

Workshop Manual

Audi A5 Cabriolet 2009 ➤

Audi A5 Coupé 2008 ➤

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

Engine ID	CALA								
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Edition 12.2008

Audi

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List of Workshop Manual Repair Groups

Repair Group

24 - Mixture preparation - injection

28 - Ignition system



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

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Simos direct petrol injection and ignition system (6-cyl. 3.2 ltr. 4-valve) - Edition 12.2008



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24 – Mixture preparation - injection

1 Safety precautions and rules for cleanliness

1.1 General notes on self-diagnosis

- ◆ The engine control unit has a self-diagnosis capability. Before carrying out repairs and fault finding the fault 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 1](#).

1.2 Safety precautions

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



WARNING

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

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

- *The use of test equipment while driving causes distraction.*
- *There is an increased risk of injury if test equipment is not secured.*
- ◆ *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 damage to the fuel injection and ignition system, the following must be noted:



WARNING

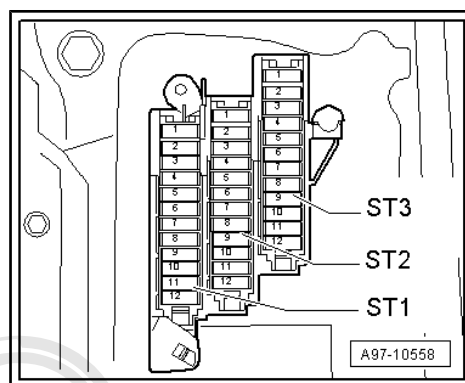
- ◆ *The fuel system operates under high pressure. The pressure in the high-pressure part of the injection system must be reduced to a residual pressure prior to opening the system ➔ [page 3](#) .*
- ◆ *A clean cloth must then be wrapped around the connection and the residual pressure dissipated by carefully loosening the connection.*



Caution

- ◆ *Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.*
- ◆ *Observe notes on procedure for disconnecting the battery ➔ Rep. Gr. 27 .*

- ◆ If the battery is not disconnected, the fuse for the fuel pump control unit -J538- (located in the fuse carrier in the driver's side of the dash panel) must be removed as a precaution before opening the fuel system, because the fuel pump will otherwise be activated by the contact switch on the driver's door.
- ◆ Persons wearing a cardiac pacemaker must at all times maintain a safe distance from high-voltage components such as the ignition system and gas-discharge headlights.
- ◆ Do not open any fuel line connections while the engine is running.
- ◆ Always switch off the ignition before connecting or disconnecting injection or ignition system wiring or tester cables.
- ◆ If engine is to be operated at cranking speed without it starting (e.g. compression test), unplug connectors from ignition coils and remove fuse for electric fuel pump.
- ◆ Certain tests may lead to a fault being detected by the control unit and stored. The fault memory should therefore be interrogated and (if necessary) erased after completing the tests and any repair work that may be required.
- ◆ Always switch off the ignition before cleaning the engine.
- ◆ Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.



1.3 Rules for cleanliness when working on the injection system

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

- ◆ Carefully clean connection points and the surrounding area with engine cleaner or brake cleaner and dry thoroughly before opening.

- ◆ Plug open lines and connections with suitable protective caps immediately.
- ◆ Place parts that have been removed on a clean surface and cover them over. Use only lint-free cloths.
- ◆ Only install clean components; replacement parts should only be unpacked immediately prior to installation. Do not use parts that have been previously unpacked and stored away loose (e.g. in toolboxes, etc.).
- ◆ When the system is open: Do not work with compressed air. Do not move the vehicle unless absolutely necessary.

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



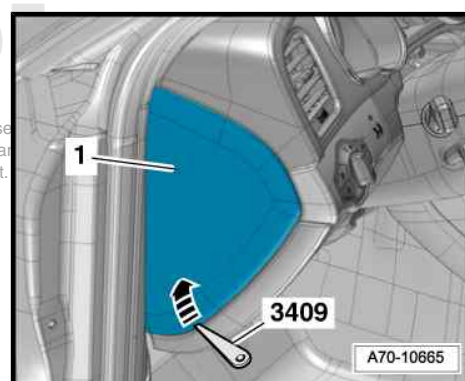
Caution

The injection system consists of a high-pressure section (maximum approx. 120 bar) and a low-pressure section (approx. 6 bar).

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

Reducing fuel pressure in high-pressure section

- Connect up the vehicle diagnostic, testing and information system -VAS 5051B- .
 - Start engine and run at idling speed.
 - Select "Engine electronics" in vehicle self-diagnosis.
 - Then select "Measured values".
 - Select "Fuel pressure" from the list.
 - With the engine idling, the fuel pressure displayed will be between 30 and 40 bar.
-
- Pry off cover -1- -arrow- on left side of dash panel using removal wedge -3409- or similar.



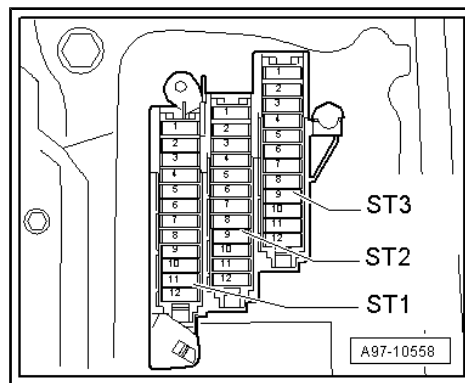
Protected by copyright. Copying for private or commercial purpose permitted unless authorised by AUDI AG. AUDI AG does not guarantee with respect to the correctness of information in this document.

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



Note

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



WARNING

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

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

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

The following operations must be performed after completing repair work:

- Refit fuse.
- Erase fault memory and generate readiness code in engine control unit using "Guided Functions" mode of vehicle diagnostic, testing and information system -VAS 5051B- .

1.5 Checking for leaks in fuel system

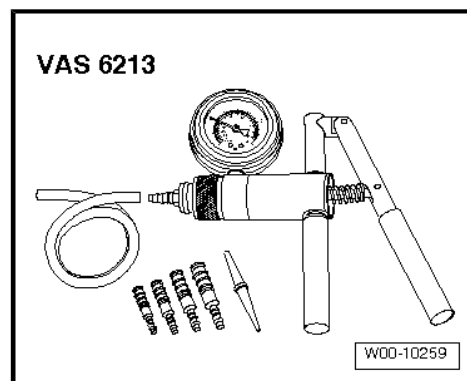
Proceed as follows:

- 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 of fuel system again for leaks.

1.6 Checking vacuum system

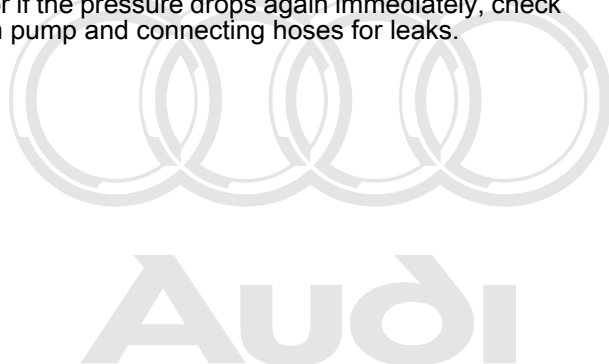
Special tools and workshop equipment required

◆ 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 a fault is stored in the fault 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 hand vacuum pump -VAS 6213- or if the pressure drops again immediately, check hand vacuum pump and connecting hoses for leaks.



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2 Injection system

2.1 Technical data

Test data	3.2 ltr. / 4V FSI
Idling speed Cannot be adjusted; regulated by idling speed stabilisation	650 ... 750 rpm ¹⁾
Fuel pressure after high-pressure pump	40 ... 110 bar
Fuel pressure before high-pressure pump	3.0 ... 5.7 bar
• ¹⁾ Depending on demands placed on engine control unit.	

2.2 Overview of fitting locations

Engine compartment (right-side)

1 - Lambda probe -G39-

- ☐ Fitting location
⇒ [page 15](#)
- ☐ Fitting location of electrical connector
⇒ [page 15](#)
- ☐ Removing and installing
⇒ [page 45](#)
- ☐ 55 Nm

2 - Exhaust camshaft control valve 1 -N318-

- ☐ Fitting location
⇒ [page 12](#)
- ☐ Renew O-ring
- ☐ 2.5 Nm

3 - Camshaft control valve 1 -N205-

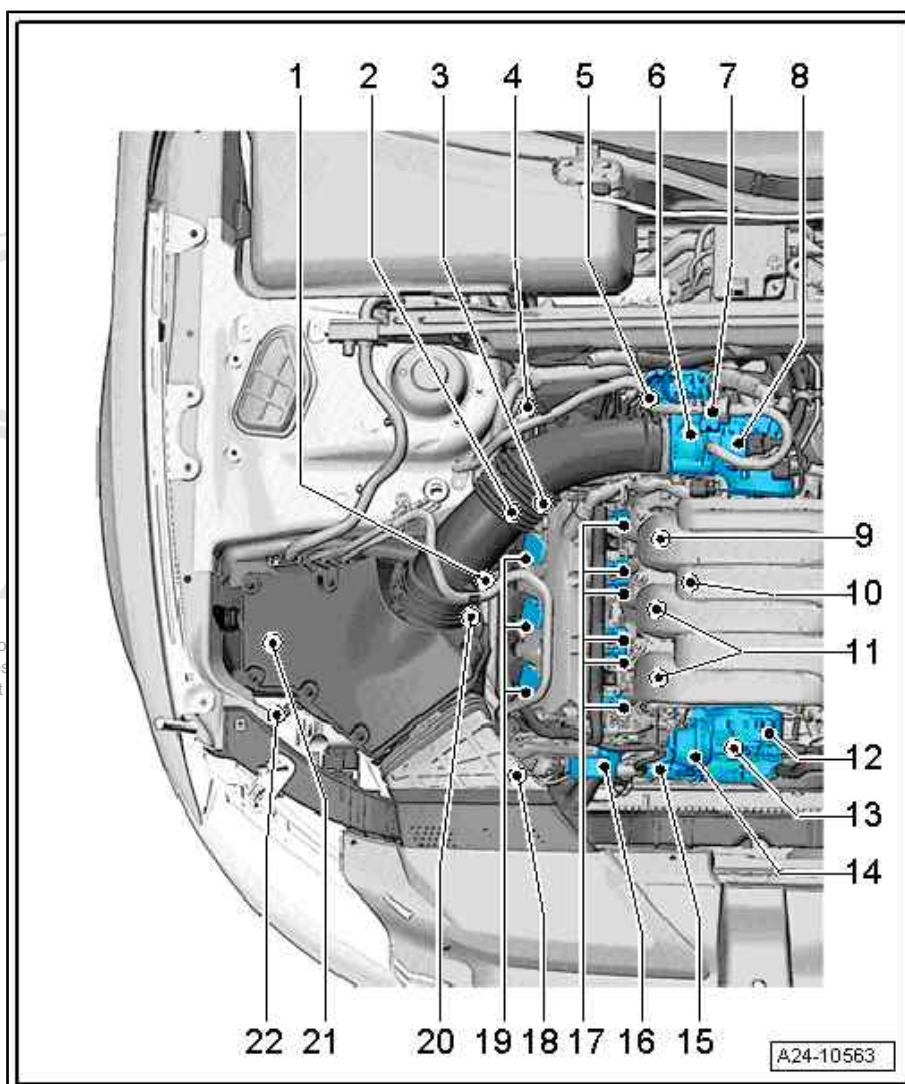
- ☐ Fitting location
⇒ [page 12](#)
- ☐ Renew O-ring
- ☐ 2.5 Nm

4 - Lambda probe after catalytic converter -G130-

- ☐ Fitting location
⇒ [page 15](#)
- ☐ Fitting location of connector ⇒ [page 15](#)
- ☐ Removing and installing
⇒ [page 47](#)
- ☐ 55 Nm

5 - Connectors

- ☐ For injectors, cylinder bank 1
- ☐ For throttle valve module -J338-
- ☐ For knock sensor 1 -G61-



- ☐ For Lambda probe -G39-
- ☐ For Lambda probe after catalytic converter -G130-
- ☐ Fitting locations of connectors ➔ [page 15](#)

6 - Throttle valve module -J338-

- ☐ Including 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 renewing, perform adaption in “Guided Functions”, option “Adapt throttle valve module”
- ☐ Fitting location ➔ [page 14](#)

7 - Activated charcoal filter solenoid valve 1 -N80-

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

- ☐ Fitting location ➔ [page 14](#)

9 - Injector, cylinder bank 1

- ☐ Injector, cylinder 3 -N32-
- ☐ Fitting location ➔ [page 12](#)
- ☐ Removing and installing ➔ [page 39](#)

10 - Knock sensor 1 -G61-

- ☐ Fitting location ➔ [page 12](#)
- ☐ Fitting location of electrical connector ➔ [page 15](#)
- ☐ Removing and installing ➔ [page 64](#)

11 - Injectors, cylinder bank 1

- ☐ Injector, cylinder 1 -N30-
- ☐ Injector, cylinder 2 -N31-
- ☐ Fitting location ➔ [page 12](#)
- ☐ Removing and installing ➔ [page 39](#)

12 - Variable intake manifold position sender -G513-

13 - Variable intake manifold changeover valve -N156-

- ☐ Fitting location ➔ [page 13](#)

14 - Actuator for intake manifold changeover

- ☐ Vacuum unit

15 - Coolant temperature sender -G62-

- ☐ Fitting location ➔ [page 13](#)

16 - Hall sender -G40-

- ☐ Fitting location ➔ [page 12](#)
- ☐ Renew O-ring
- ☐ 9 Nm
- ☐ Removing and installing ➔ [page 65](#)

17 - 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-
- ☐ Fitting location ➔ [page 12](#)

18 - High-pressure pump

- ☐ With fuel pressure sender, low pressure -G410- and fuel metering valve -N290-
- ☐ Fitting location ➔ [page 14](#)

- ☐ Removing and installing ➤ [page 35](#)

19 - 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 62](#)

20 - Hall sender 3 -G300-

- ☐ Fitting location ➤ [page 12](#)
- ☐ Renew O-ring
- ☐ 9 Nm
- ☐ Removing and installing ➤ [page 65](#)

21 - Secondary air pump motor -V101-

- ☐ Not installed in all vehicles (only EU 5)
- ☐ Removing and installing ➤ Rep. Gr. 26

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

- ☐ Not installed in all vehicles

Engine compartment (left-side)

1 - Bracket (left-side) for connectors

- ☐ For knock sensor 2 - G66-
- ☐ For injectors, cylinder bank 2
- ☐ For fuel pressure sender -G247-
- ☐ Fitting locations of connectors ➤ [page 14](#)

2 - Lambda probe 2 after catalytic converter -G131-

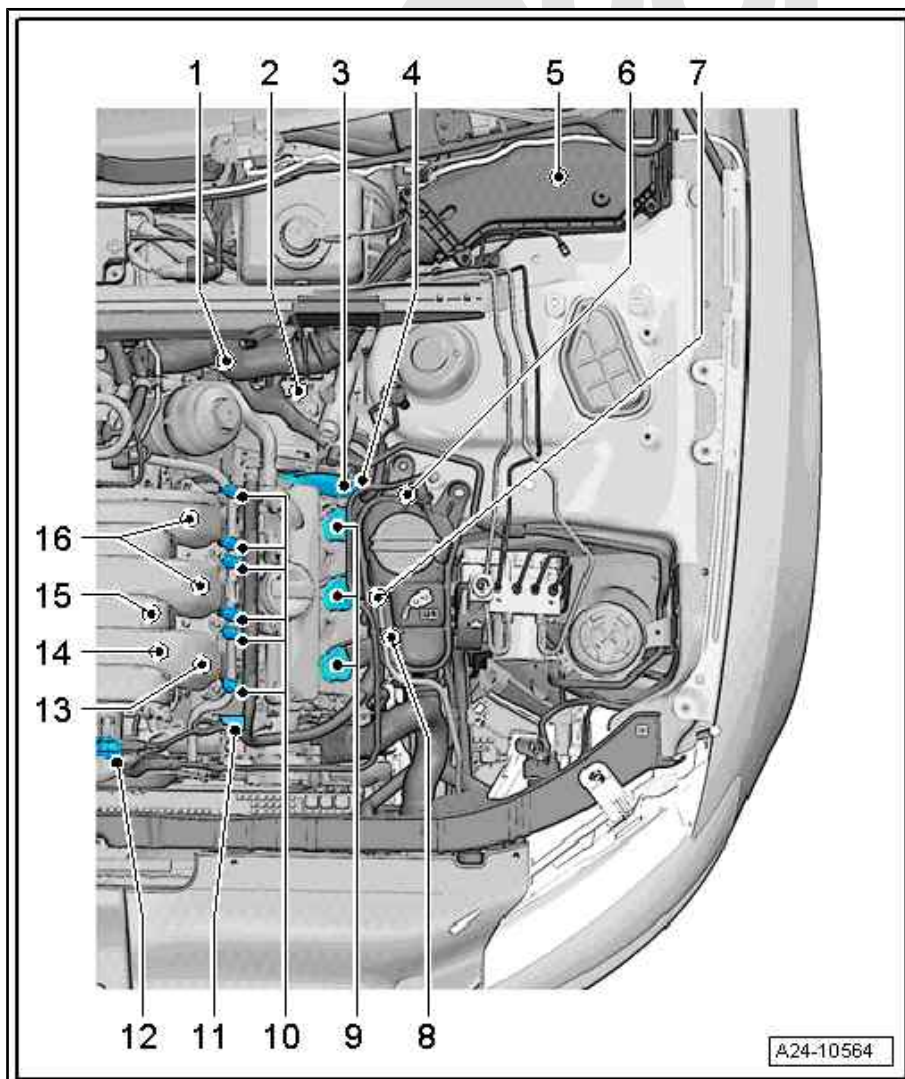
- ☐ Fitting location ➤ [page 16](#)
- ☐ Fitting location of electrical connector ➤ [page 15](#)
- ☐ Removing and installing ➤ [page 51](#)
- ☐ 55 Nm

3 - Camshaft control valve 2 - N208-

- ☐ Fitting location ➤ [page 12](#)
- ☐ Renew O-ring
- ☐ 2.5 Nm

4 - Exhaust camshaft control valve 2 -N319-

- ☐ Fitting location



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⇒ [page 12](#)

- ☐ Renew O-ring
- ☐ 2.5 Nm

5 - Engine control unit -J623-

- ☐ Fitting location ⇒ [page 10](#)
- ☐ Removing and installing ⇒ [page 55](#)

6 - Lambda probe 2 -G108-

- ☐ Fitting location ⇒ [page 16](#)
- ☐ Fitting location of electrical connector ⇒ [page 15](#)
- ☐ Removing and installing ⇒ [page 49](#)
- ☐ 55 Nm

7 - Hall sender 4 -G301-

- ☐ Fitting location ⇒ [page 12](#)
- ☐ Renew O-ring
- ☐ 9 Nm
- ☐ Removing and installing ⇒ [page 65](#)

8 - Valve for oil pressure control -N428-

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

9 - 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 62](#)

10 - Actuators for camshaft adjustment

- ☐ Actuator 7 for camshaft adjustment -F372-
- ☐ Actuator 8 for camshaft adjustment -F373-
- ☐ Actuator 9 for camshaft adjustment -F374-
- ☐ Actuator 10 for camshaft adjustment -F375-
- ☐ Actuator 11 for camshaft adjustment -F376-
- ☐ Actuator 12 for camshaft adjustment -F377-
- ☐ Fitting location ⇒ [page 12](#)

11 - Hall sender 2 -G163-

- ☐ Fitting location ⇒ [page 12](#)
- ☐ Renew O-ring
- ☐ 9 Nm
- ☐ Removing and installing ⇒ [page 65](#)

12 - Variable intake manifold position sender -G513-

- ☐ Fitting location ⇒ [page 13](#)

13 - Injector, cylinder bank 2

- ☐ Injector, cylinder 4 -N33-

14 - Fuel pressure sender -G247-

- ☐ Fitting location ⇒ [page 12](#)

15 - Knock sensor 2 -G66-

- ☐ Fitting location ⇒ [page 12](#)
- ☐ Fitting location of connector ⇒ [page 14](#)
- ☐ Removing and installing ⇒ [page 64](#)



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16 - Injectors, cylinder bank 2

- ☐ Injector, cylinder 5 -N83-
- ☐ Injector, cylinder 6 -N84-
- ☐ Fitting location ⇒ [page 12](#)
- ☐ Removing and installing ⇒ [page 39](#)

A - Engine speed sender -G28-

- ☐ Fitting location ⇒ [page 14](#)
- ☐ Removing and installing ⇒ [page 66](#)
- ☐ 9 Nm

B - Fuel pump control unit -J538-

- ☐ Fitting location ⇒ [page 11](#)
- ☐ Removing and installing ⇒ Rep. Gr. 20

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

- ☐ In footwell on accelerator pedal (both senders are accommodated in one housing)
- ☐ Fitting location ⇒ [page 11](#)
- ☐ Removing and installing ⇒ Rep. Gr. 20

D - Brake light switch -F- / brake pedal switch -F47-

- ☐ In footwell on brake pedal
- ☐ Removing and installing ⇒ Rep. Gr. 45
- ☐ Fitting location ⇒ [page 11](#)

E - Clutch position sender -G476-

- ☐ Only fitted on vehicles with manual gearbox
- ☐ Fitting location ⇒ [page 11](#)

F - Oil pressure switch -F22-

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

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

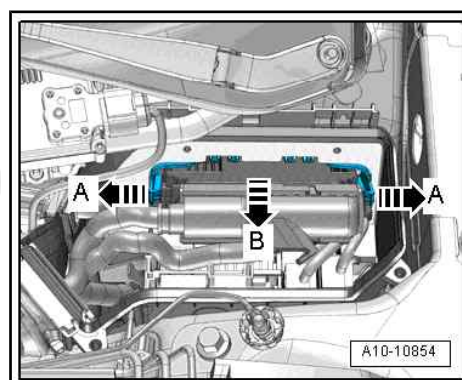
- ☐ Fitting location ⇒ [page 13](#)

H - Relay and fuse holder in electronics box in plenum chamber (left-side)

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

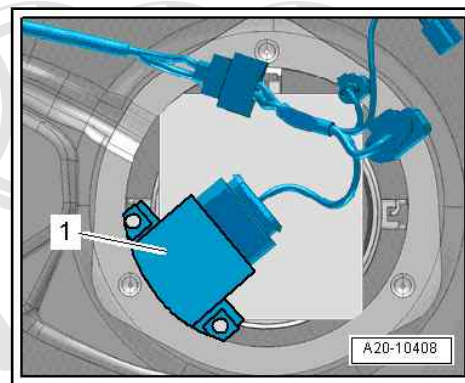
Fitting location of engine control unit -J623-

- ◆ In left-side electronics box in engine compartment.



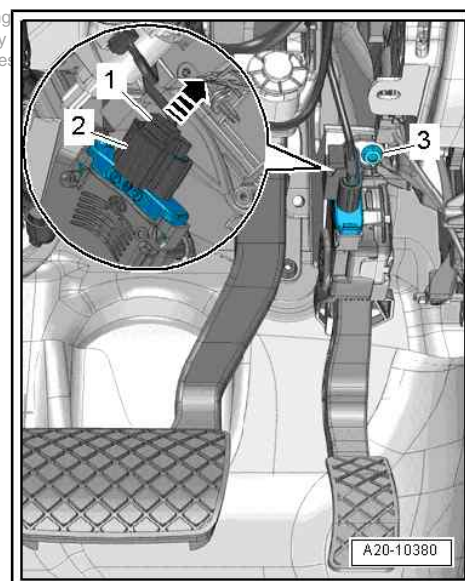
Fuel pump control unit -J538- -1-

Removing and installing ⇒ Rep. Gr. 20



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

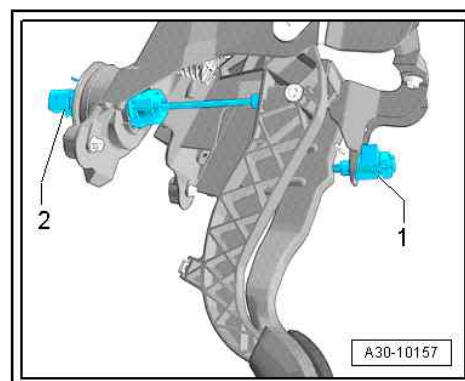
2 - Electrical connector



Clutch position sender -G476- -2-

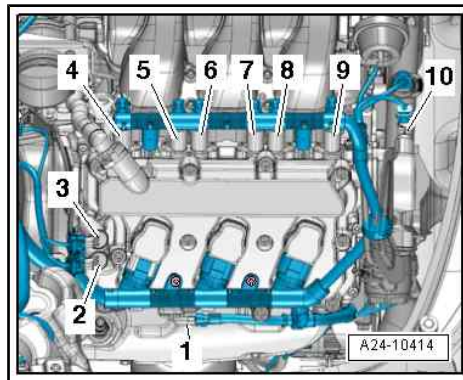
Integrated functions: clutch pedal switch for engine start -F194- and clutch pedal switch -F36-

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



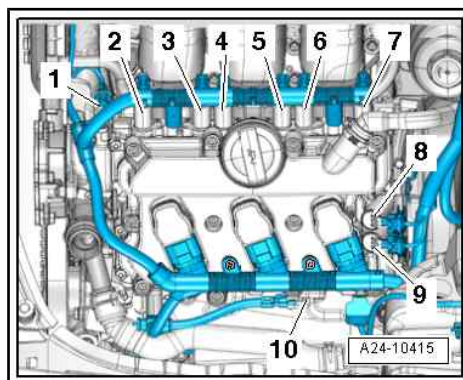
Fitting location on cylinder bank 1 (right-side)

- 1 - Hall sender 3 -G300-
- 2 - Exhaust camshaft control valve 1 -N318-
- 3 - Camshaft control valve 1 -N205-
- 4 - Actuator 6 for camshaft adjustment -F371-
- 5 - Actuator 5 for camshaft adjustment -F370-
- 6 - Actuator 4 for camshaft adjustment -F369-
- 7 - Actuator 3 for camshaft adjustment -F368-
- 8 - Actuator 2 for camshaft adjustment -F367-
- 9 - Actuator 1 for camshaft adjustment -F366-
- 10 - Hall sender -G40-



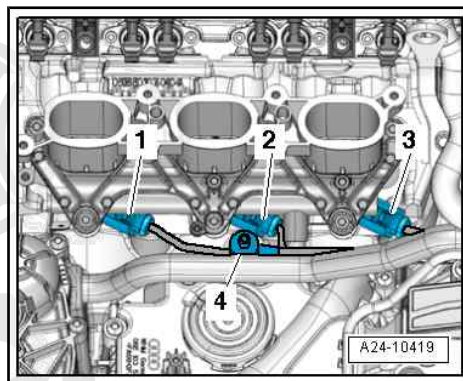
Fitting locations on cylinder bank 2 (left-side)

- 1 - Hall sender 2 -G163-
- 2 - Actuator 7 for camshaft adjustment -F372-
- 3 - Actuator 8 for camshaft adjustment -F373-
- 4 - Actuator 9 for camshaft adjustment -F374-
- 5 - Actuator 10 for camshaft adjustment -F375-
- 6 - Actuator 11 for camshaft adjustment -F376-
- 7 - Actuator 12 for camshaft adjustment -F377-
- 8 - Camshaft control valve 2 -N208-
- 9 - Exhaust camshaft control valve 2 -N319-
- 10 - Hall sender 4 -G301-



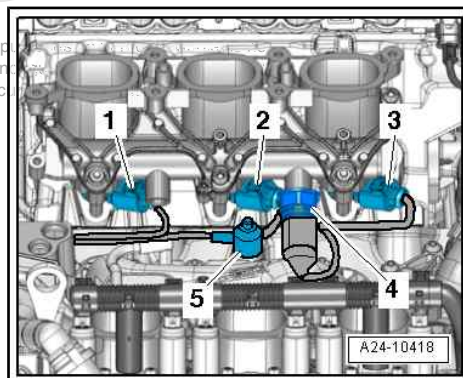
Fitting locations: components on inside of right cylinder bank 1

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

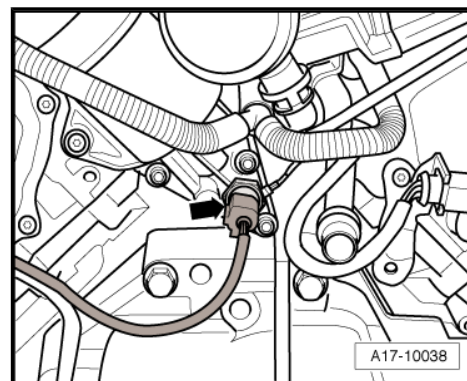


Fitting locations: components on inside of left cylinder bank 2

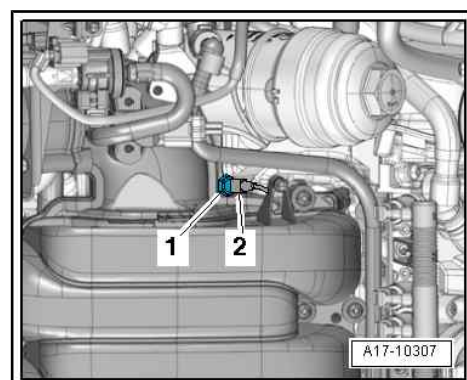
- 1 - Injector, cylinder 6 -N84-
- 2 - Injector, cylinder 5 -N83-
- 3 - Injector, cylinder 4 -N33-
- 4 - Fuel pressure sender -G247-
- 5 - Knock sensor 2 -G66-



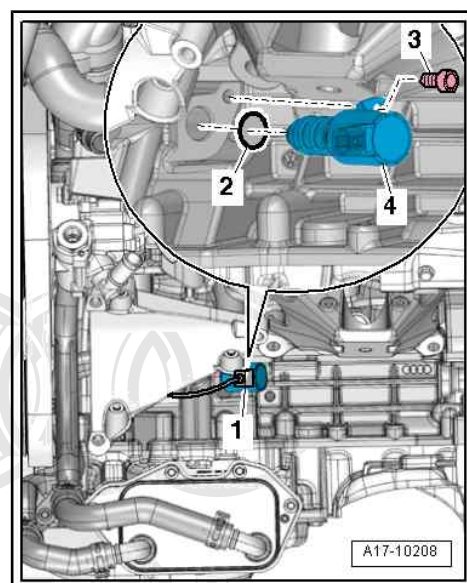
Oil pressure switch -F22- -arrow-



Oil pressure switch for reduced oil pressure -F378-

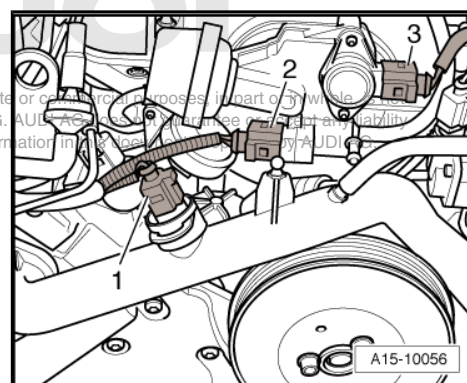


Valve for oil pressure control -N428-



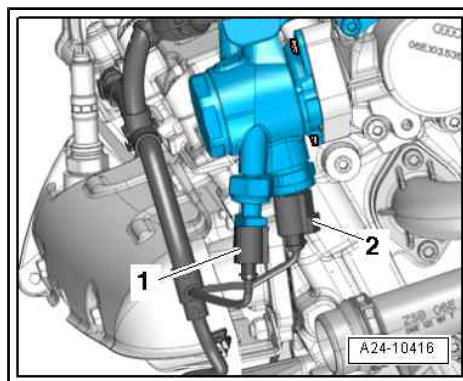
Fitting location: at front of engine

- 1 - Coolant temperature sender -G62-
- 2 - Variable intake manifold changeover valve -N156-
- 3 - Variable intake manifold position sender -G513-



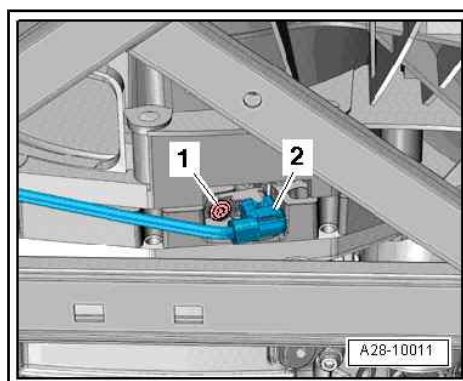
Fitting locations at high-pressure pump

- 1 - Fuel pressure sender for low pressure -G410-
- 2 - Fuel metering valve -N290-



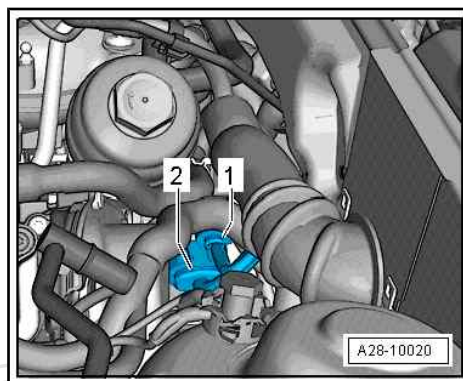
Fitting location of engine speed sender -G28-

- ◆ Bolted into gearbox from below



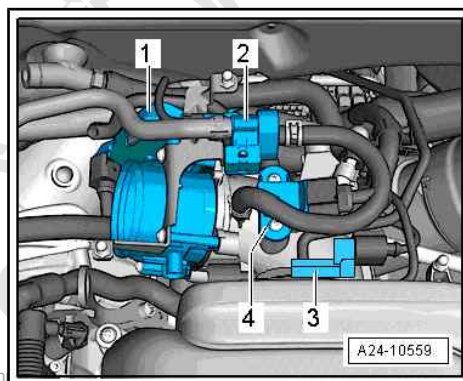
Electrical connectors

- 1 - Knock sensor 2 -G66-
- 2 - Injectors, cylinder bank 2, and for fuel pressure sender -G247-



Fitting location: at rear of intake manifold

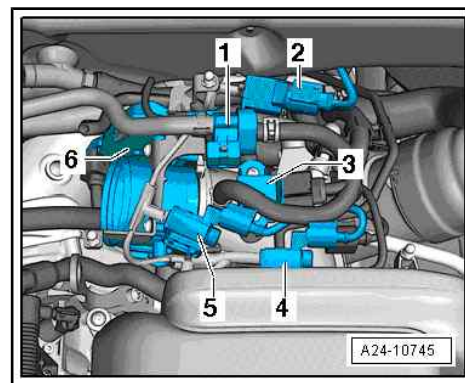
- 1 - Throttle valve module -J338-
- 2 - Activated charcoal filter solenoid valve 1 -N80-
- 3 - Climatronic coolant shut-off valve -N422- (only fitted on vehicles without auxiliary heater)
- 4 - Intake air temperature sender -G42- / intake manifold pressure sender -G71-



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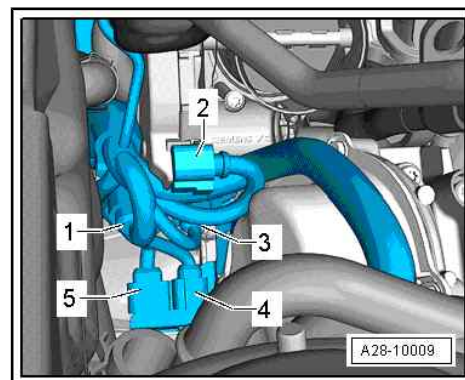
Fitting locations at rear of intake manifold (emission standard ULEV 2)

- 1 - Activated charcoal filter solenoid valve 1 -N80-
- 2 - Secondary air inlet valve -N112-
- 3 - Intake air temperature sender -G42- / intake manifold pressure sender -G71-
- 4 - Climatronic coolant shut-off valve -N422- (only fitted on vehicles without auxiliary heater)
- 5 - Secondary air inlet valve 2 -N320-
- 6 - Throttle valve module -J338-



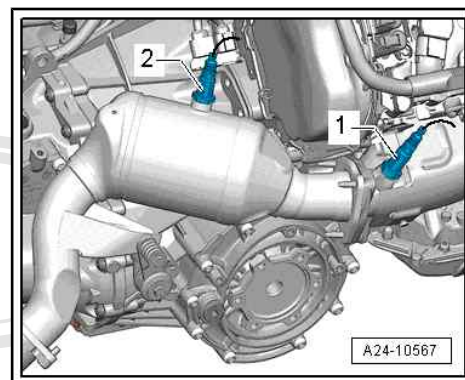
Electrical connectors on cylinder bank 1 (right-side)

- 1 - Injectors, cylinder bank 1
- 2 - Throttle valve module -J338-
- 3 - Knock sensor 1 -G61-
- 4 - Lambda probe -G39-
- 5 - Lambda probe after catalytic converter -G130-



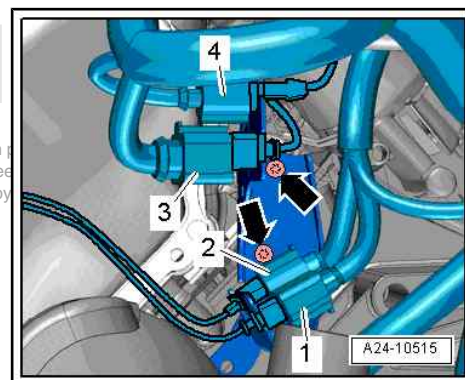
Fitting location of Lambda probes on cylinder bank 1 (right-side)

- 1 - Lambda probe -G39-
- 2 - Lambda probe after catalytic converter -G130-



Electrical connectors for Lambda probes on cylinder bank 2 (left-side)

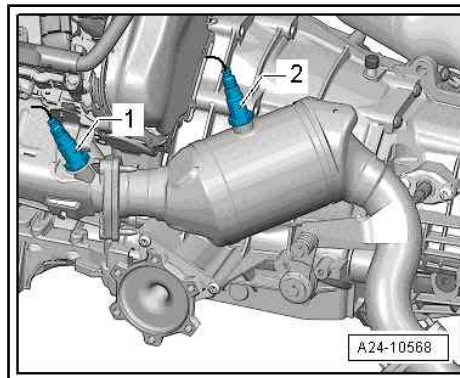
- 1 - Lambda probe 2 after catalytic converter -G131-
- 2 - Lambda probe 2 -G108-
- 3 - Injectors, cylinder bank 2, and for fuel pressure sender -G247-
- 4 - Knock sensor 2 -G66-



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

1 - Lambda probe 2 -G108-

2 - Lambda probe 2 after catalytic converter -G131-



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 811 or A5 Cabriolet
⇒ Maintenance ; Booklet 818
- ☐ Removing and installing
⇒ [page 17](#)
- ☐ Also clean snow screen (if fitted)

4 - Air duct

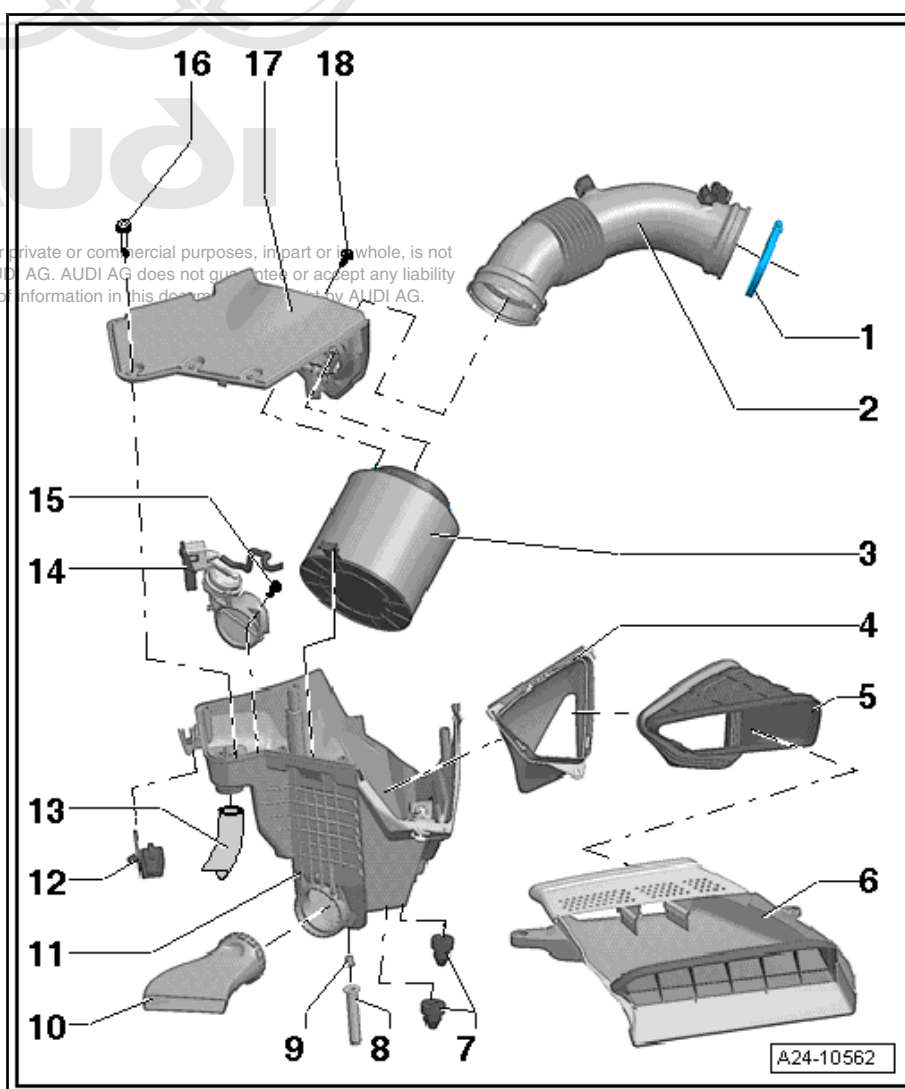
- ☐ Clipped into air cleaner housing (top section)
- ☐ Clean dirt and leaves out of air duct

5 - Air duct

- ☐ Clean dirt and leaves out of air duct

6 - Air duct

- ☐ To lock carrier
- ☐ Clean dirt and leaves



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 housing (bottom section)

- ☐ Clean any salt deposits or leaves and dirt out of air cleaner housing (bottom section)
- ☐ Check for dirt in water drain and clean as required (this is important)

12 - Retainer for securing air cleaner housing (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 housing (top section)

- ☐ Clean any salt deposits or leaves and dirt out of air cleaner housing (top section)

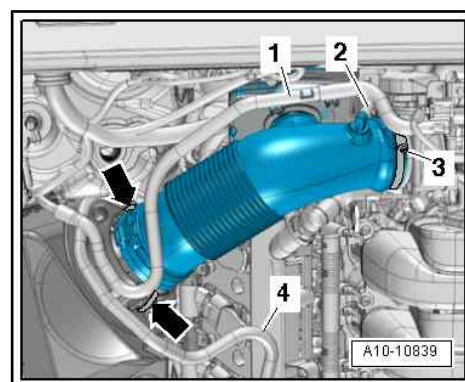
18 - Bolt

- ☐ 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.

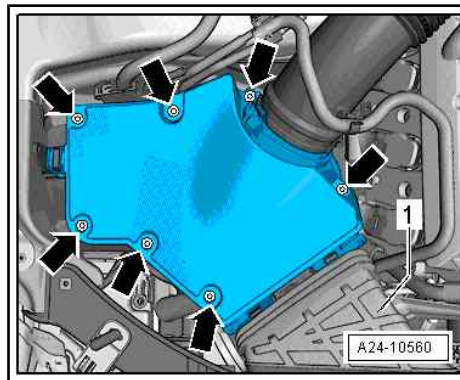


- Unscrew bolts -arrows- on top section of air cleaner housing and lift off top section of air cleaner housing.

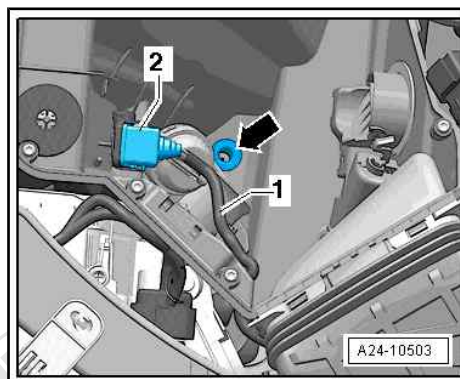


Note

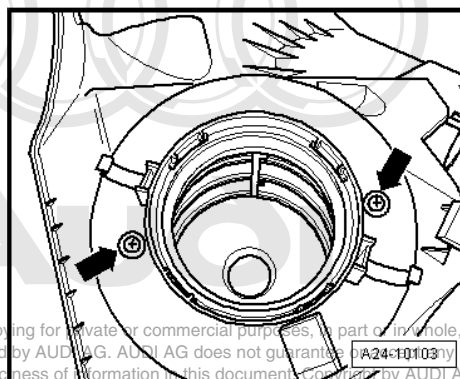
- ♦ Always use genuine part for air filter element.
- ♦ Use a silicone-free lubricant when installing the intake hose.
- ♦ Secure all hose connections with the correct type of hose clips (same as original equipment): ➔ Parts catalogue



- Check water drain hose -arrow- in air cleaner housing (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 housing (top section).



- Screw top section of air cleaner housing onto new air filter element.



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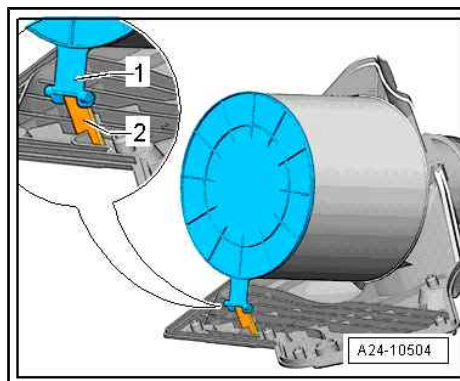
- Lug on air filter element -1- must make contact with lug on air cleaner housing -2-.
- Fit the top section of the air cleaner housing carefully on the bottom section, without using force.



Note

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

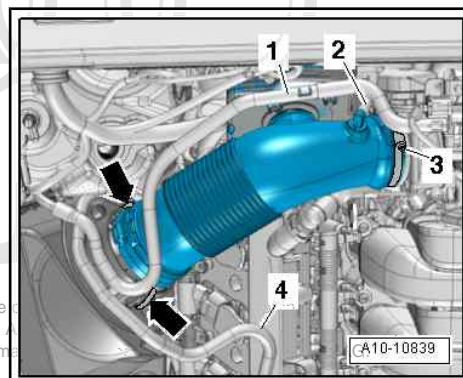
- Then secure top section of air cleaner housing to bottom section.
- Make sure that air hose is securely fitted.
- The remaining installation steps are carried out in the reverse sequence.



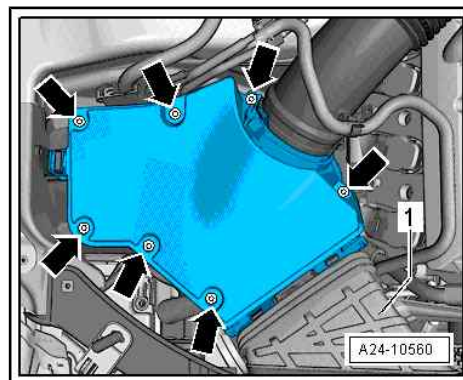
2.5 Removing air cleaner housing (bottom section)

Removing

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



- Unscrew bolts -arrows- on top section of air cleaner housing and lift off top section of air cleaner housing.

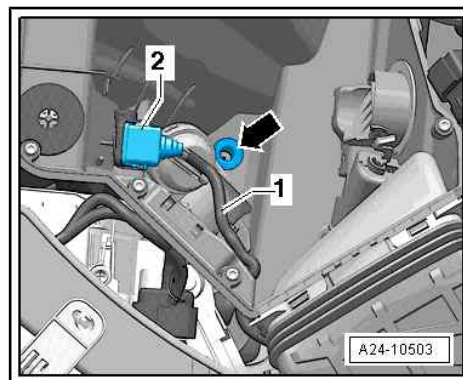


- Disconnect vacuum hose -1- at variable intake manifold change-over valve -N335- -2-.
- Release retainer for bottom section of air cleaner housing (press in rubber on left and right side and pull upwards).



Note

Do not use lubricant when installing retainer.



- Disconnect air hose -1- leading to secondary air pump.



Note

- ◆ *Item 1 is not installed in all vehicles (only EU 5).*
- ◆ *Electrical connector at variable intake manifold change-over valve -N335- is not fitted in all vehicles.*

- Carefully take out bottom section of air cleaner housing.

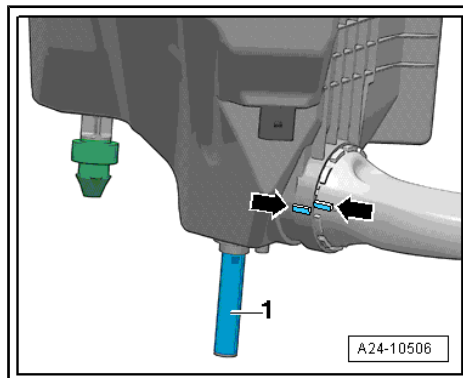
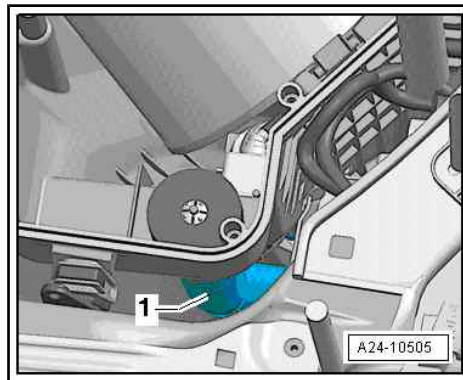
Installing



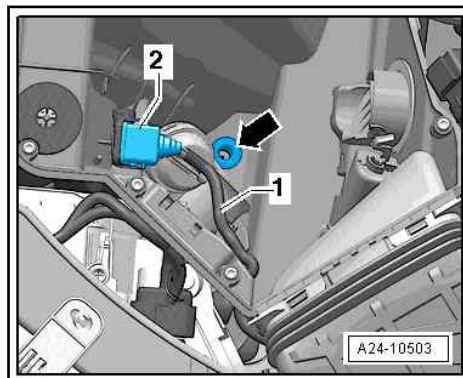
Note

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

- If warm air intake hose is fitted (for countries with cold climates only), make sure that air intake connection has engaged properly -arrows- (pay attention to markings).



- Check water drain hose -arrow- in air cleaner housing (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.
- Re-attach electrical connector at variable intake manifold change-over valve -N335- (if fitted).



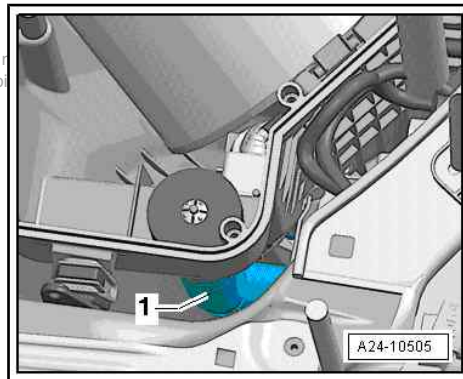
- Re-attach air hose -1- (if fitted).

- Re-install bottom section of air cleaner housing.

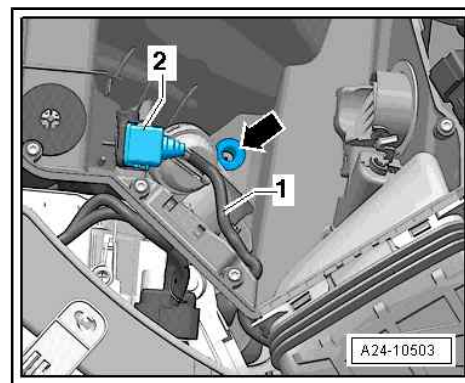


Note

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



- Slide vacuum hose -1- back onto connection of variable intake manifold change-over valve -N335- .



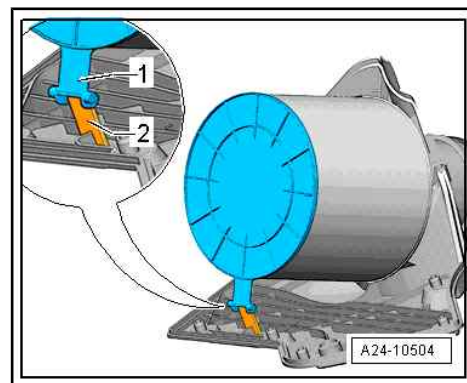
- Lug on air filter element -1- must make contact with lug on air cleaner housing -2-.
- Fit the top section of the air cleaner housing carefully on the bottom section, without using force.



Note

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

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



2.6 Intake manifold (top section) - exploded view



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1 - Vacuum hose
2 - Variable intake manifold changeover valve -N156-
3 - Bolt

- ☐ For variable intake manifold position sender -G513-
- ☐ 2.5 Nm

4 - Bolt

- ☐ 2.5 Nm

5 - Actuator for intake manifold change-over

- ☐ Installation position of toothed segments for intake manifold change-over ➔ [page 23](#)
- ☐ Replacement part is supplied together with -item 26-

6 - Seal

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

7 - Ball stud

- ☐ 2.5 Nm

8 - Intake manifold (top section)

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

9 - Seal

- ☐ Renew

10 - Throttle valve module -J338-
11 - Bracket
12 - Bolt

- ☐ 6 Nm

13 - Activated charcoal filter solenoid valve 1 -N80-
14 - Hose
15 - Bolt

- ☐ 3 Nm

16 - Intake air temperature sender -G42- / intake manifold pressure sender -G71-
17 - O-ring

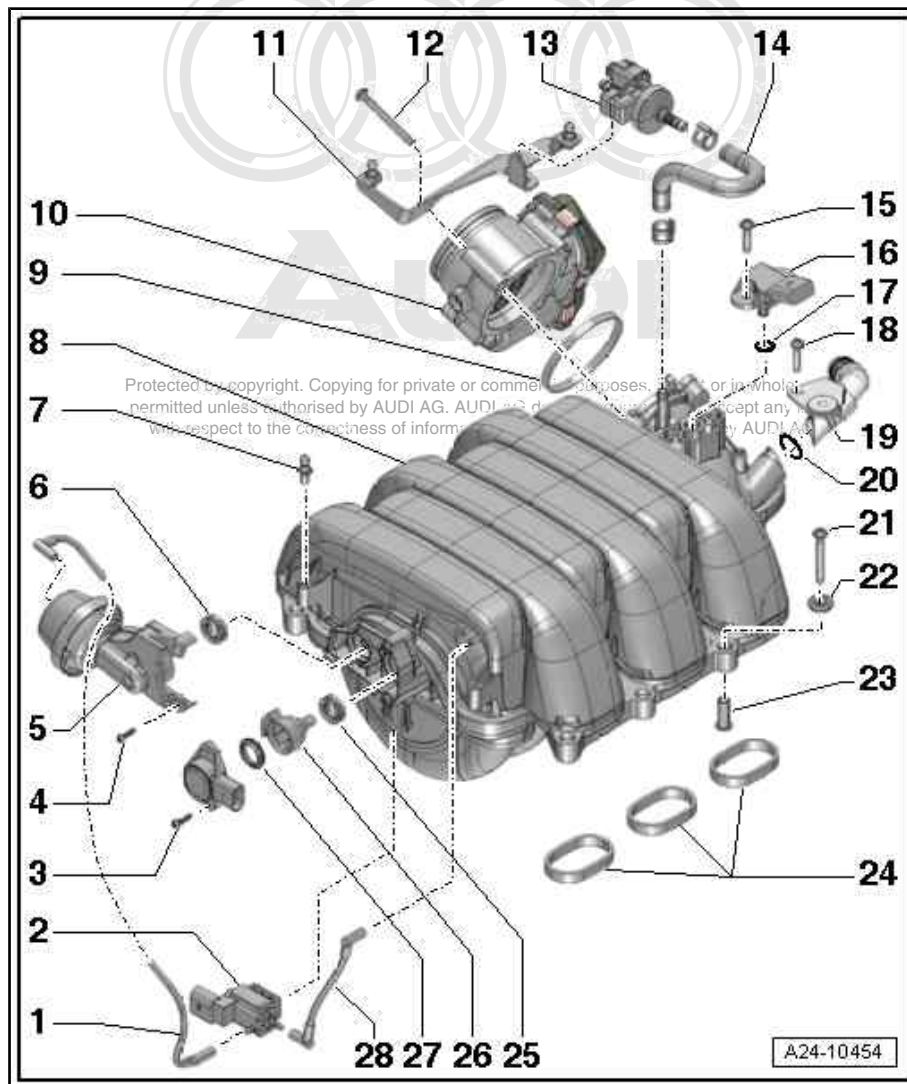
- ☐ Renew

18 - Bolt

- ☐ 2.5 Nm

19 - Crankcase breather hose
20 - O-ring

- ☐ Renew



21 - Bolt

- ☐ 8 Nm

22 - Washer

23 - Sleeve

24 - Gaskets

- ☐ Renew

25 - Seal

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

26 - Lever with toothed segment

- ☐ For intake manifold change-over
- ☐ Installation position of toothed segments ⇒ [page 23](#)
- ☐ Replacement part is supplied together with -item 5-

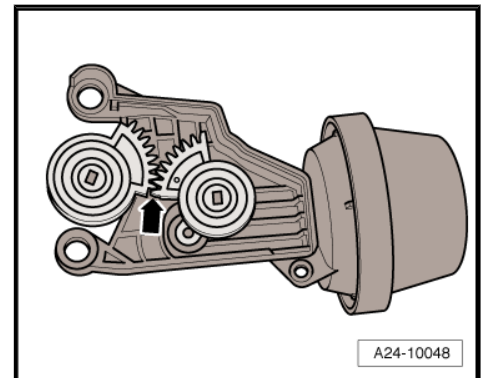
27 - Seal

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

28 - Vacuum hose

Installation position of toothed segments for intake manifold change-over

- The lower edges of the toothed segments must be flush -arrow-.



2.7 Intake manifold (bottom section) with fuel rail - exploded view

1 - Intake manifold (bottom section)

- ☐ Removing and installing (left and right)
⇒ [page 27](#)

2 - Sleeve

3 - Fuel pressure sender - G247-

- ☐ 20 Nm

4 - Bracket

5 - Bolt

- ☐ 9 Nm

6 - High-pressure pipe



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.

- ☐ Reducing fuel pressure in high-pressure section of injection system
⇒ [page 3](#)
- ☐ Do not alter shape
- ☐ Do NOT bend open retainer for fuel pipe
- ☐ If retainer has been bent open or fuel pipe has to be renewed, retainer must also be renewed
- ☐ Tightening ⇒ [page 25](#)

7 - Bolt

- ☐ 9 Nm

8 - Threaded connection

- ☐ 40 Nm

9 - Stud

10 - Nut

- ☐ 9 Nm

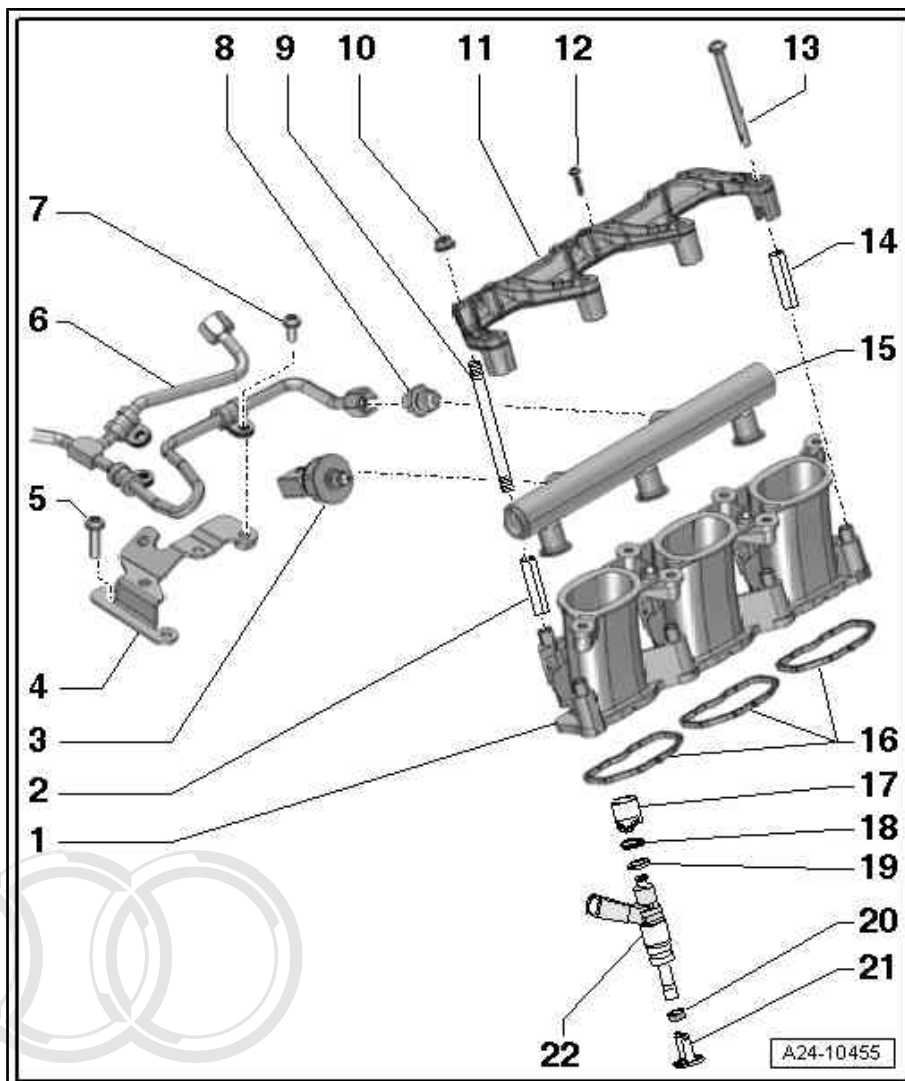
11 - Retainer for fuel rail

12 - Bolt

- ☐ 2.5 Nm

13 - Bolt

- ☐ 9 Nm



14 - Sleeve

15 - Fuel rail

16 - Gaskets

- ☐ Renew

17 - 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.

18 - O-ring

- ☐ Renew
- ☐ Lubricate lightly with clean engine oil

19 - Spacer ring

- ☐ Renew if damaged

20 - Combustion chamber ring seal

- ☐ Renewing ⇒ [“2.14 Removing and installing injectors”, page 39](#)

21 - Radial compensation element

- ☐ Renew if damaged
- ☐ Clip onto support ring -item 17-

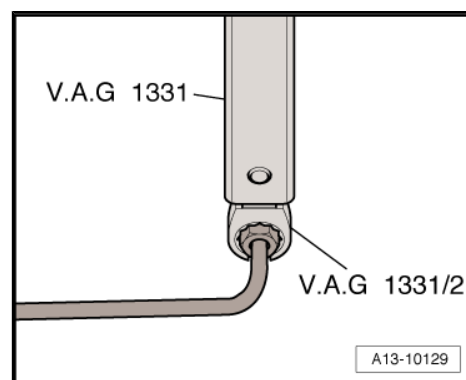
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22 - Injector

Removing and installing ⇒ [page 39](#)

Installing high-pressure pipe

- Tighten union nut on high-pressure pipe hand-tight initially.
- Ensure that high-pressure pipe is not under tension.
- To tighten high-pressure pipe on fuel rail, use torque wrench
-V.A.G 1331- with tool insert (open-end ring spanner, 17 mm)
-V.A.G 1331/2- .
- Tightening torque for union nut on high-pressure pipe: 27 Nm



2.8 Removing and installing intake manifold (top section)

Removing



Note

Fit all cable ties in the original positions when installing.

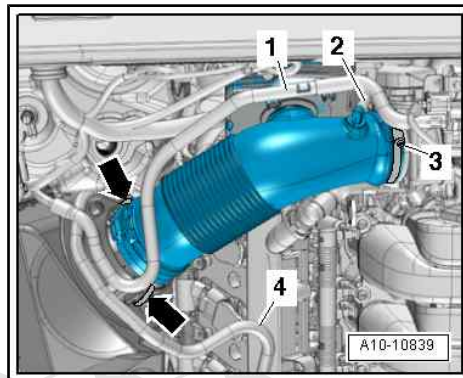
- Pull off engine cover panels (front and rear).

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



Note

Disregard item -4-.

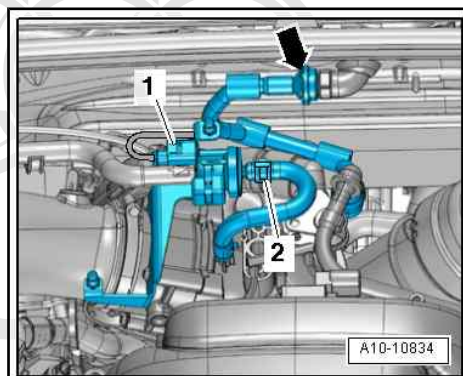


- Detach vacuum hose -2-.



Note

Ignore -arrow-.



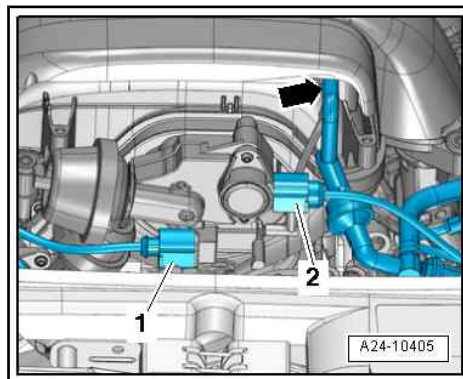
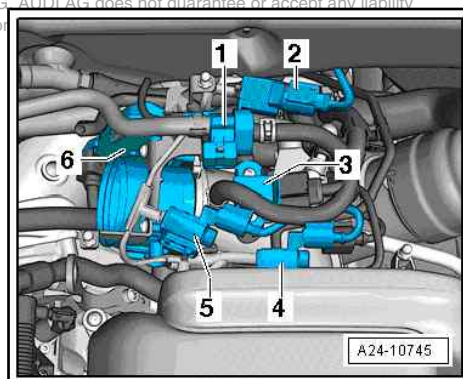
Unplug following electrical connectors:

- 1 - Activated charcoal filter solenoid valve 1 -N80-
- 2 - Secondary air inlet valve -N112- (only fitted for emission standard ULEV 2)
- 3 - Intake air temperature sender -G42- / intake manifold pressure sender -G71-
- 4 - Climatronic coolant shut-off valve -N422- (only fitted on vehicles without auxiliary heater)
- 5 - Secondary air inlet valve 2 -N320- (only fitted for emission standard ULEV 2)
- 6 - Throttle valve module -J338-

- Detach activated charcoal filter solenoid valve 1 -N80- from bracket and move it clear to the side with hose still attached.

- Unplug electrical connectors at front of intake manifold.

- 1 - Variable intake manifold changeover valve -N156-
 - 2 - Variable intake manifold position sender -G513-
- Disconnect vacuum hose -arrow-.

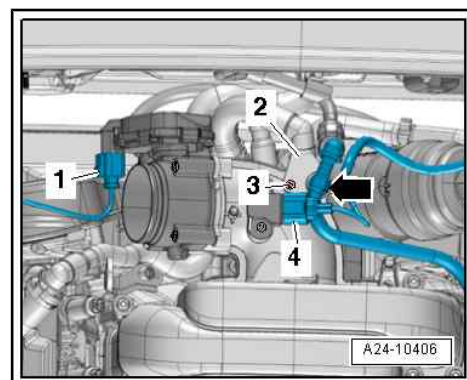
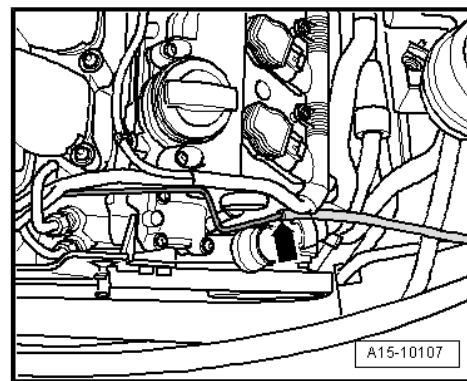


USA models:

- Disconnect vacuum hose -arrow- leading to leak diagnostic pump.

All vehicles:

- Move vacuum hose clear -arrow-.
- Move electrical wiring harness clear.
- Remove bolt -3-.
- Press retaining tab -2- up slightly and detach crankcase breather hose from intake manifold.



- Unscrew bolts -arrows- and remove intake manifold (top section).



Note

Seal intake ports on cylinder heads with clean cloths.

Installing

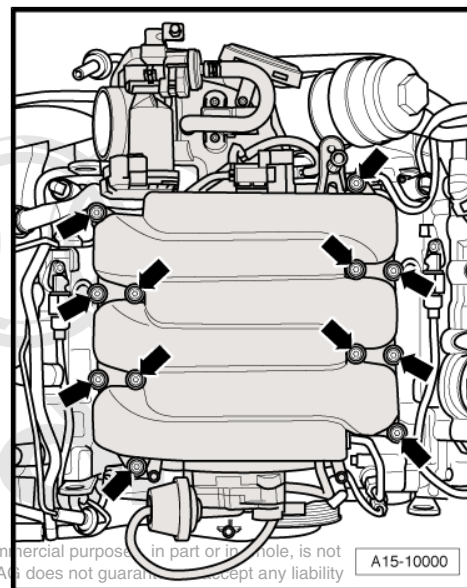
Installation is carried out in the reverse order; note the following:

- Tightening torque ➔ [page 21](#)



Note

- ◆ Renew gaskets and O-rings.
- ◆ Fit all cable ties in the original positions when installing.
- ◆ Secure all hose connections with the correct type of hose clips (same as original equipment) ➔ *Parts catalogue*.

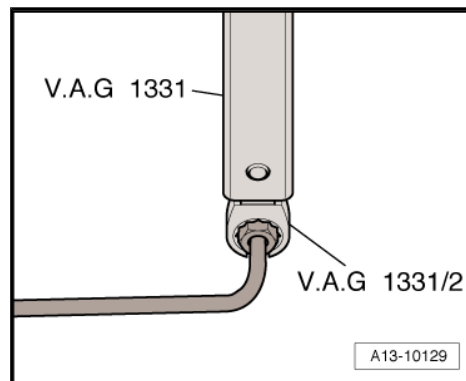


2.9 Removing and installing intake manifold (bottom section) with fuel rail

Special tools and workshop equipment required

- ◆ Torque wrench -V.A.G 1331-

- ◆ Tool insert (open-end ring spanner, 17 mm) -V.A.G 1331/2-



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.

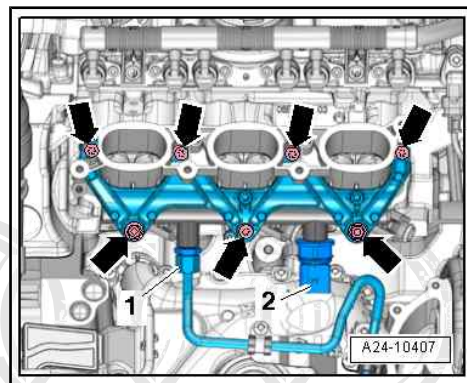
- ◆ The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening the system ➔ [page 3](#).
- ◆ Wrap a clean cloth around the connection and carefully loosen the connection to allow the residual pressure to dissipate.

- Remove intake manifold (top section) ➔ [page 25](#).
- Unplug electrical connector at fuel pressure sender -G247- -item 2-.
- Remove union nut -1-.
- Unscrew bolts and nuts -arrows- and detach intake manifold (bottom section) with fuel rail.



Note

Seal intake ports on cylinder heads with clean cloths.



Installing

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

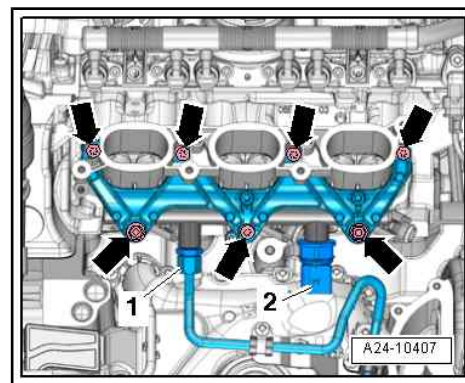


Note

- ◆ Renew gaskets and O-rings.
- ◆ Lubricate O-rings of injectors lightly with clean engine oil.
- Press intake manifold (bottom section) with fuel rail evenly on to injectors.

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- Tighten bolts and nuts -arrows- for intake manifold (bottom section) in diagonal sequence and in stages.
- For tightening torque refer to exploded view of intake manifold (bottom section) with fuel rail ➔ [page 24](#)
- Plug in electrical connector -2- at fuel pressure sender -G247- .

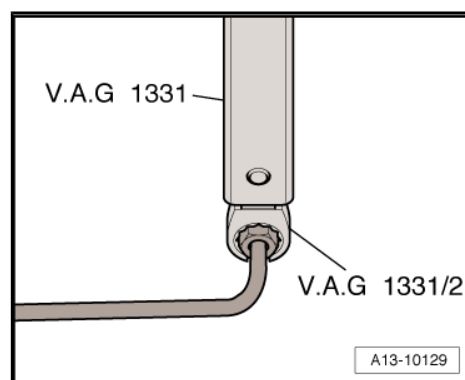


- Fit high-pressure pipe -1- on fuel rail ➔ [page 43](#) .



Note

Check fuel system for leaks.



2.10 Removing and installing fuel pressure sender -G247-

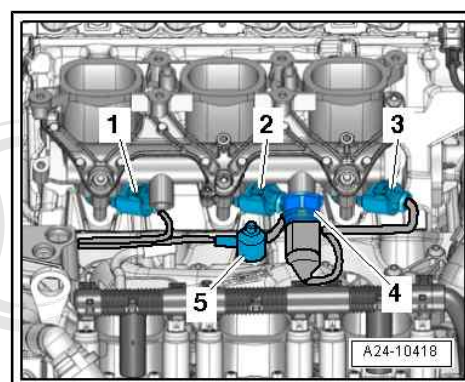
Removing

- Remove intake manifold (top section) ➔ [page 25](#) .
- Unplug electrical connector at fuel pressure sender -G247- -4-.
- Unscrew fuel pressure sender -G247- -4-.

Installing

Install in reverse order.

- Tightening torques: Intake manifold (bottom section) with fuel rail - exploded view ➔ [page 24](#)
- Install intake manifold top section ➔ [page 25](#) .



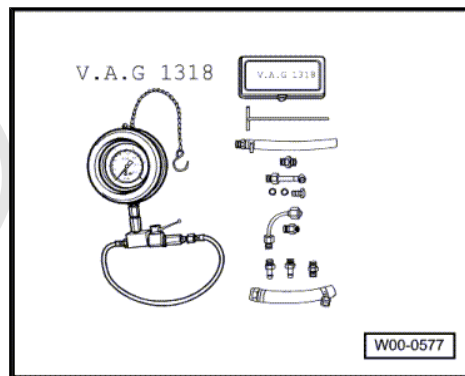
2.11 Checking fuel pressure and residual pressure (up to high-pressure pump)

Special tools and workshop equipment required

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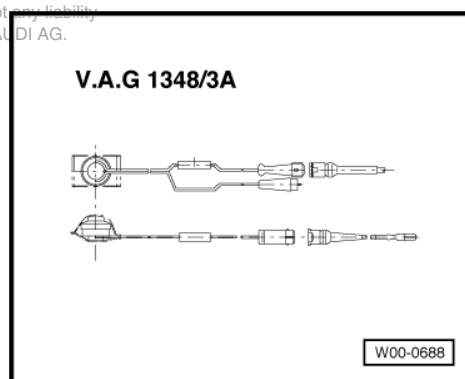
- ◆ K-Jetronic pressure tester -V.A.G 1318-



- ◆ 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

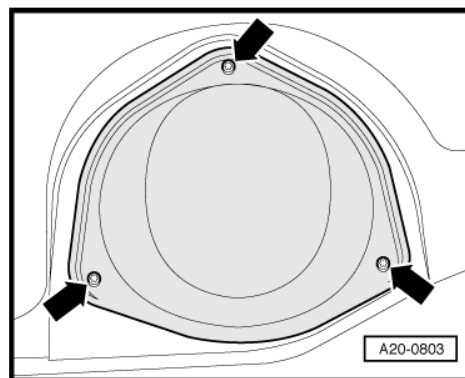
- ◆ Protective gloves

Checking fuel pressure

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

Checking fuel pressure

- Remove rear seat bench ⇒ Rep. Gr. 72 .
- Unscrew cover for flange -arrows-.



- Unplug electrical connector -1- at flange.

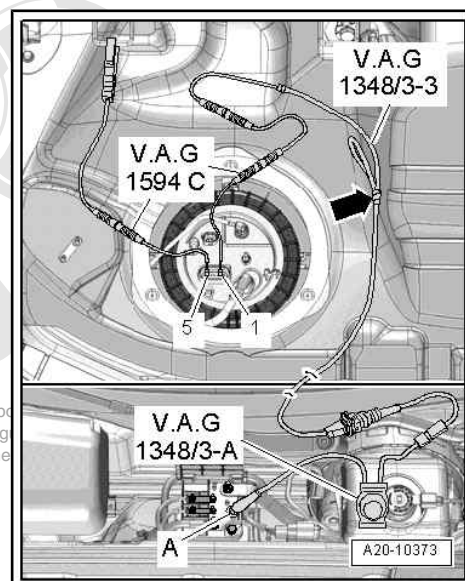
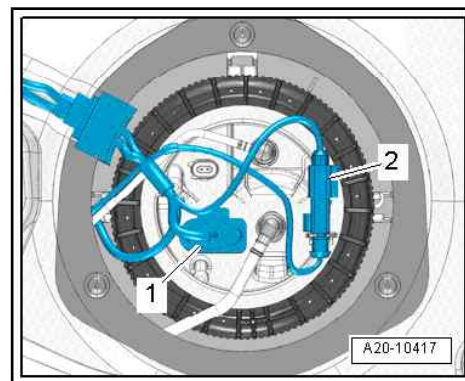


Note

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

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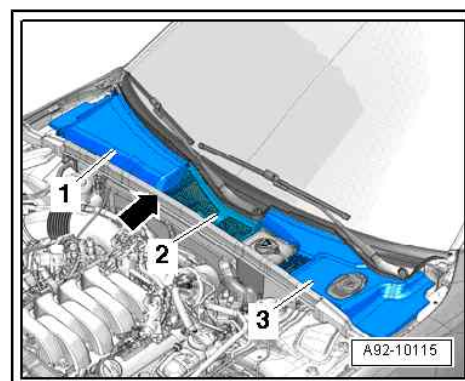


- Remove seal -arrow-.
- Unclip plenum chamber cover -2- and remove.

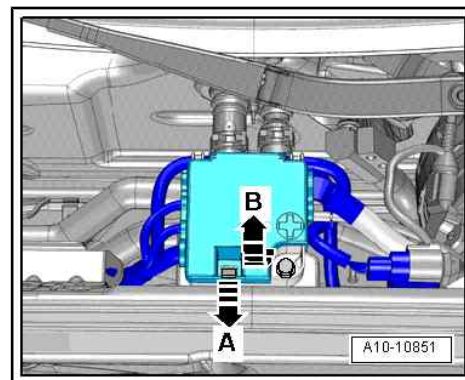


Note

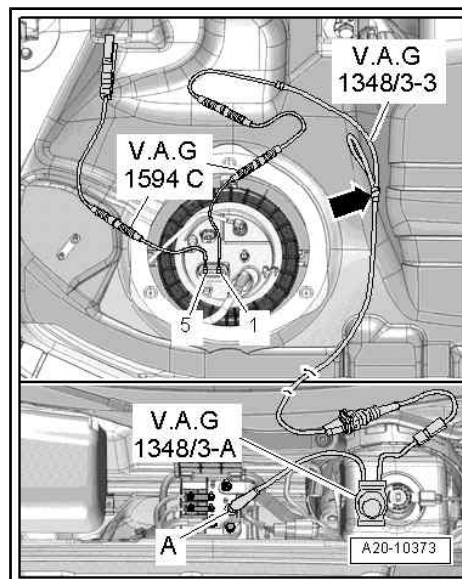
Disregard -items 1 and 3-.



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



- Connect crocodile clip to jump start socket -U6- -item A- in terminal 30 wiring junction 2 -TV22- located in plenum chamber.
- Remove filler cap from fuel filler neck.
- Pull off engine cover panel (front).



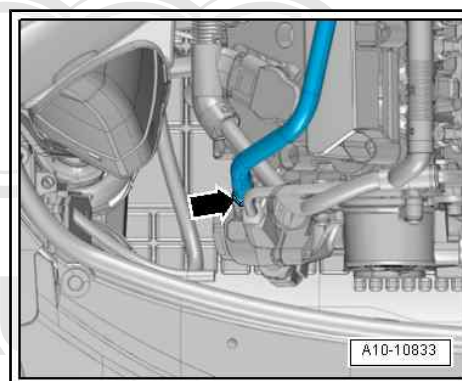
- Disconnect fuel supply pipe -arrow- at high-pressure pump.



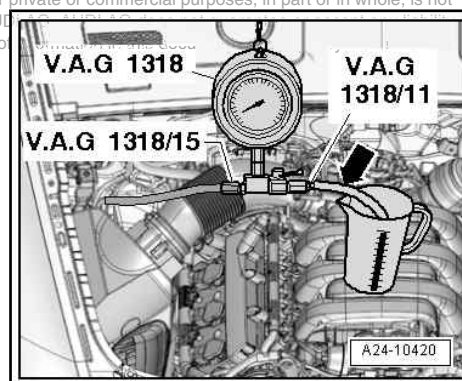
WARNING

Risk of injury - fuel system operates under high pressure.

- ◆ *To reduce the pressure in the fuel system, wrap a clean cloth around the connection and carefully loosen the connection.*



- Connect K-Jetronic pressure tester -V.A.G 1318- to fuel supply pipe using an adapter.
- Fit test hose -arrow- onto pressure tester and hold end of hose into a container to catch escaping fuel.
- Open cut-off valve on pressure tester.
 - Lever points in direction of flow.
- Bleed fuel system by pressing remote control switch briefly.



- Close cut-off valve on pressure gauge.
- Lever is at right angle to direction of flow -arrow-.
- Press switch on remote control until pressure gauge shows no further increase in pressure.
- Specification: approx. 5.5 bar (4.5 ... 6.5 bar)

If specification is not obtained:

- Check fuel pump delivery rate ⇒ Rep. Gr. 20 .

Checking residual pressure

- Check for leaks and check residual pressure by watching drop in pressure 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 gauge and fuel line for leaks.
- ◆ Check pressure tester for leaks.
- ◆ Check fuel lines and their connections for leaks.
- ◆ Check fuel pump delivery rate ⇒ Rep. Gr. 20 .
- ◆ Renew fuel filter with integral fuel pressure regulator ⇒ Rep. Gr. 20 .
- ◆ Non-return valve of fuel pump is defective ⇒ Rep. Gr. 20 .

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

- Switch off ignition.



Note

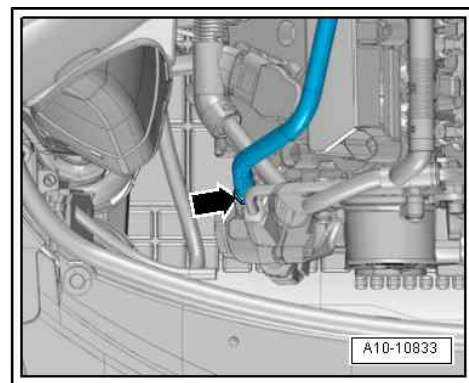
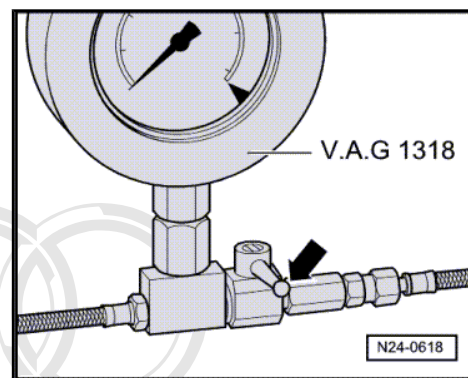
Before removing pressure gauge, release fuel pressure by opening cut-off valve. Hold a container under the connection.

- Re-connect fuel supply pipe -arrow- to high-pressure pump.



Note

Check fuel system for leaks.



2.12 High-pressure pump - exploded view

1 - Fuel pressure sender for low pressure -G410-

- ☐ 15 Nm

2 - Seal

- ☐ Renew

3 - Bolt

- ☐ 9 Nm

4 - High-pressure pump

- ☐ With fuel metering valve -N290-
- ☐ To loosen and tighten fuel pipes, counterhold at fuel pipe connection
- ☐ Re-tighten threaded connections for fuel pipes before installing fuel pipes
- ☐ Removing and installing
⇒ [page 35](#)
- ☐ Do not dismantle

5 - Threaded connection

- ☐ 27 Nm

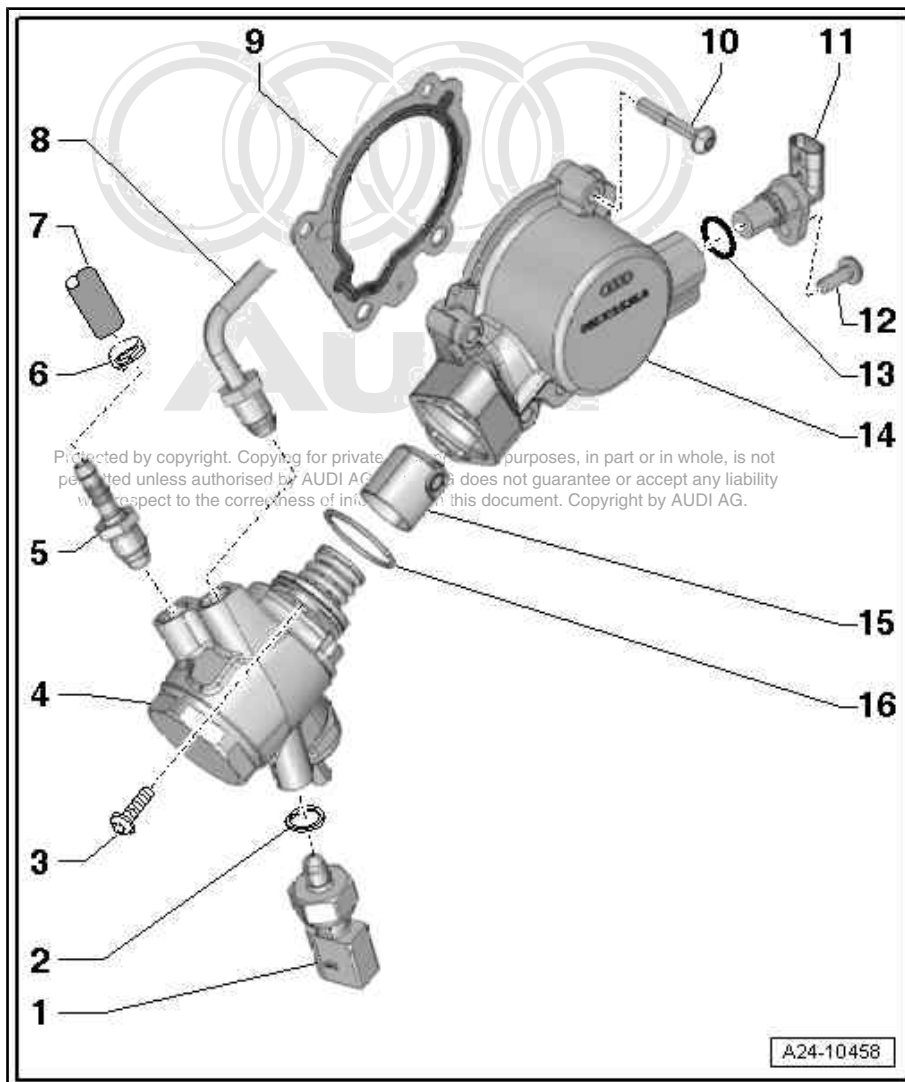
6 - Hose clip

- ☐ Renew; use correct type of hose clips (as original equipment) ⇒ Parts catalogue

7 - Fuel supply hose

- ☐ Low-pressure section

8 - High-pressure fuel pipe



WARNING

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

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

- ☐ Reducing fuel pressure in high-pressure section of injection system ⇒ [page 3](#)
- ☐ To loosen and tighten union nut, counterhold at connection on high-pressure pump
- ☐ Before installation, re-tighten connection on high-pressure pump
- ☐ Installing ⇒ [page 35](#)

9 - Gasket

- ☐ Renew

10 - Bolt

- ☐ 9 Nm

11 - Hall sender -G40-

12 - Bolt

- ☐ 9 Nm

13 - O-ring

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

14 - Housing

15 - Roller tappet

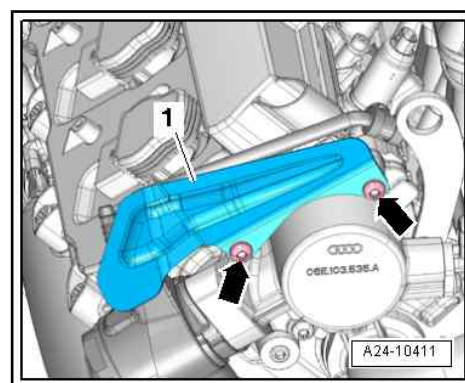
- ☐ Lubricate lightly with clean engine oil before installing

16 - O-ring

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

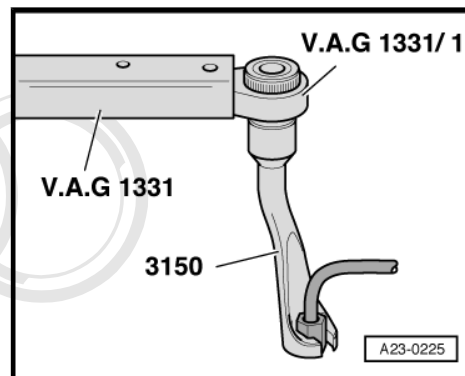
Guard plate for high-pressure pipe - tightening torque

- Tighten bolts -arrows- securing guard plate -1-.
- Tightening torque: 9 Nm



Installing high-pressure pipe

- Tighten union nut on high-pressure pipe hand-tight initially.
- Ensure that high-pressure pipe is not under tension.
- To tighten union of high-pressure pipe at high-pressure pump, use torque wrench -V.A.G 1331- with ratchet -V.A.G 1331/1- and socket, 14 mm -3150-.
- Tightening torque for union nut on high-pressure pipe: 25 Nm



2.13 Removing and installing high-pressure pump

Special tools and workshop equipment required

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◆ Torque wrench -V.A.G 1331-

V.A.G 1331

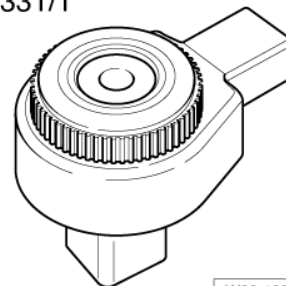


W00-0427

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◆ Ratchet -V.A.G 1331/1-

V.A.G 1331/1



W00-10045

◆ Socket, 14 mm -3150-

3150



W00-0282

Removing



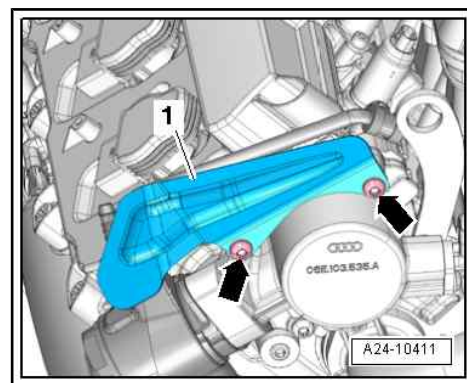
WARNING

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](#).*
- ◆ *Wrap a clean cloth around the connection and carefully loosen the connection to allow the residual pressure to dissipate.*

 Note

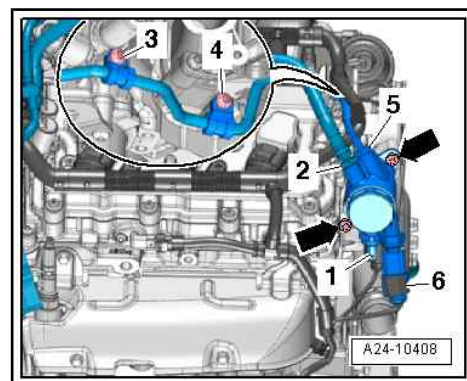
- ◆ *The high-pressure fuel pump should only be removed and installed when the engine is cold.*
- ◆ *When installing the high-pressure fuel pump, it is essential to ensure that no dirt enters the fuel system.*
- ◆ *Use a cloth to catch escaping fuel.*
- ◆ *The O-ring must always be renewed.*
- ◆ *Always ensure that the high-pressure fuel pipes are free of tension when tightening the connections.*
- Remove air cleaner housing (bottom section) ➤ [page 19](#) .
- Unscrew bolts -arrows- and remove guard plate -1-.



- Unplug electrical connectors -1- and -6-.
- Detach fuel supply hose -2- and unscrew connection -5-.
- Remove bolts -3- and -4- from retaining clips.
- Remove bolts -arrows- and lift high-pressure pipe carefully.

 Note

- ◆ *Do not bend fuel pipes to a different shape.*
- ◆ *Do NOT bend open retaining clamps for fuel pipe.*
- ◆ *If one of the retaining clamps has been bent open or the fuel pipe has to be renewed, the retaining clamps must also be renewed.*
- Carefully pull out high-pressure pump.



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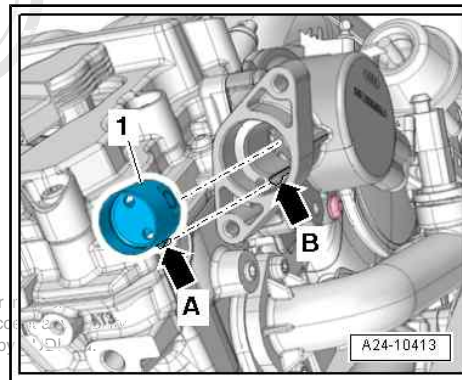
- Pull roller tappet -1- out of housing.

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 bend fuel pipes to a different shape.*
- ◆ *Do NOT bend open retaining clamps for fuel pipe.*
- ◆ *If one of the retaining clamps has been bent open or the fuel pipe has to be renewed, the retaining clamps must also be renewed.*

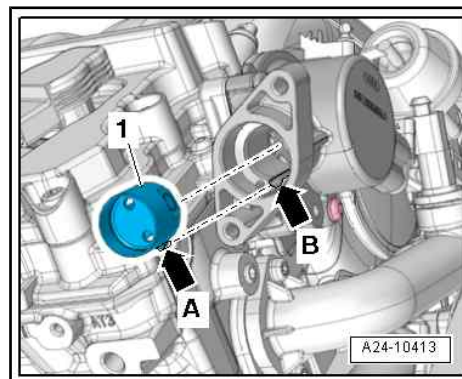


- Renew O-ring for high-pressure pump.
- Check roller tappet -1- for damage and renew if necessary.
- Lightly lubricate roller tappet with oil and insert it so that lug -arrow A- slides into guide notch -arrow B-.

Note

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

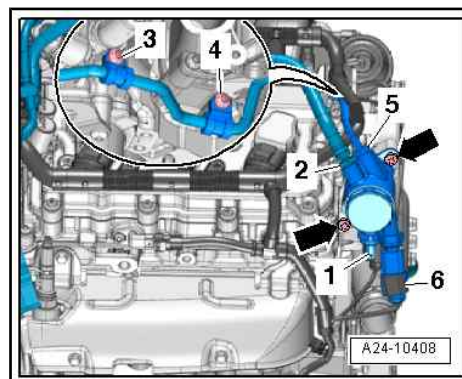
- Rotate crankshaft in direction of engine rotation by turning bolt for vibration damper, and at the same time press roller tappet into cylinder head until it reaches its lowest point.
- Only lift high-pressure pipe slightly to fit high-pressure pump.
- Insert high-pressure pump into housing.
- Hand-tighten the bolts -arrows- as far as the flange.
- Now tighten bolts in diagonal sequence to specified torque (approx 1 turn each until high-pressure pump makes contact).



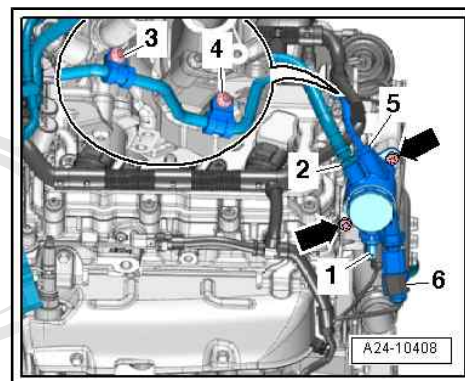
Note

The pump can be damaged if it is tightened too much on one side (keep it straight).

- Tightening torque: refer to exploded view of high-pressure pump ➔ [page 33](#).
- Tighten union nut -5- on fuel supply line hand-tight. Align so that parts are free of tension.
- Connect fuel supply hose -2- again.

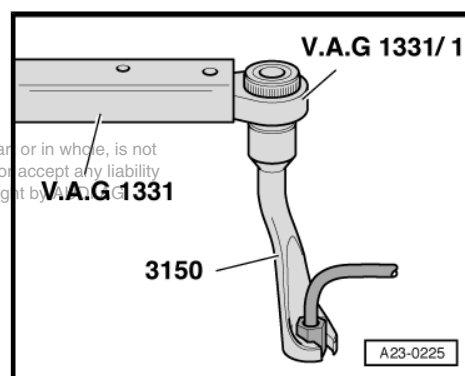


- Tighten bolts -3- and -4- on retaining clips.
- Plug in electrical connectors -1- and -6-.



- Tighten high-pressure pipe to specified torque ➔ [page 35](#) .

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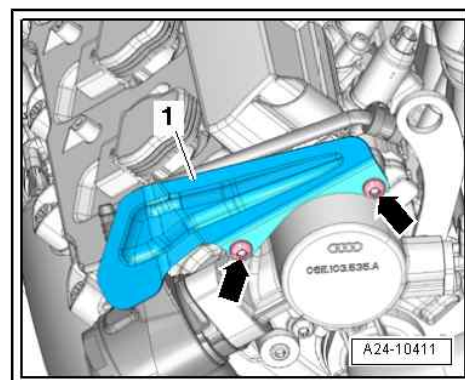


- Install guard plate -1-.
- Install air cleaner housing (bottom section) ➔ [page 19](#) .



Note

Check fuel system for leaks.



2.14 Removing and installing injectors

Special tools and workshop equipment required

- ◆ Tool set for FSI engines -T10133-





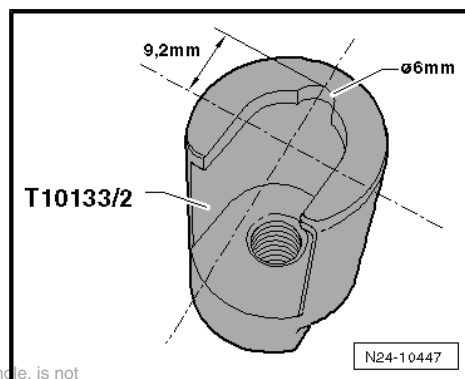
Note

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

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

Special tools and workshop equipment required

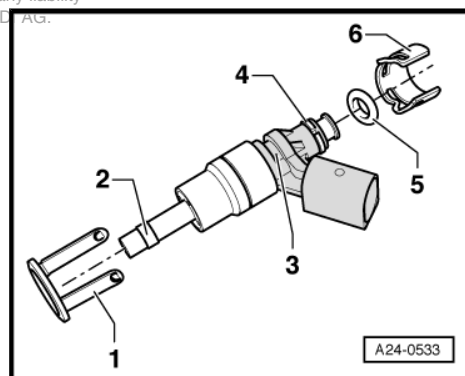
- ◆ Round file, approx. 6 mm
- File out a semi-circular recess as shown in the illustration. The recess allows the tool to be pushed further onto the injector so the contact surface is increased.
- For identification purposes, mark the modified tool with the letter “A” after the tool number.



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High-pressure injector - exploded view

- 1 - Radial compensation element (renew if damaged)
- 2 - Combustion chamber ring seal (teflon ring seal) - renew; when fitting, do not grease ring or use any other lubricant.
- 3 - Groove on 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 the support ring the fuel rail exerts force which secures injector in cylinder head)



Removing



WARNING

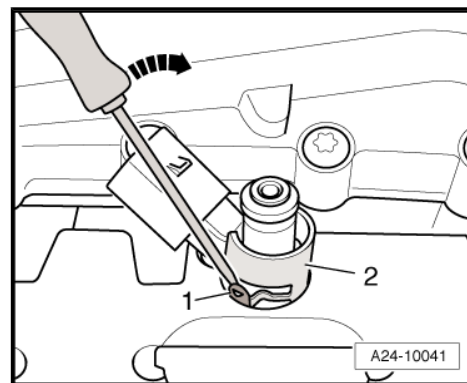
The fuel system operates at extremely high pressure. This can cause injury.

- ◆ **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](#) .**
- ◆ **Wrap a clean cloth around the connection and carefully loosen the connection to allow the residual pressure to dissipate.**

- Remove intake manifold (top section) ➔ [page 25](#) .
- Remove intake manifold (bottom section) on relevant side ➔ [page 27](#) .

If injectors cannot be pulled out of cylinder head by hand, proceed as follows:

- Use a screwdriver to bend retainer tabs -1- of radial compensation element to side -arrow- and pull support ring -2- off injector.

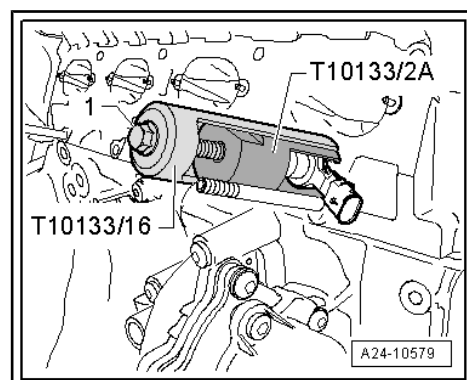


- Guide puller -T10133/2A- into groove on injector.
- Then attach removal tool -T10133/16- and pull out injector by turning bolt -1-.



Note

When inserting the puller, there is a risk of destroying the radial compensation element due to the retainer tabs breaking.



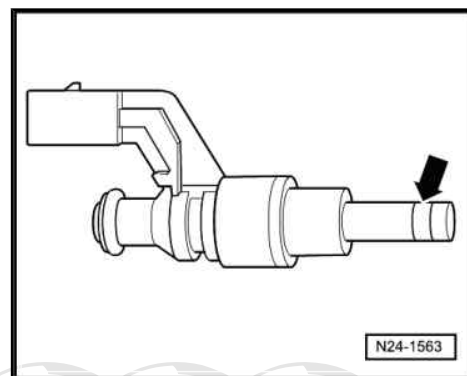
- Carefully remove old combustion chamber ring seal -arrow-. To do so, cut open ring using knife or prise open ring with small screwdriver and then pull off forwards.
- Take care not to damage injector groove. The injector must be renewed if the groove is damaged.

Installing

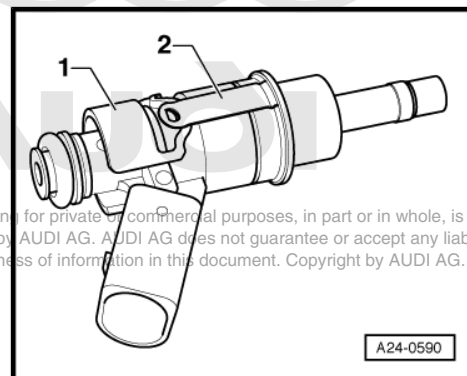


Note

- ◆ *Renew combustion chamber ring seals and O-rings.*
- ◆ *Renew spacer ring and radial compensation element if damaged.*
- ◆ *Lightly lubricate O-rings for injectors with clean engine oil.*
- ◆ *The injector pipes must be re-installed on the same cylinders.*

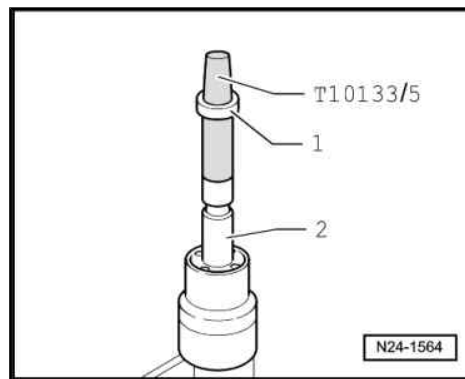


- Clip radial compensation element -1- into support ring -2-.
- When re-installing an injector, clean any combustion residue off groove for combustion chamber ring seal and injector stem with a clean cloth.

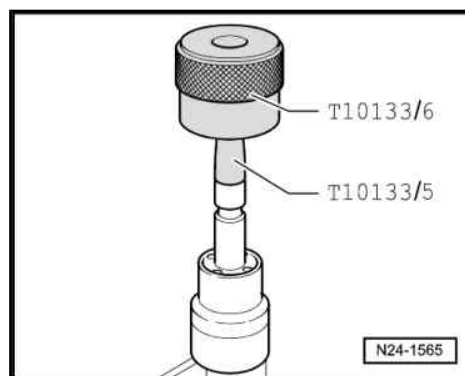


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- Fit assembly cone -T10133/5- with new combustion chamber ring seal -1- onto injector -2-.



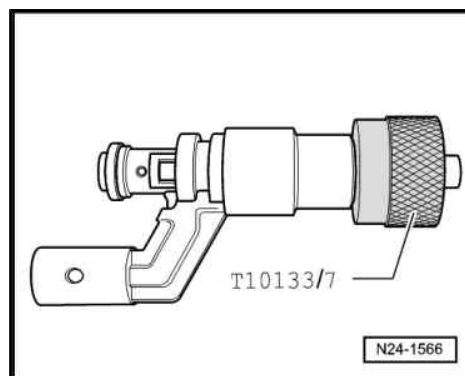
- Push combustion chamber ring seal onto assembly cone -T10133/5- as far as it will go using assembly sleeve -T10133/6-.
- Turn assembly sleeve -T10133/6- upside down and push combustion chamber ring seal into sealing ring groove.



Note

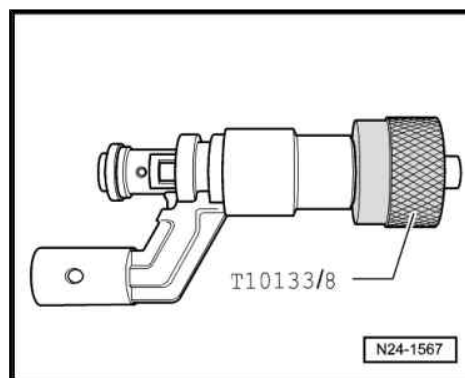
The combustion chamber ring seal is widened when it is pushed onto the injector. After pushing it on, it therefore has to be compressed again. This is done in two stages, as described below.

- 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.
- Lubricate new O-ring lightly with clean engine oil before installing.



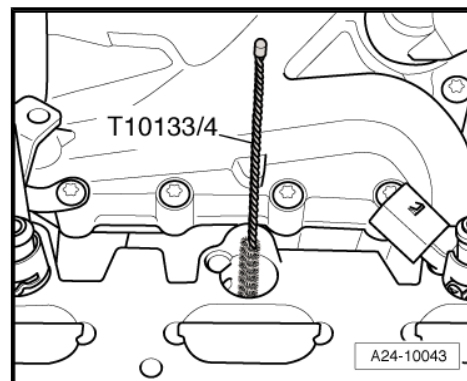
Note

The combustion chamber ring seal must not be lubricated.



Installing injectors

- Clean bore in cylinder head with nylon cylinder brush - T10133/4- .



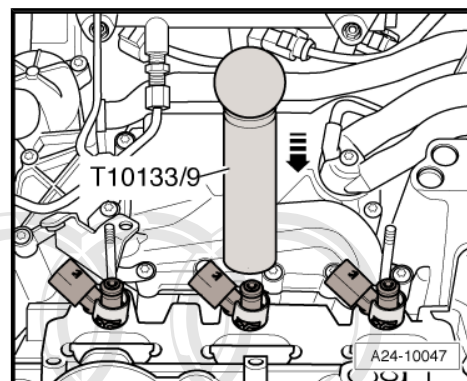
- Use assembly tool -T10133/9- to push injector as far as it will go into hole in cylinder head.



Note

It should be possible to insert the injector easily. If necessary wait until the combustion chamber ring seal has contracted sufficiently.

- Make sure injector is in correct installation position in cylinder head:
- Electrical connector of injector must engage in recess in cylinder head.



Remaining installation steps are carried out in reverse sequence; note the following:

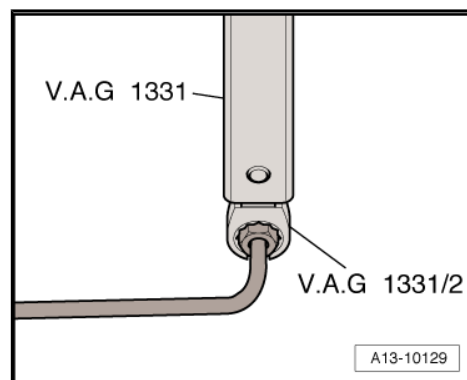
- Install intake manifold (bottom section) ➔ [page 27](#) .
- Install intake manifold (top section) ➔ [page 25](#) .

2.15 Removing and installing high-pressure pipes

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Special tools and workshop equipment required

- ◆ Torque wrench -V.A.G 1331-
- ◆ Tool inserts -V.A.G 1331/2-




Note

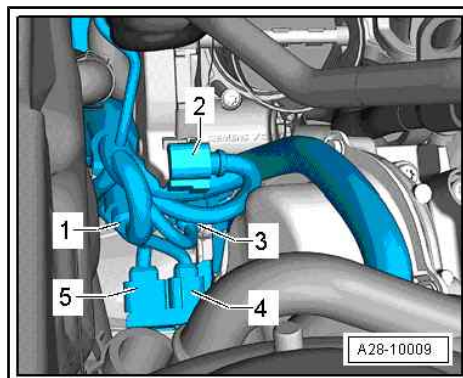
- ♦ *Tightening union nut on high-pressure fuel pump:
⇒ [page 35](#).*
- ♦ *The connections of the high-pressure pipes must not be damaged.*
- ♦ *Do not bend the high-pressure pipes out of shape.*
- ♦ *Do NOT bend open retaining clamps for fuel pipe.*
- ♦ *If one of the retaining clamps has been bent open or the fuel pipe has to be renewed, the retaining clamps must also be renewed.*

- Lubricate threads of union nuts with fuel.
- Hand-tighten union nuts on high-pressure pipes (ensure that pipes are not under tension).
- To tighten high-pressure pipe on fuel rail, use torque wrench -V.A.G 1331- with open-end ring spanner (tool insert -V.A.G 1331/2-).
- Tightening torque for union nut on high-pressure pipe: 25 Nm
- Do not install retaining tabs until high-pressure pipes have been tightened.
- Check for leaks in fuel system.

2.16 Lambda probes - overview

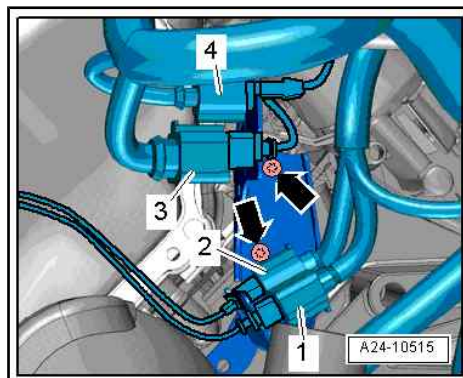
Electrical connectors for Lambda probes on cylinder bank 1 (right-side)

- 1 - Injectors, cylinder bank 1
- 2 - Knock sensor 1 -G61-
- 4 - Lambda probe -G39-
- 5 - Lambda probe after catalytic converter -G130-



Electrical connectors for Lambda probes on cylinder bank 2 (left-side)

- 1 - Lambda probe 2 after catalytic converter -G131-
- 2 - Lambda probe 2 -G108-
- 3 - Injectors, cylinder bank 2, and for fuel pressure sender -G247-
- 4 - Knock sensor 2 -G66-



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

- 1 - Lambda probe -G39-
- 2 - Lambda probe after catalytic converter -G130-

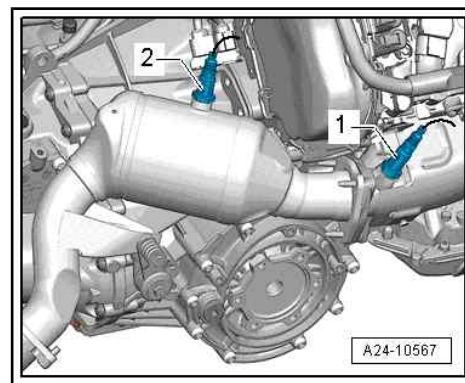
Removing and installing Lambda probe -G39-

⇒ [“2.17 Removing and installing Lambda probe G39 before catalytic converter - bank 1 \(right-side\)”, page 45](#)

Removing and installing Lambda probe after catalytic converter - G130-

⇒ [“2.18 Removing and installing Lambda probe after catalytic converter G130 - bank 1 \(right-side\)”, page 47](#)

- Tightening torque: 55 Nm



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

- 1 - Lambda probe 2 -G108-
- 2 - Lambda probe 2 after catalytic converter -G131-

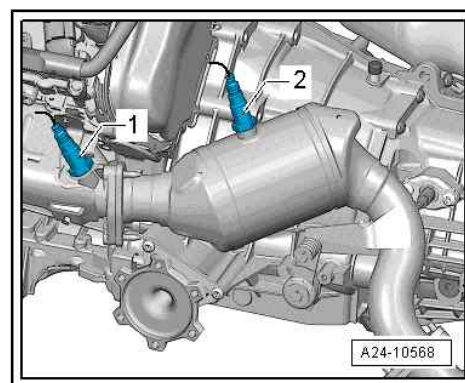
Removing and installing Lambda probe 2 -G108-

⇒ [“2.19 Removing and installing Lambda probe 2 G108 before catalytic converter - bank 2 \(left-side\)”, page 49](#)

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

⇒ [“2.20 Removing and installing Lambda probe 2 after catalytic converter G131 - bank 2 \(left-side\)”, page 51](#)

- Tightening torque: 55 Nm

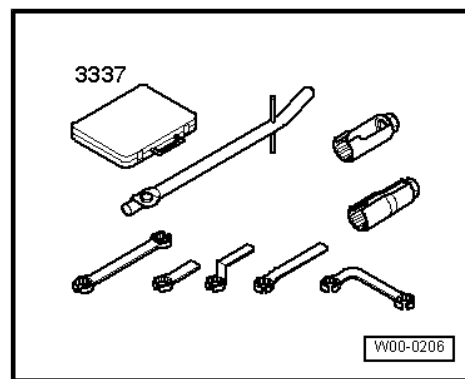


2.17 Removing and installing Lambda probe -G39- before catalytic converter - bank 1 (right-side)

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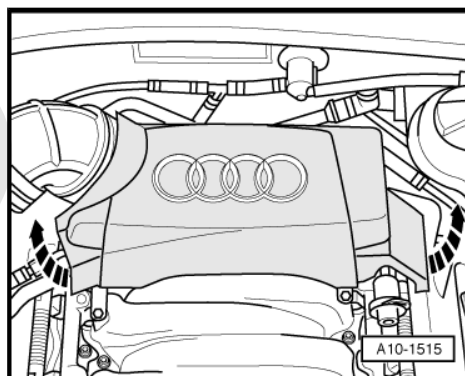
Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set -3337-



Removing

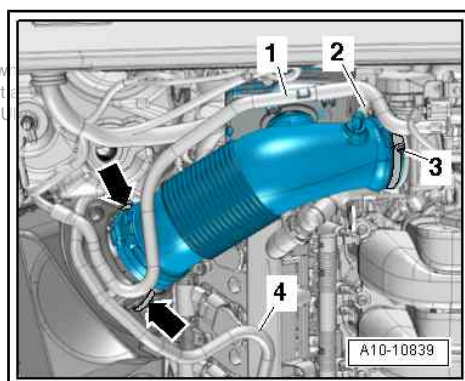
- Pull off engine cover panel (rear) -arrows-.



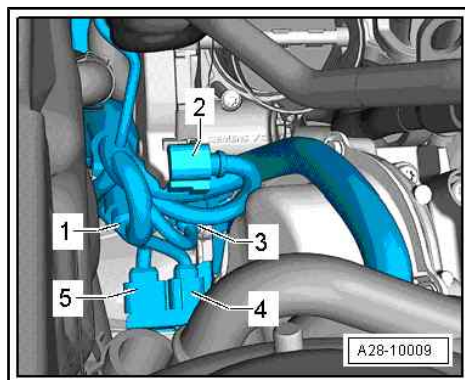
- Move fuel supply hose -4- and hose connection -1- leading to activated charcoal filter clear on air cleaner housing and air pipe.

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- Detach vacuum hose -2- from air hose.
- Remove air hose. To do so, release hose clip -3- and clamps -arrows-.
- Remove air cleaner housing (bottom section) ➔ [page 19](#) .



- Unplug electrical connector -4- for Lambda probe -G39- .



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



Note

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

Installing

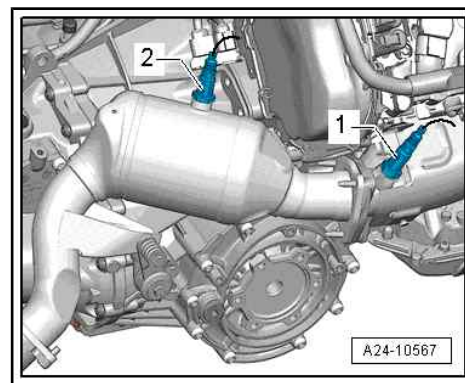
Installation is carried out in the reverse order; note the following:

- Tightening torques: refer to exploded view of Lambda probes
⇒ [page 44](#) .



Note

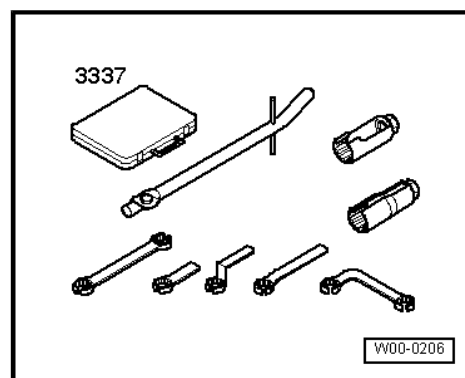
- ◆ *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- ◆ *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the probe body. High-temperature paste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



2.18 Removing and installing Lambda probe after catalytic converter -G130- - bank 1 (right-side)

Special tools and workshop equipment required

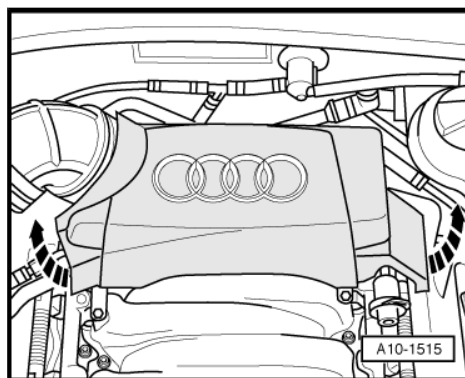
- ◆ Lambda probe open ring spanner set -3337-



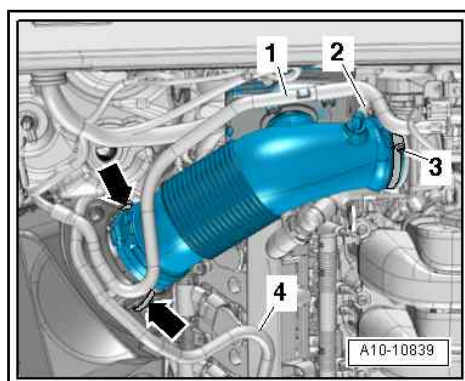


Removing

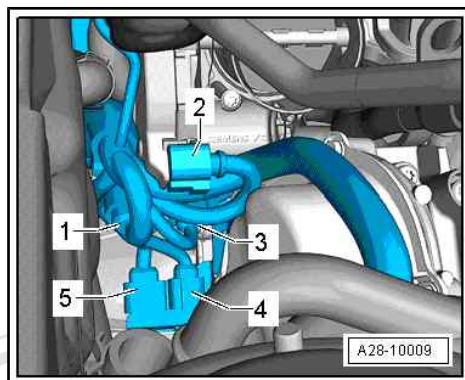
- Pull off engine cover panel (rear) -arrows-.



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



- Unplug electrical connector -5- for Lambda probe after catalytic converter -G130- .



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

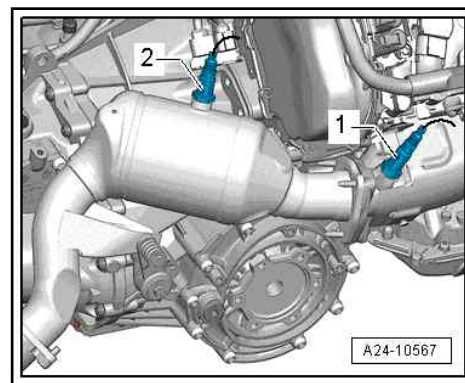
 Note

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

Installing

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

- Tightening torques: refer to exploded view of Lambda probes
⇒ [page 44](#) .



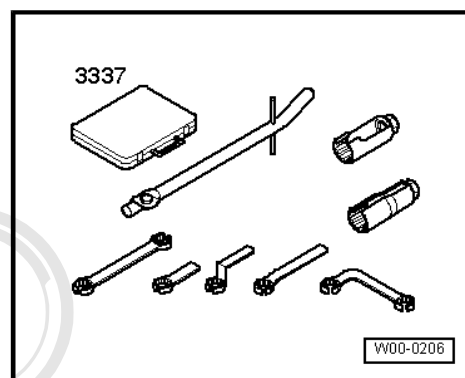
 Note

- ◆ *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 probe body. High-temperature paste ⇒ Parts catalogue*
- ◆ *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*
- ◆ *Fit all cable ties in the original positions when installing.*

2.19 Removing and installing Lambda probe 2 -G108- before catalytic converter - bank 2 (left-side)

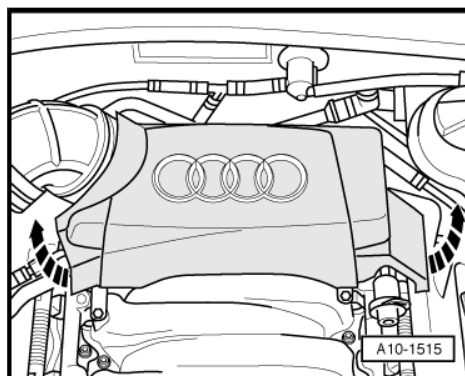
Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set -3337-

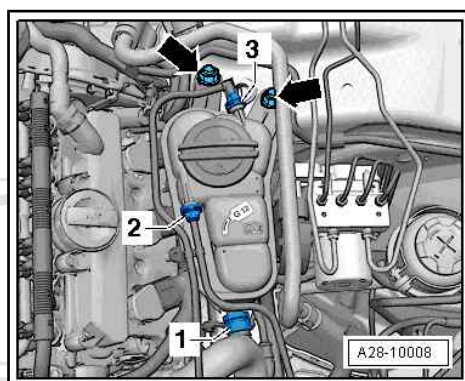


Removing

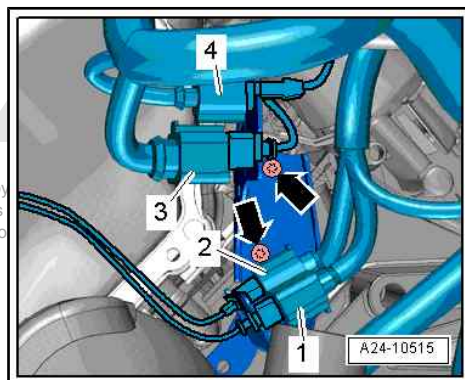
- Pull off engine cover panel (rear) -arrows-.



- Unbolt coolant expansion tank -arrows-.
- 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-, -2- and -3- attached.



- Unplug electrical connector -2- for Lambda probe 2 -G108- .



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



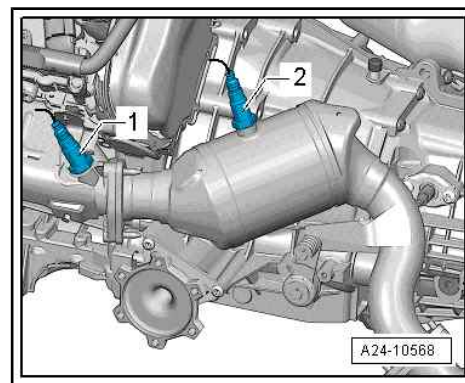
Note

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

Installing

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

- Tightening torques: refer to exploded view of Lambda probes
⇒ [page 44](#) .



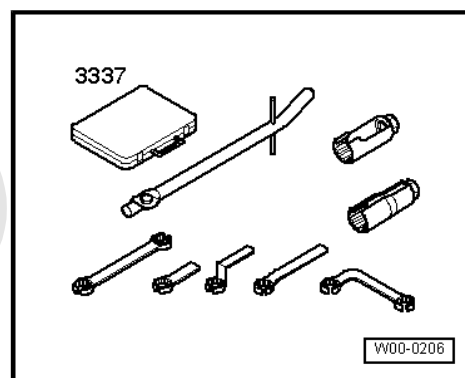
Note

- ◆ *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 probe body. High-temperature paste ⇒ Parts catalogue*
- ◆ *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*
- ◆ *Fit all cable ties in the original positions when installing.*

2.20 Removing and installing Lambda probe 2 after catalytic converter -G131- - bank 2 (left-side)

Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set -3337-

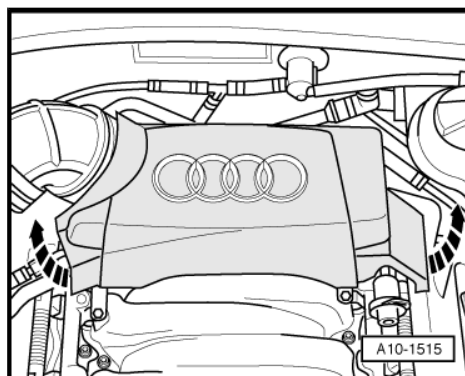


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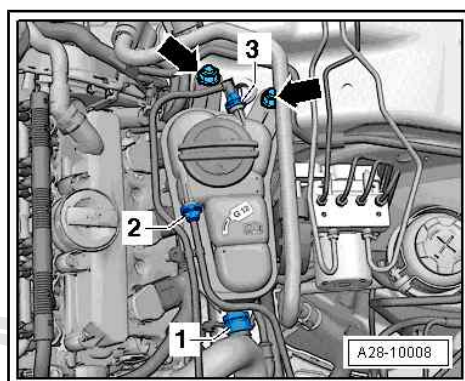


Removing

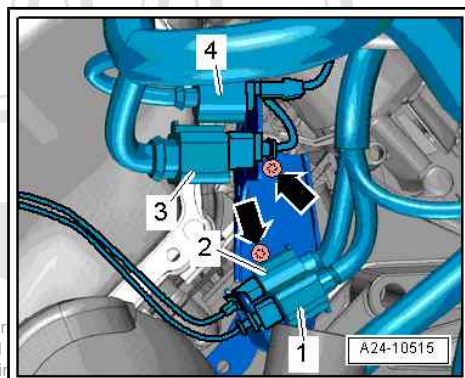
- Pull off engine cover panel (rear) -arrows-.



- Unbolt coolant expansion tank -arrows-.
- 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-, -2- and -2- attached.



- Unplug electrical connector -1- for Lambda probe 2 after catalytic converter -G131- .



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- 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 with the engine removed.

Installing

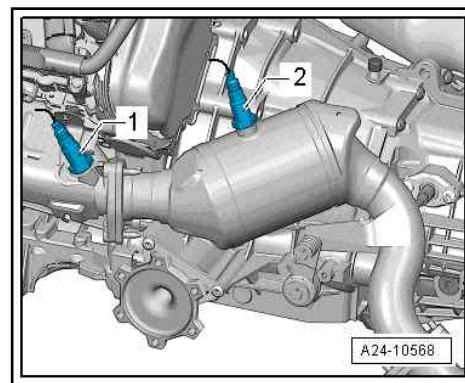
Installation is carried out in the reverse order; note the following:

- Tightening torques: refer to exploded view of Lambda probes
⇒ [page 44](#) .



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 probe body. High-temperature paste ⇒ Parts catalogue*
- ◆ *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*
- ◆ *Fit all cable ties in the original positions when installing.*



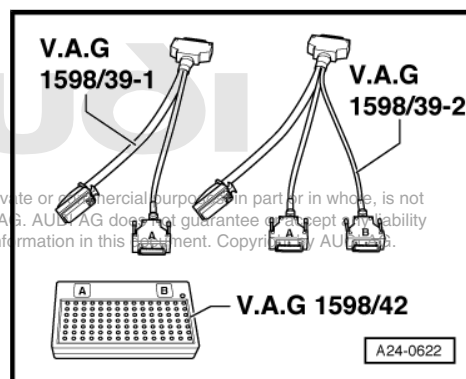
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3 Engine control unit

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-



Note

- ◆ *The test box has 105 contacts. 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.*
- ◆ *If you want to check a wiring connection to the engine control unit, first refer to the current flow diagram to find out which connector on the engine control unit the wiring connection leads to. If the wire goes to the 60-pin connector, connect the smaller of the two connectors -V.A.G 1598/39-1- to input "A" of test box -V.A.G 1598/42- .*
- ◆ *If a wiring connection leads to the 94-pin connector (according to current flow diagram), connect the larger of the two connectors -V.A.G 1598/39-2- as follows: The connector marked "A" must be attached to input "A" on the test box -V.A.G 1598/42- and the connector marked "B" must be attached to input "B" on the test box -V.A.G 1598/42- .*
- ◆ *The test box -V.A.G 1598/42- is designed so it can be connected both to the wiring harness for the engine control unit and to the engine control unit itself at the same time.*
- ◆ *The advantage of this is that the electronic engine control system remains fully functional when the test box is connected (for example, for measuring signals when the engine is running).*
- ◆ *The relevant test procedure will state whether it is necessary to also connect the engine control unit to the test box.*
- ◆ *Always use auxiliary measuring set -V.A.G 1594 C- to connect test equipment (e.g. voltage tester -V.A.G 1527 B- , hand-held multimeter -V.A.G 1526 C- etc.).*



WARNING

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

- Remove engine control unit -J623- ➔ [page 55](#) .
- Connect test box -V.A.G 1598/42- to wiring harness connector. The earth clip on the test box must be connected to the negative battery terminal. The instructions for performing the individual tests indicate whether or not the engine control unit -J623- 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.

- Make sure you fit metal casing back on engine control unit -J623- .
- Always use new shear bolts.
- Clean threaded holes for new shear bolts to remove any residue from locking fluid. This can be done using a thread tap.
- Interrogate fault memory and erase if necessary. If you have erased fault memory, you must then generate readiness code in engine control unit in "Guided Functions" mode (refer to vehicle diagnosis and service information system -VAS 5052-).



Note

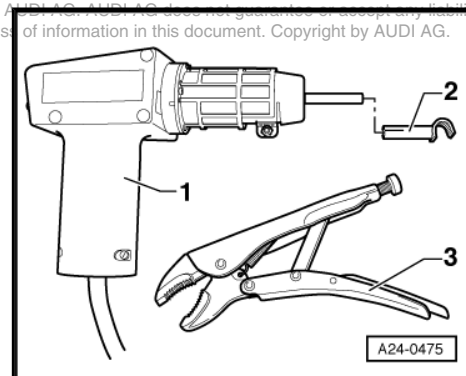
After completion of the Guided Fault Finding routine, the tester will attempt to erase the fault memories of all control units. If this is not successful, the remaining faults registered in the memories must be rectified until all faults can be erased.

3.2 Removing and installing engine control unit -J623-

Special tools and workshop equipment required

- ◆ Hot air blower (220 V/ 50 Hz) -VAS 1978/14- -item 1- with nozzle attachment -2- from wiring harness repair set -VAS 1978-
- ◆ Small, commercially available vice grip pliers -3- (mole grip)

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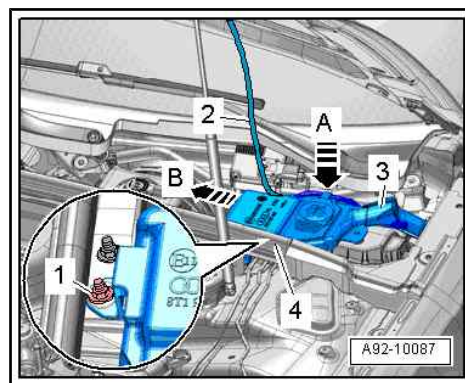
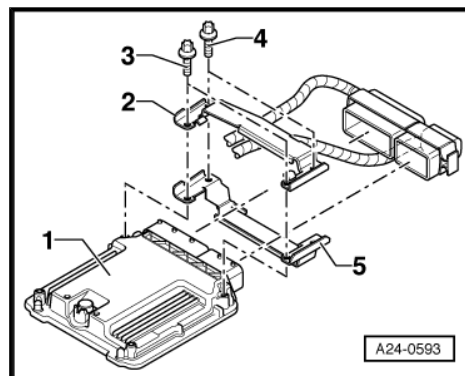


Note

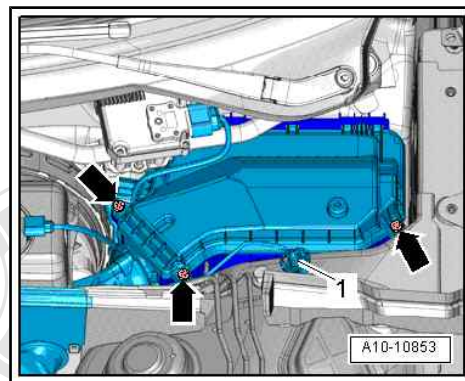
- ◆ The engine control unit -1- is bolted to the protective housing -5-. To make it more difficult to unscrew the shear bolts -4- for locking plate -2-, their threads have been coated with locking fluid.
- ◆ The metal casing has to be removed before the connectors can be unplugged from the engine control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

Removing

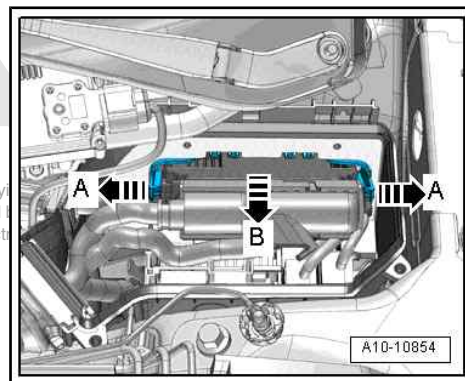
- When renewing engine control unit, select diagnosis object "Replace engine control unit" in "Guided Functions" on vehicle diagnosis, testing and information system -VAS 5051B- .
- Switch off ignition and remove ignition key.
- Slightly pull off rubber seal in front of nut -1- on plenum chamber cover.
- 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.



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

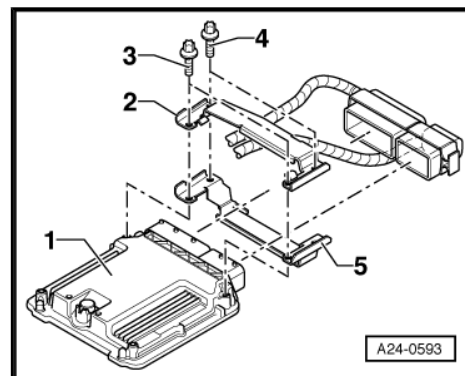


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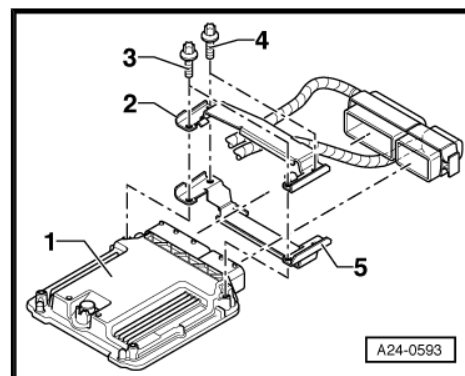
not
bility

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.

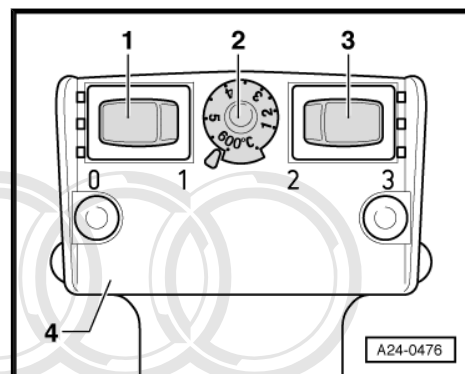


- Select settings on hot air blower as shown in illustration, i.e. set temperature potentiometer -2- to maximum heat output and two-stage air flow switch -3- to position 3.

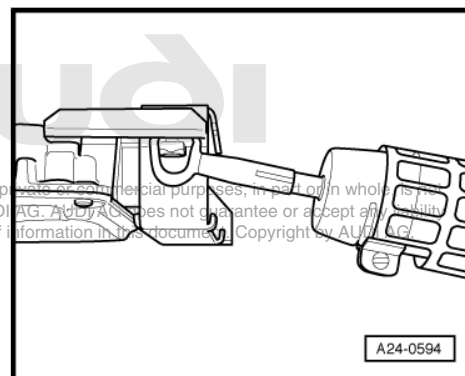


WARNING

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 vice-grip pliers (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 can be removed without heating.
- 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- .

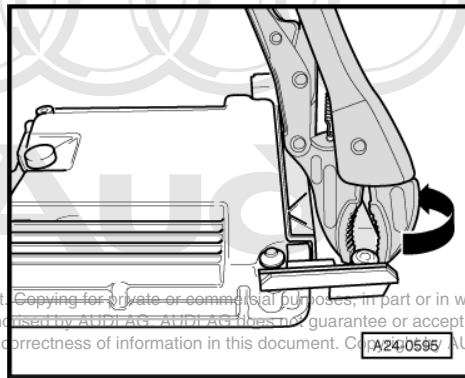
Installing

Installation is performed in the reverse sequence.

- After installation, the locking plate must be re-fitted on the engine control unit -J623- .
- Clean threaded holes for shear bolts to remove any residue from locking fluid. This can be done using a thread tap.
- Always use new shear bolts.
- 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 vehicle diagnostic, testing and information system -VAS 5051B- in "Guided Functions" mode, "Replace engine control unit".



28 – Ignition system

1 General notes and safety precautions

1.1 General notes on ignition system

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

1.2 Safety precautions

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

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WARNING

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

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

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

To avoid any risk of injuries to persons and/or damage to the fuel injection and ignition system, always observe the following safety precautions.

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



- ◆ Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.



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2 Servicing ignition system

2.1 Test data

Engine data		3.2 ltr. / 4V FSI
Idling speed (not adjustable)		
Ignition timing		Not adjustable (determined by control unit)
Ignition system		Multi-coil system with 8 ignition coils (output stages integrated) connected directly to spark plugs via spark plug connectors
Spark plugs	Designations	⇒ Data sheets for exhaust emission test
Firing order		1-5-3-6-2-4

2.2 Ignition system - exploded view

1 - Connector for ignition coil

- ☐ 4-pin

2 - Bolt

- ☐ 10 Nm

3 - 3-pin connector

4 - Hall sender

- ☐ Hall sender -G40- (cylinder bank 1)
- ☐ Hall sender 3 -G300- (cylinder bank 1)
- ☐ Hall sender 2 -G163- (cylinder bank 2)
- ☐ Hall sender 4 -G301- (cylinder bank 2)

5 - O-ring

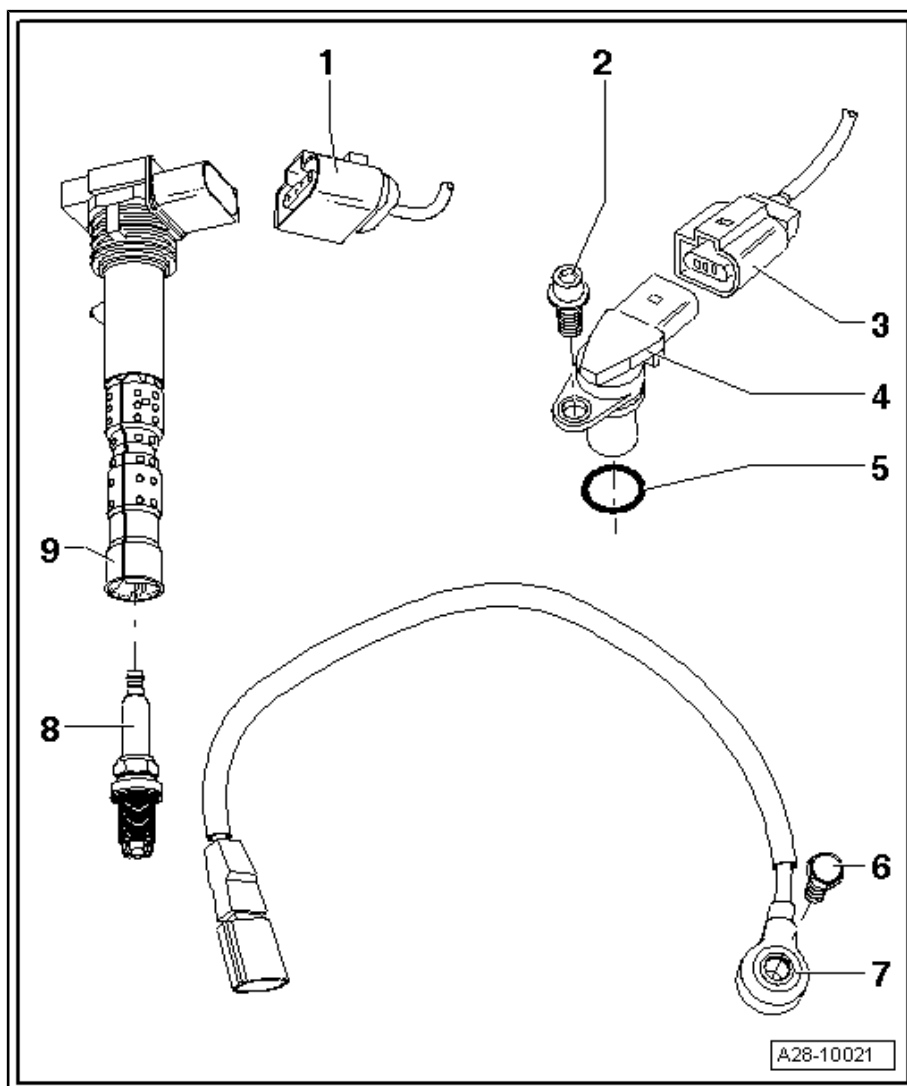
- ☐ Renew if damaged
- ☐ Lubricate lightly with clean engine oil

6 - Bolt

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

7 - Knock sensors

- ☐ Contact surfaces between knock sensor and cylinder block must be free of corrosion, oil and grease.
- ☐ Knock sensor 1 -G61-



(cylinder bank 1)

- ☐ Knock sensor 2 -G66-
(cylinder bank 1)
- ☐ Removing and installing ⇒ [page 64](#)

8 - Spark plug

- ☐ Remove and install using spark plug socket and extension -3122 B- → Maintenance ; Booklet 811 or A5 Cabriolet → Maintenance ; Booklet 818
- ☐ 30 Nm

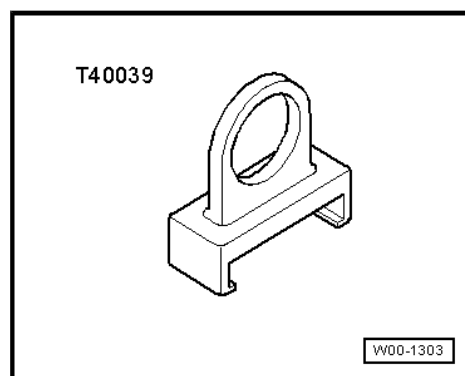
9 - Ignition coil

- ☐ 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-
- ☐ Ignition coil 5 with output stage -N323-
- ☐ Ignition coil 6 with output stage -N324-
- ☐ Removing and installing ⇒ [page 62](#)
- ☐ Use puller -T40039- for removal

2.3 Removing and installing ignition coils

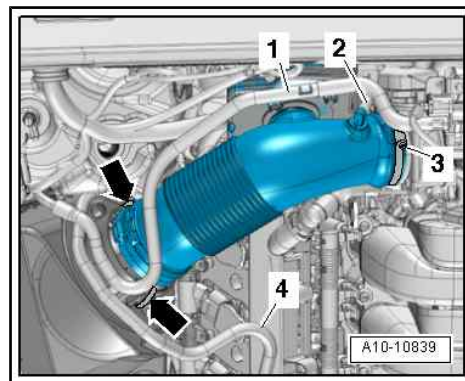
Special tools and workshop equipment required

- ◆ Puller -T40039-



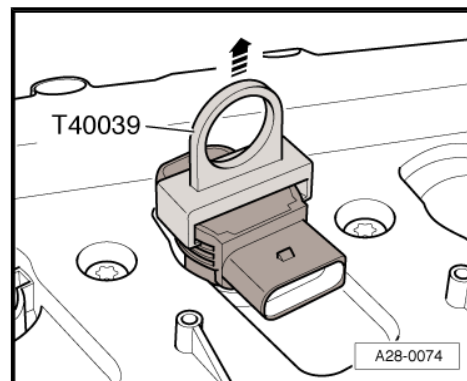
Removing ignition coils on cylinder bank 1:

- Only remove air cleaner housing (bottom section) when removing ignition coil for cylinder 1 ⇒ [page 19](#) .
- When removing ignition coils for cylinders 2 and 3, remove air hose by opening hose clip -3- and releasing clamps -arrows-).
- Remove bolts from wiring harness of ignition coils.
- Release electrical connectors and pull all connectors off ignition coils at the same time.

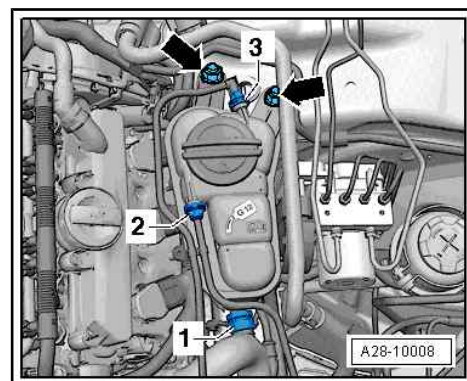


- Pull ignition coils out of spark plug apertures using puller - T40039- .

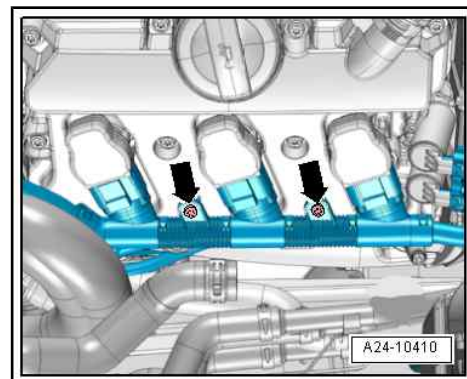
Removing ignition coils on cylinder bank 2:



- Unbolt coolant expansion tank -arrows-.
- 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-, -2- and -3- attached.



- Remove bolts -arrows-.
- Pull ignition coil approx. 30 mm out of spark plug hole using puller -T40039- .



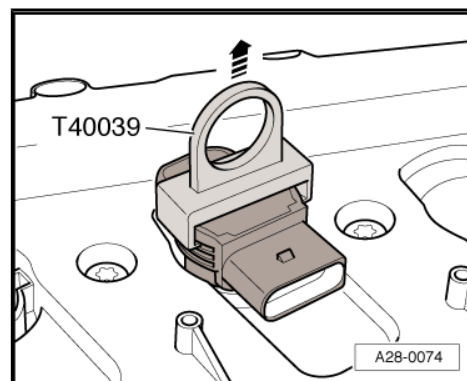
- Release electrical connectors and pull all connectors off ignition coils at the same time.

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 evenly (do NOT use tool).

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

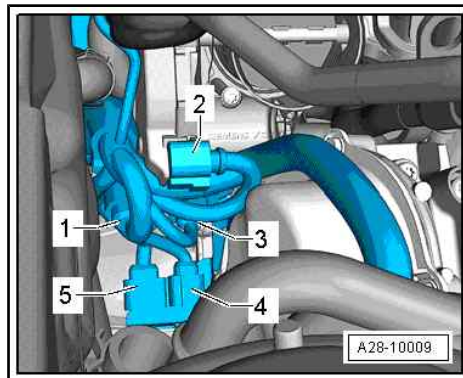
- Tightening torque for electrical wiring guide for ignition coils to cylinder head cover: 5 Nm



2.4 Removing and installing knock sensors

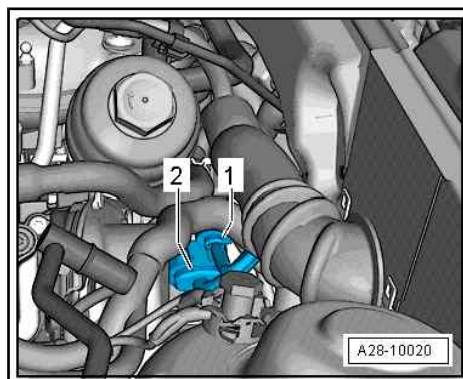
Electrical connectors

- 1 - To injectors on cylinder bank 1
- 2 - Throttle valve module -J338-
- 3 - Knock sensor 1 -G61-
- 4 - Lambda probe -G39-
- 5 - Lambda probe after catalytic converter -G130-



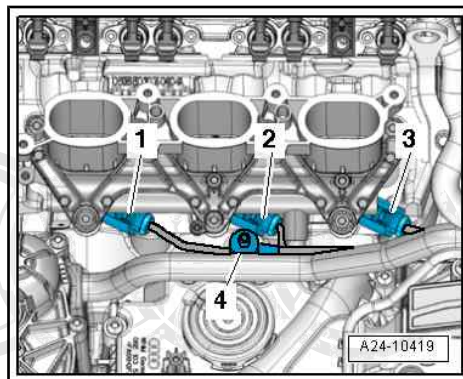
Electrical connectors

- 1 - Knock sensor 2 -G66-
- 2 - Injectors, cylinder bank 2, and for fuel pressure sender -G247-



Knock sensor for cylinder bank (right-side)

- 4 - Knock sensor 1 -G61-



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Knock sensor for cylinder bank (left-side)

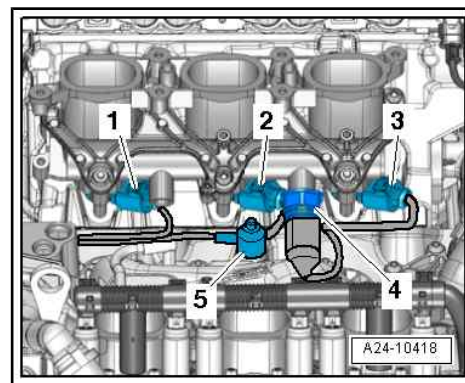
5 - Knock sensor 2 -G66-

Removing



WARNING

- ◆ *The fuel system operates under high pressure. The pressure in the high-pressure part of the injection system must be reduced to a residual pressure prior to opening the system ➔ [page 3](#).*
- ◆ *A clean cloth must then be wrapped around the connection and the residual pressure dissipated by carefully loosening the connection.*
- ◆ *Observe notes on procedure for disconnecting the battery ➔ Rep. Gr. 27.*



- Remove intake manifold (top section) ➔ [page 25](#).
- Remove relevant intake manifold (bottom section) with fuel rail ➔ [page 27](#).



Note

Injector No. 2 must be removed for access to bolt securing knock sensor 1 -G61- -4-. Injector No. 5 must be removed for access to bolt securing knock sensor 2 -G66- -4-.

- Remove bolt from corresponding knock sensor.

Installing

- Re-install whichever knock sensor was removed.



Note

The tightening torque influences the function of the knock sensor.

- Tightening torque: refer to exploded view of ignition system ➔ [page 61](#).
- Install relevant intake manifold (bottom section) with fuel rail ➔ [page 27](#).
- Install intake manifold ➔ [page 25](#).

2.5 Removing and installing Hall sender

Fitting locations of the four Hall senders: refer to Fitting locations - overview ➔ [page 6](#).

Removing

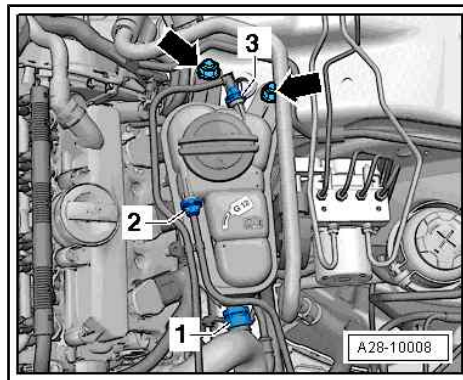
- Unplug electrical connector from corresponding Hall sender.
- To remove Hall sender 3 -G300- on cylinder bank 1 you must first remove the air cleaner housing (bottom section). Removing air cleaner housing (bottom section) ➔ [page 19](#)

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- To remove Hall sender 4 -G301- on cylinder bank 2 you must first remove the coolant expansion tank.
- 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-, -2- and -3- attached.

Installing

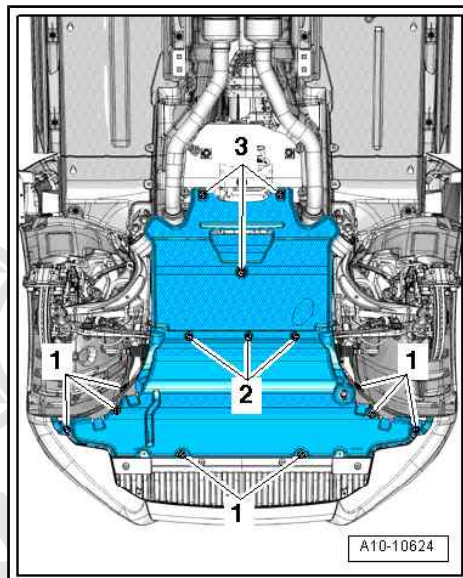
- Renew O-ring and lubricate with clean engine oil.
- Carefully press in Hall sender by hand.
- Secure Hall sender and plug back connector.
- The remaining installation steps are carried out in the reverse sequence.
- Tightening torque: refer to exploded view of ignition system
⇒ [page 61](#) .



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 6](#) .

