

Workshop Manual Audi A6 2005 ➤

Direct petrol injection and ignition system (10-cyl. 5.2 ltr. 4-valve)

Engine ID	BGS	BXA							
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Edition 02.2018

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List of Workshop Manual Repair Groups

Repair Group

24 - Mixture preparation - injection

28 - Ignition system



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

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24 – Mixture preparation - injection

1 Safety precautions and rules for cleanliness

(ARL005717; Edition 02.2018)

1.1 Safety precautions

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



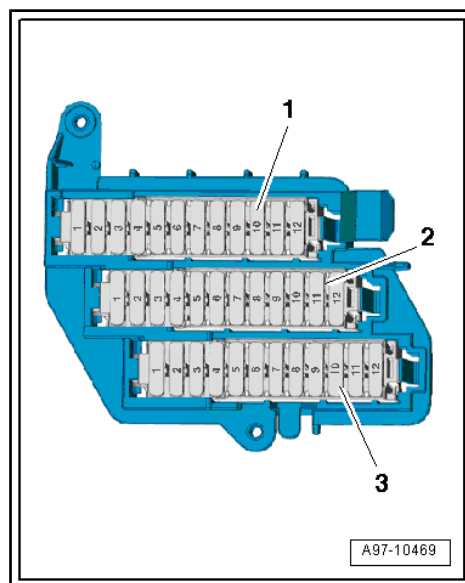
WARNING

The fuel system is pressurised. The fuel pressure in the high-pressure part of the injection system must be reduced to a residual pressure prior to opening; for procedure see [⇒ page 3](#).

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

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- ◆ If the battery is not disconnected, the fuse for the fuel pump control unit - J538- located in the fuse holder in the dash panel (right-side, fuse SC1 in 2nd row) 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.
- ◆ During some of the tests the control unit may detect a fault and store it in the memory. 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.



1.2 Rules for cleanliness and instructions for working on fuel system

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

- ◆ Clean connections and surrounding area thoroughly with engine cleaner or brake cleaner and dry cleaned area before loosening.
- ◆ Plug open lines and connections with suitable protective caps immediately.
- ◆ After removal, place parts on a clean surface and cover them. Only use lint-free cloths.
- ◆ Only install clean components; replacement parts should only be unpacked immediately prior to installation. Do not use any parts that have been unpacked previously and stored away loosely (e.g. in a tool box).
- ◆ Do not work with compressed air when the system is open. If possible, do not move vehicle.

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



Caution

The injection system consists of a high-pressure section (maximum approx. 110 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.

Special tools and workshop equipment required

- ◆ Vehicle diagnostic, testing and information system - VAS 5051B-

Reducing fuel pressure in high-pressure section

- Connect vehicle diagnostic, testing and information system - VAS 5051B-.
- Start engine and run at idling speed.
- Select "Engine electronics" in vehicle self-diagnosis.
- Then select "Read measured values".
- Select measured value block 140.
- With engine idling the fuel pressure is displayed in zone 3.
- ◆ Specification: between 35 and 45 bar
- Remove dash panel cover (right-side) ⇒ Rep. gr. 70.



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



Note

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



WARNING

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

- ◆ **Wear safety goggles and protective clothing when opening the fuel system.**
- ◆ **Before opening the high-pressure section of the fuel system, place a clean cloth around the connection to catch escaping fuel.**

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

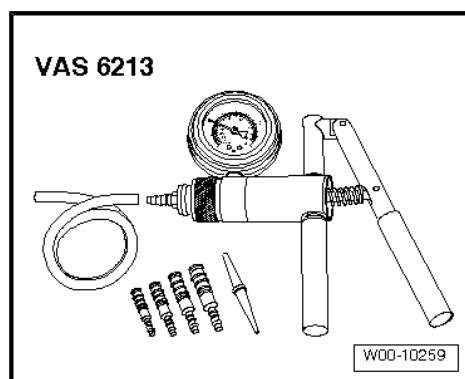
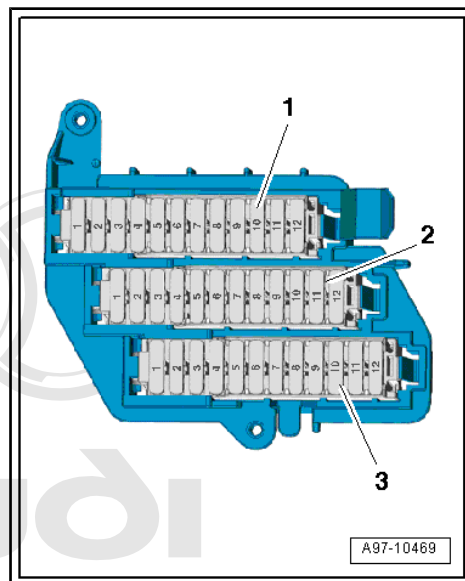
Final steps

- Re-insert fuse for fuel pump control unit - J538- .
- Erase fault memory and generate readiness code in engine control unit using "Guided Functions" mode of vehicle diagnostic, testing and information system - VAS 5051B- .

1.4 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
- ◆ Porous or leaking lines
- Check vacuum line to solenoid valve and from solenoid valve to corresponding component.
- If an entry 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

Engine data	5.2 ltr. / 320 kW engine
Idling speed (not adjustable)	approx. 650 rpm ¹⁾
Fuel pressure after high-pressure pump	18 ... 120 bar
Fuel pressure before high-pressure pump	approx. 6 bar
• ¹⁾ Depending on demands placed on engine control unit.	

2.2 Overview of fitting locations

Engine compartment (right-side)

1 - Engine control unit 2 - J624-

- ☐ Fitting location
⇒ [page 10](#)
- ☐ Removing and installing
⇒ [page 61](#)

2 - Engine control unit - J623-

- ☐ Fitting location
⇒ [page 10](#)
- ☐ Removing and installing
⇒ [page 58](#)

3 - Exhaust camshaft control valve 1 - N318-

- ☐ Fitting location
⇒ [page 13](#)

4 - Camshaft control valve 1 - N205-

- ☐ Fitting location
⇒ [page 13](#)

5 - Fuel pressure sender for low pressure - G410-

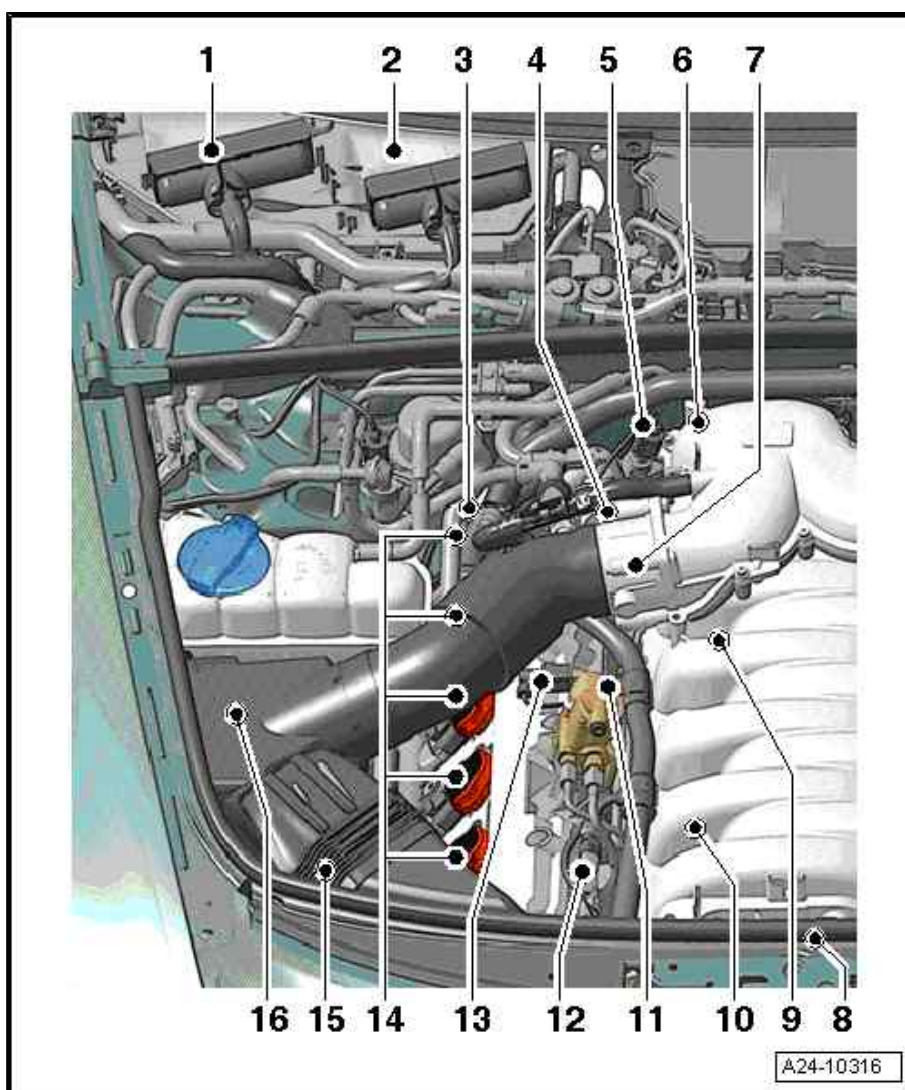
- ☐ Fitting location
⇒ [page 12](#)

6 - Coolant temperature sender - G62-

- ☐ Fitting location
⇒ [page 12](#)

7 - Throttle valve module - J338-

- ☐ After renewing, perform "Adaption" in Guided Functions under Adapt throttle



valve module ⇒ Vehicle diagnostic tester

8 - Components at front of engine

- ☐ ⇒ [page 12](#)
- ☐ Intake manifold flap potentiometer - G336-
- ☐ Variable intake manifold motor - V183-
- ☐ Intake manifold flap motor - V157-
- ☐ Secondary air inlet valve - N112-
- ☐ Intake manifold flap potentiometer 2 - G512-
- ☐ Oil pressure switch - F1-
- ☐ Knock sensor 4 - G199-
- ☐ Knock sensor 3 - G198-
- ☐ Knock sensor 1 - G61-
- ☐ Knock sensor 2 - G66-

9 - Knock sensor 2 - G66-

- ☐ Fitting location ⇒ [page 13](#)
- ☐ Electrical connector ⇒ [page 12](#)
- ☐ 22 Nm

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10 - Knock sensor 1 - G61-

- ☐ Fitting location ⇒ [page 13](#)
- ☐ Electrical connector ⇒ [page 12](#)
- ☐ 22 Nm

11 - High-pressure pump

- ☐ With fuel metering valve - N290-

12 - Hall sender - G40-

- ☐ Fitting location ⇒ [page 13](#)

13 - Electrical connector for fuel metering valve - N290-

- ☐ Combined with high-pressure pump in one unit

14 - Ignition coils, cylinder bank 1

- ☐ 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-
- ☐ Removing and installing
⇒ [“2.3 Removing and installing ignition coils with output stages - cylinders 1 ... 5”, page 68](#)

15 - Hall sender 3 - G300-

- ☐ Fitting location ⇒ [page 13](#)

16 - Air mass meter - G70- / intake air temperature sender - G42-

- ☐ Removing and installing
⇒ [“2.6 Removing and installing air mass meter G70 \(cylinder bank 1\)”, page 19](#)
- ☐ Secured in air cleaner housing

Engine compartment (left-side)

1 - Activated charcoal filter solenoid valve 1 - N80-

- ⇒ [page 11](#)

2 - Throttle valve module 2 - J544-

- After renewing, perform adaption in "Guided Functions", option "Adapt throttle valve module"
- After renewing, perform "Adaption" in Guided Functions under Adapt throttle valve module 2 ⇒ Vehicle diagnostic tester

3 - Camshaft control valve 2 - N208-

- Fitting location ⇒ [page 13](#)

4 - Exhaust camshaft control valve 2 - N319-

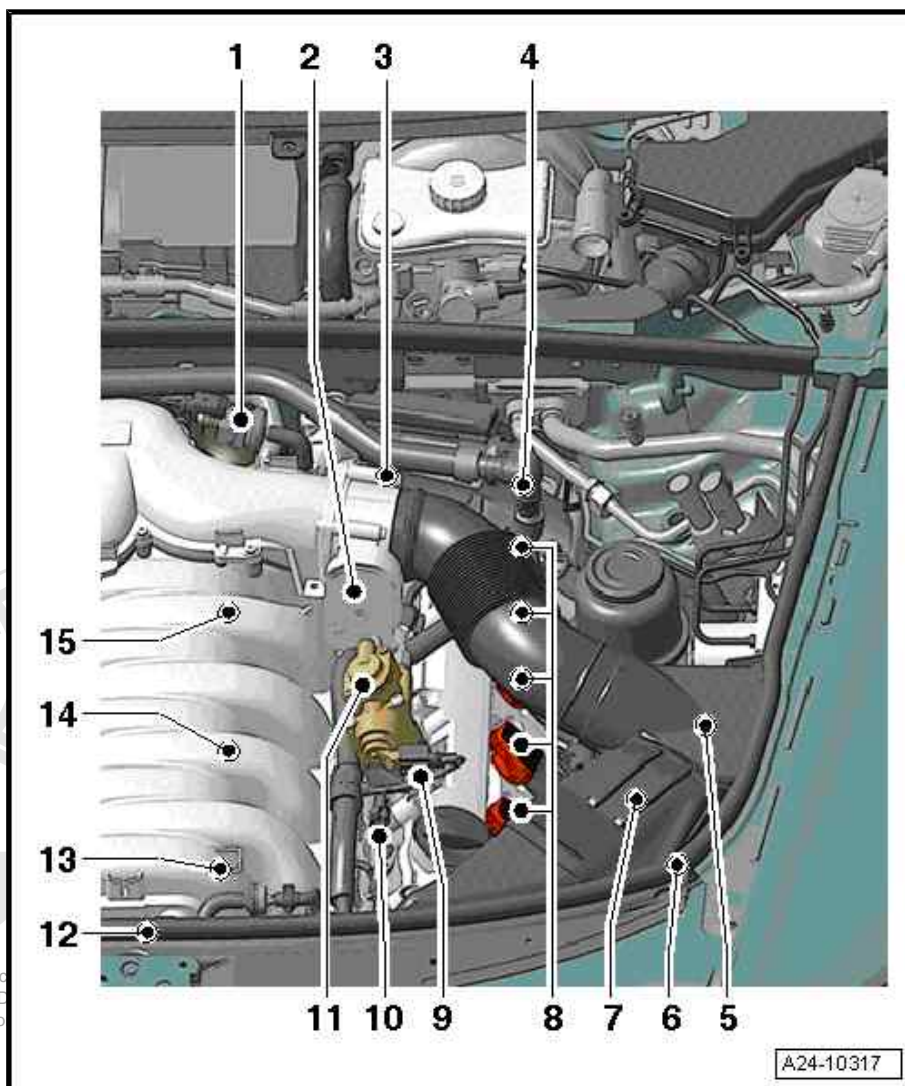
- Fitting location ⇒ [page 13](#)

5 - Air mass meter 2 - G246-

- Removing and installing ⇒ [page 22](#)
- Secured in air cleaner housing

6 - Secondary air pump motor - V101-

- Beneath longitudinal



member (left-side)

- ☐ ⇒ [page 14](#)

7 - Hall sender 4 - G301-

- ☐ Secured to outside of cylinder head
- ☐ Fitting location ⇒ [page 13](#)

8 - Ignition coils, cylinder bank 2

- ☐ Ignition coil 6 with output stage - N324-
- ☐ Ignition coil 7 with output stage - N325-
- ☐ Ignition coil 8 with output stage - N326-
- ☐ Ignition coil 9 with output stage - N327-
- ☐ Ignition coil 10 with output stage - N328-
- ☐ Removing and installing
⇒ ["2.4 Removing and installing ignition coils with output stages - cylinders 6 ... 10", page 71](#)

9 - Electrical connector for fuel metering valve 2 - N402-

- ☐ Combined with high-pressure pump in one unit

10 - Hall sender 2 - G163-

- ☐ Fitting location ⇒ [page 13](#)

11 - High-pressure pump

- ☐ With fuel metering valve 2 - N402-

12 - Components at front of engine

- ☐ ⇒ [page 12](#)
- ☐ Intake manifold flap potentiometer - G336-
- ☐ Variable intake manifold motor - V183-
- ☐ Intake manifold flap motor - V157-
- ☐ Secondary air inlet valve - N112-
- ☐ Intake manifold flap potentiometer 2 - G512-
- ☐ Oil pressure switch - F1-
- ☐ Knock sensor 4 - G199-
- ☐ Knock sensor 3 - G198-
- ☐ Knock sensor 1 - G61-
- ☐ Knock sensor 2 - G66-

13 - Fuel pressure sender - G247-

- ☐ Fitting location ⇒ [page 13](#)

14 - Knock sensor 3 - G198-

- ☐ Fitting location ⇒ [page 13](#)
- ☐ Electrical connector ⇒ [page 12](#)
- ☐ 22 Nm

15 - Knock sensor 4 - G199-

- ☐ Fitting location ⇒ [page 13](#)
- ☐ Electrical connector ⇒ [page 12](#)
- ☐ 22 Nm

A - Engine speed sender - G28-

- ☐ ⇒ [page 12](#)

B - Accelerator position sender - G79- / accelerator position sender 2 - G185-

- ☐ ⇒ [page 11](#)

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

- ☐ ⇒ [page 11](#)

D - Clutch pedal switch - F36- and clutch pedal position sender - G476-

- ☐ ⇒ [page 11](#)

E - Lambda probe - G39- (before catalytic converter) with Lambda probe heater - Z19-

- ☐ Exhaust bank I (cylinders 1, 2, 3)
- ☐ Fitting location of electrical connector
- ☐ Removing and installing ⇒ [page 52](#)

F - Lambda probe 2 before catalytic converter - G108- with Lambda probe 2 heater - Z28-

- ☐ Exhaust bank II (cylinders 4,5)
- ☐ Fitting location of electrical connector ⇒ [page 52](#)
- ☐ Removing and installing ⇒ [page 52](#)

G - Lambda probe 3 before catalytic converter - G285- with Lambda probe 3 heater - Z62-

- ☐ Exhaust bank III (cylinders 6, 7, 8)
- ☐ Fitting location of electrical connector ⇒ [page 51](#)
- ☐ Removing and installing ⇒ [page 52](#)

H - Lambda probe 4 before catalytic converter - G286- with Lambda probe 4 heater - Z63-

- ☐ Exhaust bank IV (cylinders 9, 10)
- ☐ Fitting location of electrical connector ⇒ [page 52](#)
- ☐ Removing and installing ⇒ [page 52](#)

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

- ☐ Exhaust bank I (cylinders 1, 2, 3)
- ☐ Fitting location of electrical connector ⇒ [page 52](#)
- ☐ Removing and installing ⇒ [page 52](#)

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

- ☐ Exhaust bank II (cylinders 4,5)
- ☐ Fitting location of electrical connector ⇒ [page 52](#)
- ☐ Removing and installing ⇒ [page 52](#)

K - Lambda probe 3 after catalytic converter - G287- with Lambda probe 3 heater after catalytic converter - Z64-

- ☐ Exhaust bank III (cylinders 6, 7, 8)
- ☐ Fitting location of electrical connector ⇒ [page 52](#)
- ☐ Removing and installing ⇒ [page 52](#)

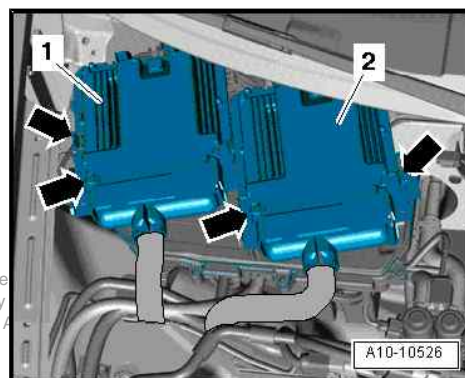
L - Lambda probe 4 after catalytic converter - G288- with Lambda probe 4 heater after catalytic converter - Z65-

- ☐ Exhaust bank IV (cylinders 9, 10)
- ☐ Fitting location of electrical connector ⇒ [page 52](#)
- ☐ Removing and installing ⇒ [page 52](#)

Fitting locations of engine control units

1 - shows engine control unit 2 - J624- (slave)

2 - shows engine control unit - J623- (master)



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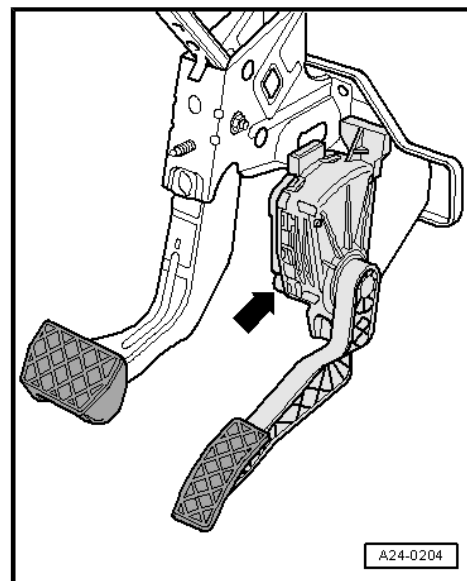
Fitting location of accelerator position sender - G79- / accelerator position sender 2 - G185-

- ◆ In accelerator pedal module -arrow-



Note

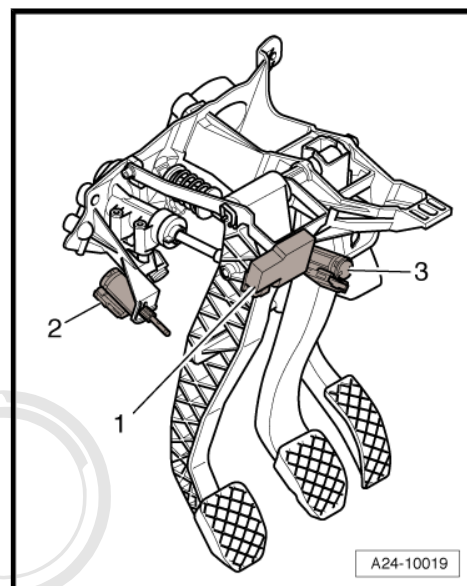
The accelerator position sender - G79- and accelerator position sender 2 - G185- are integrated in the accelerator pedal module and cannot be renewed individually.



Fitting location of brake light switch - F- / brake pedal switch - F47-, clutch pedal switch - F36- and clutch position sender - G476-

- ◆ On pedal bracket

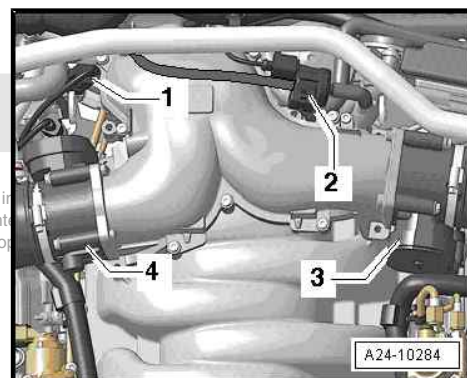
- 1 - Clutch position sender - G476-
- 2 - Clutch pedal switch - F36-
- 3 - Brake light switch - F- / brake pedal switch - F47-



Fitting locations

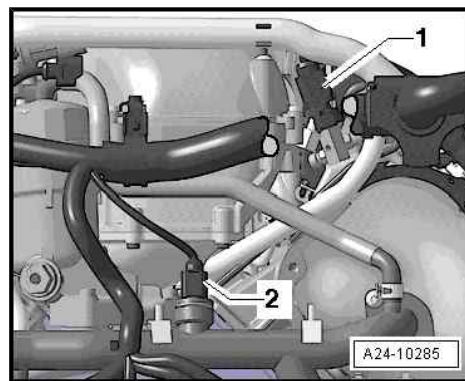
- 1 - Fuel pressure sender for low pressure - G410-
- 2 - Activated charcoal filter solenoid valve 1 - N80-
- 3 - Throttle valve module 2 - J544-
- 4 - Throttle valve module - J338-

After renewing throttle valve module an "adaption" must be performed; see "Guided Functions", vehicle diagnostic, testing and information system - VAS 5051B- .



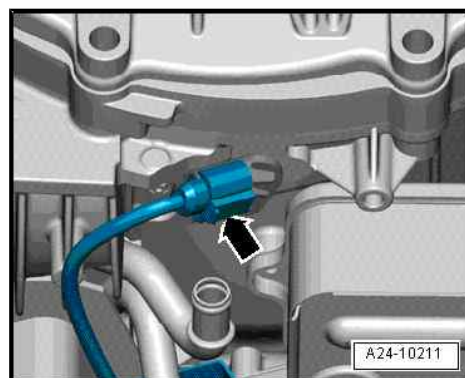
Engine (shown from rear)

- 1 - Fuel pressure sender for low pressure - G410-
- 2 - Removing and installing coolant temperature sender - G62- ⇒ Rep. gr. 19



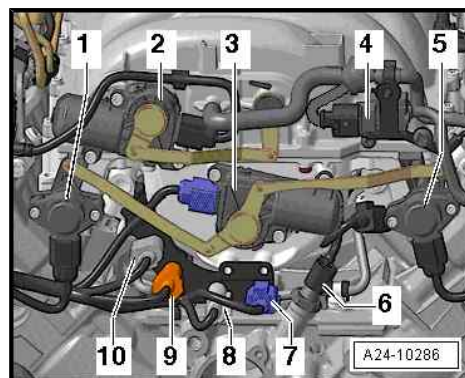
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Engine speed sender - G28- -arrow-



Engine viewed from front

- 1 - Intake manifold flap potentiometer - G336-
- 2 - Variable intake manifold motor - V183-
- 3 - Intake manifold flap motor - V157-
- 4 - Secondary air inlet valve - N112-
- 5 - Intake manifold flap potentiometer 2 - G512-
- 6 - Removing and installing oil pressure switch - F1- ⇒ Rep. gr. 17
- 7 - Knock sensor 4 - G199- (blue connector)
- 8 - Knock sensor 3 - G198- (white connector)
- 9 - Knock sensor 1 - G61- (orange connector)
- 10 - Knock sensor 2 - G66- (grey connector)



Note

To remove the knock sensors you must first remove the intake manifold. Removing and installing intake manifold ⇒ [page 26](#)

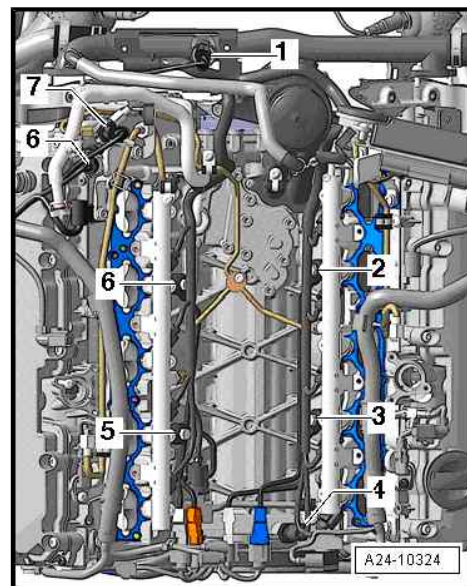
Fitting location inside cylinder head

- 1 - Coolant temperature sender - G62-
- 2 - Knock sensor 4 - G199-
- 3 - Knock sensor 3 - G198-
- 4 - Fuel pressure sender - G247-
- 5 - Knock sensor 1 - G61-
- 6 - Knock sensor 2 - G66-
- 7 - Camshaft control valve 1 - N205-
- 8 - Fuel pressure sender for low pressure - G410-



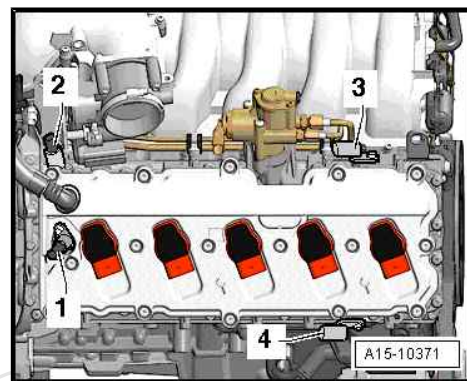
Note

To remove the fuel pressure regulator - G247- or the knock sensors you must first remove the intake manifold. Removing and installing intake manifold ⇒ [page 26](#)



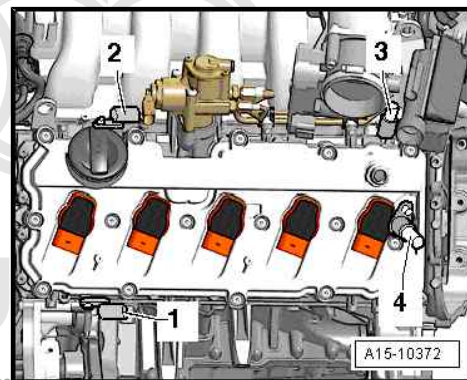
Fitting locations on cylinder bank 1 (right-side)

- 1 - Exhaust camshaft control valve 1 - N318-
- 2 - Camshaft control valve 1 - N205-
- 3 - Hall sender - G40-
- 4 - Hall sender 3 - G300-



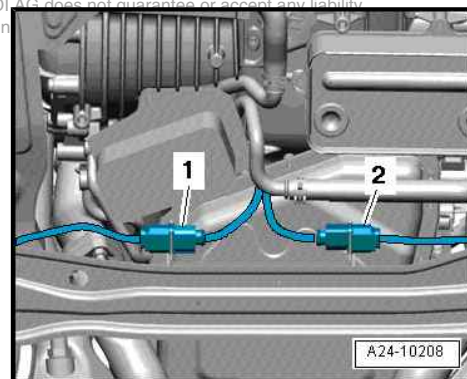
Fitting locations on cylinder bank 2 (left-side)

- 1 - Hall sender 4 - G301-
- 2 - Hall sender 2 - G163-
- 3 - Camshaft control valve 2 - N208-
- 4 - Exhaust camshaft control valve 2 - N319-



Electrical connectors for Lambda probes (on underbody)

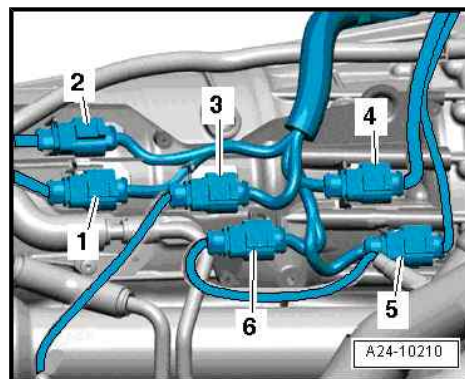
- 1 - Black connector for Lambda probe - G39- (before catalytic converter)
- 2 - Brown connector for Lambda probe 3 - G285- (before catalytic converter)



Electrical connectors for Lambda probes (on top of gearbox)

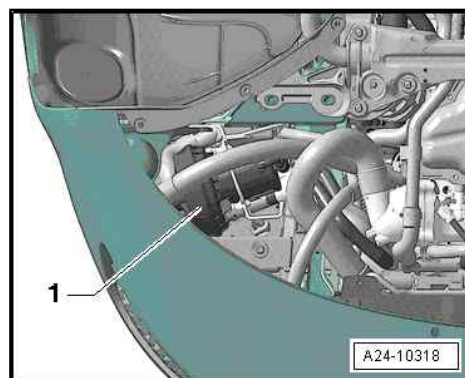
- 1 - Grey: for Lambda probe 4 after catalytic converter - G288-
- 2 - Black: for Lambda probe 3 after catalytic converter - G287-
- 3 - Brown: for Lambda probe after catalytic converter - G130-
- 4 - Brown: for Lambda probe 4 - G286- (before catalytic converter)
- 5 - Black: for Lambda probe 2 - G108- (before catalytic converter)
- 6 - Black: for Lambda probe 2 after catalytic converter - G131-

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Motor for secondary air pump - V101- (below left-side longitudinal member)

- ◆ Removing and installing ⇒ Rep. gr. 26



2.3 Exploded view - air cleaner



Note

Illustration shows air cleaner on left side.

1 - Rubber grommet**2 - 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)

3 - Rubber grommet**4 - Bolt**

- ☐ 1.5 Nm

5 - Air duct

- ☐ Clean dirt and leaves out of air duct

6 - Air cleaner housing (top section)

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

7 - Air hose

- ☐ To throttle valve module - J338-

8 - Bolt

- ☐ 1.5 Nm

9 - Air duct

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

10 - Air duct

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

11 - Bolts

- ☐ 1.5 Nm

12 - Air mass meter

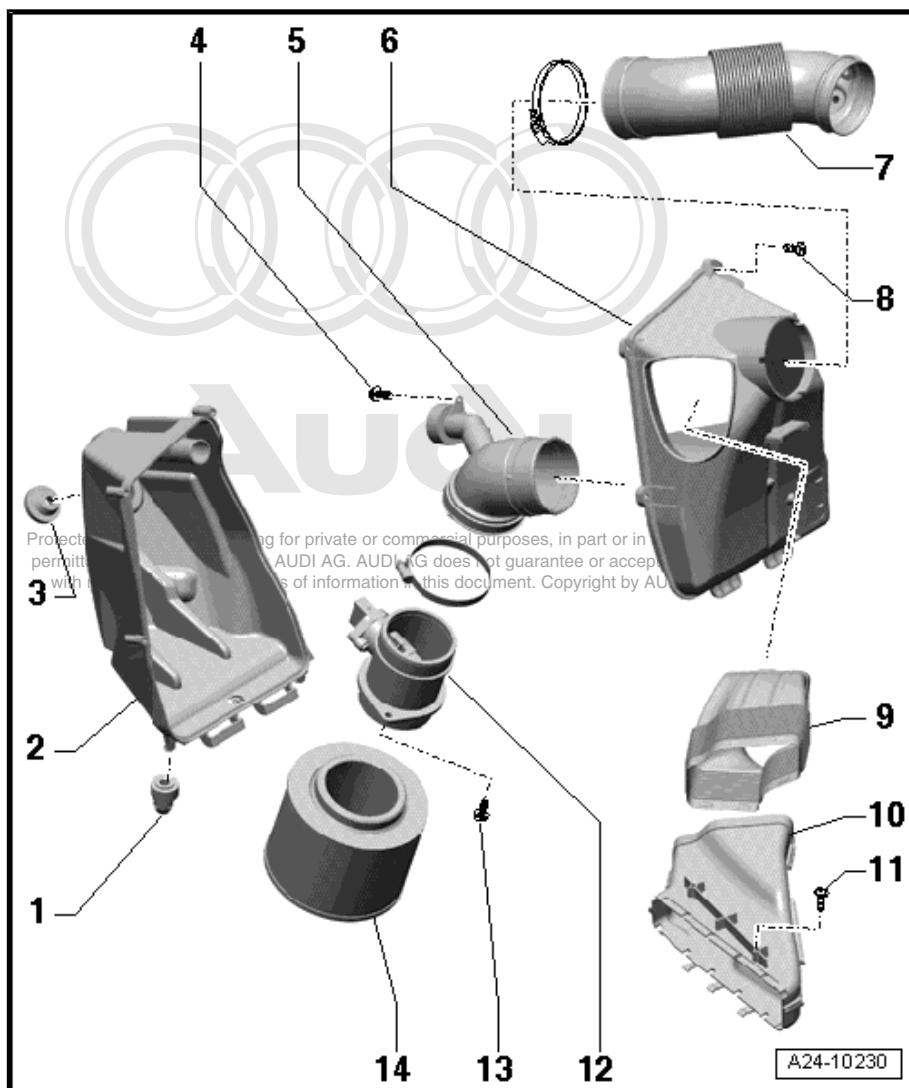
- ☐ Removing and installing air mass meter - G70- with intake air temperature sender - G42- (cylinder bank 1) ⇒ [page 19](#)
- ☐ Removing and installing air mass meter 2 - G246- (cylinder bank 2) ⇒ [page 22](#)

13 - Bolts

- ☐ 1.5 Nm

14 - Air filter element

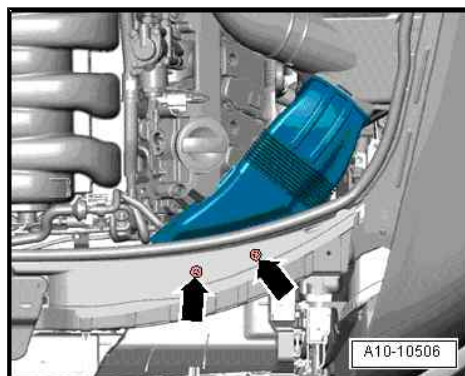
- ☐ Always use a genuine Audi air filter element
- ☐ Maintenance intervals ⇒ Maintenance ; Booklet 405
- ☐ Removing and installing ⇒ [page 16](#)
- ☐ Also clean snow screen (if fitted)



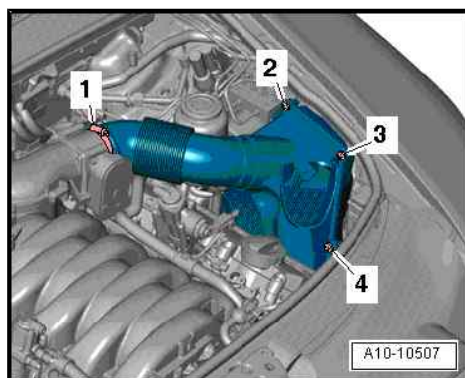
2.4 Removing and installing air filter element (left and right)

Removing air cleaner housing (left-side):

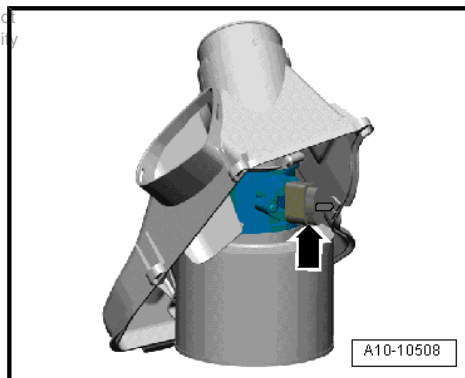
- Remove bolts -arrows- and take out air duct (left-side).



- Release hose clip -1- and unscrew bolts -2 ... 4-.

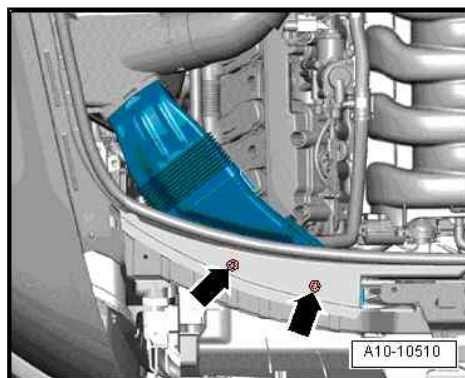


- Unplug electrical connector -arrow- at air mass meter 2 G246.
- Detach top section of air cleaner housing (left-side).
- Take out air filter element.

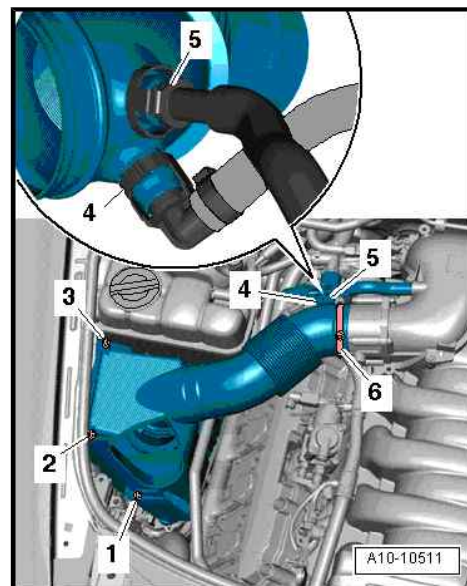


Removing air cleaner housing (right-side):

- Remove bolts -arrows- and take out air duct (right-side).
- Disconnect vacuum hoses -4- and -5-.



- Release hose clip -6- and unscrew bolts -1 ... 3-.



- Unplug electrical connector -arrow- at air mass meter - G70-.
- Detach top section of air cleaner housing (right-side).
- Take out air filter element.

Installing

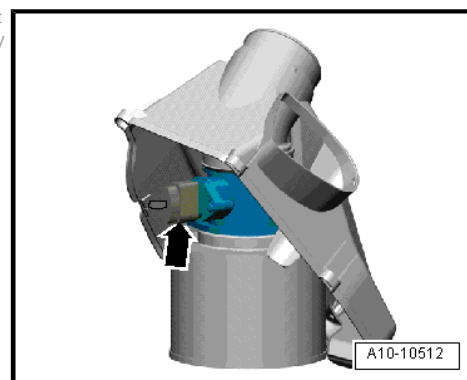
Installation is performed in reverse sequence; note the following:

To ensure the correct function of the air mass meter it is important to observe the following notes and adhere to the procedures described below.

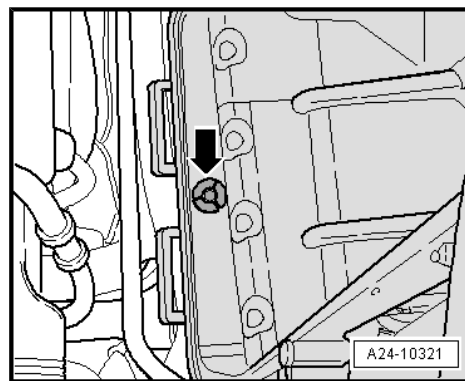


Note

- ◆ *If the air filter element is very dirty or wet, dirt particles or water can reach the air mass meter and falsify the detected air mass values. This will cause a loss of power, as the calculated injection quantities will be too low.*
- ◆ *Always use genuine air filter elements (same as original equipment).*
- ◆ *The air cleaner housing must always be clean.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue .*
- ◆ *When cleaning the air cleaner housing with compressed air, cover the critical components of the engine intake system such as the air mass meter and intake pipes etc. with a clean cloth to avoid malfunctioning.*
- ◆ *Please observe requirements for disposal.*



- Clean water drain (small hole in bottom section of air cleaner housing -arrow-), blow out with compressed air 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 salt residue, dirt and leaves in air mass meter and air hose (engine intake side).
- Check air duct leading from lock carrier to air cleaner housing for dirt and leaves.
- When installing the air filter element, make sure it is positioned centrally on the mounting in the bottom section of the air cleaner housing.
- Carefully fit the top section of the air cleaner housing on the bottom section without applying any significant force. Make sure the top section of the air cleaner housing is fitted straight on the air filter element (note position of sealing lip on air filter element).
- Make sure that the air hose is seated correctly at the air mass meter.



Tightening torque

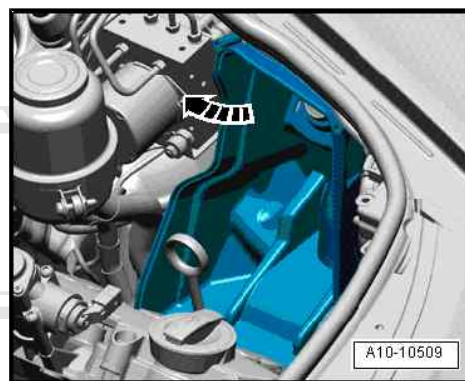
Component	Nm
Hose clips for air hoses	2.5

2.5 Removing and installing air cleaner housing (left and right)

- Remove air filter element on the relevant side of vehicle
⇒ [page 16](#).

Removing air cleaner housing (left-side):

- Pull bottom section of air cleaner housing away from connection on side.
- Pivot bottom section of air cleaner housing upwards -arrow- and remove.



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Removing air cleaner housing (right-side):

- Pull bottom section of air cleaner housing away from connection on side.
- Pivot bottom section of air cleaner housing upwards -arrow- and remove.

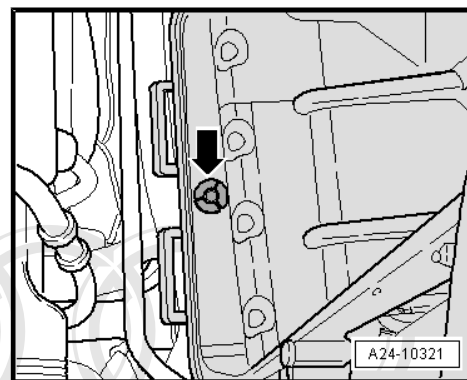
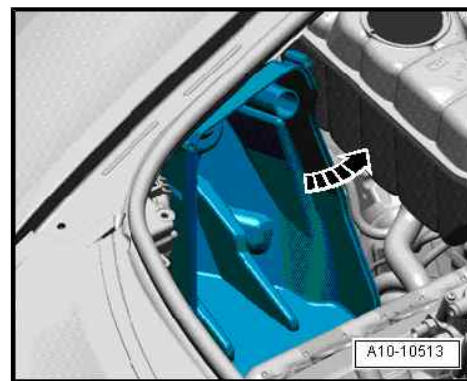
Installing

Installation is performed in reverse sequence; note the following:

**Note**

- ◆ *The air cleaner housing must always be clean.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue .*
- ◆ *When cleaning the air cleaner housing with compressed air, cover the critical components of the engine intake system such as the air mass meter and intake pipes etc. with a clean cloth to avoid malfunctioning.*

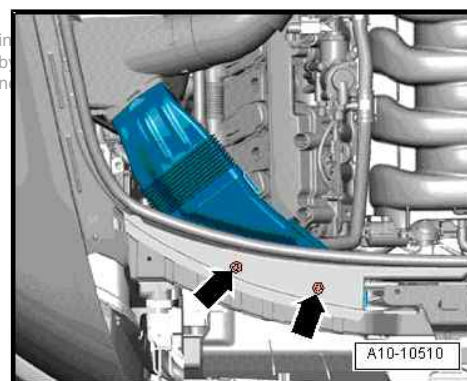
- Clean water drain (small hole in bottom section of air cleaner housing -arrow-), blow out with compressed air if necessary.
- Clean salt residue, dirt and leaves out of air cleaner housing (top and bottom sections); use a vacuum cleaner if necessary.
- Check for salt residue, dirt and leaves in air mass meter and air hose (engine intake side).
- Check air duct leading from lock carrier to air cleaner housing for dirt and leaves.
- Carefully fit the top section of the air cleaner housing on the bottom section without applying any significant force. Make sure the top section of the air cleaner housing is fitted straight on the air filter element (note position of sealing lip on air filter element).



2.6 Removing and installing air mass meter - G70- (cylinder bank 1)

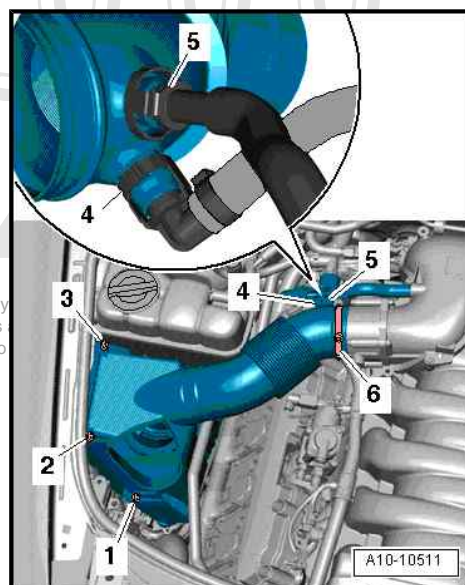
Removing

- Remove bolts -arrows- and take out air duct (right-side).
- Disconnect vacuum hoses -4- and -5-.



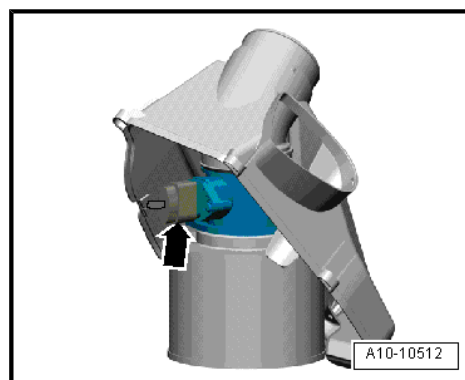
- Release hose clip -6- and unscrew bolts -1 ... 3-.

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- Unplug electrical connector -arrow- at air mass meter - G70- .



- Loosen hose clip -1- and remove both bolts -2-.
- Then carefully pull air mass meter - G70- out of guide on air cleaner housing (top section).

Installing

To ensure the correct function of the air mass meter it is important to observe the following notes and adhere to the procedures described below.



Note

- ◆ *If the air filter element is very dirty or wet, dirt particles or water can reach the air mass meter and falsify the detected air mass values. This will cause a loss of power, as the calculated injection quantities will be too low.*
- ◆ *Always use genuine air filter elements (same as original equipment).*
- ◆ *Always renew O-ring on air mass meter if damaged (air leak).*
- ◆ *Use silicone-free lubricant when fitting air hose.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue .*
- Check air mass meter and air hose (engine intake side) for salt residue, dirt and leaves.
- Check intake duct as far as air filter element for dirt. If necessary, clean salt residue, dirt and leaves out of air cleaner housing (top and bottom sections); wash out or use a vacuum cleaner as required. Removing and installing top section of air cleaner housing ⇒ [page 16](#)
- If top section of air cleaner housing has been removed check water drain -arrow- in bottom section of air cleaner housing for dirt and other obstructions (if necessary clean by blowing it out).

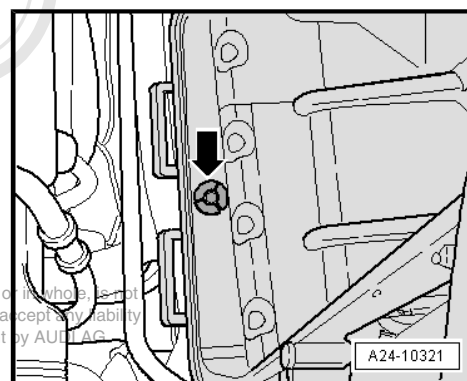
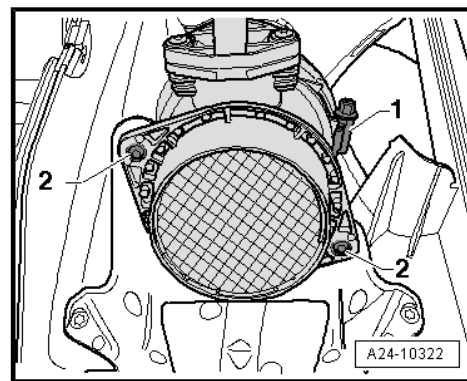


Note

The illustration shows the bottom section of the air cleaner housing (left-side).

- Make sure that air hose is seated securely between air mass meter - G70- and throttle valve module - J338- .

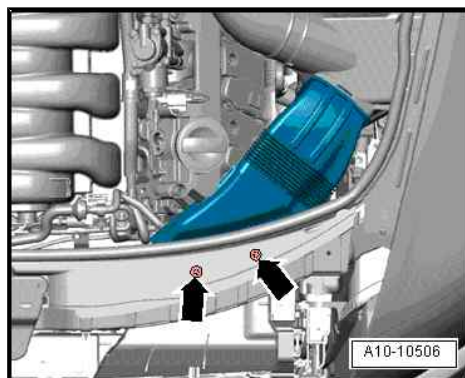
The remaining installation steps are carried out in the reverse sequence.



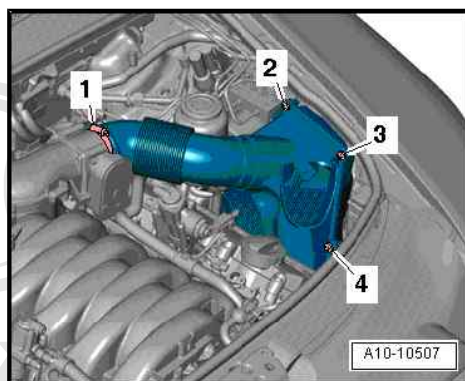
2.7 Removing and installing air mass meter 2 - G246- (cylinder bank 2)

Removing

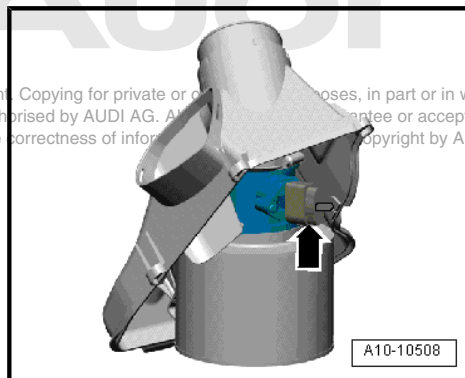
- Remove bolts -arrows- and take out air duct (left-side).



- Release hose clip -1- and unscrew bolts -2 ... 4-.



- Unplug electrical connector -arrow- at air mass meter 2 - G246- .



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- Loosen hose clip -1- and remove both bolts -2-.
- Then carefully pull air mass meter 2 - G246- out of guide on air cleaner housing (top section).

Installing

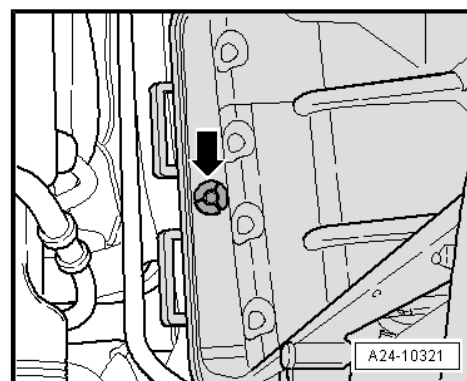
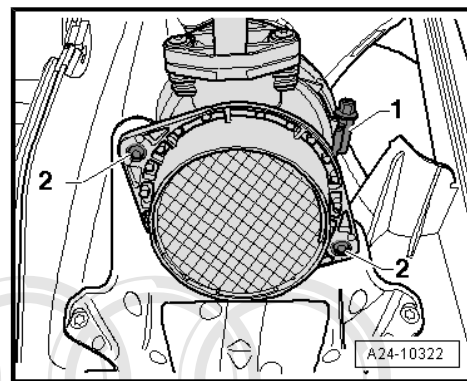
To ensure the correct function of the air mass meter it is important to observe the following notes and adhere to the procedures described below.



Note

- ◆ *If the air filter element is very dirty or wet, dirt particles or water can reach the air mass meter and falsify the detected air mass values. This will cause a loss of power, as the calculated injection quantities will be too low.*
- ◆ *Always use genuine air filter elements (same as original equipment).*
- ◆ *Always renew O-ring on air mass meter if damaged (air leak).*
- ◆ *Use silicone-free lubricant when fitting air hose.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ [Parts catalogue](#).*
- Check air mass meter and air hose (engine intake side) for salt residue, dirt and leaves.
- Check intake duct as far as air filter element for dirt. If necessary, clean salt residue, dirt and leaves out of air cleaner housing (top and bottom sections); wash out or use a vacuum cleaner as required. Removing and installing top section of air cleaner housing ⇒ [page 16](#)
- If top section of air cleaner housing has been removed check water drain -arrow- in bottom section of air cleaner housing for dirt and other obstructions (if necessary clean by blowing it out).
- Make sure that air hose is properly seated between air mass meter 2 - G246- and throttle valve module 2 - J544- .

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



2.8 Exploded view - intake manifold

1 - Intake manifold flap motor - V157-
2 - Bolt

- ☐ 9 Nm

3 - Bolt

- ☐ 9 Nm

4 - Variable intake manifold motor - V183-
5 - Bolt

- ☐ 2.5 Nm

6 - Intake manifold flap potentiometer - G336-

- ☐ Right cylinder bank
- ☐ After renewing, perform "Adaption" in Guided Functions under Adapt intake manifold flap potentiometer ⇒ Vehicle diagnostic tester

7 - Seal

- ☐ Renew if damaged
- ☐ Open side faces towards intake manifold flap potentiometer - G336-

8 - Intake manifold

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

9 - Seal

- ☐ Renew

10 - Gasket

- ☐ Renew

11 - Throttle valve module - J338-

- ☐ After renewing, perform "Adaption" in Guided Functions under Adapt throttle valve module ⇒ Vehicle diagnostic tester

12 - Bolt

- ☐ 9 Nm

13 - Bolt

- ☐ 9 Nm

14 - Air duct
15 - Gasket

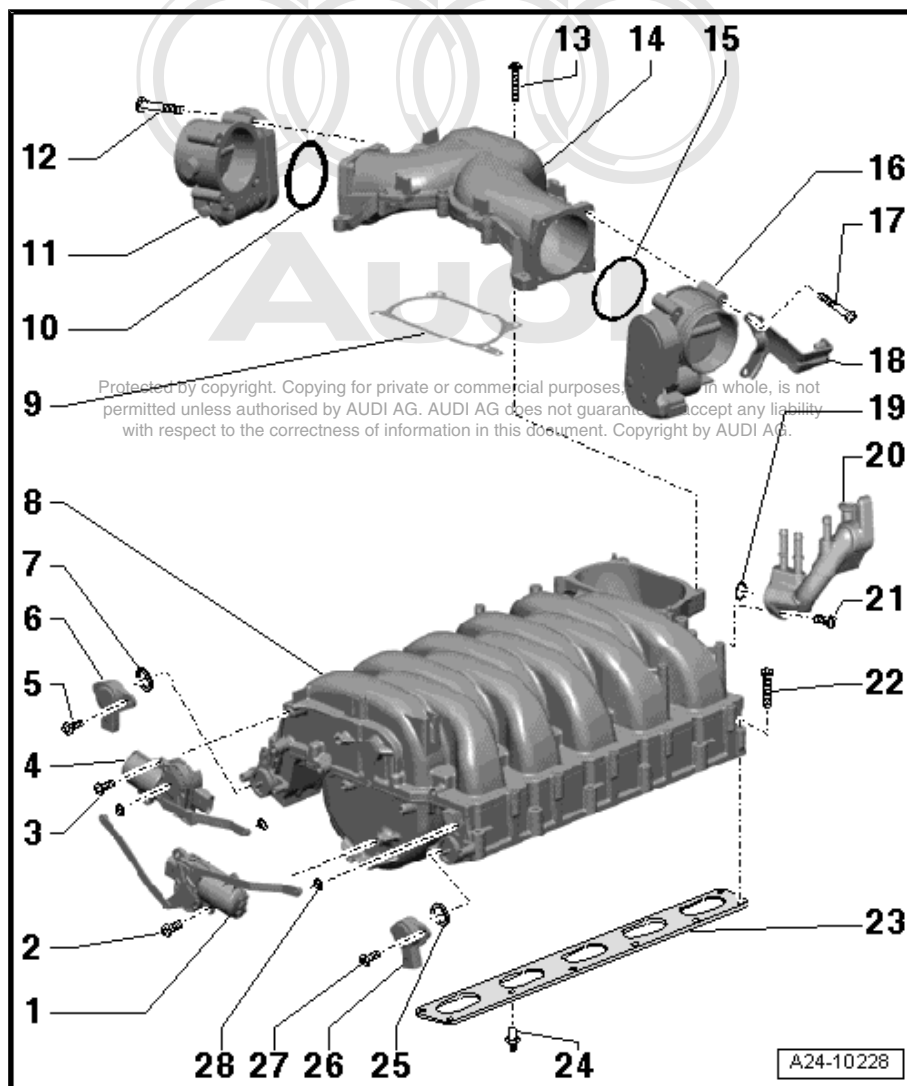
- ☐ Renew

16 - Throttle valve module 2 - J544-

- ☐ After renewing, perform "Adaption" in Guided Functions under Adapt throttle valve module 2 ⇒ Vehicle diagnostic tester

17 - Bolt

- ☐ 9 Nm



18 - Bracket**19 - O-ring**

- ☐ Renew

20 - Connecting piece with coolant connection

- ☐ For crankcase breather

21 - Bolt

- ☐ 9 Nm

22 - Bolt

- ☐ Renew
- ☐ Tighten initially to 8 Nm
- ☐ Subsequently tighten to 9 Nm and then tighten 90° further

23 - Intake manifold gasket

- ☐ Renew

24 - Locating pin

- ☐ 2x
- ☐ Check whether fitted

25 - Gasket

- ☐ Renew if damaged
- ☐ Open side faces towards intake manifold flap potentiometer 2 - G512-

26 - Intake manifold flap potentiometer 2 - G512-

- ☐ Left cylinder bank
- ☐ After renewing, perform "Adaption" in Guided Functions under Adapt intake manifold flap potentiometer ⇒ Vehicle diagnostic tester

27 - Bolt

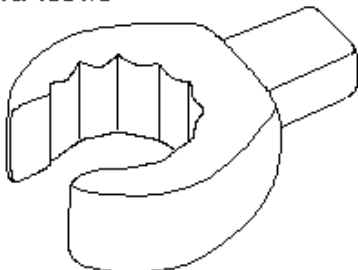
- ☐ 2.5 Nm

28 - Circlip

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2.9 Removing and installing intake manifold

Special tools and workshop equipment required

V.A.G 1331 	V.A.G 1331/6 
V.A.G 1331/8 	
	G24-10006

- ◆ Torque wrench - V.A.G 1331-
- ◆ Open end spanner insert, AF 17 - V.A.G 1331/6-
- ◆ Socket insert AF 14, flared ring spanner - V.A.G 1331/8-

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.**

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**Note**

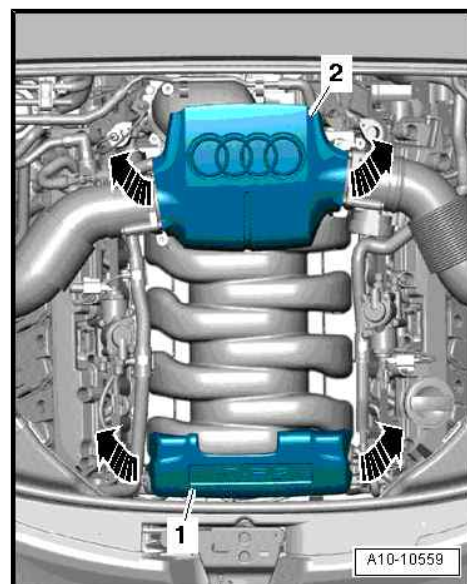
All cable ties which are released or cut open when removing must be fitted in the same position when installing.

**Caution**

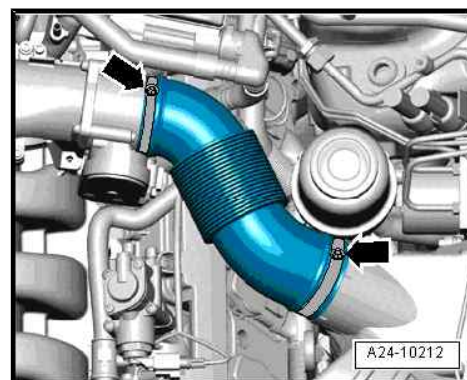
Observe notes on procedure for disconnecting the battery ⇒ Rep. gr. 27.

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- Disconnect earth wire at battery with ignition switched off.
- Drain off coolant ⇒ Rep. gr. 19 .
- Remove radiator ⇒ Rep. gr. 19 .
- Remove radiator cowl ⇒ Rep. gr. 19 .
- Pull off engine cover panels at front -1- and at rear -2- -arrows-.



- Remove air hose (left-side) -arrows-.



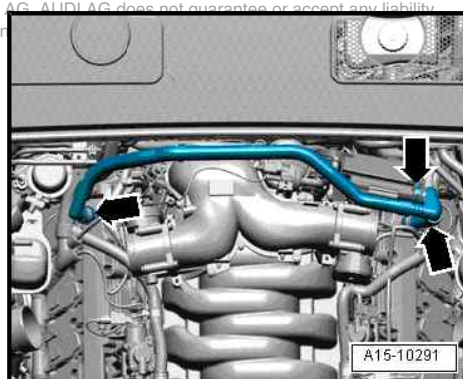
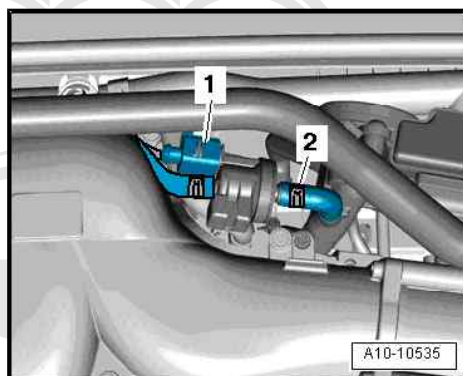
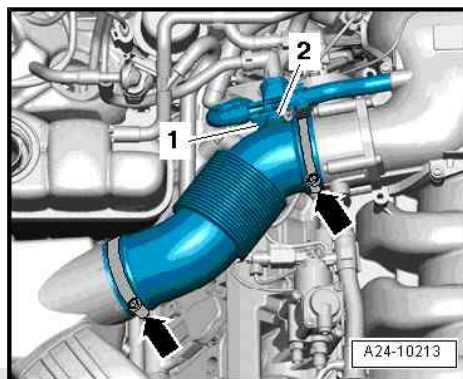
- Disconnect vacuum hoses -1- and -2-.



Caution

Do not disconnect crankcase breather vacuum hose -1- on USA models. Move air pipe clear instead (vacuum hose remains connected).

- Remove air hose (right-side) -arrows-.
- Unplug electrical connector -1- at activated charcoal filter solenoid valve 1 - N80- .
- Detach vacuum hose -2- coming from activated charcoal filter solenoid valve 1 - N80- .
- Detach activated charcoal filter solenoid valve 1 - N80- from bracket and move it clear to the side with hose still attached.
- Remove vacuum hose for crankcase breather system -arrows-.

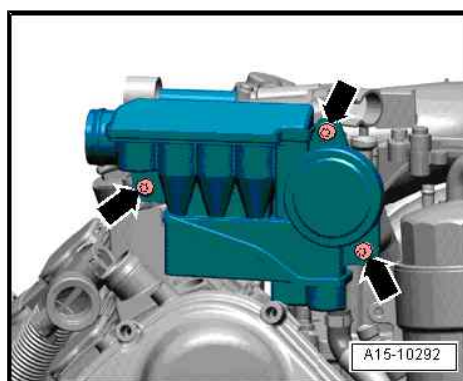


- Remove bolts -arrows-.
- Detach pressure control valve for crankcase breather system towards the rear.

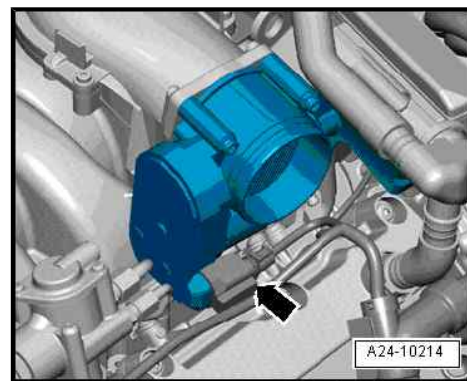


Note

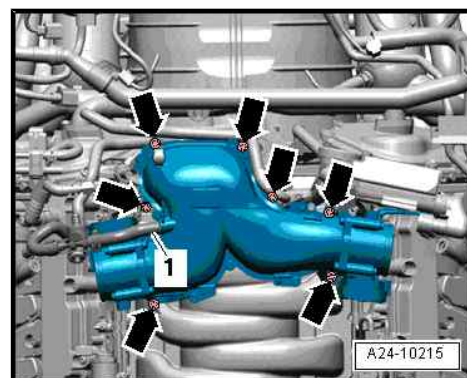
The pressure control valve for the crankcase breather system remains in the engine compartment with the return hose connected.



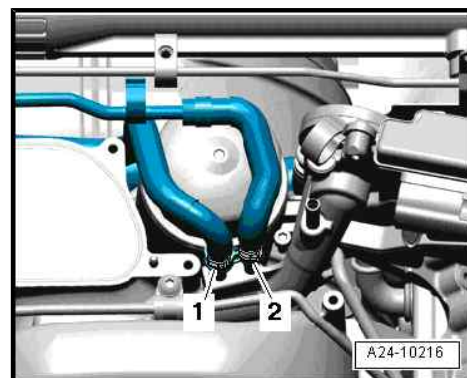
- Unplug electrical connectors -arrow- on left and right of intake manifold at throttle valve module - J338- and throttle valve module 2 - J544- .



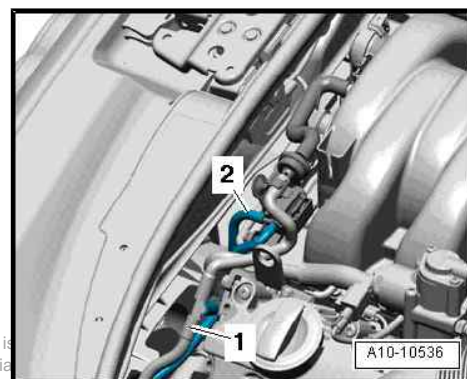
- Detach vacuum hose -1- from intake manifold.
- Unscrew bolts -arrows- and remove air duct.



- Detach coolant hoses -1- and -2- from intake connecting pipe.



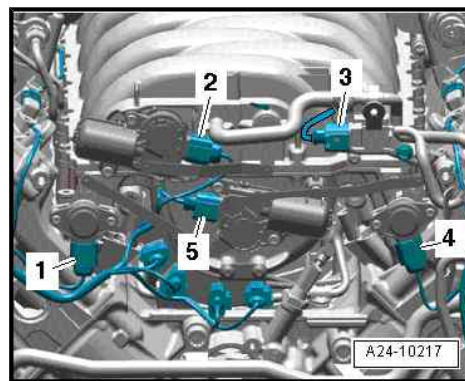
- Pull bonnet seal off lock carrier and wing panels.
- Disconnect vacuum hoses -1- and -2-.
- Move vacuum hoses clear.



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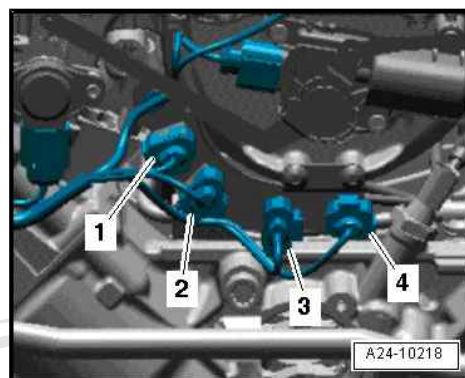
– Unplug electrical connectors for:

- 1 - Intake manifold flap potentiometer - G336-
- 2 - Variable intake manifold motor - V183- (black connector)
- 3 - Secondary air inlet valve - N112-
- 4 - Intake manifold flap potentiometer 2 - G512-
- 5 - Intake manifold flap motor - V157- (blue connector)

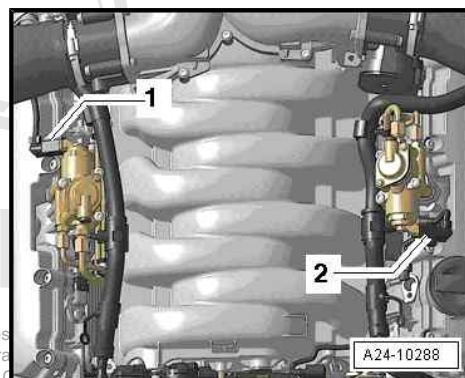


– Unplug electrical connectors for:

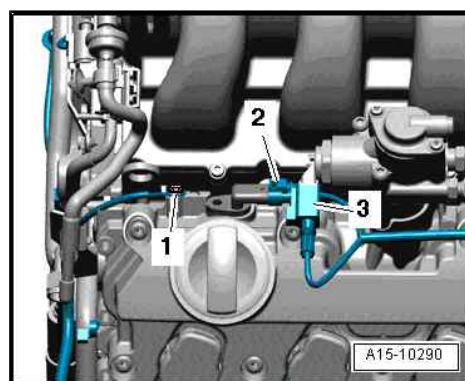
- 1 - Knock sensor 2 - G66- (grey connector)
- 2 - Knock sensor 1 - G61- (orange connector)
- 3 - Knock sensor 3 - G198- (white connector)
- 4 - Knock sensor 4 - G199- (blue connector)



- Unplug electrical connectors for fuel metering valve - N290- -1- and fuel metering valve 2 - N402- -2-.
- Unplug electrical connectors (left and right) -2- at Hall sender - G40- and Hall sender 2 - G163- on cylinder head.



- Unbolt earth cable (left and right) -1- at cylinder head.



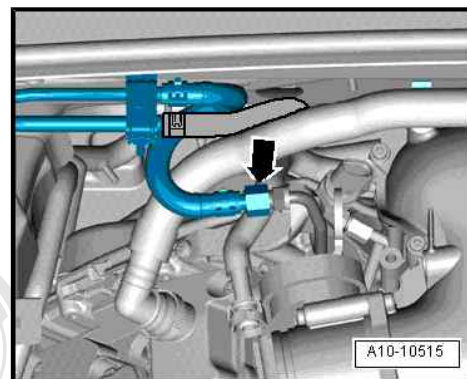
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- Disconnect fuel supply line -arrow-.

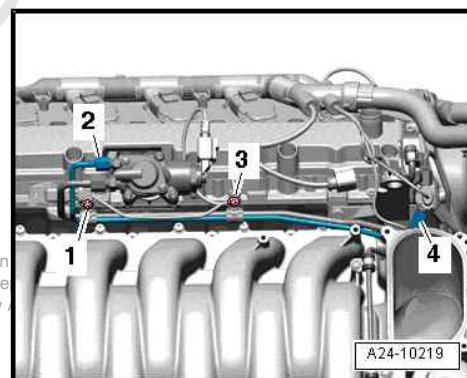


WARNING

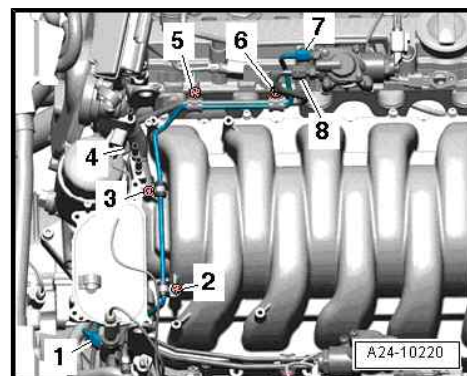
The fuel system is pressurised. Before opening the system place a clean cloth around the connection. Then carefully loosen the connection to relieve the pressure.



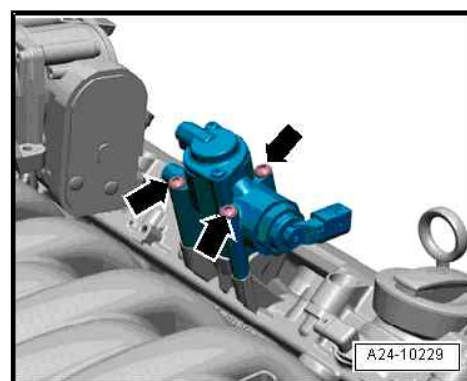
- Loosen bolts -1 ... 4- and detach fuel supply line leading to high-pressure pump (right-side).



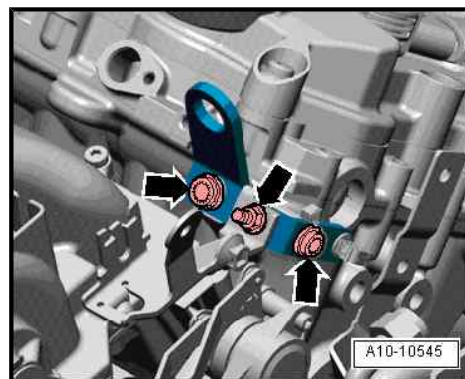
- Loosen bolts -1 ... 8- and detach fuel supply line and high-pressure pipe leading to high-pressure pump (left-side).



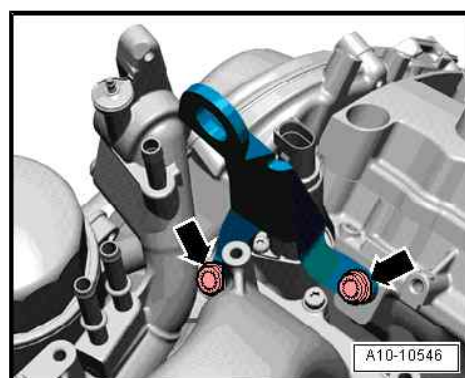
- Unscrew bolts on left and right -arrows- and detach both high-pressure pumps.



- Unscrew the bolts and the nut -arrows- and remove engine lifting eye (front left).



- Unscrew bolts -arrows- and remove engine lifting eye (rear left).



- Remove intake manifold bolts in the sequence -12 ... 1-.
- Remove intake manifold from engine compartment.



Note

Seal intake ports on cylinder heads with clean cloths.

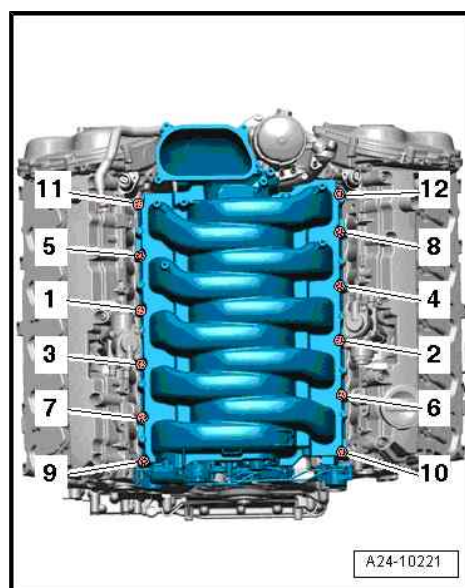
Installing

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



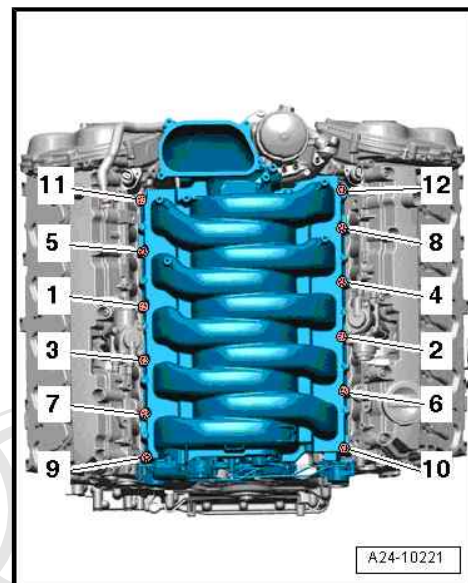
Note

- ◆ If an injector has been pulled out of the cylinder head, the teflon ring seal must be renewed.
- ◆ Renew gaskets, seals and O-rings.
- ◆ Secure all hose connections with the correct type of hose clips (same as original equipment) → Parts catalogue .
- ◆ Fit all cable ties in the original positions when installing.



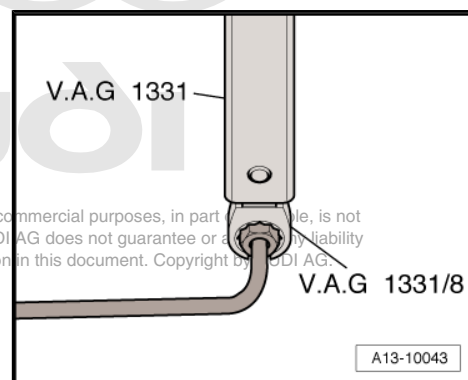
- Renew intake manifold gaskets (note locating pins).
- Observe locating pins when fitting intake manifold.

- Tighten bolts for intake manifold in 2 stages.
- Tightening torque ⇒ [page 23](#)

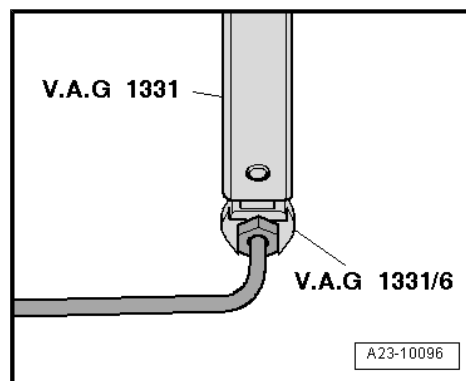


Note

- ◆ *The connections of the high-pressure pipes must not be damaged.*
- ◆ *Do not attempt to bend high-pressure pipes to a different shape.*
- Tighten union nuts on high-pressure pipes hand-tight initially.
- Ensure that high-pressure pipes are not under tension.
- To tighten union nut (14 mm) for high-pressure pipes, use torque wrench - V.A.G 1331- with socket insert, AF 14, flared ring spanner - V.A.G 1331/8- .



- To tighten union nut (17 mm) for high-pressure pipes, use torque wrench - V.A.G 1331- with open end spanner insert, AF 17 - V.A.G 1331/6- .
- Do not install mounting brackets until high-pressure pipes have been finally secured.
- Install high-pressure pumps (right and left) ⇒ [page 39](#) .
- Install radiator ⇒ Rep. gr. 19 .
- Install radiator cowl ⇒ Rep. gr. 19 .
- Fill up coolant ⇒ Rep. gr. 19 .
- Observe notes on procedures required after connecting battery ⇒ Rep. gr. 27 .
- After installing, "Adaptions" must be performed ⇒ Vehicle diagnostic tester, Guided Functions, Adapt intake manifold flap potentiometer, Adapt throttle valve module and Adapt throttle valve module 2.



Tightening torques

Component	Nm
Engine lifting eye to cylinder head	22
High-pressure pipes to: Fuel rail	25
High-pressure pump	25
Pipe/wiring retainer to intake manifold	9
Cap on oil filter housing	25
Fuel supply line to fuel rail	25
Air duct to intake manifold	9

2.10 Exploded view - injectors and fuel rail



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1 - Radial compensation element

- ☐ Renew if damaged
- ☐ Clip onto support ring
⇒ [Item 6 \(page 35\)](#)

2 - Combustion chamber ring seal

- ☐ Do not apply grease to ring seal or use any other lubricants
- ☐ Renewing ⇒ [page 41](#)

3 - Injector

- ☐ Removing and installing
⇒ [page 41](#)

4 - Spacer ring

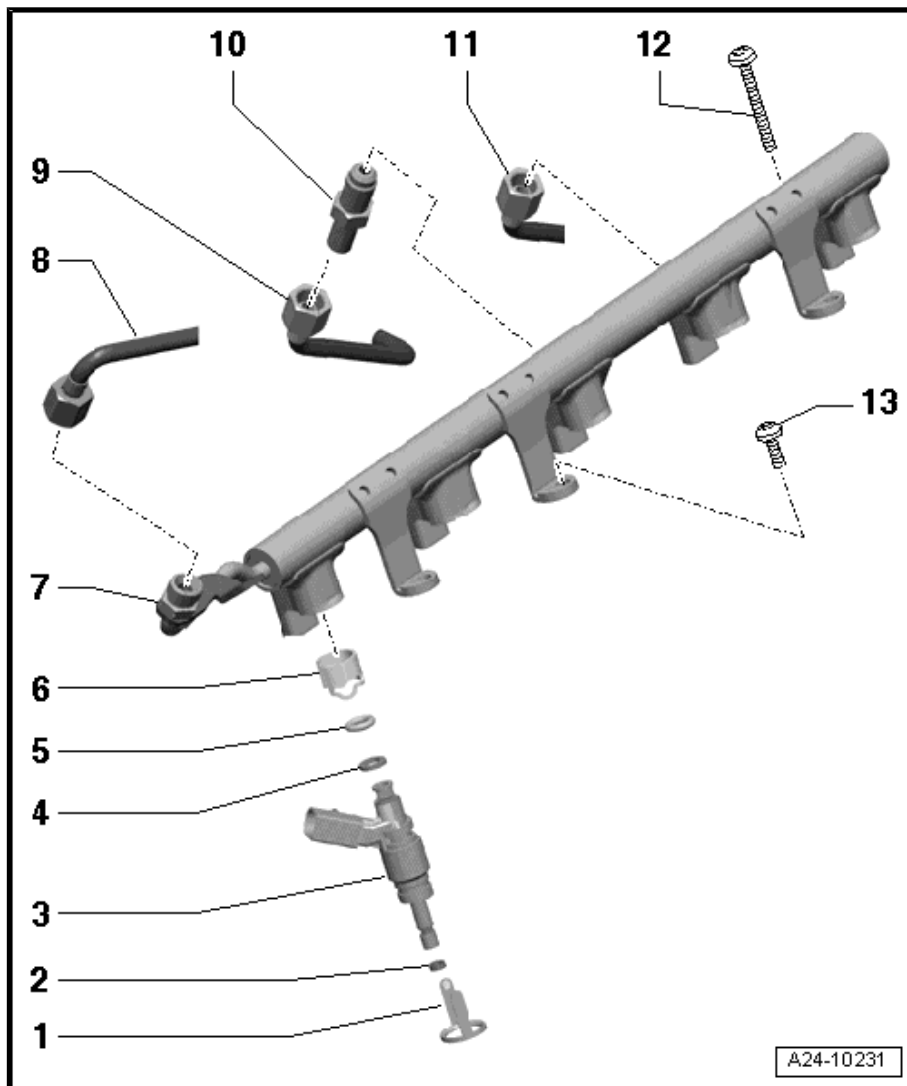
- ☐ Renew if damaged

5 - O-ring

- ☐ Renew
- ☐ Lubricate lightly with clean engine oil

6 - Support ring

- ☐ Renew
- ☐ Via this support ring, the fuel rail exerts the clamping force that holds the injector in the cylinder head

7 - Fuel rail**8 - High-pressure pipe****WARNING**

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

▲ 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.

- ☐ Connections must not be damaged
- ☐ Do not alter shape
- ☐ 25 Nm

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9 - High-pressure pipe



WARNING

*The pressure in the high-pressure part of the injection system must be reduced to a residual pressure prior to opening the system ⇒ **page 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.

- ☐ Connections must not be damaged
- ☐ Do not alter shape
- ☐ 25 Nm

10 - Pressure relief valve, 120 bar

- ☐ For high-pressure pipe
- ☐ 25 Nm

11 - High-pressure pipe



WARNING

*The pressure in the high-pressure part of the injection system must be reduced to a residual pressure prior to opening the system ⇒ **page 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.

- ☐ Connections must not be damaged
- ☐ Do not alter shape
- ☐ 25 Nm

12 - Bolt

- ☐ 9 Nm
- ☐ Tighten in stages and in diagonal sequence

13 - Bolt

- ☐ 9 Nm
- ☐ Tighten in stages and in diagonal sequence



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2.11 Exploded view - high-pressure pump

1 - High-pressure pump

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

2 - Bolt

- ☐ 9 Nm

3 - Seal

- ☐ Renew

4 - Plug

- ☐ 10 Nm

5 - High-pressure pipe



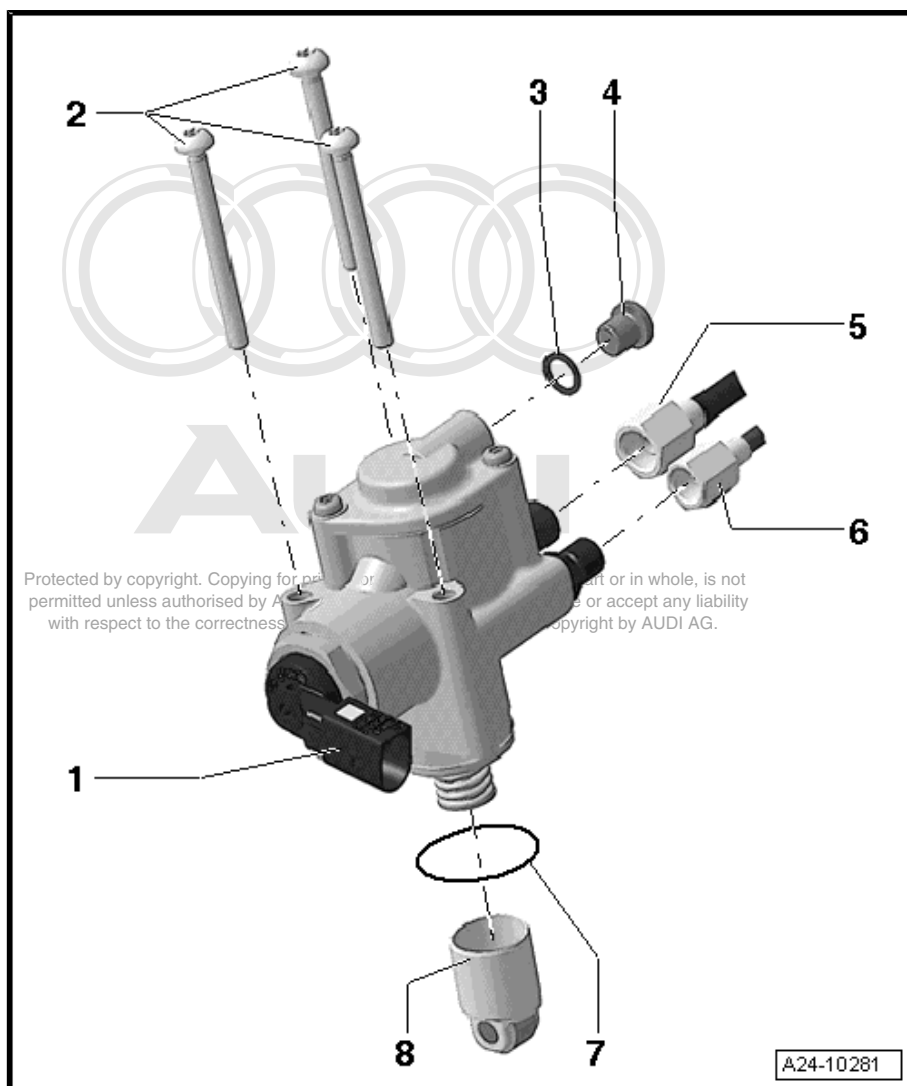
WARNING

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.

- ☐ Connections must not be damaged
- ☐ Do not alter shape
- ☐ 25 Nm



6 - High-pressure pipe (fuel supply line)**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** .*

▲ 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 .

- ☐ Connections must not be damaged
- ☐ Do not alter shape
- ☐ 25 Nm

7 - O-ring

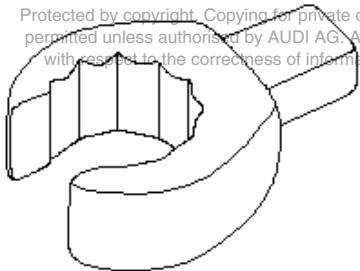
- ☐ Renew

8 - Roller tappet

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2.12 Removing and installing high-pressure pump

Special tools and workshop equipment required

V.A.G 1331 	V.A.G 1331/6 
V.A.G 1331/8 	Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.
	G15-10028

- ◆ Torque wrench - V.A.G 1331-
- ◆ Open end spanner insert, AF 17 - V.A.G 1331/6-
- ◆ Socket insert AF 14, flared ring spanner - V.A.G 1331/8-

Removing

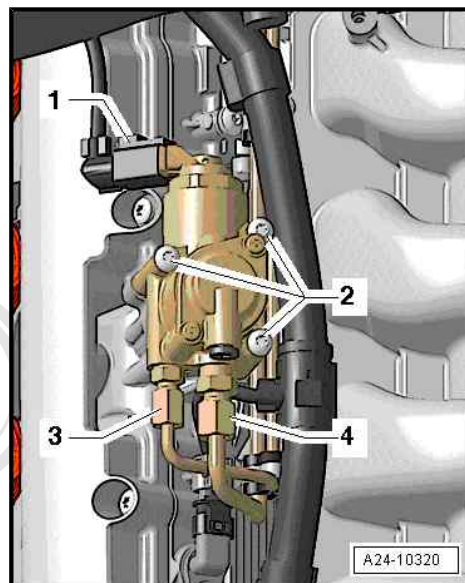


WARNING

- ◆ *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.*

- In each case, unplug electrical connector -1- from high-pressure pump.

High-pressure pump on right side (in direction of travel)



High-pressure pump on left side (in direction of travel)

- Unfasten union nuts -3- and -4-.

- Unscrew bolts -2-.



Note

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

- Carefully pull out high-pressure pump.
- Pull roller tappet out of cylinder head.

Installing

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

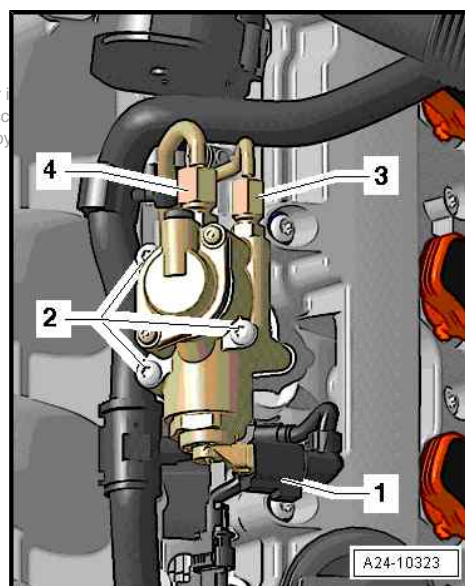
- Tightening torques: exploded view - high-pressure pump
⇒ [page 37](#)



Note

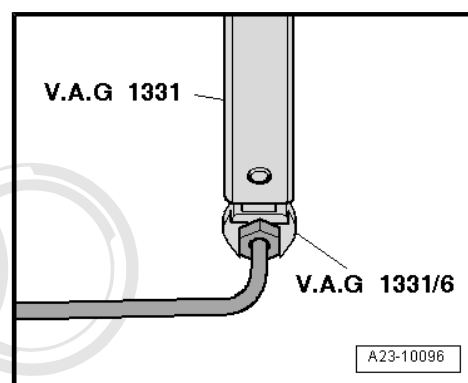
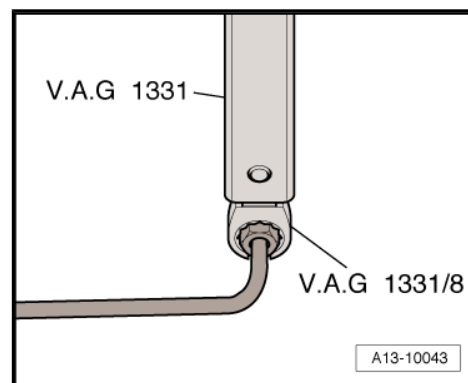
Always renew O-ring.

- Fit roller tappet in cylinder head.
- Only lift high-pressure pipes slightly to fit the high-pressure pump.
- Insert high-pressure pump with new O-ring in cylinder head and tighten.



**Note**

- ◆ *The connections of the high-pressure pipes must not be damaged.*
- ◆ *Do not attempt to bend high-pressure pipes to a different shape.*
- Tighten union nuts on high-pressure pipes hand-tight initially.
- Ensure that high-pressure pipes are not under tension.
- To tighten union nut (14 mm) for high-pressure pipes, use torque wrench - V.A.G 1331- with socket insert AF 14, flared ring spanner - V.A.G 1331/8- .
- To tighten union nut (17 mm) for high-pressure pipe, use torque wrench - V.A.G 1331- with open end spanner insert, AF 17 - V.A.G 1331/6- .

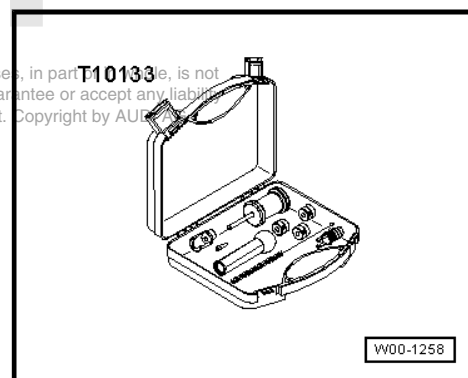


2.13 Removing and installing injectors

Special tools and workshop equipment required

- ◆ Tool set for FSI engines - T10133-

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- ◆ Torque wrench - V.A.G 1331-
- ◆ Open end spanner insert, AF 17 - V.A.G 1331/6-
- ◆ Socket insert AF 14, flared ring spanner - V.A.G 1331/8-

**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 puller -T10133/2- 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.

Removing

- Remove intake manifold ⇒ [page 26](#) .



Note

Seal off the intake ports in the cylinder heads with clean cloths.

- Unplug electrical connectors at injectors.
- Unscrew high-pressure pipe -1- at connection on fuel rail.
- Unscrew high-pressure pipe -2- at connection on fuel rail. To do so, counterhold at hexagon flats with an open-end spanner and slacken union nut.
- Remove bolts -arrows-.



Note

- ◆ Illustration shows left-side cylinder head.
- ◆ Do not attempt to bend high-pressure pipes to a different shape.
- Pull off fuel rail together with injectors.

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.
- Remove O-ring from injector.
- Insert puller -T10133/10- into groove on injector and carefully knock out injector.

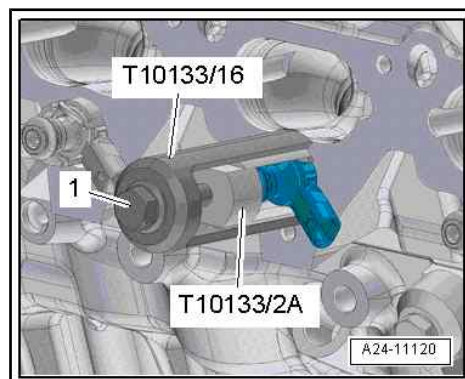
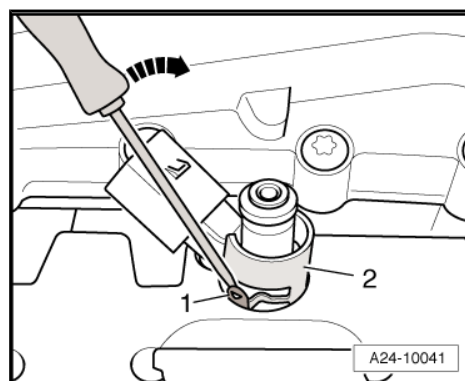
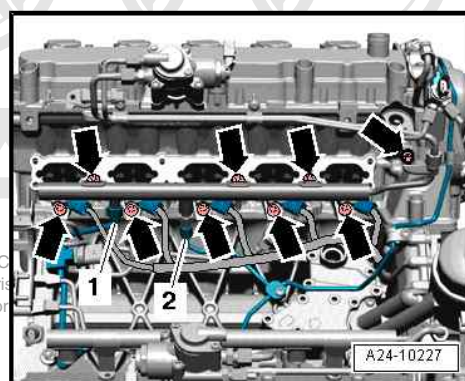
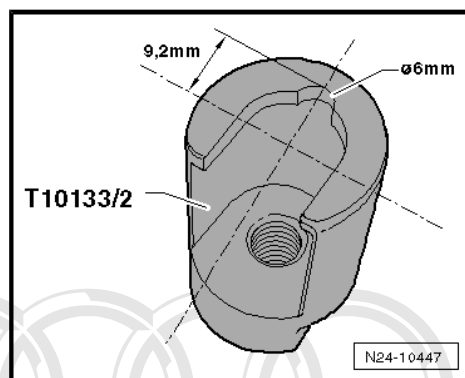
- Guide puller -T10133/2A- into groove on injector.
- Apply puller -T10133/16A- and pull out injector by turning bolt -1-.



Note

- ◆ When inserting the puller, there is a risk of destroying the radial compensation element due to the retainer tabs breaking.
- ◆ The combustion chamber ring seal must always be renewed prior to re-installing the high-pressure injector.

Renewing combustion chamber ring seal (teflon ring seal)



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



Note

The injector must be renewed if the groove is damaged.

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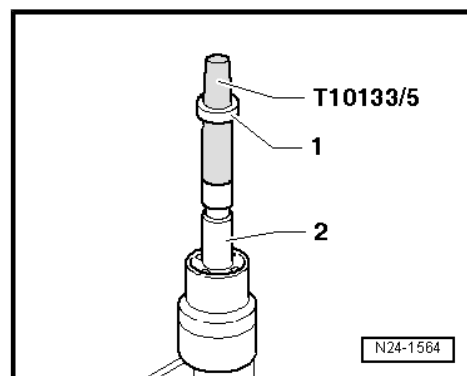
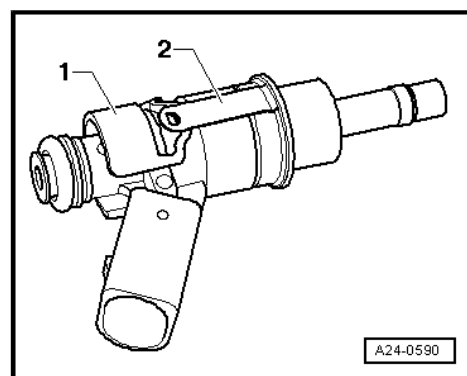
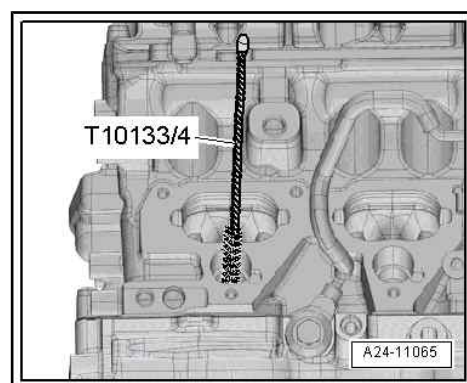
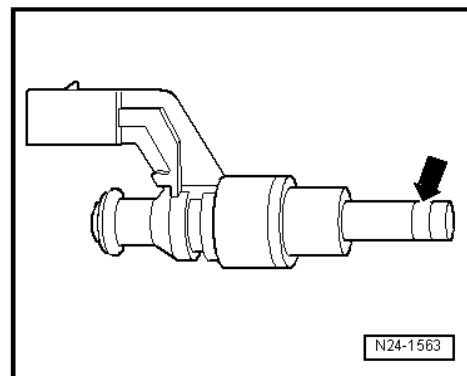


Note

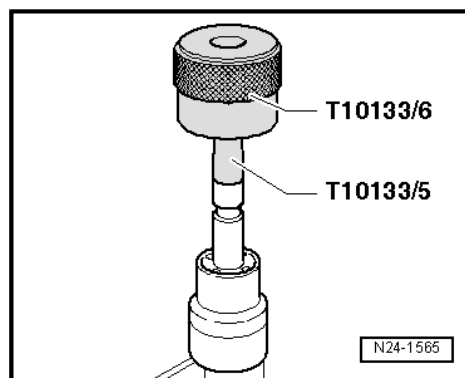
- ◆ *Renew combustion chamber ring seal and O-ring.*
- ◆ *Renew spacer ring if damaged.*
- ◆ *Lightly lubricate O-rings for injectors with clean engine oil.*
- ◆ *The injector pipes must be re-installed on the same cylinders.*

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

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

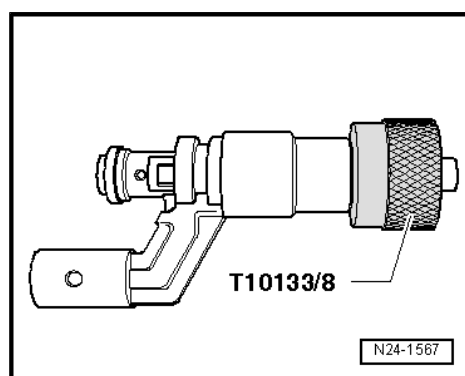
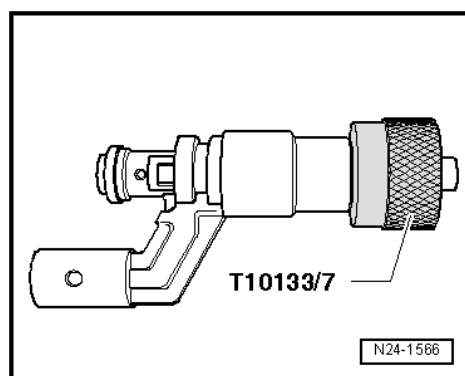


- Push combustion chamber ring seal onto assembly cone - T10133/6- as far as it will go using assembly sleeve - T10133/5- .
- Turn assembly sleeve - T10133/6- upside down and push combustion chamber ring seal into groove.


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.

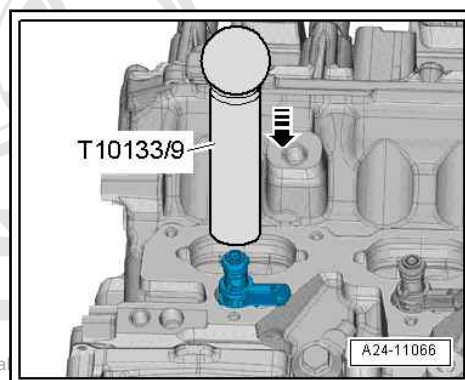

Note

The combustion chamber ring seal must not be lubricated.

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

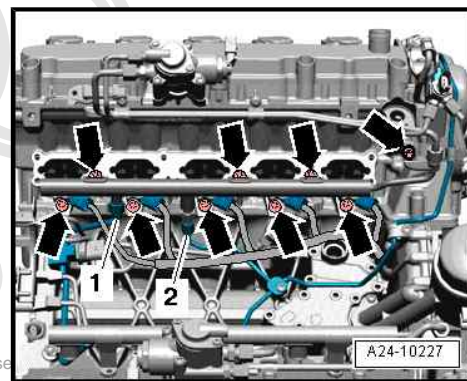

Note

- ◆ *It should be possible to insert injector easily. If necessary wait until the combustion chamber ring seal has contracted sufficiently.*
- ◆ *Note correct installation position and ensure that injectors are properly seated in cylinder head.*
- ◆ *If the injector cannot be pushed in by hand, use puller - T10133/2A- -2- with striker - T10133/3- to insert the injector.*
- ◆ *Use assembly tool -T10133/9- to insert injector as far as it will go into hole in cylinder head; note correct installation position.*



- Electrical connector of injector must engage in recess in cylinder head.

- Press fuel rail evenly onto injectors.
- Tighten bolts -arrows- in stages and in diagonal sequence.



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Note

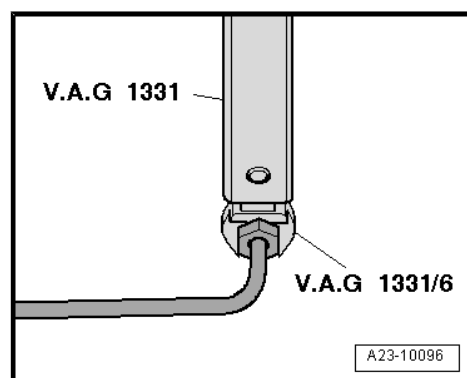
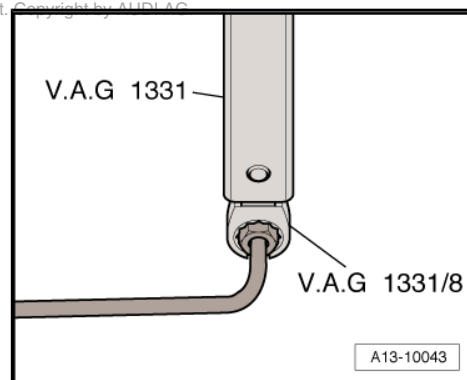
- ◆ *The connections of the high-pressure pipes must not be damaged.*
- ◆ *Do not attempt to bend high-pressure pipes to a different shape.*
- Tighten union nuts on high-pressure pipes hand-tight initially.
- Ensure that high-pressure pipes are not under tension.
- To tighten union nut (14 mm) for high-pressure pipes, use torque wrench - V.A.G 1331- with socket insert AF 14, flared ring spanner - V.A.G 1331/8- .
- To tighten union nut (17 mm) for high-pressure pipe, use torque wrench - V.A.G 1331- with open end spanner insert, AF 17 - V.A.G 1331/6- .
- Do not install mounting brackets until high-pressure pipes have been finally secured.

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

- Install intake manifold ⇒ [page 26](#) .
- Fill up coolant ⇒ Rep. gr. 19 .

Tightening torques

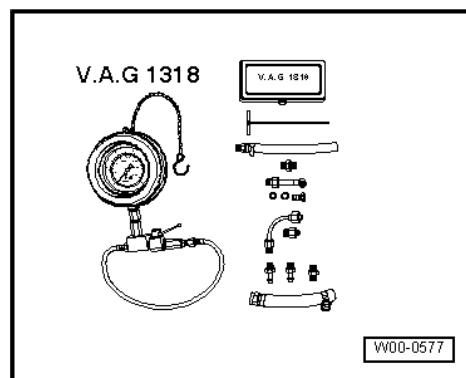
Component	Nm
Fuel rail to cylinder head	9
High-pressure pipes to fuel rail	25
Engine lifting eye to cylinder head	22



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

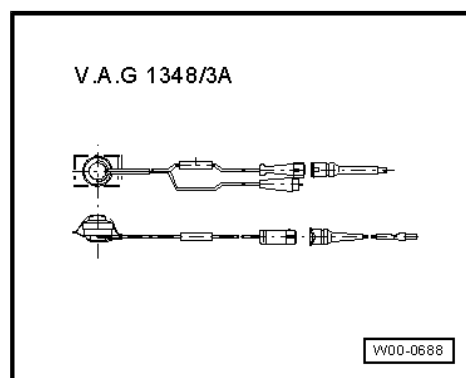
Special tools and workshop equipment required

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



◆ Adapter set - V.A.G 1318/10-12-

◆ Remote control - V.A.G 1348/3A- for V.A.G 1348 with adapter cable -V.A.G 1348/3-3-



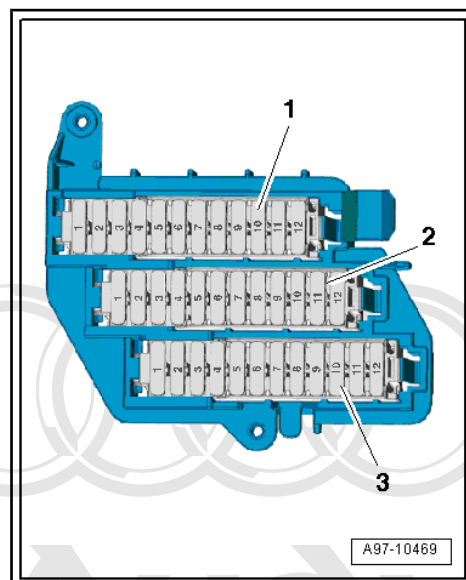
◆ Fuel-resistant measuring container

Test condition

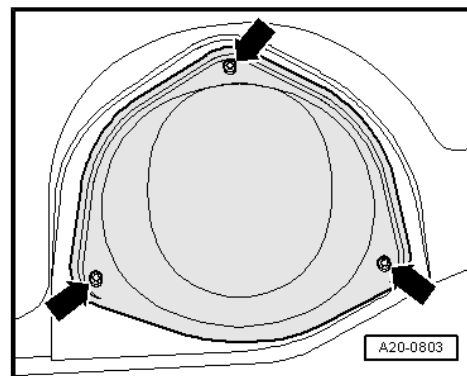
- Battery voltage at least 12.5 V
- Fuse 1 on middle holder -2- of fuse holder on dash panel (right-side) must be OK.
- Fuel pump control unit - J538- OK; check in "Guided Fault Finding" using vehicle diagnostic, testing and information system - VAS 5051B- .
- Fuel filter OK.
- Fuel tank at least $\frac{1}{4}$ full.
- Ignition switched off.

Checking fuel pressure

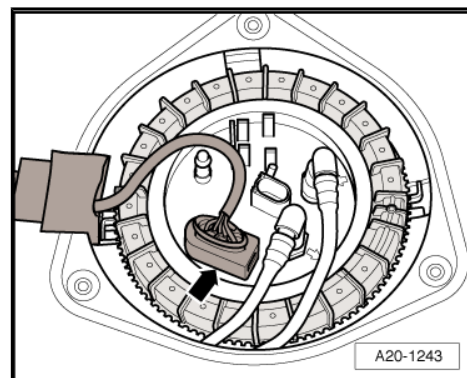
- Remove rear seat bench ⇒ Rep. gr. 72 .



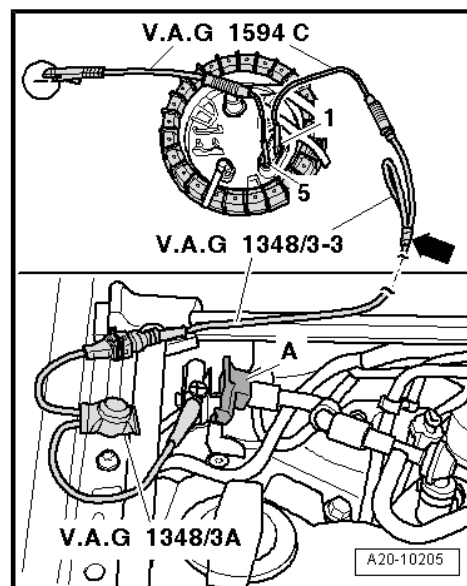
- Unscrew cover for flange (right-side) -arrows-.



- Unplug electrical connector -arrow- at flange.



- 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.
- Move switch of remote control - V.A.G 1348/3A- for V.A.G 1348 to front of engine compartment.
- Release retaining clip and open cover -A- above positive terminal.
- Connect crocodile clip to positive terminal.
- Connect contact -5- to the body (earth) using a test lead from auxiliary measuring set - V.A.G 1594C- .
- Remove filler cap from fuel filler neck.



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- Pull off rear engine cover panel -2- -arrows-.

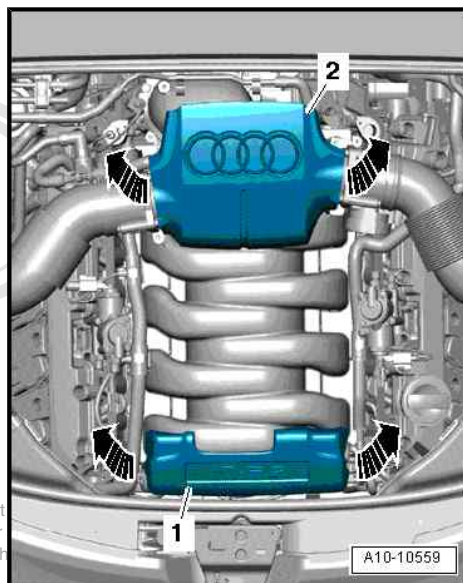
**Note**

Disregard -item 1-.

**WARNING**

The fuel system is pressurised. Before opening the system place a clean cloth around the connection. Then carefully loosen the connection to relieve the pressure.

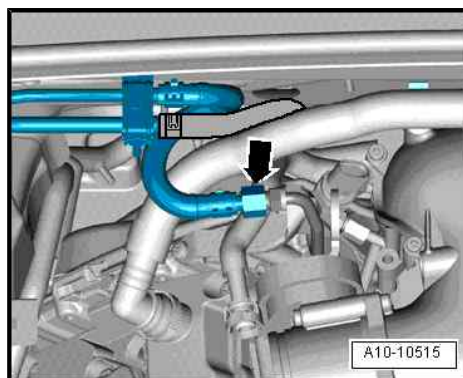
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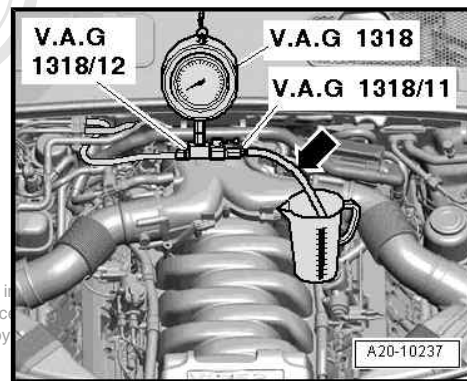
- Disconnect fuel pipe -arrow- at fuel rail.

**Caution**

Observe rules for cleanliness when working on the injection system.



- Connect K-Jetronic pressure tester - V.A.G 1318- with adapters - V.A.G 1318/11- and -V.A.G 1318/12- to fuel pipe.
- Fit auxiliary hose -arrow- onto pressure tester and hold it in a container.
- Open cut-off valve on pressure tester. Cut-off valve must point in direction of flow.
- Bleed fuel system by pressing remote control button briefly.
- Close cut-off valve on pressure tester. Cut-off valve is at right angle to direction of flow.
- Press button on remote control until pressure tester shows no further increase in pressure.



- Specification: approx. 6 bar (5 ... 7 bar)

If specification is not obtained:

- Check delivery rate of fuel pumps ⇒ Rep. gr. 20 .

Checking residual pressure

- Check leak-tightness and residual pressure by watching the drop in pressure on the K-Jetronic pressure tester - V.A.G 1318- .
- After 10 minutes pressure should still be at least 3.75 bar.

If the residual pressure drops below 3.75 bar:

- ◆ Check union between K-Jetronic pressure tester - V.A.G 1318- and fuel line for leaks.
- ◆ Check pressure tester for leaks.
- ◆ Check fuel lines and their connections for leaks.
- ◆ Renew fuel filter with integral fuel pressure regulator ⇒ Rep. gr. 20 . Then repeat the test.
- ◆ If necessary, renew fuel pump - G23- (right-side) ⇒ Rep. gr. 20 .

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

- Switch off ignition.



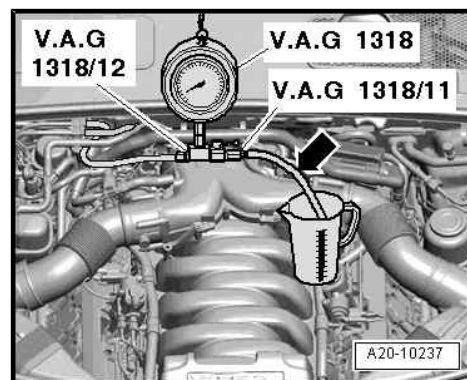
Note

Before removing the pressure tester, release the fuel pressure by opening the cut-off valve. Hold hose in a container.

- Re-install fuel supply line (make sure that all parts are clean).

Tightening torque

Component	Nm
Fuel supply line	25



2.15 Overview - Lambda probes

I - Starter catalytic converter for cylinders 1, 2, 3 (exhaust bank I)

II - Starter catalytic converter for cylinders 4, 5 (exhaust bank II)

III - Starter catalytic converter for cylinders 6, 7, 8 (exhaust bank III)

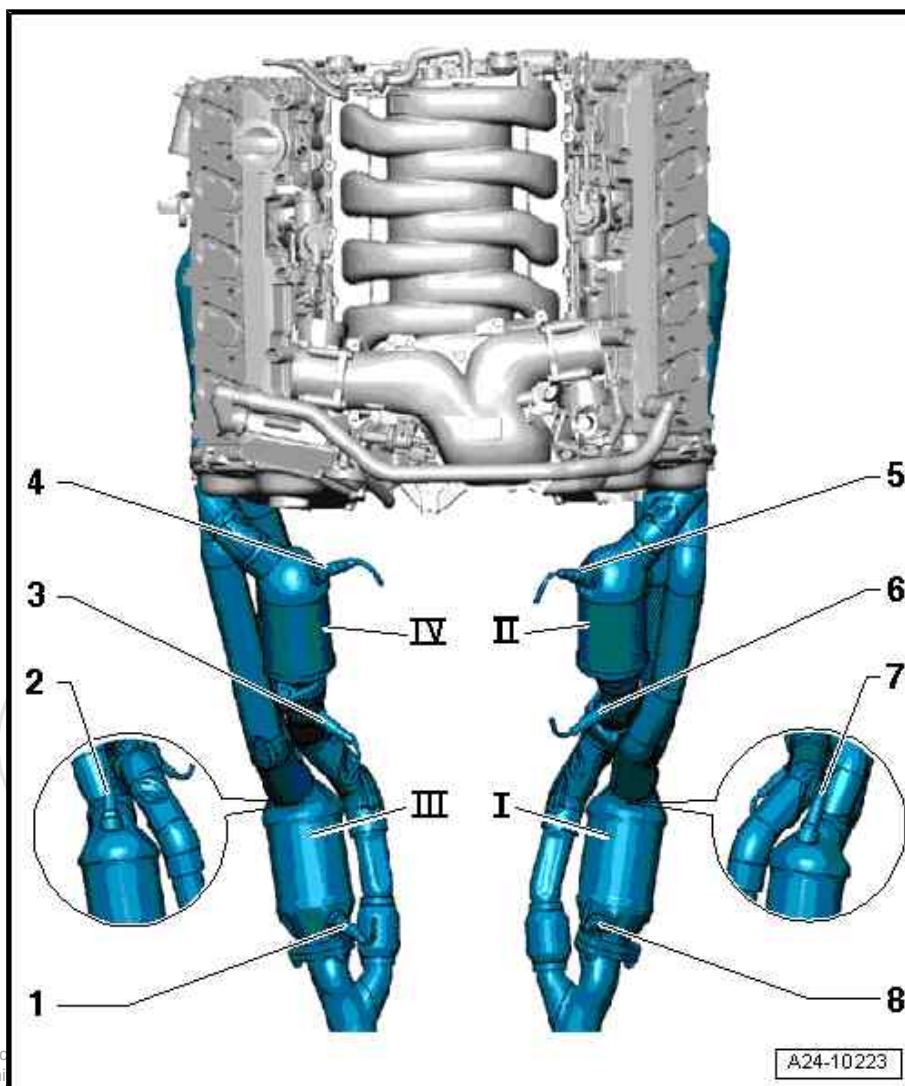
IV - Starter catalytic converter for cylinders 9, 10 (exhaust bank IV)

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

- ☐ Exhaust bank III (cylinders 6, 7, 8)
- ☐ Fitting location of electrical connector
⇒ [page 52](#)
- ☐ Removing and installing
⇒ [page 52](#)

2 - Lambda probe 3 before catalytic converter - G285- with Lambda probe 3 heater - Z62-

- ☐ Exhaust bank III (cylinders 6, 7, 8)
- ☐ Fitting location of electrical connector
⇒ [page 51](#)
- ☐ Removing and installing



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⇒ [page 52](#)

3 - Lambda probe 4 after catalytic converter - G288- with Lambda probe 4 heater after catalytic converter - Z65-

- ☐ Exhaust bank IV (cylinders 9, 10)
- ☐ Fitting location of electrical connector ⇒ [page 52](#)
- ☐ Removing and installing ⇒ [page 52](#)

4 - Lambda probe 4 before catalytic converter - G286- with Lambda probe 4 heater - Z63-

- ☐ Exhaust bank IV (cylinders 9, 10)
- ☐ Fitting location of electrical connector ⇒ [page 52](#)
- ☐ Removing and installing ⇒ [page 52](#)

5 - Lambda probe 2 before catalytic converter - G108- with Lambda probe 2 heater - Z28-

- ☐ Exhaust bank II (cylinders 4,5)
- ☐ Fitting location of electrical connector ⇒ [page 52](#)
- ☐ Removing and installing ⇒ [page 52](#)

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

- ☐ Exhaust bank II (cylinders 4,5)
- ☐ Fitting location of electrical connector ⇒ [page 52](#)
- ☐ Removing and installing ⇒ [page 52](#)

7 - Lambda probe - G39- (before catalytic converter) with Lambda probe heater - Z19-

- ☐ Exhaust bank I (cylinders 1, 2, 3)
- ☐ Fitting location of electrical connector
- ☐ Removing and installing ⇒ [page 52](#)

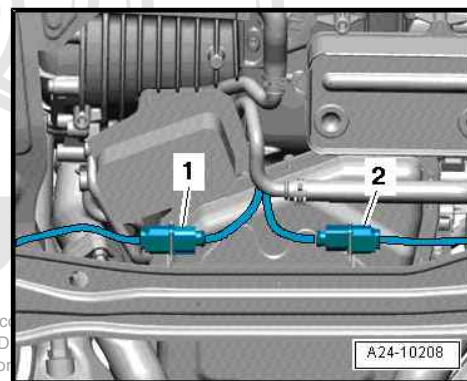
8 - Lambda probe after catalytic converter - G130- with Lambda probe 1 heater after catalytic converter - Z29-

- ☐ Exhaust bank I (cylinders 1, 2, 3)
- ☐ Fitting location of electrical connector ⇒ [page 52](#)
- ☐ Removing and installing ⇒ [page 52](#)

Fitting location of electrical connectors for Lambda probes -G39- and -G285-

◆ On underbody

- 1 - Black connector for Lambda probe - G39- (before catalytic converter)
- 2 - Brown connector for Lambda probe 3 - G285- (before catalytic converter)

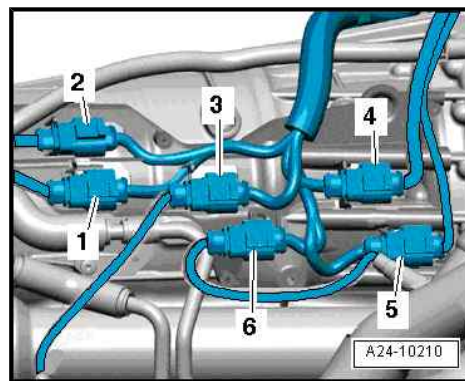


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Fitting location of electrical connectors for Lambda probes - G108- , -G130- , -G131- , -G286- , -G287- , -G288-

◆ On top of gearbox.

- 1 - Grey: for Lambda probe 4 after catalytic converter - G288-
- 2 - Black: for Lambda probe 3 after catalytic converter - G287-
- 3 - Brown: for Lambda probe after catalytic converter - G130-
- 4 - Brown: for Lambda probe 4 - G286- (before catalytic converter)
- 5 - Black: for Lambda probe 2 - G108- (before catalytic converter)
- 6 - Black: for Lambda probe 2 after catalytic converter - G131-

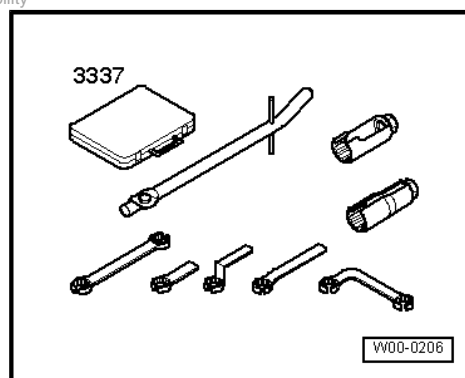


2.16 Removing and installing Lambda probe - G39- and Lambda probe 3 - G285-

Special tools and workshop equipment required

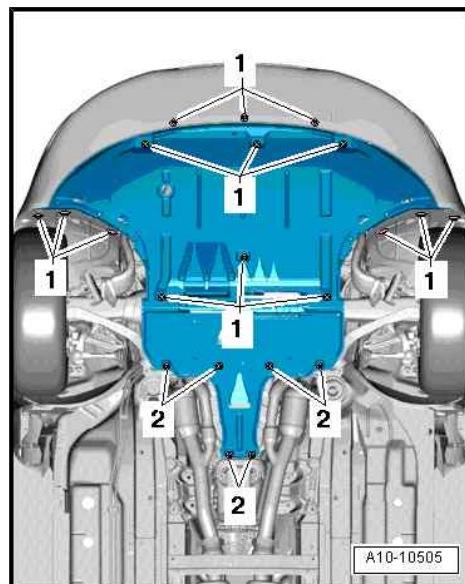
- ◆ Lambda probe open ring spanner set - 3337-

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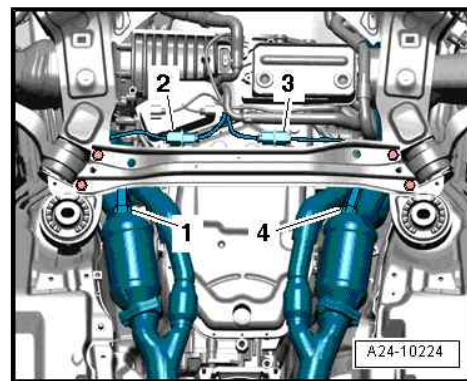


Removing

- Open quick-release fasteners -2- and remove rear noise insulation.



- Detach electrical connectors from bracket and unplug connectors:
- 2 - Black connector for Lambda probe - G39- (before catalytic converter)
- 3 - Brown connector for Lambda probe 3 - G285- (before catalytic converter)
- Unscrew relevant Lambda probe using tool from Lambda probe open ring spanner set - 3337- .
- 1 - Lambda probe - G39- (before catalytic converter)
- 4 - Lambda probe 3 - G285- (before catalytic converter)



Installing

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



Note

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

Tightening torque

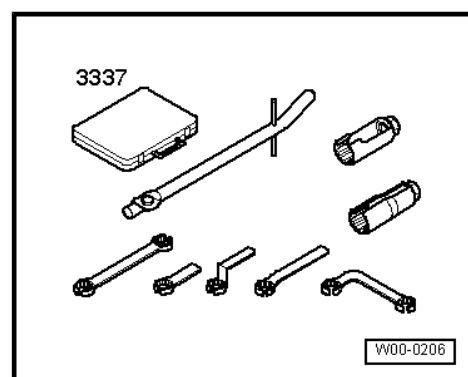
Component	Nm
Lambda probe in starter catalytic converter	55

2.17 Removing and installing Lambda probes -G108- , -G130- , -G131- , -G286- , -G287- , -G288-

Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set - 3337-

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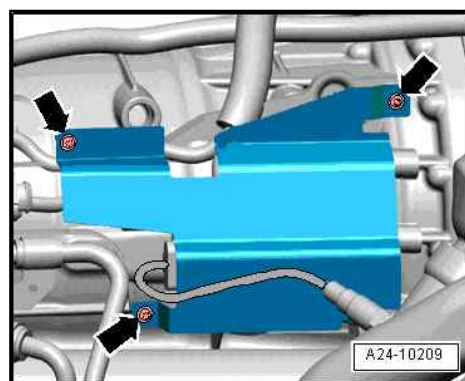
Removing



Note

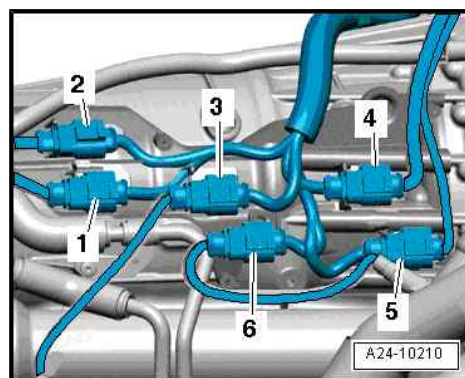
- ◆ *Fit all heat shields and heat insulation sleeves in the original positions when installing.*
- ◆ *All cable ties which are released or cut open when removing must be fitted in the same position when installing.*

- Remove engine ⇒ Rep. gr. 10 .
- Leave engine on scissor-type assembly platform - VAS 6131- with gearbox attached.
- Unbolt heat shield for electrical connectors for Lambda probes (right-side) from gearbox -arrows-.



- Remove relevant electrical connector for Lambda probe from bracket on gearbox.

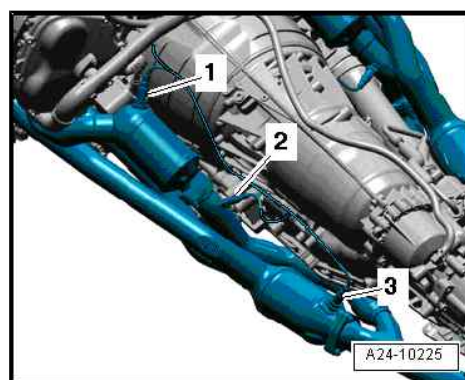
- 1 - Grey: for Lambda probe 4 after catalytic converter - G288-
 - 2 - Black: for Lambda probe 3 after catalytic converter - G287-
 - 3 - Brown: for Lambda probe after catalytic converter - G130-
 - 4 - Brown: for Lambda probe 4 - G286- (before catalytic converter)
 - 5 - Black: for Lambda probe 2 - G108- (before catalytic converter)
 - 6 - Black: for Lambda probe 2 after catalytic converter - G131-
- Unplug relevant electrical connector and move wiring clear.



Exhaust pipes (left-side):

- Unscrew relevant Lambda probe using Lambda probe open ring spanner set - 3337- .

- 1 - Lambda probe 4 - G286- (before catalytic converter)
- 2 - Lambda probe 4 after catalytic converter - G288-
- 3 - Lambda probe 3 after catalytic converter - G287-



Exhaust pipes (right-side):

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

- 1 - Lambda probe after catalytic converter - G130-
- 2 - Lambda probe 2 after catalytic converter - G131-
- 3 - Lambda probe 2 - G108- (before catalytic converter)

Installing

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



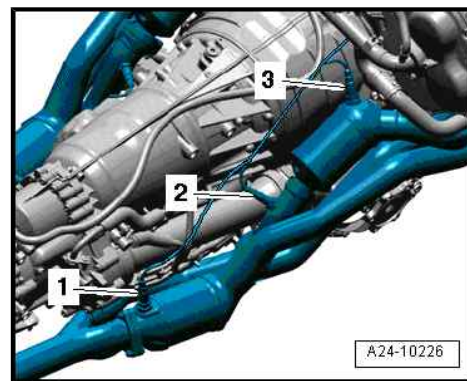
Note

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

- Install engine ⇒ Rep. gr. 10 .

Tightening torque

Component	Nm
Lambda probe in starter catalytic converter	55



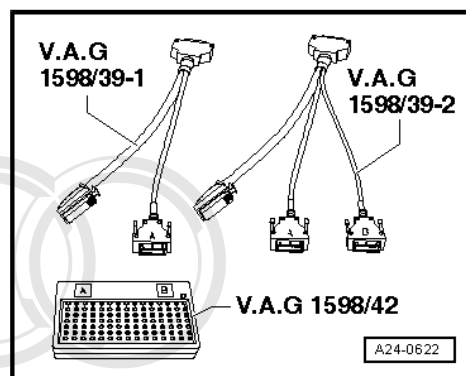
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3 Engine control units

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

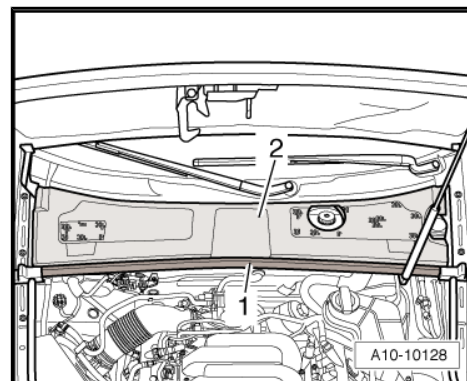
- ◆ *The test box - V.A.G 1598/42- has 105 sockets. It can be connected to the engine control unit via 2 different adapter cables.*
- ◆ *The engine control unit is connected to the vehicle's wiring harness via two connectors, one of which has 60 pins, the other has 94 pins.*
- ◆ *To carry out tests on the 60-pin wiring harness connector, the adapter cable - V.A.G 1598/39-1- is connected to connector -A- on the test box. For components connected to 60-pin wiring harness connector ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.*
- ◆ *To carry out tests on the 94-pin wiring harness connector, the adapter cable - V.A.G 1598/39-2- must be connected to connectors -A- and -B- on the test box. For components connected to 94-pin wiring harness connector ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.*
- ◆ *The test box - V.A.G 1598/42- is designed so it can be connected both to the wiring harness for the engine control unit and to the engine control unit itself at the same time. The advantage of this is that the electronic engine control system remains fully functional when the test box is connected (for example, for measuring signals when the engine is running).*
- ◆ *Always use auxiliary measuring set - V.A.G 1527 B- to connect test equipment (e.g. voltage tester - V.A.G 1526 C- , hand-held multimeter - V.A.G 1594 C- etc.).*

The engine control units have to be removed first in order to be able to unplug the multi-pin connectors from the engine control units.

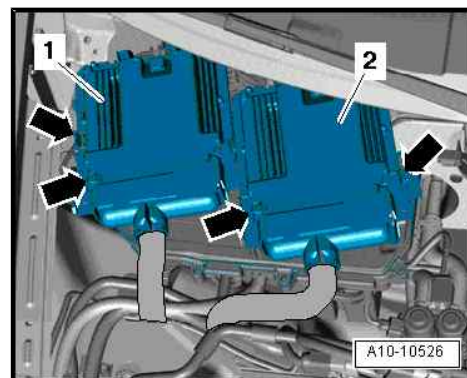
**Caution**

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

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

**Note**

- ◆ *The two engine control units are identical from the outside. However, if both control units are removed, they must be marked before removal so they are not interchanged on re-installation.*
- ◆ *Master engine control unit 2: mark "M" (for example)*
- ◆ *Slave engine control unit 1: mark "S" (for example)*
- ◆ *Item -1- is engine control unit 2 - J624- (slave).*
- ◆ *Item -2- is engine control unit - J623- (master).*
- Carefully pull cowl panel grille off retainer at windscreen (only pull off as far as necessary).



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

- ◆ Removing and installing engine control unit - J623-
⇒ [page 58](#)
- ◆ Removing and installing engine control unit 2 - J624-
⇒ [page 61](#)

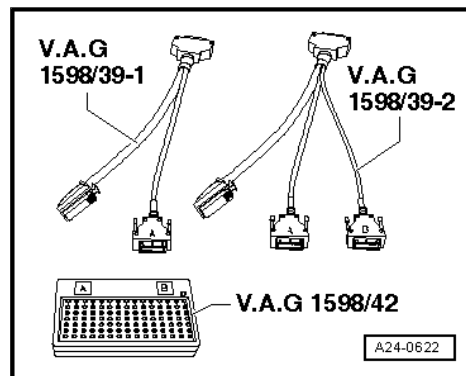
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- Connect the test box - V.A.G 1598/42- to wiring harness with adapter cable - V.A.G 1598/39-1- or adapter cable - V.A.G 1598/39-2- . Connect earth clip of test box to negative terminal of battery. The instructions for performing the individual tests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

Installing engine control unit

Installation is performed in the reverse sequence.

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



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- (master)

In the case of the V10, two engine control units are responsible for engine management.

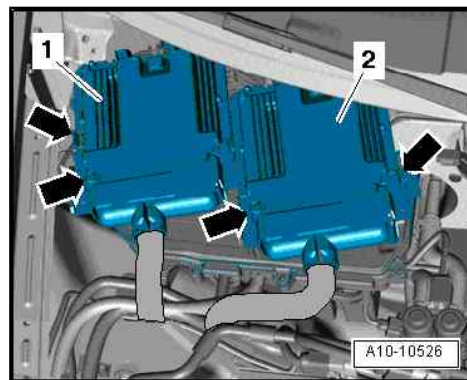
The two engine control units communicate via a separate CAN bus.

Engine control unit - J623- (master control unit) informs engine control unit 2 - J624- (slave control unit) which functions it has to perform.



Note

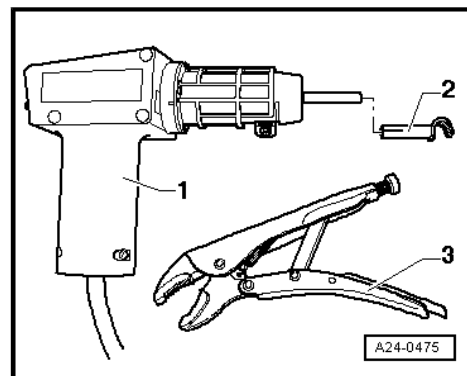
- ◆ *The two engine control units are identical from the outside. However, if both control units are removed, they must be marked before removal so they are not interchanged on re-installation.*
- ◆ *Mark engine control unit - J623- (master) with an "M" (for example).*
- ◆ *Mark engine control unit 2 - J624- (slave) with an "S" (for example)*
- ◆ *Item -1- is engine control unit 2 - J624- (slave).*
- ◆ *Item -2- is engine control unit - J623- (master).*
- When renewing engine control unit, select diagnosis object "Replace engine control unit" in "Guided Functions" on vehicle diagnosis, testing and information system - VAS 5051B- .



Special tools and workshop equipment required

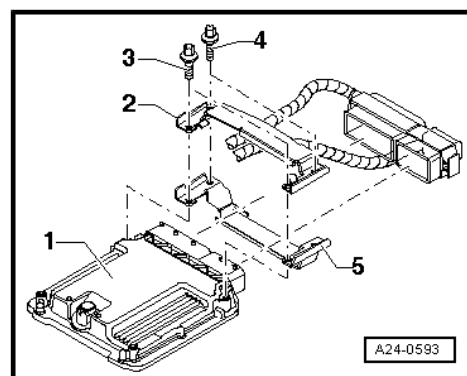
- ◆ Hot air blower - VAS 1978/14A- -item 1- with nozzle attachment -2- from wiring harness repair set - VAS 1978 B-

- ◆ Small, commercially available mole grips -3-



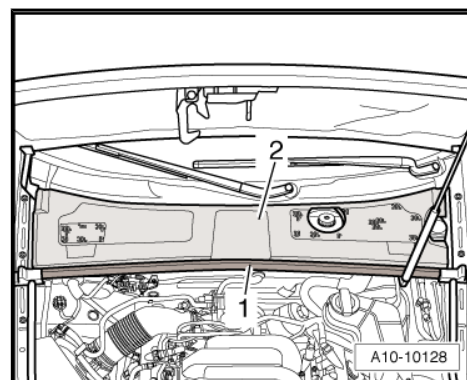
Note

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



Removing

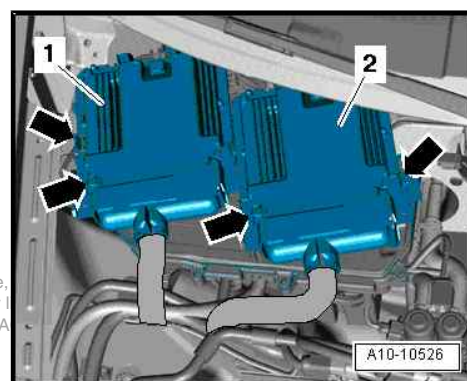
- Switch off ignition and remove ignition key.
- Pull off rubber seal -1- and remove plenum chamber cover -2-.
- Carefully pull cowl panel grille off retainer at windscreen (only pull off as far as necessary).



- Remove engine control unit - J623- -2-.

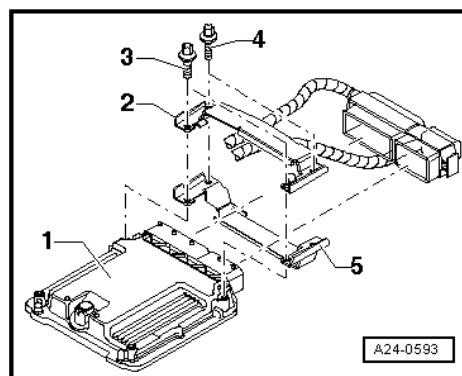
Remove engine control unit - J623- .

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

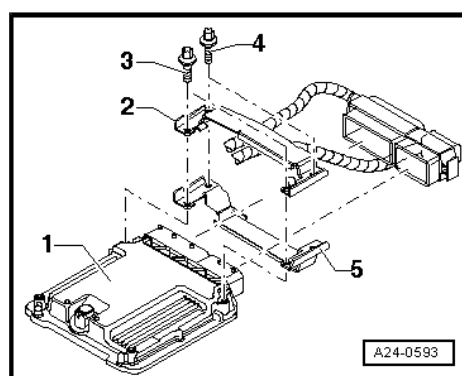


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The threads of the two shear bolts -4- which are not screwed into the engine control unit are secured with locking fluid. To unscrew these two bolts, the threads must therefore be heated with the hot air blower.



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

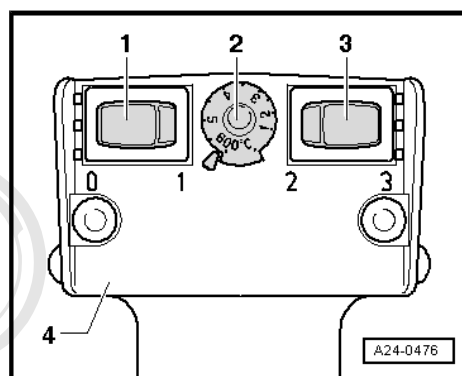


Select settings on hot air blower as shown in illustration, i.e. set temperature potentiometer -2- to maximum heat output and two-stage air flow switch -3- to position 3.



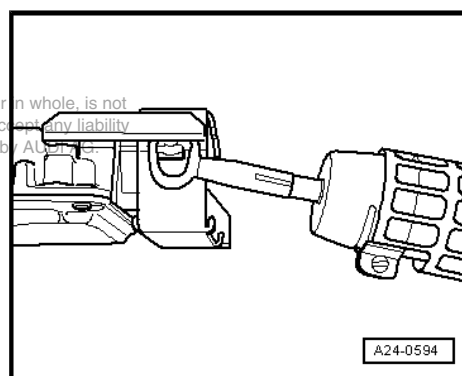
WARNING

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



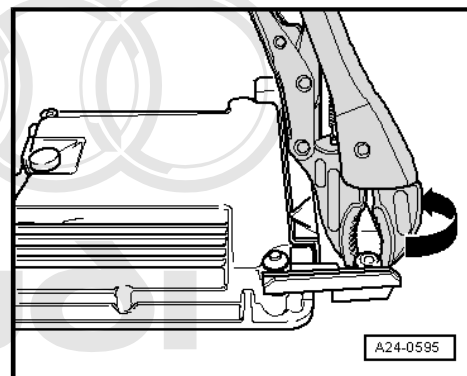
Apply heat to the threads of the shear bolts on the connector side as shown in the illustration.

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



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- Unscrew shear bolts using mole grips (see arrow in illustration).
- The two shear bolts screwed into the engine control unit do not need to be heated. They should be removed without being heated.
- Detach metal locking plate from connectors.
- Unscrew two bolts securing retainers for engine control unit - J623- .
- Release connectors on engine control unit - J623- and unplug connectors.
- Take out old engine control unit - J623- and connect new engine control unit - J623- .



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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.
- Carefully clip cowl panel grille into retainer at windscreen.

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

3.3 Removing and installing engine control unit 2 - J624- (slave)

In the case of the V10, two engine control units are responsible for engine management.

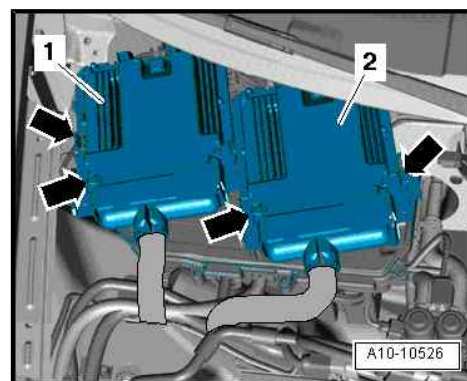
The two engine control units communicate via a separate CAN bus.

Engine control unit - J623- (master control unit) informs engine control unit 2 - J624- (slave control unit) which functions it has to perform.



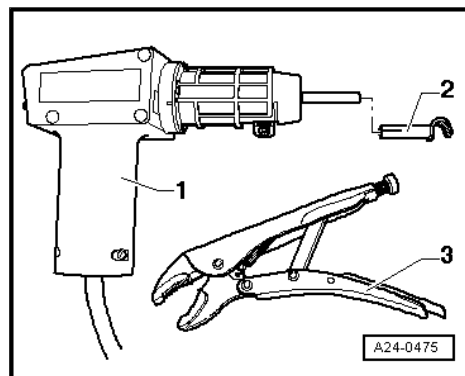
Note

- ◆ The two engine control units are identical from the outside. However, if both control units are removed, they must be marked before removal so they are not interchanged on re-installation.
- ◆ Mark engine control unit - J623- (master) with an "M" (for example).
- ◆ Mark engine control unit 2 - J624- (slave) with an "S" (for example)
- ◆ Item -1- is engine control unit 2 - J624- (slave).
- ◆ Item -2- is engine control unit - J623- (master).
- When renewing engine control unit, select diagnosis object "Replace engine control unit" in "Guided Functions" on vehicle diagnosis, testing and information system - VAS 5051B- .



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 1978A-

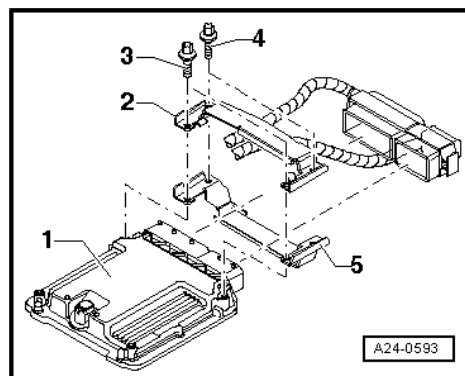


- ◆ Small, commercially available vice grip pliers -3- (mole grip)



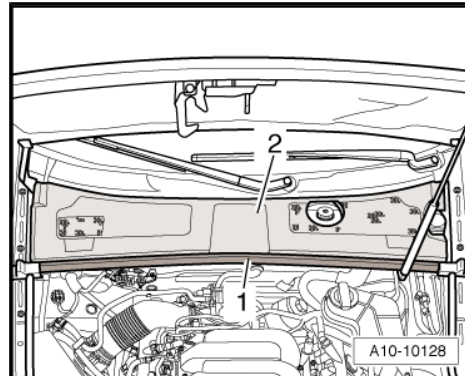
Note

- ◆ 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 protective housing has to be removed before the connectors can be unplugged from the engine control unit (e.g. to connect the test box or renew the engine control unit).



Removing

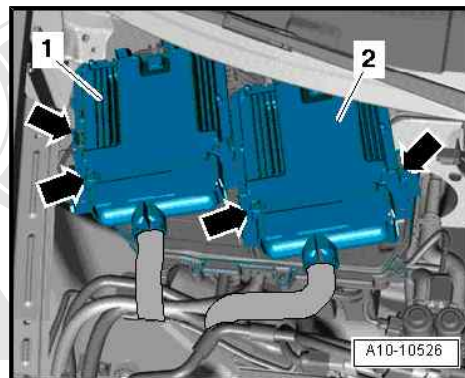
- Switch off ignition and remove ignition key.
- Pull off rubber seal -1- and remove plenum chamber cover -2-.
- Carefully pull cowl panel grille off retainer at windscreen (only pull off as far as necessary).



- Remove engine control unit 2 - J624- -1-.

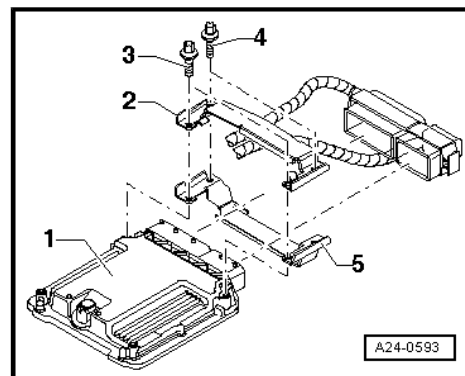
Remove engine control unit 2 - J624- .

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

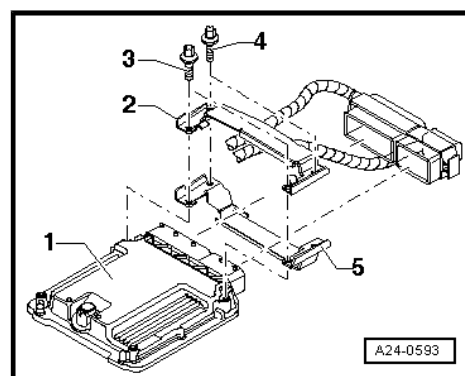


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The threads of the two shear bolts -4- which are not screwed into the engine control unit are secured with locking fluid. To unscrew these two bolts, the threads must therefore be heated with the hot air blower.



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

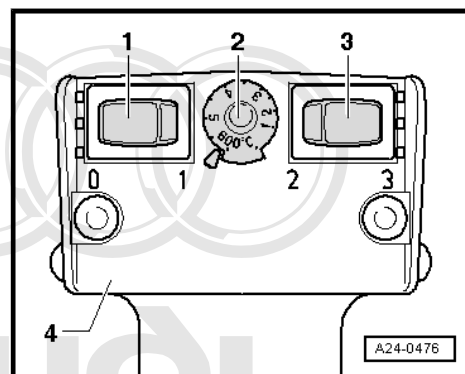


Select settings on hot air blower as shown in illustration, i.e. set temperature potentiometer -2- to maximum heat output and two-stage air flow switch -3- to position 3.



WARNING

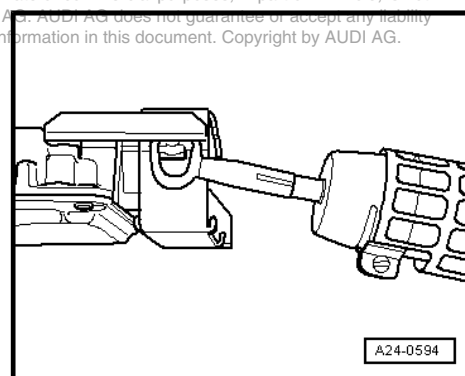
Heating the thread of the locking plate also heats up the shear bolts and parts of the metal housing. Take care to avoid burns. It is also important to ensure that only the thread is heated and none of the surrounding components if at all possible. These should be covered if necessary.



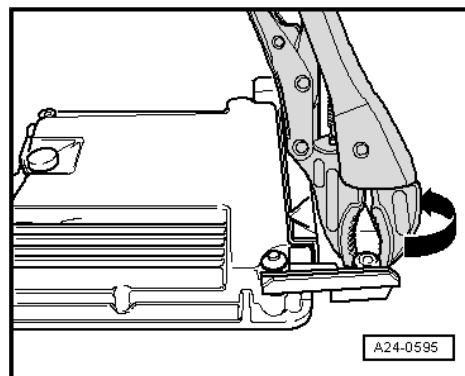
Apply heat to the threads of the shear bolts on the connector side as shown in the illustration.

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

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- Unscrew shear bolts using mole grips (see arrow in illustration).
- The two shear bolts screwed into the engine control unit do not need to be heated. They should be removed without being heated.
- Detach metal locking plate from connectors.
- Unscrew two bolts securing retainers for engine control unit 2 - J624- .
- Release connectors on engine control unit 2 - J624- and unplug connectors.
- Take out old engine control unit 2 - J624- 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 2 - J624- .
- 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.
- Carefully clip cowl panel grille into retainer at windscreen.

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



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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.
- ◆ During some of the tests the control unit may detect a fault and store it in the memory. 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

Please 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.*

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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 cranking speed.
- ◆ The ignition must be switched off before disconnecting or connecting ignition system wiring, high-voltage wires and test leads.
- ◆ If you want to turn the engine at cranking speed without actually starting it (e.g. compression test), first unplug the connectors from the ignition coils and the injectors. 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		5.2 ltr. / 4V / 320 kW engine
Ignition timing		Cannot be adjusted; determined by control unit
Ignition system		Multi-coil system with 10 ignition coils (output stages integrated) connected directly to spark plugs via spark plug connectors
Spark plugs	Designations	⇒ Data sheets for exhaust emissions test
	Tightening torque	⇒ Maintenance ; Booklet 405

2.2 Exploded view - ignition system

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

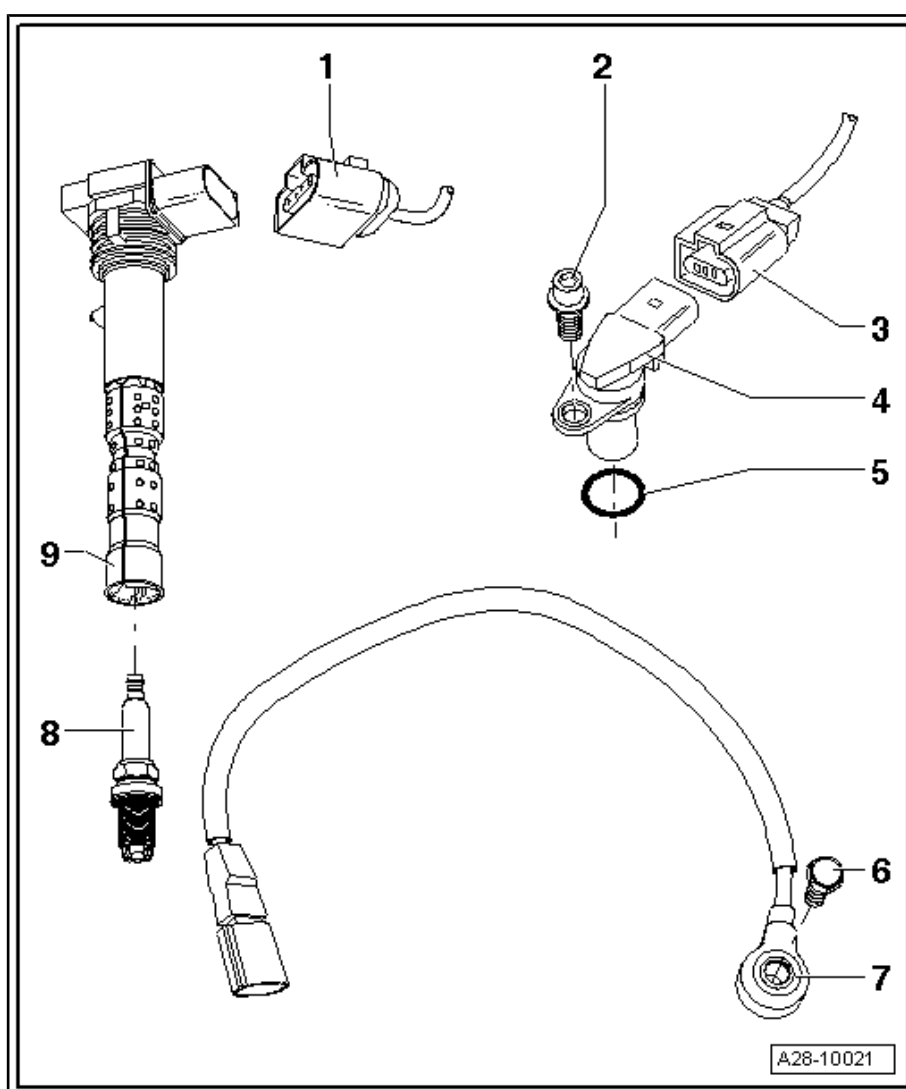
- Renew if damaged
- Lubricate lightly with clean engine oil

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)
- ☐ Knock sensor 3 - G198- (cylinder bank 2)
- ☐ Knock sensor 4 - G199- (cylinder bank 2)
- ☐ Removing and installing ⇒ [page 73](#)

8 - Spark plug

- ☐ Remove and install with spark plug socket and extension - 3122 B- ⇒ Maintenance ; Booklet 405
- ☐ 30 Nm

9 - Ignition coil

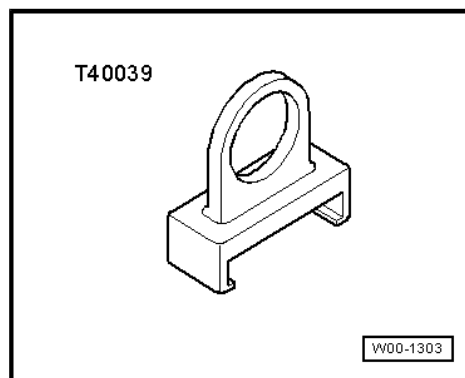
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- ☐ Ignition coil 1 with output stage - N70-
- ☐ Ignition coil 2 with output stage - N127-
- ☐ Ignition coil 3 with output stage - N291-
- ☐ Ignition coil 4 with output stage - N292-
- ☐ Ignition coil 5 with output stage - N323-
- ☐ Ignition coil 6 with output stage - N324-
- ☐ Ignition coil 7 with output stage - N325-
- ☐ Ignition coil 8 with output stage - N326-
- ☐ Ignition coil 9 with output stage - N327-
- ☐ Ignition coil 10 with output stage - N328-
- ☐ Removing and installing ignition coils 1 to 5
⇒ ["2.3 Removing and installing ignition coils with output stages - cylinders 1 ... 5", page 68](#)
- ☐ Removing and installing ignition coils 6 to 10
⇒ ["2.4 Removing and installing ignition coils with output stages - cylinders 6 ... 10", page 71](#)
- ☐ Use puller - T40039- for removal

2.3 Removing and installing ignition coils with output stages - cylinders 1 ... 5

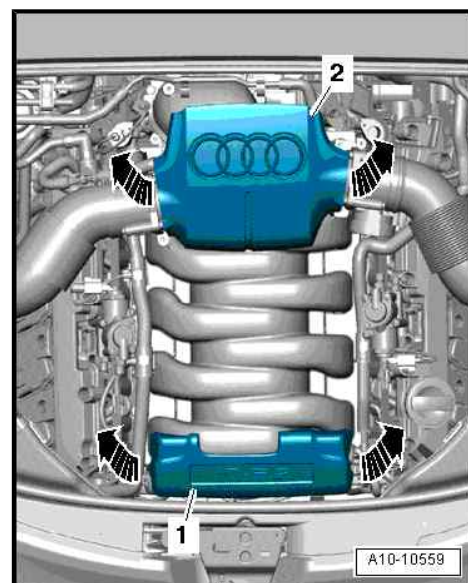
Special tools and workshop equipment required

- ◆ Puller - T40039-

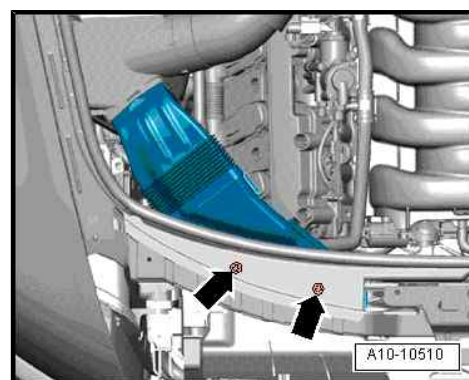


- Pull off rear engine cover panel -2-.

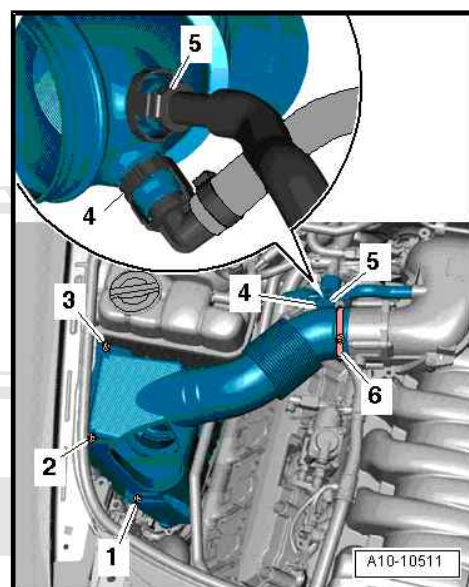
Removing, cylinder bank 1 (right-side):



- Remove bolts -arrows- and detach air duct (left-side).

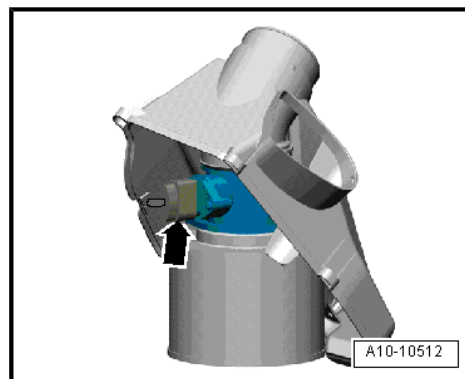


- Release hose clip -6- and unscrew bolts -1 ... 3-.

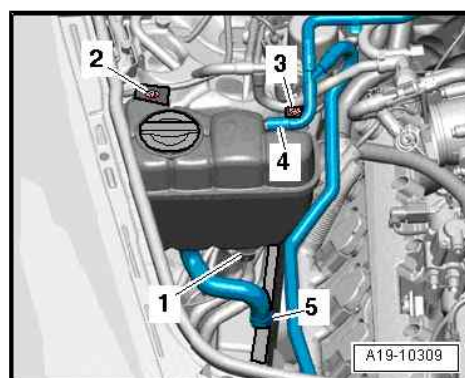


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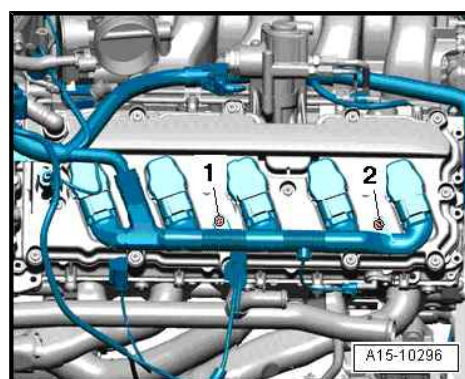
- Unplug electrical connector -arrow- at air mass meter - G70- .
- Detach top section of air cleaner housing (right-side).
- Take out air filter element.



- Unplug electrical connector -1- at coolant shortage indicator switch - F66- on coolant expansion tank (bottom).
- Remove bolts -2- and -3- and move coolant expansion tank to one side with coolant hoses -4- and -5- connected.



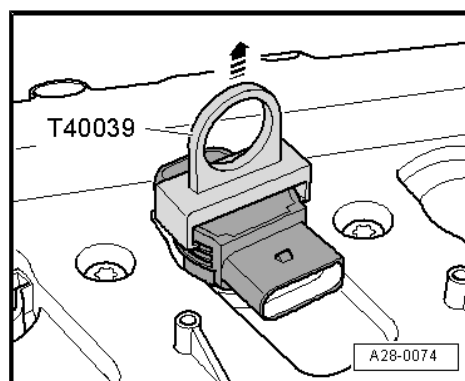
- Remove bolts -1- and -2-.



- Use puller - T40039- to pull ignition coils approx. 30 mm out of spark plug holes.
- Release electrical connectors and pull connectors off ignition coils at the same time.

Installing ignition coils

- Fit all ignition coils loosely into spark plug holes.
- Align ignition coils with connectors and attach all connectors onto coils simultaneously.
- Press ignition coils onto spark plugs by hand with uniform pressure (do not use tools).
- Install air cleaner housing (right-side)
⇒ "2.4 Removing and installing air filter element (left and right)", page 16 .



Tightening torque

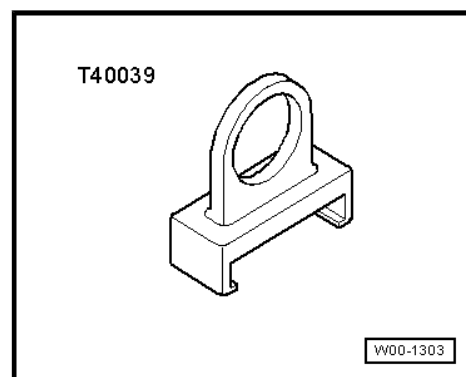
Component	Nm
Electrical wiring guide for ignition coils to cylinder head cover	5

2.4 Removing and installing ignition coils with output stages - cylinders 6 ... 10

Special tools and workshop equipment required

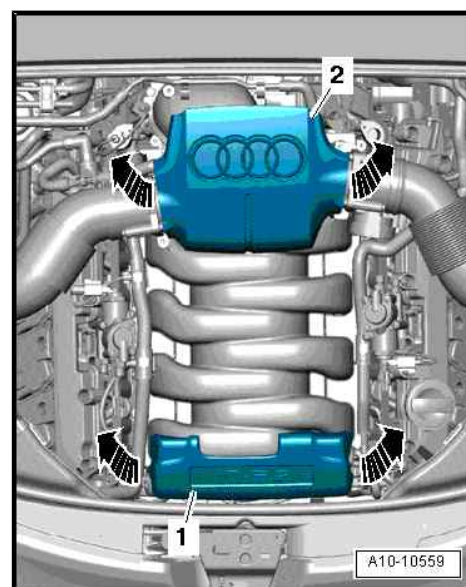
- ◆ Puller - T40039-

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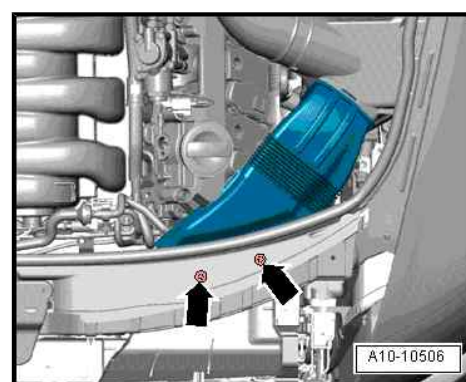


- Pull off rear engine cover panel -2-.

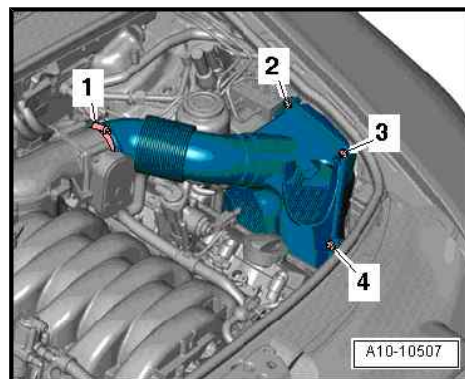
Removing, cylinder bank 2 (left side):



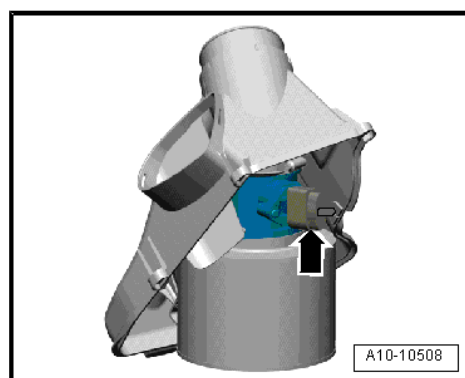
- Remove bolts -arrows- and detach air duct (left-side).



- Release hose clip -1- and unscrew bolts -2 ... 4-.



- Unplug electrical connector -arrow- at air mass meter 2 - G246- .
- Detach top section of air cleaner (left-side).
- Take out air filter element.

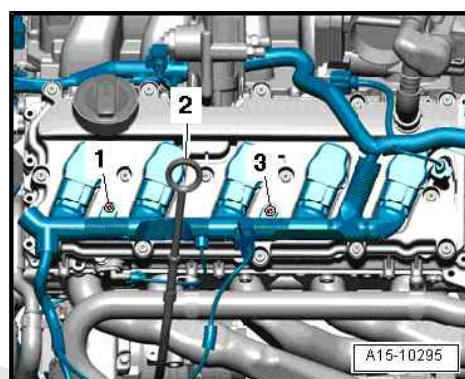


- Remove bolts -1- and -3-.



Note

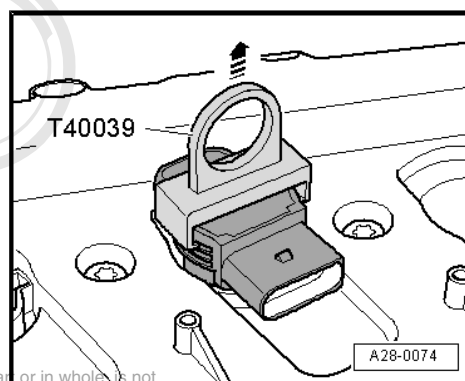
The hydraulic fluid reservoir must be unbolted from the bracket in order to remove the ignition coils from cylinders 9 and 10.



- Use puller - T40039- to pull ignition coils approx. 30 mm out of spark plug holes.
- Release electrical connectors and pull connectors off ignition coils at the same time.

Installing ignition coils

- Fit all ignition coils loosely into spark plug holes.
- Align ignition coils with connectors and attach all connectors onto coils simultaneously.
- Press ignition coils onto spark plugs by hand with uniform pressure (do not use any tools).
- Install air cleaner housing (left-side)
⇒ "2.4 Removing and installing air filter element (left and right)", page 16 .



Tightening torque

Component	Nm
Electrical wiring guide for ignition coils to cylinder head cover	5

2.5 Removing and installing knock sensors

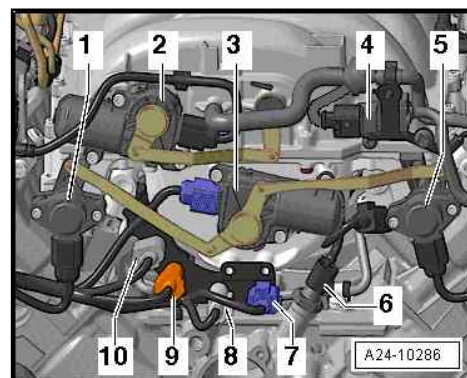


WARNING

- ◆ *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.*

Fitting location of electrical connectors at front of engine

- 7 - Knock sensor 4 - G199- (blue connector)
- 8 - Knock sensor 3 - G198- (white connector)
- 9 - Knock sensor 1 - G61- (orange connector)
- 10 - Knock sensor 2 - G66- (grey connector)



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Fitting location of knock sensors inside cylinder head

- 1 - Coolant temperature sender - G62-
- 2 - Knock sensor 4 - G199-
- 3 - Knock sensor 3 - G198-
- 4 - Fuel pressure sender - G247-
- 5 - Knock sensor 1 - G61-
- 6 - Knock sensor 2 - G66-
- 7 - Camshaft control valve 1 - N205-
- 8 - Fuel pressure sender for low pressure - G410-
- Remove intake manifold ⇒ [page 26](#) .



Note

Seal off the intake ports in the cylinder heads with clean cloths.

- Then remove relevant knock sensor.

Installing

- Secure relevant knock sensor (removed before) at fitting location.

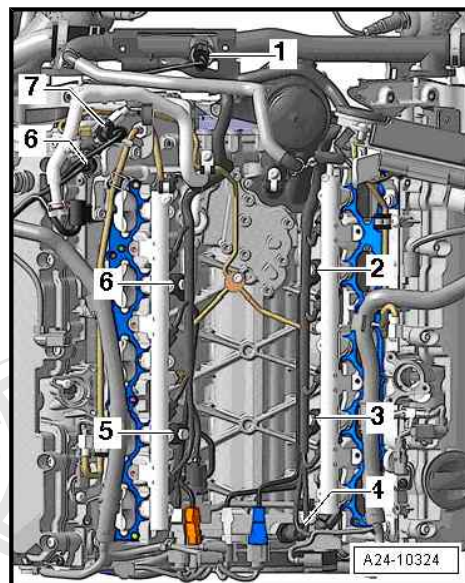
- Tightening torque: refer to exploded view of ignition system ⇒ [page 67](#) .



Note

The tightening torque influences the function of the knock sensor.

- Install intake manifold ⇒ [page 26](#) .



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