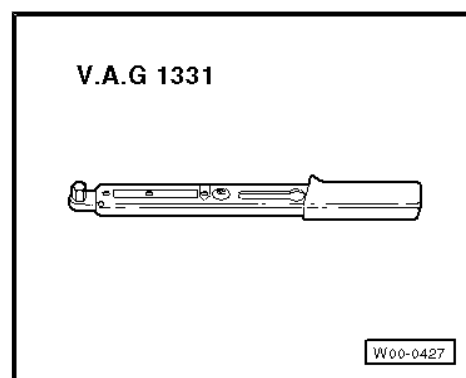
17 - O-ring

- ☐ Renew
- ☐ Lubricate lightly with clean engine oil before installing

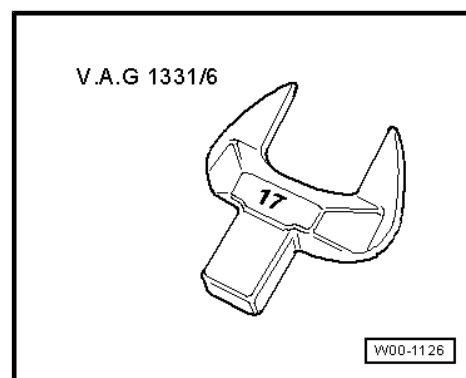
2.12 Removing and installing high-pressure pipe

Special tools and workshop equipment required

- ◆ Torque wrench - V.A.G 1331-



- ◆ Open end spanner insert, AF 17 - V.A.G 1331/6-



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Removing



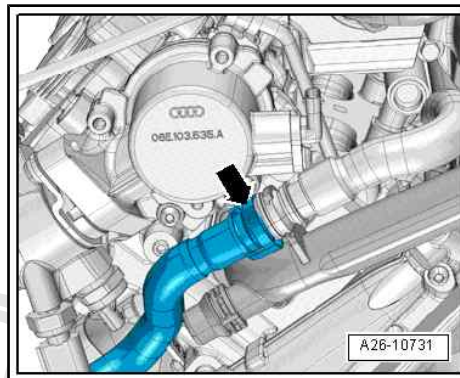
WARNING

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

- ◆ ***The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening the system.***

- Reduce fuel pressure in high-pressure section of injection system ⇒ [page 3](#) .
- Remove supercharger ⇒ Rep. gr. 21 .

- Press release tabs and detach secondary air hose -arrow- to front from bracket.



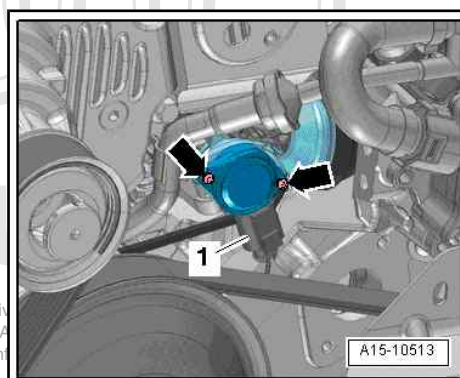
- Remove bolts -arrows- and move intake manifold flap potentiometer - G336- with vacuum unit for intake manifold flap clear to one side.



Note

- ♦ Disregard -item 1-.
- ♦ The procedure is illustrated for the left-side cylinder bank 2.

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- Unscrew bolts -arrows- and bolt connection -1-.
- Unscrew union nuts -2- and -3- (counterhold threaded connection).

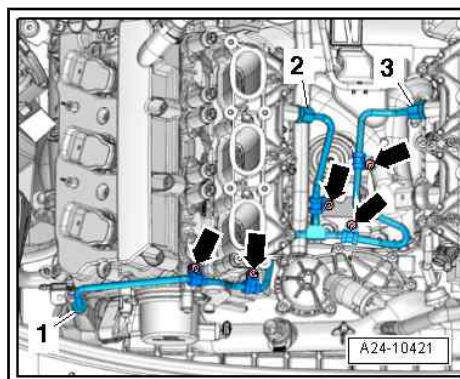


Note

Do not attempt to bend high-pressure pipe to a different shape.

Installing

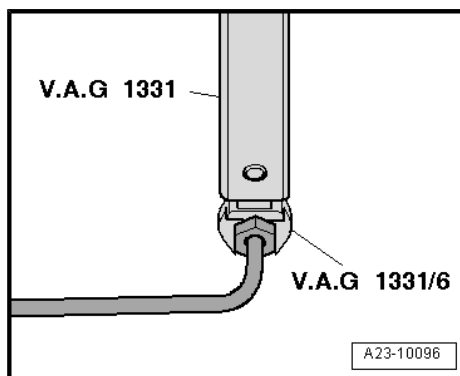
- Tightening torques: High-pressure pump - exploded view
⇒ [page 35](#) .



Note

- ♦ The connections of the high-pressure pipe must not be damaged.
- ♦ Do not attempt to bend high-pressure pipe to a different shape.

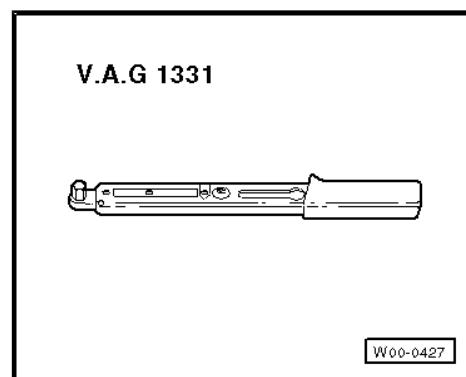
- First tighten union nut by hand until it makes contact, making sure that high-pressure pipe is not under tension.
- Tighten union nut with torque wrench - V.A.G 1331- and tool insert, AF 17 - V.A.G 1331/6- ; to do so, counterhold at hexagon flats of threaded connection on fuel rail with an open-end spanner.
- Do not tighten bolt for retainer until high-pressure pipe has been tightened.
- Install supercharger ⇒ Rep. gr. 21 .



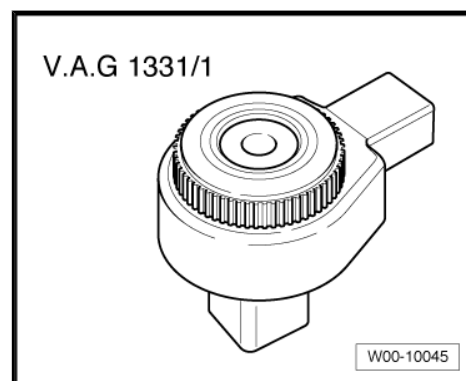
2.13 Removing and installing high-pressure pump

Special tools and workshop equipment required

- ◆ Torque wrench - V.A.G 1331-



- ◆ Ratchet - V.A.G 1331/1-



- ◆ Socket insert AF 14, flared ring spanner - V.A.G 1331/8-

Removing



WARNING

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

- ◆ *The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening the system ➔ [page 3](#).*



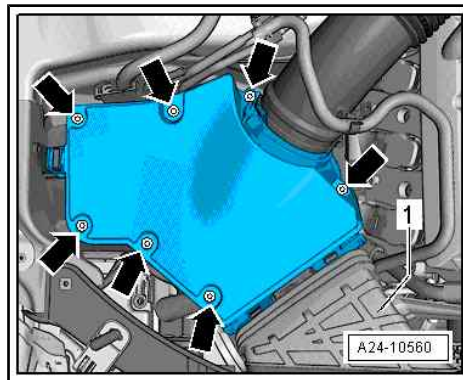
Note

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

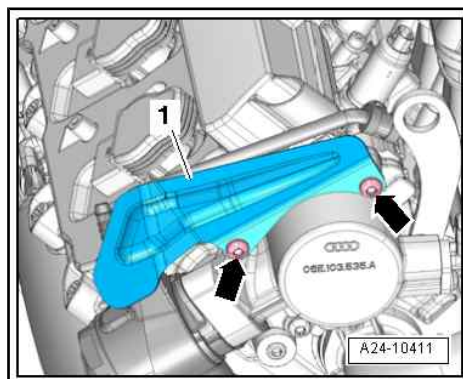
- Reduce fuel pressure in high-pressure section of injection system ➔ [page 3](#).

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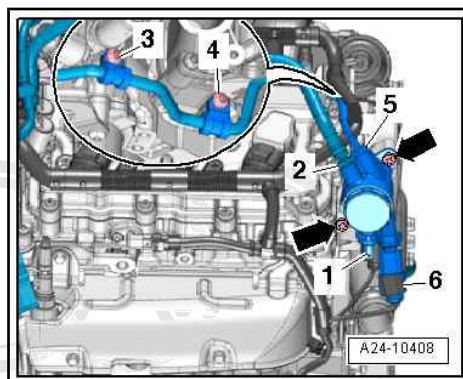
- Remove air duct -1-.



- Unscrew nuts -arrows- and remove guard plate -1-.



- Unplug electrical connectors -1- and -6-.
- Remove bolt -3- on retaining clip.
- Unscrew connections -2- and -5-.
- Remove bolts -arrows-.
- Carefully pull out high-pressure fuel pump. It is possible that the sleeve may remain lodged inside.



Note

- ◆ *Do not bend pipes to a different shape.*
- ◆ *Disregard -item 4-.*

Installing

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

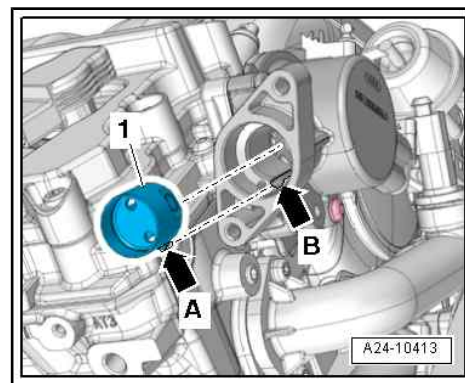


Note

- ◆ *The connections of the high-pressure pipe must not be damaged.*
- ◆ *Do not attempt to bend high-pressure pipe to a different shape.*
- Renew O-ring for high-pressure pump.

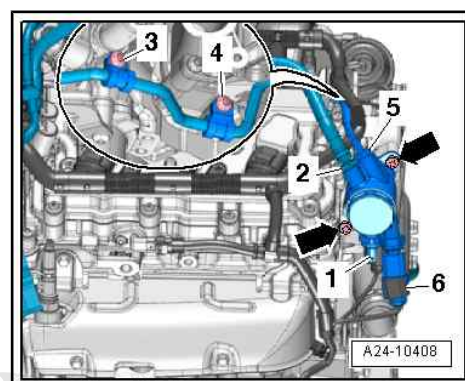
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- Check roller tappet -1- for damage and renew if necessary.
- Lightly lubricate roller tappet with oil and insert it so that lug -arrow A- slides into guide notch -arrow B-.
- Rotate crankshaft in direction of engine rotation by turning bolt for vibration damper, and at the same time press roller tappet into cylinder head until it reaches its lowest point.
- Only lift high-pressure pipe slightly to fit high-pressure pump.
- Hand-tighten bolts for high-pressure pump as far as stop.
- Now tighten bolts in diagonal sequence to specified torque.
- Tightening torques: High-pressure pump - exploded view
 ➔ [page 35](#) .
- Install high-pressure pipes -2- and -5- ➔ [page 37](#) .
- Re-attach electrical connectors -1- and -6-.
- Tighten bolt -3- on retaining clip.



Note

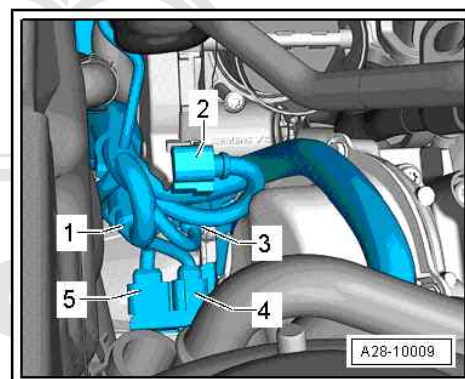
Check fuel system for leaks.



2.14 Lambda probes - overview

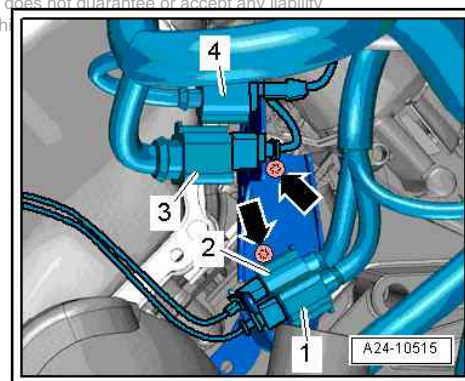
Connectors of Lambda probes (cylinder bank 1)

- 1 - For injectors (cylinder bank 1)
- 2 - Throttle valve module - J338-
- 3 - Knock sensor 1 - G61-
- 4 - For Lambda probe - G39- with Lambda probe heater - Z19-
- 5 - For Lambda probe after catalytic converter - G130- with Lambda probe 1 heater after catalytic converter - Z29-



Connectors of Lambda probes (cylinder bank 2)

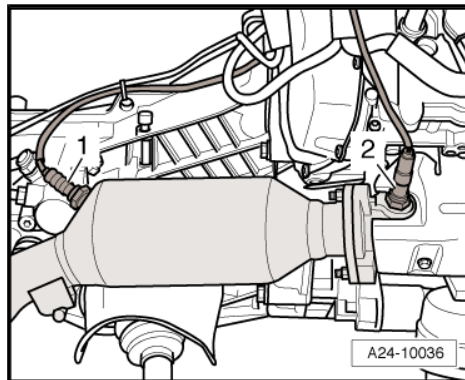
- 1 - For Lambda probe 2 after catalytic converter - G131- with Lambda probe 2 heater after catalytic converter - Z30-
- 2 - For Lambda probe 2 - G108- with Lambda probe heater 2 - Z28-
- 3 - For injectors (cylinder bank 2) and for fuel pressure sender - G247-
- 4 - For knock sensor 2 - G66-



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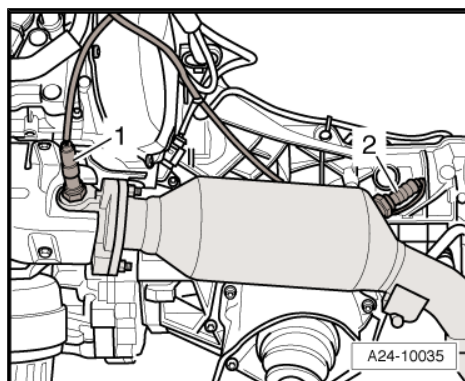
Fitting location of Lambda probes on cylinder bank 1 (right-side)

- 1 - Lambda probe after catalytic converter - G130- with Lambda probe 1 heater after catalytic converter - Z29-
 - 2 - Lambda probe - G39- with Lambda probe heater - Z19-
- Tightening torque: 55 Nm



Fitting location of Lambda probes on cylinder bank 2 (left-side)

- 1 - Lambda probe 2 - G108- with Lambda probe heater 2 - Z28-
 - 2 - Lambda probe 2 after catalytic converter - G131- with Lambda probe 2 heater after catalytic converter - Z30-
- Tightening torque: 55 Nm



Note

- ◆ *New Lambda probes are coated with an assembly paste.*
- ◆ *If reinstalling the old Lambda probes, coat the threads with high-temperature paste ⇒ [Electronic parts catalogue](#) .*
- ◆ *The assembly paste/high-temperature paste must not get into the slots on the Lambda probe body.*
- ◆ *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*
- ◆ *Fit all cable ties in the original positions when installing.*

Removing and installing Lambda probe - G39- and Lambda probe heater - Z19- ⇒ [page 42](#)

Removing and installing Lambda probe after catalytic converter - G130- and Lambda probe 1 heater after catalytic converter - Z29- ⇒ [page 44](#)

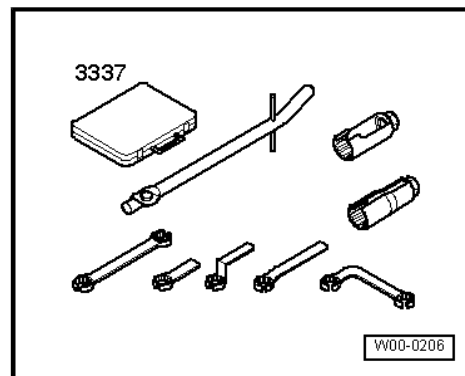
Lambda probe 2 - G108- with Lambda probe heater 2 - Z28- ⇒ [page 46](#)

Lambda probe 2 after catalytic converter - G131- with Lambda probe 2 heater after catalytic converter - Z30- ⇒ [page 48](#)

2.15 Removing and installing Lambda probe - G39-

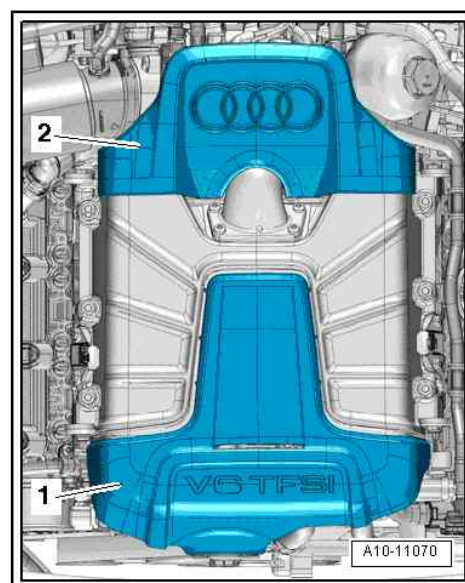
Special tools and workshop equipment required

◆ Lambda probe open ring spanner set - 3337-

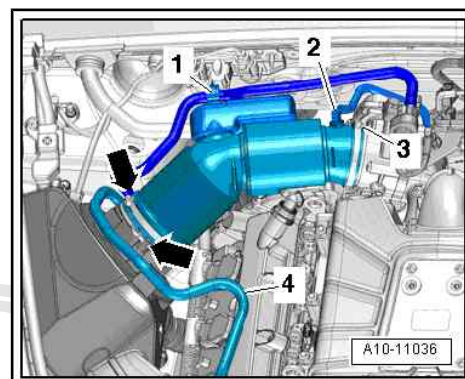


Removing

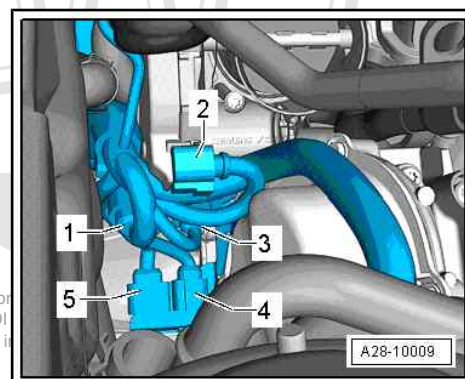
- Lift off engine cover panel (rear) -2-.



- Move clear fuel line -4- and line -1- leading to activated charcoal filter on air cleaner housing and air pipe.
- Detach vacuum hose -2- from connection on air hose.
- Remove air pipe. To do so, release hose clip -3- and clamps -arrows-.
- Remove bottom section of air cleaner ➔ [page 19](#) .



- Unplug electrical connector -4- for Lambda probe - G39- and move wiring clear.



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



Note

For illustration purposes, the installation position is shown from the rear and with the engine removed.

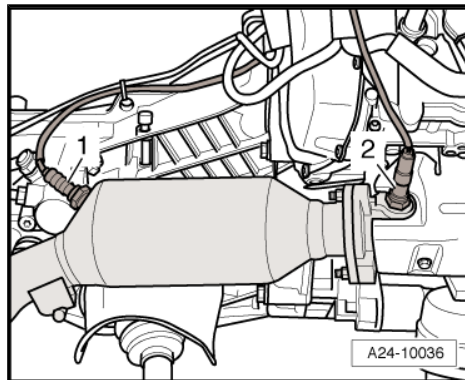
Installing

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



Note

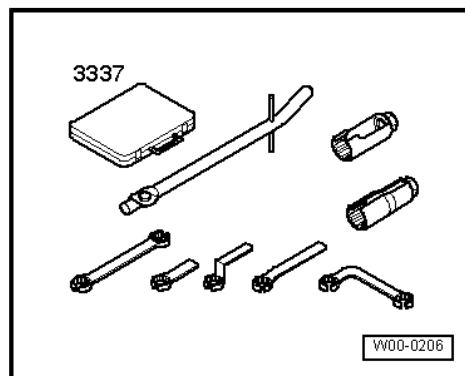
- ♦ *New Lambda probes are coated with an assembly paste.*
- ♦ *If reinstalling the old Lambda probes, coat the threads with high-temperature paste ⇒ *Electronic parts catalogue* .*
- ♦ *The assembly paste/high-temperature paste must not get into the slots on the Lambda probe body.*
- ♦ *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*
- ♦ *Fit all cable ties in the original positions when installing.*
- Tightening torques: Lambda probes - overview ⇒ [page 41](#) .



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

Special tools and workshop equipment required

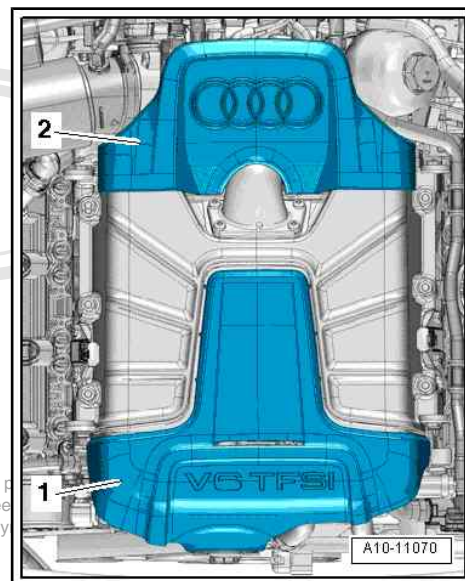
- ♦ Lambda probe open ring spanner set - 3337-



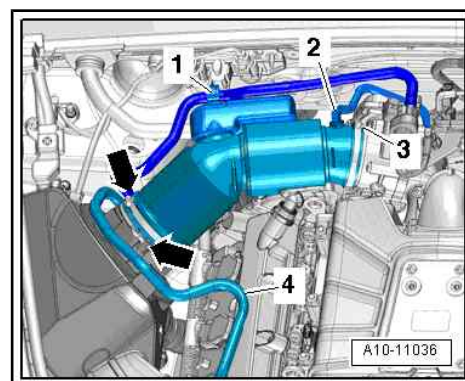
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Removing

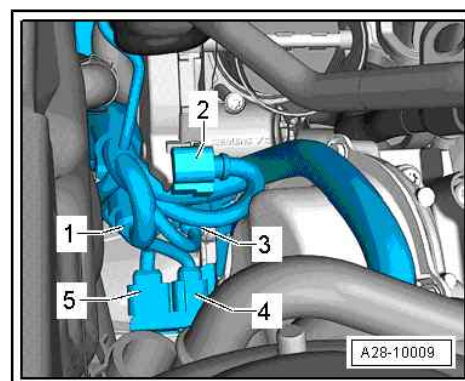
- Lift off engine cover panel (rear) -2-.



- Move clear fuel line -4- and line -1- leading to activated charcoal filter on air cleaner housing and air pipe.
- Detach vacuum hose -2- from connection on air hose.
- Remove air pipe. To do so, release hose clip -3- and clamps -arrows-.
- Remove bottom section of air cleaner ➔ [page 19](#) .



- Unplug electrical connector -5- for Lambda probe after catalytic converter - G130- and move wiring clear.



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



Note

For illustration purposes, the installation position is shown from the rear and with the engine removed.

Installing

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



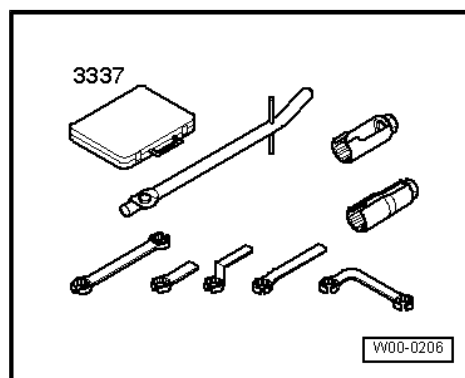
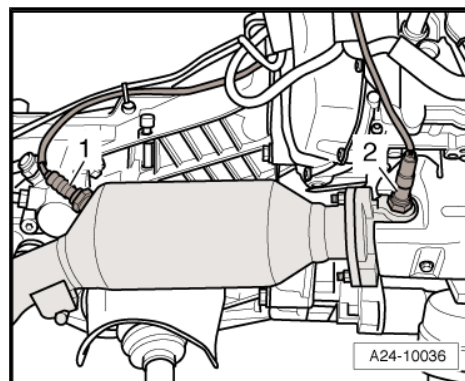
Note

- ◆ New Lambda probes are coated with an assembly paste.
- ◆ If reinstalling the old Lambda probes, coat the threads with high-temperature paste ⇒ *Electronic parts catalogue* .
- ◆ The assembly paste/high-temperature paste must not get into the slots on the Lambda probe body.
- ◆ When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.
- ◆ Fit all cable ties in the original positions when installing.
- Tightening torques: Lambda probes - overview ⇒ [page 41](#) .

2.17 Removing and installing Lambda probe 2 - G108-

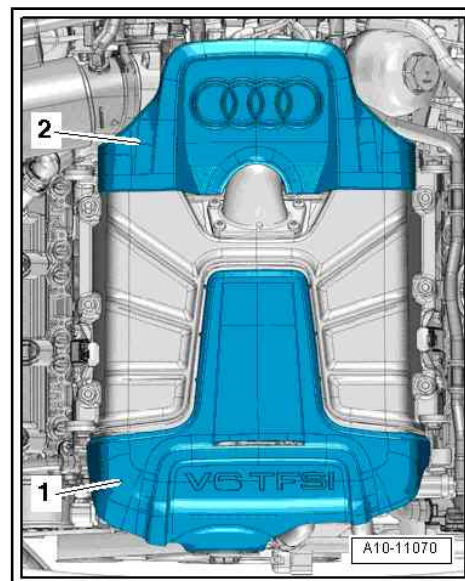
Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set - 3337-

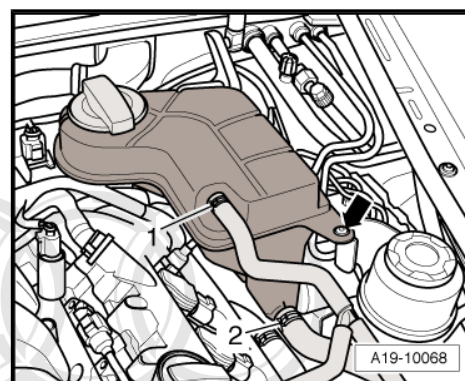


Removing

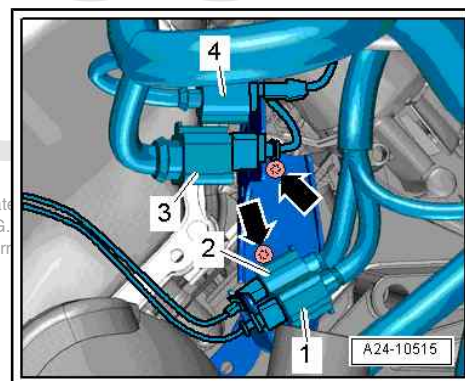
- Lift off engine cover panel (rear) -2-.



- Remove bolt -arrow-.
- Unplug electrical connector for coolant shortage indicator switch - F66- at bottom of expansion tank and move expansion tank to one side with coolant hoses -1- and -2- attached.



- Unplug electrical connector -2- for Lambda probe 2 - G108- and move wiring clear.



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- Unscrew Lambda probe 2 - G108- -1- using tool from Lambda probe open ring spanner set - 3337- .



Note

For illustration purposes, the installation position is shown from the rear and with the engine removed.

Installing

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



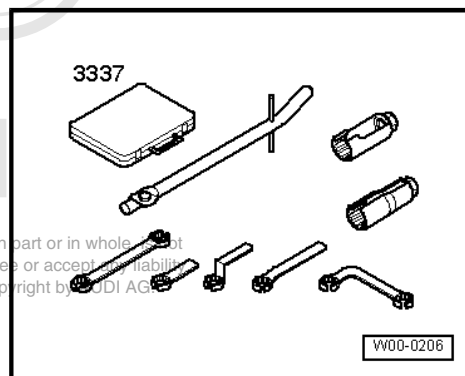
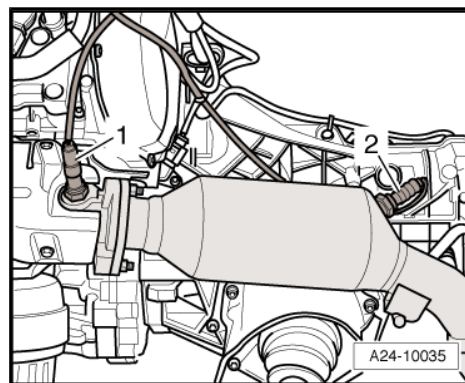
Note

- ◆ New Lambda probes are coated with an assembly paste.
- ◆ If reinstalling the old Lambda probes, coat the threads with high-temperature paste ⇒ *Electronic parts catalogue* .
- ◆ The assembly paste/high-temperature paste must not get into the slots on the Lambda probe body.
- ◆ When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.
- ◆ Fit all cable ties in the original positions when installing.
- Tightening torques: Lambda probes - overview ⇒ [page 41](#) .

2.18 Removing and installing Lambda probe 2 after catalytic converter - G131-

Special tools and workshop equipment required

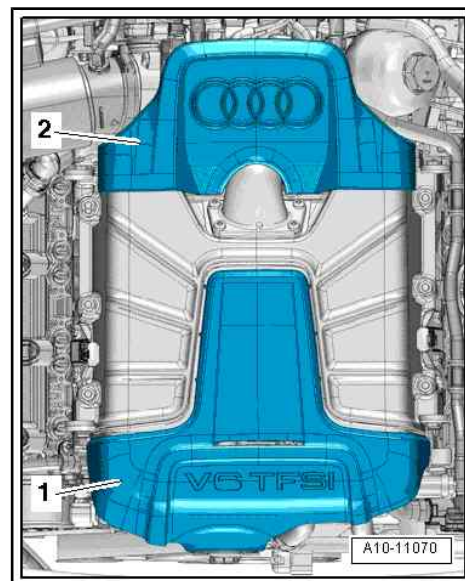
- ◆ Lambda probe open ring spanner set - 3337-



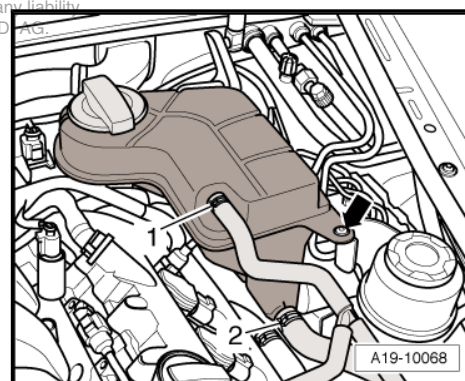
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Removing

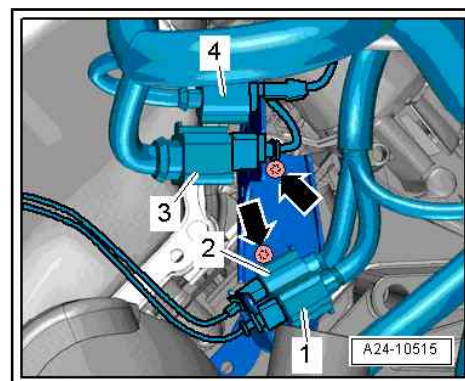
- Lift off engine cover panel (rear) -2-.



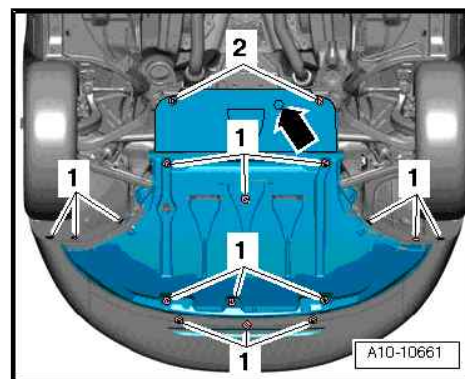
- Remove bolt -arrow-.
- Unplug electrical connector for coolant shortage indicator switch - F66- at bottom of expansion tank and move expansion tank to one side with coolant hoses -1- and -2- attached.



- Unplug electrical connector -1- for Lambda probe 2 after catalytic converter - G131- and move wiring clear.



- Release fasteners -1, 2, arrow- and remove noise insulation panels.



- Unscrew Lambda probe 2 after catalytic converter - G131-2- using tool from Lambda probe open ring spanner set - 3337- .



Note

For illustration purposes, the installation position is shown from the rear and with the engine removed.

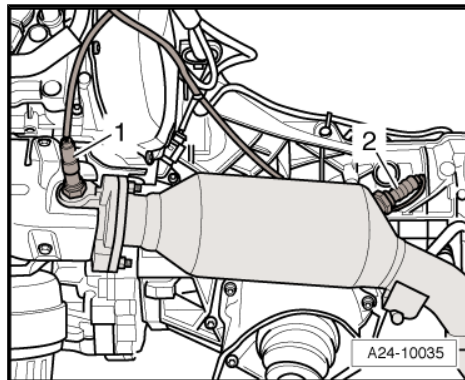
Installing

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



Note

- ◆ *New Lambda probes are coated with an assembly paste.*
- ◆ *If reinstalling the old Lambda probes, coat the threads with high-temperature paste ⇒ [Electronic parts catalogue](#) .*
- ◆ *The assembly paste/high-temperature paste must not get into the slots on the Lambda probe body.*
- ◆ *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*
- ◆ *Fit all cable ties in the original positions when installing.*
- Tightening torques: Lambda probes - overview ⇒ [page 41](#) .
- Install noise insulation panels ⇒ Rep. gr. 50 .



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3 Engine control unit

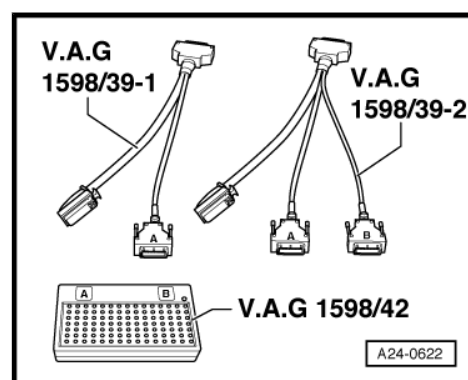
Overview

- ◆ ⇒ [“3.1 Wiring and component check with test box V.A.G 1598/42”, page 51](#)
- ◆ ⇒ [“3.2 Removing and installing engine control unit”, page 53](#)

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

Special tools and workshop equipment required

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

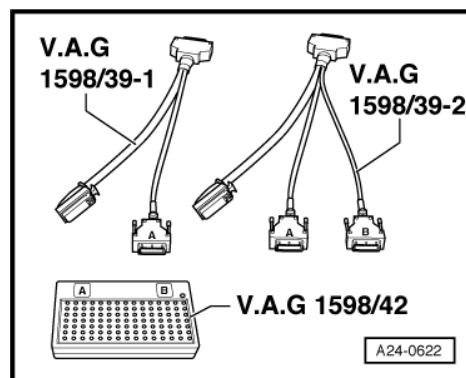


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Note

- ◆ *The test box has 105 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.*



Procedure



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 53](#) .
- 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.
- Connect earth clip of test box to negative terminal in engine compartment.



Note

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 repair procedure.

Installing engine control unit

Installation is performed in the reverse sequence.

- Make sure you fit protective housing (if fitted) back on engine control unit.
- Clean threaded holes for shear bolts to remove any residue from locking fluid. This can be done using a thread tap.
- Always use new shear bolts.

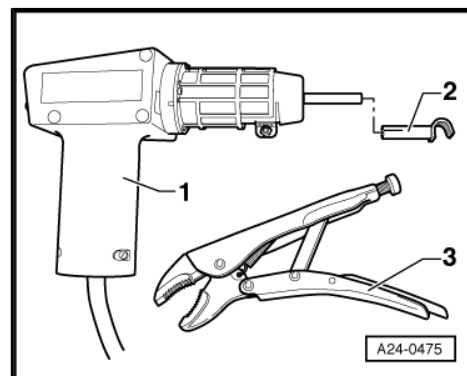
Perform the following after reconnecting engine control unit:

- Interrogate event memory.

3.2 Removing and installing engine control unit

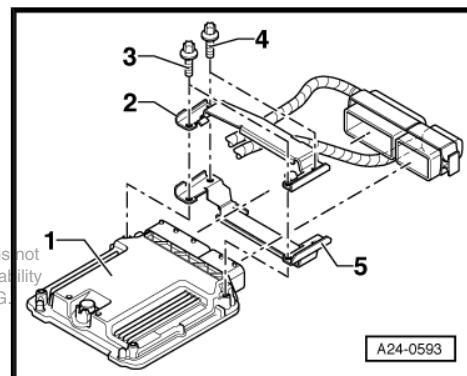
Special tools and workshop equipment required

- ◆ 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

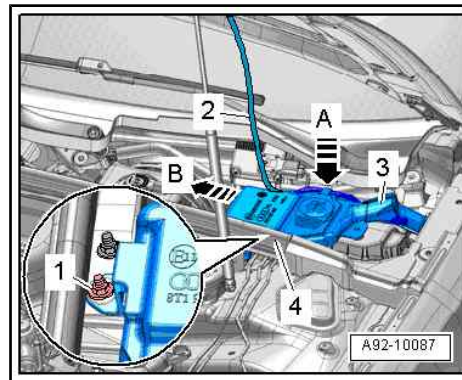
- ◆ *Not every engine control unit is bolted to a protective housing. Whether a protective housing is fitted depends on the engine/gearbox combination.*
- ◆ *The engine control unit -1- is bolted to the protective housing -5-. To make it more difficult to unscrew the shear bolts -4- for locking plate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



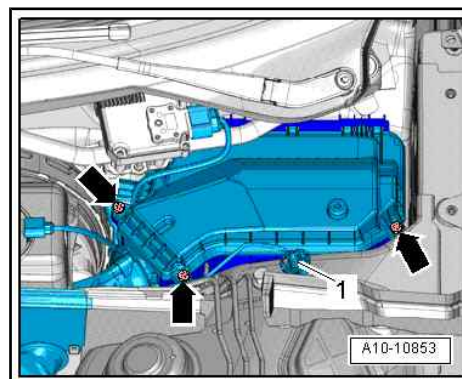
Removing

- When renewing engine control unit, select diagnosis object "Replace engine control unit" in "Guided Functions". Use vehicle diagnostic tester to do so.
- Switch off ignition and remove ignition key.

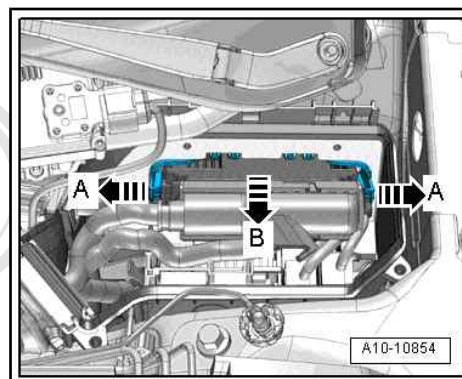
- Slightly pull off rubber seal in front of nut -1- on plenum chamber cover.
- Unhook wiring harness -2- from retainer -A-.
- Remove nut -1-.
- Pull filler neck -3- with filler pipe out of washer fluid reservoir and through opening in body.



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

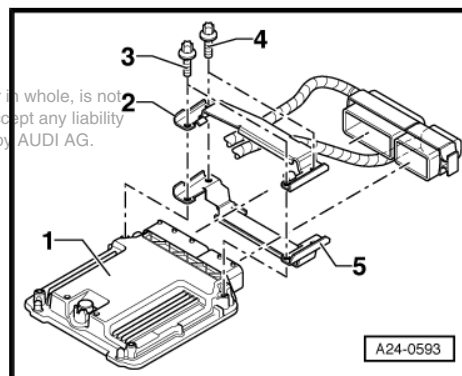


- Release retainers -arrows A- and pull out engine control unit - J623- -arrow B-.

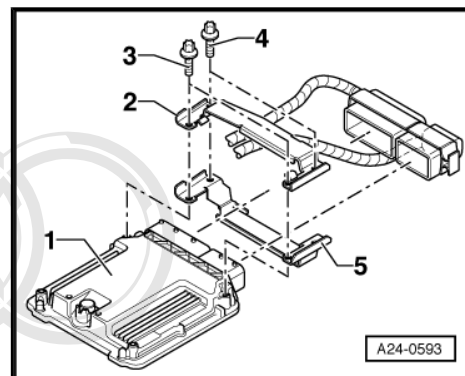


To help prevent unauthorised access to the connectors on the engine control unit, the engine control unit -1- is bolted to a metal casing -5- by means of shear bolts -3 and 4- and a locking plate -2-.

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



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



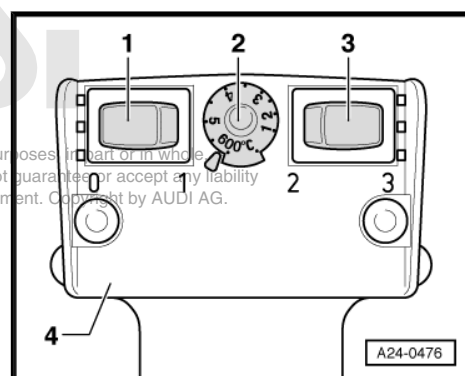
- Select settings on hot air blower as shown in illustration, i.e. set temperature potentiometer -2- to maximum heat output and two-stage air flow switch -3- to position 3.



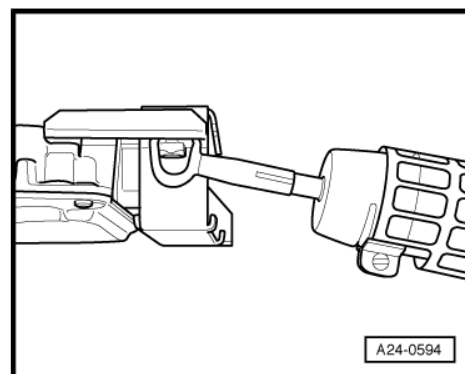
WARNING

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

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



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

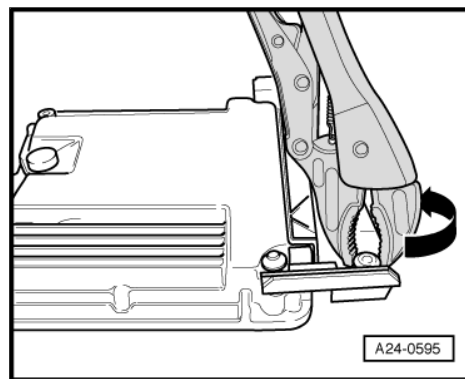
Installing

Installation is performed in the reverse sequence.

- 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 lid 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 57](#)
- ◆ ⇒ [“1.2 Safety precautions”, page 57](#)

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 faults being stored in the engine control unit. The event memory must be interrogated after completing all tests and repair work. If faults are stored:
- ◆ 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.*

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

- ◆ Persons wearing a cardiac pacemaker must at all times maintain a safe distance from high-voltage components such as the ignition system and xenon headlights.
- ◆ Always switch off the ignition before connecting or disconnecting electrical wiring for the injection or ignition system or tester cables.
- ◆ Do not touch or disconnect ignition wiring when the engine is running or being turned at cranking speed.
- ◆ Always switch off ignition before washing engine.

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- ◆ If you want to turn the engine at cranking speed without actually starting it (e.g. compression test), first unplug the connectors from the ignition coils and the injectors.
- ◆ Certain tests may lead to faults being stored in the engine control unit. The event memory must be interrogated after completing all tests and repair work. If faults are stored:



Caution

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

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

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- Disconnect battery ⇒ Rep. gr. 27 .

2 Servicing ignition system

2.1 Test data

3.0 ltr. TFSI engine		
Idling speed	Cannot be adjusted; regulated by idling speed stabilisation	
Ignition timing	Not adjustable (determined by control unit)	
Ignition system	Multi-coil system with 6 ignition coils (output stages integrated) connected directly to spark plugs via spark plug connectors	
Spark plugs	Designations	⇒ Data sheets for exhaust emissions test
	Tightening torque	⇒ Maintenance ; Booklet 812
Firing order	1-4-3-6-2-5	

2.2 Ignition system - exploded view

1 - Bolt

- 9 Nm

2 - Hall sender - G40-

- Removing and installing
 ⇒ [page 63](#)

3 - O-ring

- Renew

4 - Knock sensor

- Knock sensor 1 - G61- (cylinder bank 1), knock sensor 2 - G66- (cylinder bank 2)
- Removing and installing
 ⇒ [page 62](#)

5 - Bolt

- 20 Nm
- Tightening torque influences the function of the knock sensors

6 - Camshaft control valve 1 - N205-

7 - Bolt

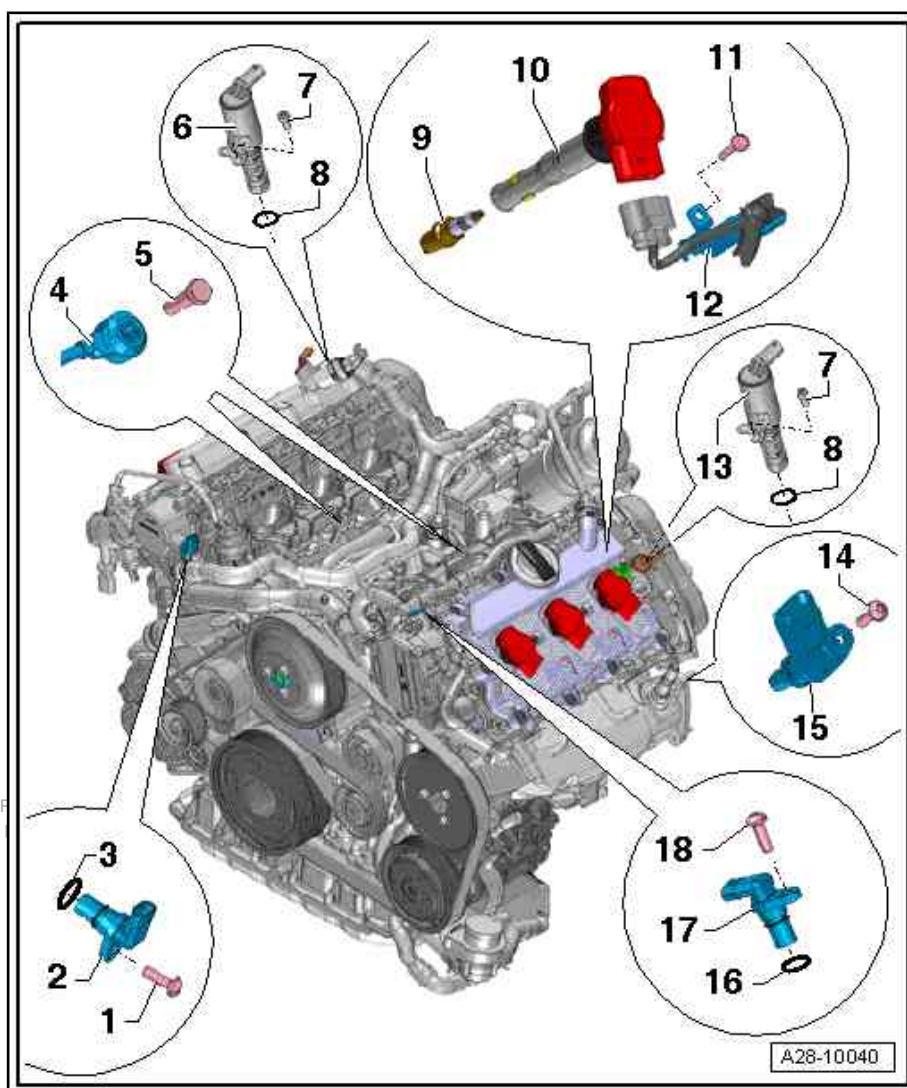
- 5 Nm

8 - O-ring

- Renew

9 - Spark plug

- Change interval ⇒ Maintenance tables
- Tightening torque
 ⇒ Maintenance ; Booklet 812 or ⇒ Maintenance ; Booklet 818





10 - Ignition coil

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

11 - Bolt

- ☐ 5 Nm

12 - Electrical wiring harness

13 - Camshaft control valve 2 - N208-

14 - Bolt

- ☐ 9 Nm

15 - Engine speed sender - G28-

- ☐ Removing and installing ⇒ [page 64](#)

16 - O-ring

- ☐ Renew

17 - Hall sender 2 - G163-

- ☐ Removing and installing ⇒ [page 63](#)

18 - Bolt

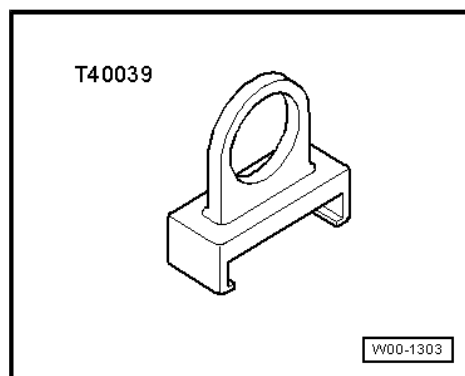
- ☐ 9 Nm

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2.3 Removing and installing ignition coils

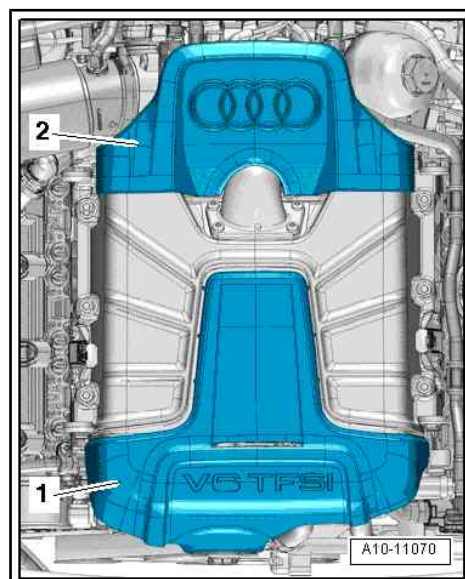
Special tools and workshop equipment required

- ◆ Puller - T40039-

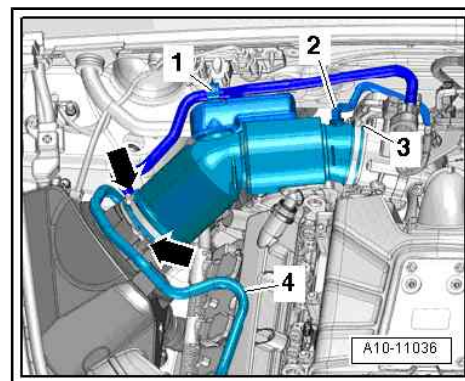


Removing

- Lift off engine cover panels -1- and -2-.



- Move clear fuel line -4- and line -1- leading to activated charcoal filter on air cleaner housing and air pipe.
- Detach vacuum hose -2- from connection on air hose.
- Remove air pipe. To do so, release hose clip -3- and clamps -arrows-.
- Remove air cleaner housing.

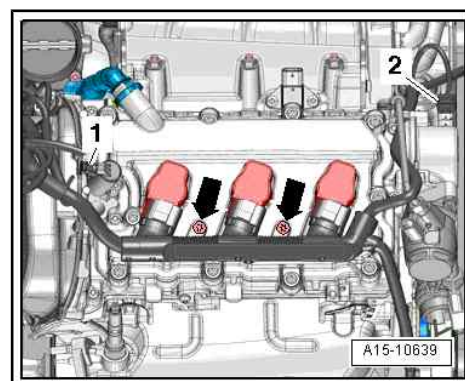


- Remove bolts -arrows- and unplug electrical connectors at ignition coils.
- Move electrical wiring harness down slightly.



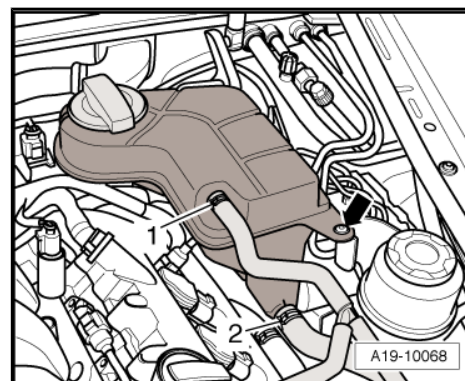
Note

Disregard -items 1, 2-.



Cylinder bank 2 (left-side):

- Remove bolt -arrow-.
- Unplug electrical connector for coolant shortage indicator switch - F66- at bottom of expansion tank and move expansion tank to one side with coolant hoses -1- and -2- attached.

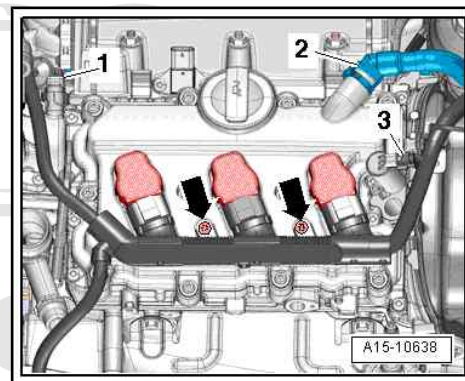


- Remove bolts -arrows- and unplug electrical connectors at ignition coils.
- Move electrical wiring harness down slightly.



Note

Disregard -items 1, 2, 3-.



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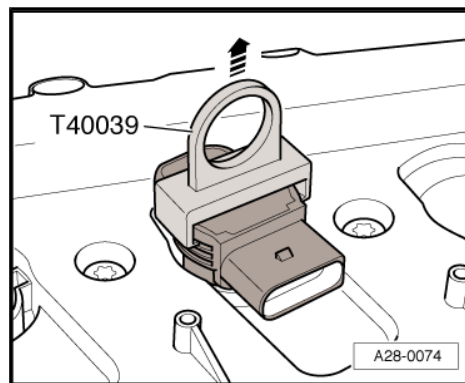
Continuation for both sides:

- Remove ignition coils using puller - T40039- .

Installing

- Tightening torques ➔ [page 17](#) and ➔ [page 59](#)

Install in reverse order.



2.4 Removing and installing knock sensors -G61- / -G66-

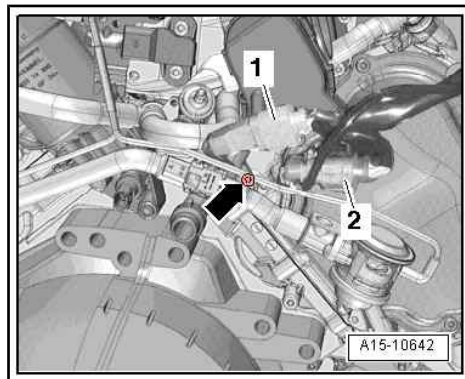
Removing

- Remove supercharger ➔ Rep. gr. 21 .
- Remove intake manifold bottom sections (left and right) ➔ [page 23](#) .
- Remove electrical connector -1- for knock sensor 1 - G61- from bracket (right-side) and unplug connector.



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Disregard -item 2- and -arrow-.

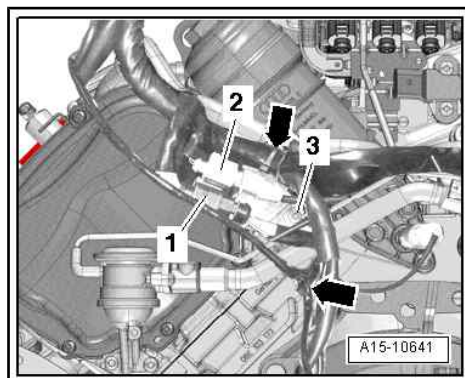


- Remove electrical connector -2- for knock sensor 2 - G66- from bracket (left-side) and unplug connector.



Note

Disregard items marked -1-, 3- and -arrows-.



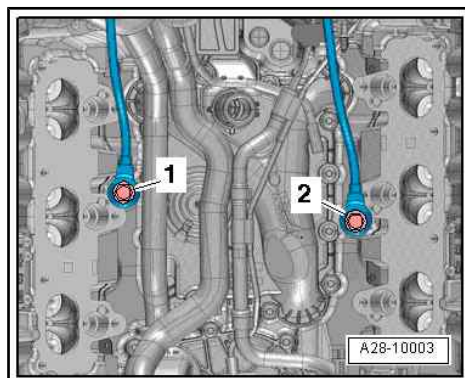
- Remove bolt -1- for knock sensor 1 - G61- and bolt -2- for knock sensor 2 - G66- and detach knock sensors.

Installing

- Tightening torque ➔ [page 59](#)

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

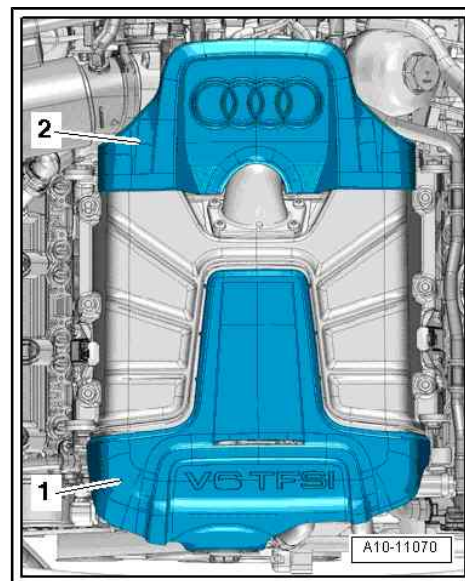
- Install intake manifold bottom sections (left and right) ➔ [page 23](#) .
- Install supercharger ➔ Rep. gr. 21 .



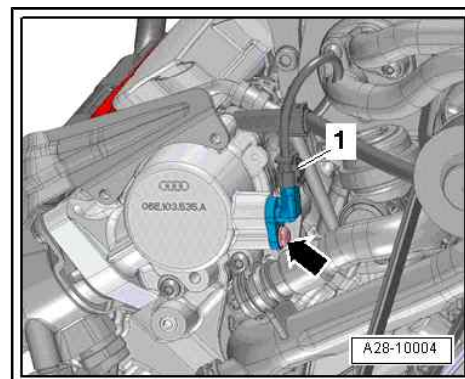
2.5 Removing and installing Hall senders - G40- / -G163-

Removing

- Lift off engine cover panel (front) -1-.



- Unplug electrical connector -1-.
- Remove bolt -arrow- and detach Hall sender - G40- (cylinder bank 1).

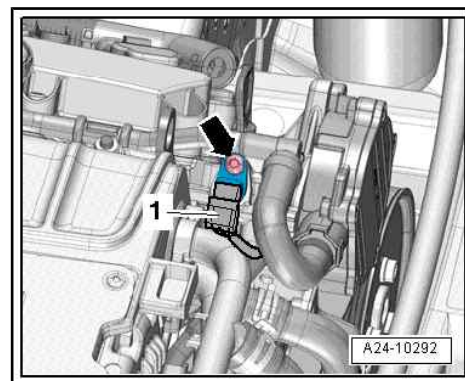


- Unplug electrical connector -1-.
- Remove bolt -arrow- and detach Hall sender 2 - G163- (cylinder bank 2).

Installing

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

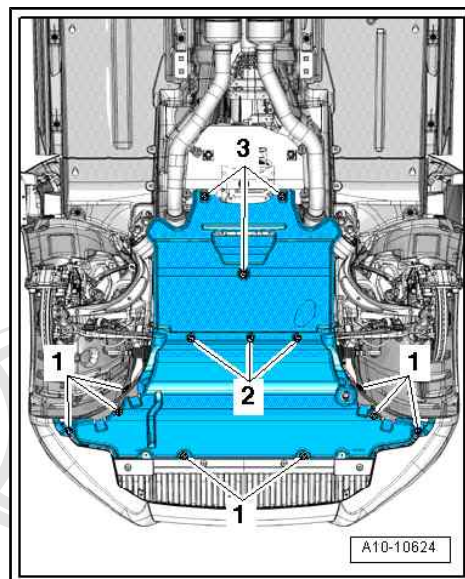
- Fit new O-rings.
- Tightening torques: ignition system - exploded view
⇒ [page 59](#)



2.6 Removing and installing engine speed sender - G28-

Removing

- Release fasteners -1, 2, 3- and remove noise insulation panels.



- Unplug electrical connector -2-.
- Unscrew bolt -1- and remove engine speed sender - G28-.

Installing

Install in reverse order.

- Tightening torques: refer to overview of fitting locations
⇒ [page 7](#).

