



Workshop Manual

Audi A6 2005 ➤

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Direct petrol injection and ignition system (10-cyl. 5.0 ltr. 4-valve turbo)

Engine ID

BUH

Edition 03.2016

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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Audi A6 2005 ►

Direct petrol injection and ignition system (10-cyl. 5.0 ltr. 4-valve turbo) - Edition 03.2016



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24 – Mixture preparation - injection

1 Safety precautions

(ARL004692; Edition 03.2016)

⇒ [“1.1 Safety precautions when working on the fuel supply system”, page 1](#)

⇒ [“1.2 Safety precautions when working on vehicles with start/stop system”, page 1](#)

⇒ [“1.3 Safety precautions when using testers and measuring instruments during a road test”, page 2](#)

⇒ [“1.3 Safety precautions when using testers and measuring instruments during a road test”, page 2](#)

⇒ [“1.4 Safety precautions when working on the subframe”, page 2](#)

⇒ [“1.5 Safety precautions when working on the cooling system”, page 2](#)

⇒ [“1.6 Safety precautions when working on the ignition system”, page 2](#)

1.1 Safety precautions when working on the fuel supply system

Risk of injury - fuel system operates under high pressure

The fuel system is pressurised. There is a risk of injury as fuel may spray out.

Before opening the fuel system:

- Put on safety goggles.
- Put on protective gloves.
- Release pressure (wrap clean cloth around connection and open connection carefully).

Risk of fire due to escaping fuel

If the battery is connected, the door contact switch activates the fuel pump when the driver's door is opened. Escaping fuel may ignite, causing a fire.

- Before opening the fuel system, disconnect power supply to fuel pump.

1.2 Safety precautions when working on vehicles with start/stop system

Risk of injury - engine may start unexpectedly

On vehicles with the start/stop system activated, the engine may start unexpectedly. If the start/stop system is activated, this is indicated by a message on the dash panel insert.

- Deactivate start/stop system by switching off ignition.

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

Risk of injury if test equipment is not secured

If an accident occurs and the front passenger's airbag is triggered, test equipment which is not secured adequately may be catapulted through the vehicle with potentially serious consequences.

- Secure test equipment on the rear seat with a strap.

Or

- Have a second mechanic operate test equipment on the rear seat.

1.4 Safety precautions when working on the subframe



Caution

Risk of damage to running gear components.

- ◆ ***The vehicle must NOT be lowered onto its wheels if the engine/gearbox mountings, steering rack or subframe cross brace are not properly installed.***
- ◆ ***The vehicle must NOT be supported by applying a trolley jack or similar to the subframe or subframe cross brace.***

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1.5 Safety precautions when working on the cooling system

Risk of scalding as hot coolant can escape

The cooling system is under pressure when the engine is hot. Hot steam/hot coolant can escape - risk of scalding.

- Put on protective gloves.
- Put on safety goggles.
- Release pressure (cover filler cap on coolant expansion tank with a cloth and open carefully).

1.6 Safety precautions when working on the ignition system

Risk of injury caused by electric shock

When the engine is running, there are high voltage levels in the ignition system. There is a risk of electric shock when touching the ignition system!

- Never touch or disconnect ignition wiring when the engine is running or being turned at cranking speed.

Risk of damage to components

Washing the engine or connecting/disconnecting electrical wiring may result in components being damaged if the engine is running.

- Switch off ignition before connecting/disconnecting electrical wiring.
- Switch off ignition before cleaning engine.



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2 Repair instructions

⇒ [“2.1 Rules for cleanliness”, page 4](#)

⇒ [“2.2 Foreign particles in engine”, page 4](#)

⇒ [“2.3 Contact corrosion”, page 4](#)

⇒ [“2.4 Routing and attachment of pipes, hoses and wiring”, page 5](#)

⇒ [“2.5 Installing radiators and condensers”, page 5](#)

2.1 Rules for cleanliness

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

- ◆ Carefully clean connection points and the surrounding area with engine cleaner or brake cleaner and dry thoroughly before opening.
- ◆ Immediately seal open lines and connections with clean plugs, for example from engine bung set - VAS 6122- .
- ◆ Place parts that have been removed on a clean surface and cover them over. Do not use fluffy cloths.
- ◆ Carefully cover or seal open components if repairs cannot be carried out immediately.
- ◆ Only install clean components; replacement parts should only be unpacked immediately prior to installation. Do not use parts that have been previously unpacked and stored away loose (e.g. in toolboxes, etc.).
- ◆ When the system is open: Do not work with compressed air. Do not move the vehicle unless absolutely necessary.
- ◆ Make sure that no fuel runs onto the fuel hoses. Should this occur, the fuel hoses must be cleaned again immediately.
- ◆ Protect unplugged electrical connectors against dirt and moisture and make sure connections are dry when attaching.

2.2 Foreign particles in engine

- ◆ When performing assembly work on the engine, all open passages in the intake and exhaust systems must be sealed with suitable plugs (e.g. from engine bung set - VAS 6122-) to prevent foreign particles from entering the engine.
- ◆ In the event of mechanical damage to one of the cylinder banks, the intake and exhaust systems and combustion chambers of the opposite cylinder bank must always be examined for foreign particles to prevent further damage occurring later.

2.3 Contact corrosion

Contact corrosion can occur if unsuitable fasteners are used (e.g. bolts, nuts, washers, etc.).

For this reason, only fasteners with a special surface coating are used.

Additionally, all rubber and plastic parts and all adhesives are made of non-conductive materials.

Always install new parts if you are not sure whether used parts can be re-fitted ⇒ Electronic parts catalogue .

Note the following:

- ◆ We recommend using only genuine replacement parts; these have been tested and are compatible with aluminium.
- ◆ We recommend the use of Audi accessories.
- ◆ Damage caused by contact corrosion is not covered under warranty.

2.4 Routing and attachment of pipes, hoses and wiring

- ◆ Mark fuel lines, hydraulic lines, vacuum lines, lines for activated charcoal filter and electrical wiring etc. before removal so they can be re-installed in the original positions and correctly connected. Make sketches or take photographs if necessary.
- ◆ To prevent damaging pipes, hoses and wiring, ensure sufficient clearance from all moving or hot components in engine compartment (little space in engine compartment)

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2.5 Installing radiators and condensers

Even when the radiator and condenser are correctly installed, slight impressions may be visible on the fins of these components. This does not mean that the components are damaged. If the fins are only very slightly distorted, this does not justify renewal of the radiator or the condenser.

3 Injection system

3.1 Test data

	5.0 ltr. TFSI engine
Idling speed Cannot be adjusted; regulated by idling speed stabilisation	approx. 650 rpm ¹⁾
Fuel pressure before high-pressure pump	approx. 5 bar
Fuel pressure after high-pressure pump	35 ... 120 bar
¹⁾ Approx. 630 rpm when gear is engaged.	

3.2 Overview of fitting locations - injection system

Engine compartment (right-side)

1 - Hall sender 3 - G300-

- ☐ Fitting location
⇒ [page 11](#)
- ☐ Removing and installing
⇒ [page 71](#)

2 - Charge pressure control solenoid valve - N75-

- ☐ Fitting location
⇒ [page 10](#)

3 - Right electrohydraulic engine mounting solenoid valve - N145-

- ☐ Fitting location
⇒ [page 10](#)
- ☐ Removing and installing engine mountings ⇒ Rep. gr. 10

4 - Exhaust camshaft control valve 1 - N318-

- ☐ Fitting location
⇒ [page 15](#)

5 - Charge pressure sender - G31-

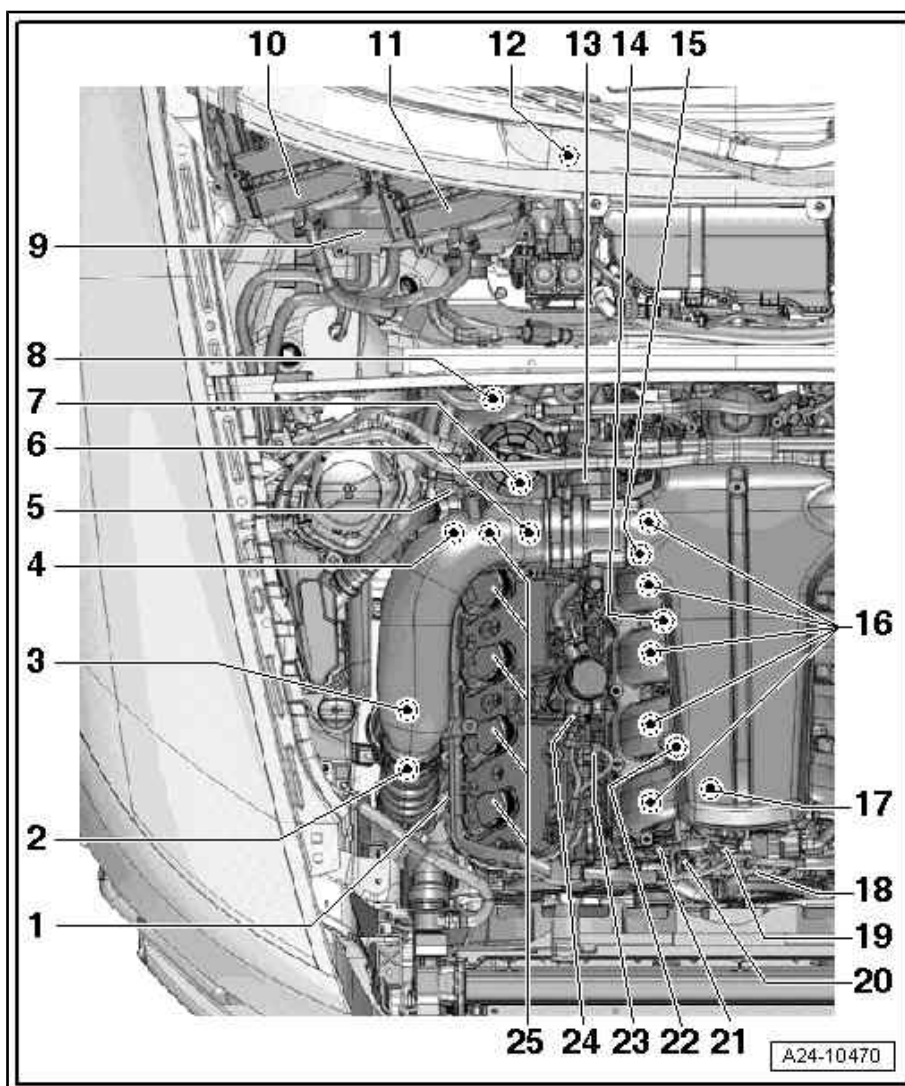
- ☐ Fitting location
⇒ [page 12](#)
- ☐ Removing and installing
⇒ Rep. gr. 21

6 - Camshaft control valve 1 - N205-

- ☐ Fitting location
⇒ [page 14](#)

7 - Continued coolant circulation pump - V51-

- ☐ Fitting location ⇒ [page 13](#)



8 - Lambda probe - G39- with Lambda probe heater - Z19-

- ☐ Fitting location ⇒ [page 11](#)
- ☐ Allocation and fitting location for connector ⇒ [page 12](#)
- ☐ Removing and installing ⇒ [page 54](#)

9 - Electronics box in plenum chamber (right-side)

- ☐ With relay carrier
- ☐ With suppression filter - C24-
- ☐ With main fuse holder
- ☐ Assignment ⇒ [page 13](#)

10 - Engine control unit 2 - J624-

- ☐ Fitting location ⇒ [page 12](#)
- ☐ Removing and installing ⇒ [page 58](#)

11 - Engine control unit - J623-

- ☐ Fitting location ⇒ [page 12](#)
- ☐ Removing and installing ⇒ [page 58](#)

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

- ☐ Fitting location ⇒ [page 11](#)
- ☐ Allocation and fitting location for connector ⇒ [page 12](#)
- ☐ Removing and installing ⇒ [page 54](#)

13 - Throttle valve module - J338-

- ☐ Removing and installing ⇒ [page 33](#)

14 - Knock sensor 2 - G66-

- ☐ Fitting location and allocation for connector ⇒ [page 14](#)
- ☐ Removing and installing ⇒ [page 71](#)

15 - Fuel pressure sender - G247-

- ☐ Fitting location ⇒ [page 14](#)

16 - Injectors, cylinder bank 1

- ☐ Injector, cylinder 1 - N30-
- ☐ Injector, cylinder 2 - N31-
- ☐ Injector, cylinder 3 - N32-
- ☐ Injector, cylinder 4 - N33-
- ☐ Injector, cylinder 5 - N83-
- ☐ Removing and installing ⇒ [page 42](#)

17 - Intake manifold flap valve - N316-

Fitting location ⇒ [page 14](#)

18 - Electrical connectors

- ☐ Fitting location and allocation for connector ⇒ [page 14](#)

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

- ☐ Fitting location ⇒ [page 14](#)

20 - Coolant temperature sender - G62-

- ☐ Fitting location ⇒ [page 15](#)

21 - Intake manifold flap potentiometer - G336-

- ☐ Fitting location ⇒ [page 14](#) , ⇒ [page 14](#)
- ☐ After renewing, perform "Adaption" in "Guided Functions" ⇒ Vehicle diagnostic tester

22 - Knock sensor 1 - G61-

- ☐ Fitting location and allocation for connector ⇒ [page 14](#)

- ☐ Removing and installing ⇒ [page 71](#)

23 - Hall sender - G40-

- ☐ Fitting location ⇒ [page 14](#)
- ☐ Removing and installing ⇒ [page 71](#)

24 - High-pressure pump

- ☐ With fuel metering valve - N290-
- ☐ Fitting location ⇒ [page 14](#)

25 - Ignition coils for cylinder bank 1

- ☐ Ignition coil 1 with output stage - N70-
- ☐ Ignition coil 2 with output stage - N127-
- ☐ Ignition coil 3 with output stage - N291-
- ☐ Ignition coil 4 with output stage - N292-
- ☐ Ignition coil 5 with output stage - N323-
- ☐ Removing and installing ⇒ [page 64](#)

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Engine compartment (left-side)

1 - Injectors, cylinder bank 2

- ☐ Injector, cylinder 6 - N84-
- ☐ Injector, cylinder 7 - N85-
- ☐ Injector, cylinder 8 - N86-
- ☐ Injector, cylinder 9 - N299-
- ☐ Injector, cylinder 10 - N300-
- ☐ Removing and installing ⇒ [page 42](#)

2 - Fuel pressure sender for low pressure - G410-

- ☐ Fitting location ⇒ [page 15](#)

3 - Fuel pressure sender 2 - G624-

- ☐ Fitting location ⇒ [page 13](#)

4 - Engine speed sender - G28-

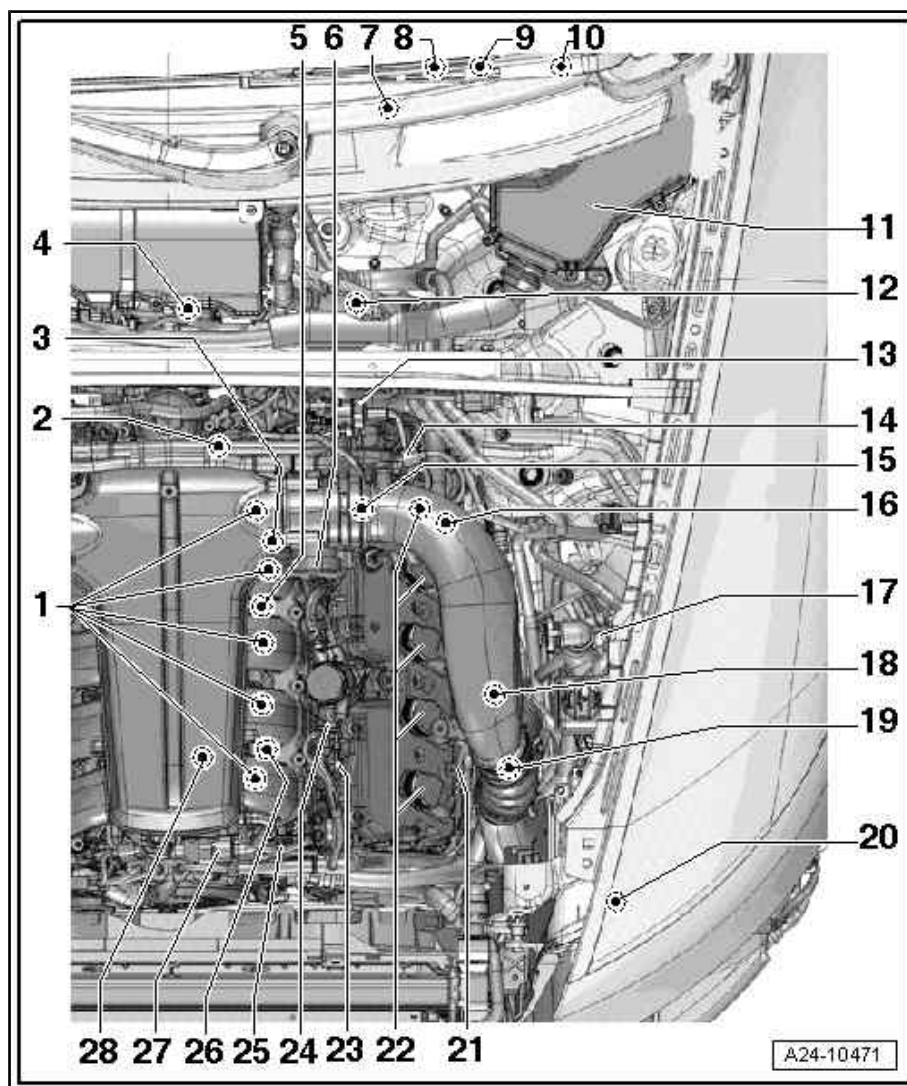
- ☐ Fitting location ⇒ [page 16](#)
- ☐ Removing and installing ⇒ [page 72](#)

5 - Knock sensor 4 - G199-

- ☐ Fitting location and allocation for connector ⇒ [page 14](#)
- ☐ Removing and installing ⇒ [page 71](#)

6 - Throttle valve module 2 - J544-

- ☐ Removing and installing ⇒ [page 33](#)



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

- ☐ Fitting location ⇒ [page 11](#)
- ☐ Allocation and fitting location for connector ⇒ [page 12](#)
- ☐ Removing and installing ⇒ [page 54](#)

8 - Engine fault warning lamp

- ☐ In instrument cluster

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

- ☐ In accelerator pedal module; fitting location ⇒ [page 16](#)

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

- ☐ Fitting location ⇒ [page 16](#)

11 - Electronics box in plenum chamber (left-side)

- ☐ With connector point
- ☐ With fuse holder
- ☐ With relay carrier
- ☐ Assignment ⇒ [page 13](#)

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

- ☐ Fitting location ⇒ [page 11](#)
- ☐ Allocation and fitting location for connector ⇒ [page 12](#)
- ☐ Removing and installing ⇒ [page 54](#)

13 - Activated charcoal filter solenoid valve 1 - N80-**14 - Charge pressure sender 2 - G447-**

- ☐ Fitting location ⇒ [page 12](#)
- ☐ Removing and installing ⇒ Rep. gr. 21

15 - Camshaft control valve 2 - N208-

- ☐ Fitting location ⇒ [page 13](#)

16 - Exhaust camshaft control valve 2 - N319-

- ☐ Fitting location ⇒ [page 15](#)

17 - Secondary air pump motor - V101-

- ☐ Removing and installing ⇒ Rep. gr. 26

18 - Left electrohydraulic engine mounting solenoid valve - N144-

- ☐ Fitting location ⇒ [page 10](#)
- ☐ Removing and installing engine mountings ⇒ Rep. gr. 10

19 - Charge pressure control solenoid valve 2 - N274-

- ☐ Fitting location ⇒ [page 10](#)

20 - Circulation pump 2 - V403-

- ☐ Fitting location ⇒ [page 15](#)
- ☐ Removing and installing ⇒ Rep. gr. 19

21 - Hall sender 4 - G301-

- ☐ Fitting location ⇒ [page 11](#)
- ☐ Removing and installing ⇒ [page 71](#)

22 - Ignition coils for 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 on cylinders 6 ... 9 ⇒ [page 65](#)
- ☐ Removing and installing on cylinder 10 ⇒ [page 66](#)

23 - Hall sender 2 - G163-

- ☐ Fitting location ⇒ [page 11](#)
- ☐ Removing and installing ⇒ [page 71](#)

24 - Fuel metering valve 2 - N402-

- ☐ In high-pressure pump

25 - Intake manifold flap potentiometer 2 - G512-

- ☐ Fitting location ⇒ [page 14](#)
- ☐ After renewing, perform "Adaption" in "Guided Functions" ⇒ Vehicle diagnostic tester

26 - Knock sensor 3 - G198-

- ☐ Fitting location and allocation for connector ⇒ [page 14](#)
- ☐ Removing and installing ⇒ [page 71](#)

27 - Turbocharger air recirculation valve - N249-

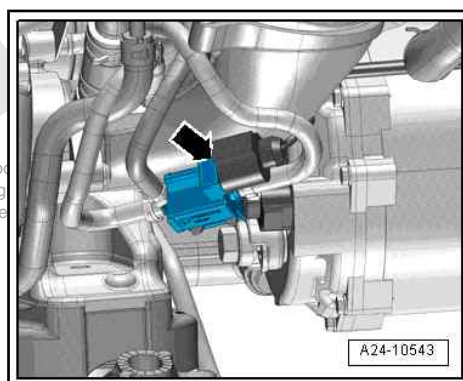
28 - Secondary air inlet valve - N112-

- ☐ Fitting location ⇒ [page 14](#)

Fitting location of charge pressure control solenoid valve - N75- (right-side), charge pressure control solenoid valve 2 - N274- (left-side)

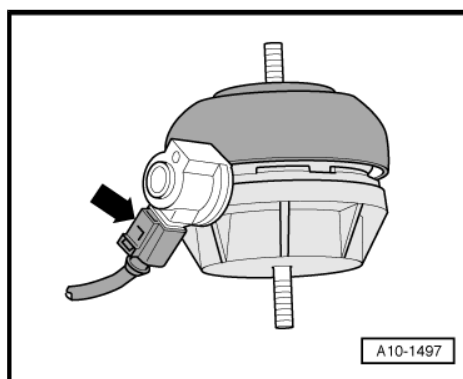
- ◆ On side of turbocharger -arrow-

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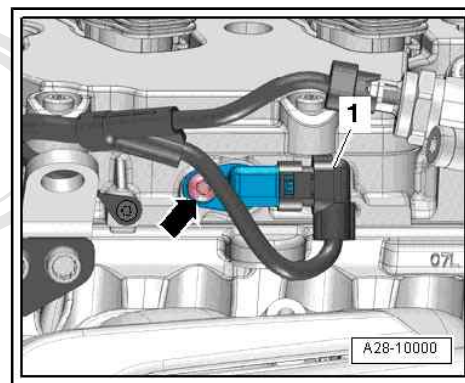
Fitting location of left electrohydraulic engine mounting solenoid valve - N144- , right electrohydraulic engine mounting solenoid valve - N145-

- ◆ On side of engine mounting -arrow-

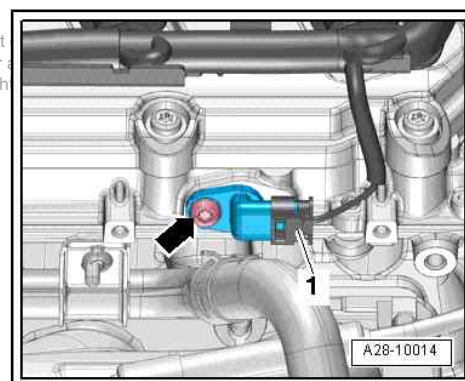


Fitting location of Hall sender - G40- (right-side), Hall sender 2 - G163- (left-side)

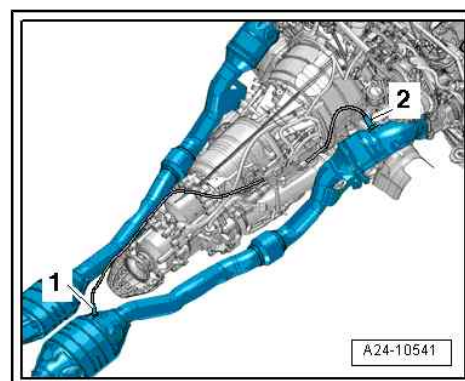
- ◆ At front and on inside of cylinder head -arrow-.

**Fitting location of Hall sender 3 - G300- (right-side), Hall sender 4 - G301- (left-side)**

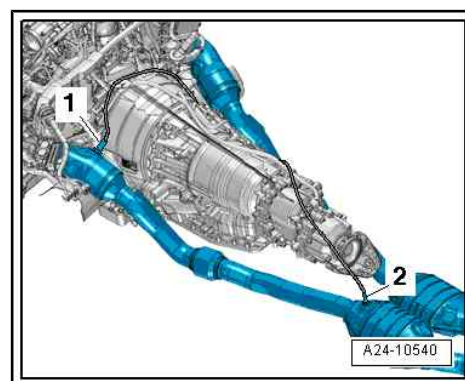
- ◆ At front and on outside of cylinder head -arrow-.

**Fitting location of Lambda probes on exhaust pipe (right-side)**

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

**Fitting location of Lambda probes on exhaust pipe (left-side)**

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

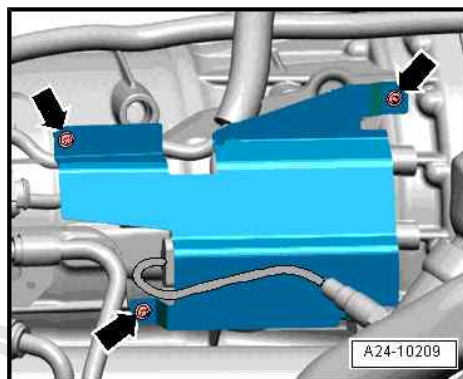


Allocation and fitting location of electrical connectors for Lambda probes



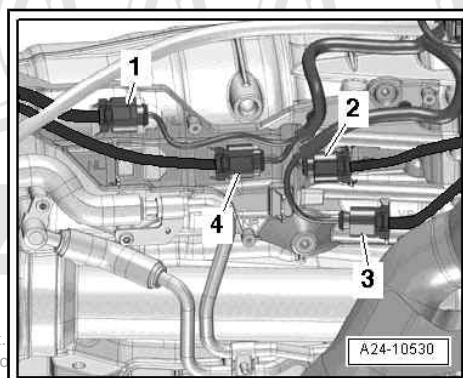
Note

When the engine/gearbox assembly is removed, the connectors for the Lambda probes are accessible if you remove the heat shield (right-side) from the gearbox -arrows-.



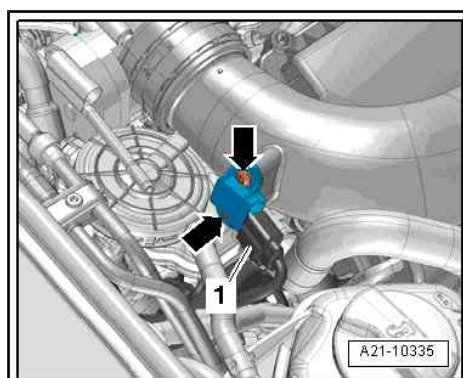
◆ On right side of gearbox

- 1 - Connector (brown) for Lambda probe 2 after catalytic converter - G131- with Lambda probe 2 heater after catalytic converter - Z30-
- 2 - Connector (brown) for Lambda probe 2 - G108- with Lambda probe 2 heater - Z28-
- 3 - Connector (black) for Lambda probe - G39- with Lambda probe heater - Z19-
- 4 - Connector (black) for Lambda probe after catalytic converter - G130- with Lambda probe 1 heater after catalytic converter - Z29-



Fitting location of charge pressure sender - G31- (right-side), charge pressure sender 2 - G447- (left-side)

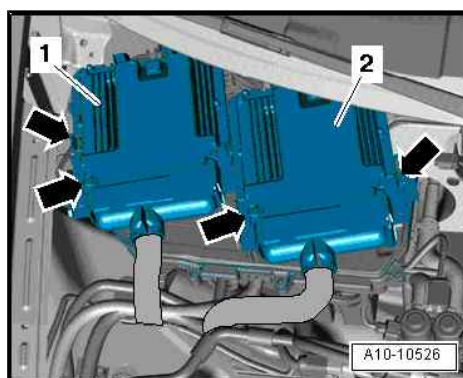
◆ At air pipes



Fitting location of engine control units

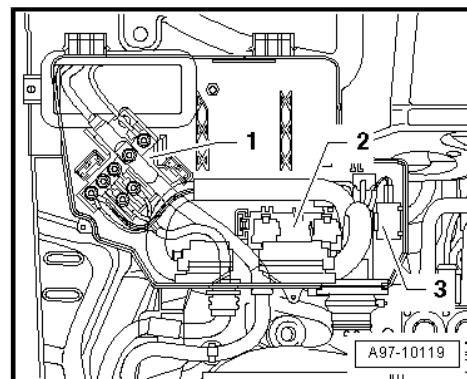
◆ In electronics box in plenum chamber (right-side)

- 1 - Engine control unit 2 - J624-
- 2 - Engine control unit - J623-



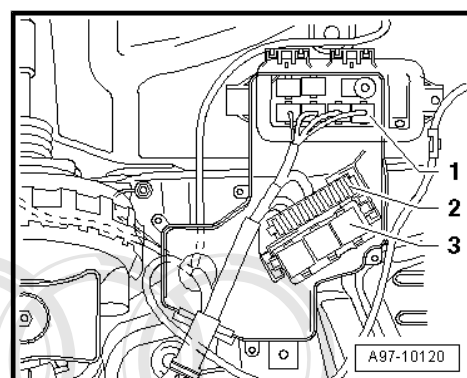
Assignment in electronics box in plenum chamber (right-side)

- 1 - Main fuse holder
- 2 - Relay and fuse holder
 - Position 1: terminal 15 voltage supply relay - J329-
 - Position 2: secondary air pump relay - J299-
 - Position 3: secondary air pump fuse - S130-
- 3 - Suppression filter - C24-



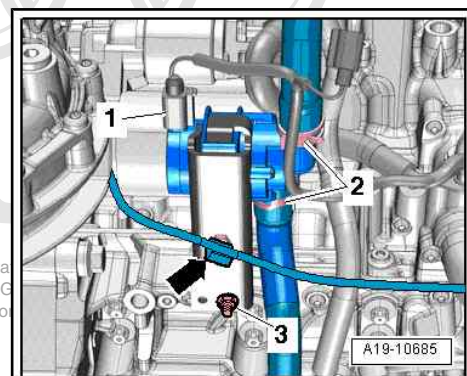
Assignment in electronics box in plenum chamber (left-side)

- 1 - Connector point
- 2 - Fuse holder
- 3 - Suppression filter - C24-
 - Position 1.1: additional coolant pump relay - J496-
 - Position 1.2: continued coolant circulation relay - J151-
 - Position 2: engine component current supply relay - J757-
 - Position 3: Motronic current supply relay - J271-



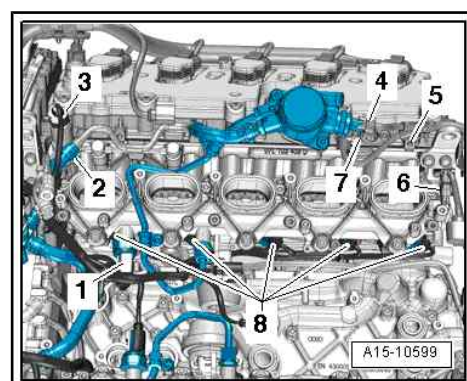
Fitting location of continued coolant circulation pump - V51-

- ◆ At front left underneath gearbox



Allocation of connectors on cylinder head (left-side):

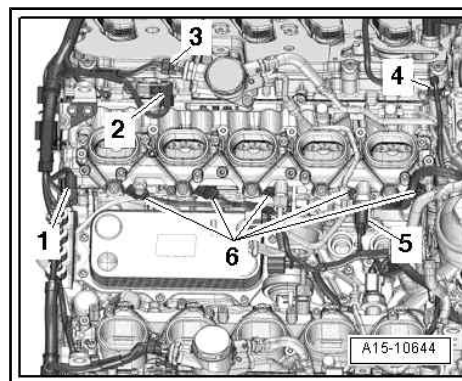
- ◆ Below intake manifold
 - 1 - For fuel pressure sender 2 - G624-
 - 3 - For camshaft control valve 2 - N208-
 - 4 - For fuel metering valve 2 - N402-
 - 6 - For intake manifold flap potentiometer 2 - G512-
 - 7 - For Hall sender 2 - G163-
 - 8 - For injectors



Allocation of connectors on cylinder head (right-side):

◆ Below intake manifold

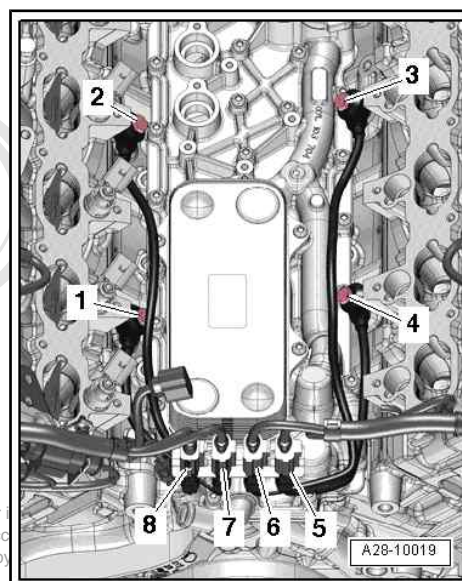
- 1 - For intake manifold flap potentiometer - G336-
- 2 - For Hall sender - G40-
- 3 - For fuel metering valve - N290-
- 4 - For camshaft control valve 1 - N205-
- 5 - For fuel pressure sender - G247-
- 6 - For injectors



Fitting location of knock sensors and allocation for connectors

◆ Below intake manifold

- 1 - Knock sensor 1 - G61-
- 2 - Knock sensor 2 - G66-
- 3 - Knock sensor 4 - G199-
- 4 - Knock sensor 3 - G198-
- 5 - Connector (blue) for knock sensor 3 - G198-
- 6 - Connector (orange) for knock sensor 4 - G199-
- 7 - Connector (grey) for knock sensor 2 - G66-
- 8 - Connector (black) for knock sensor 1 - G61-

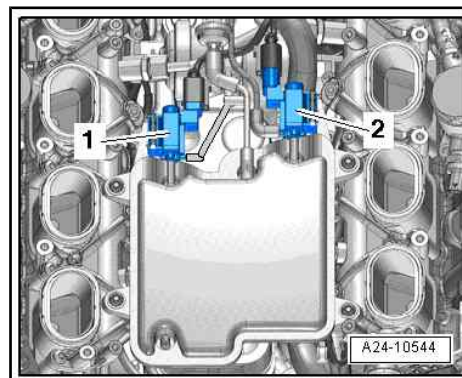


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Fitting location of secondary air inlet valve - N112-, intake manifold flap valve - N316-

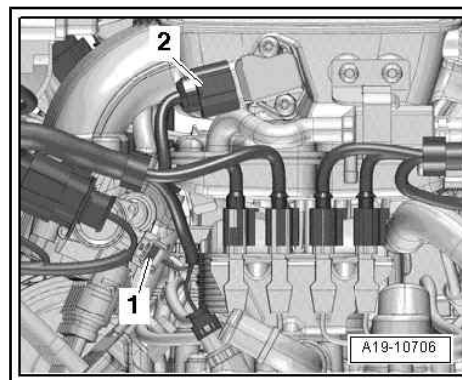
◆ Below intake manifold

- 1 - Intake manifold flap valve - N316-
- 2 - Secondary air inlet valve - N112-



Fitting location of intake air temperature sender - G42- / intake manifold pressure sender - G71-, intake manifold flap potentiometer 2 - G512-

- 1 - Intake manifold flap potentiometer - G336- (right-side), intake manifold flap potentiometer 2 - G512- (left-side)
- 2 - Intake air temperature sender - G42- / intake manifold pressure sender - G71-

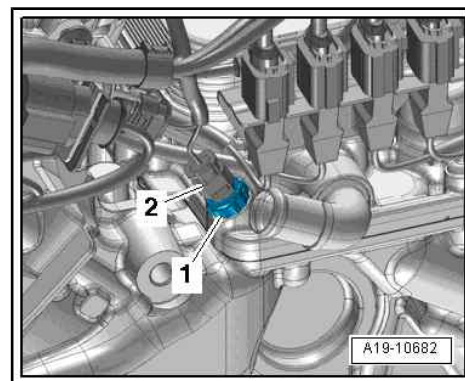


Fitting location of coolant temperature sender - G62-

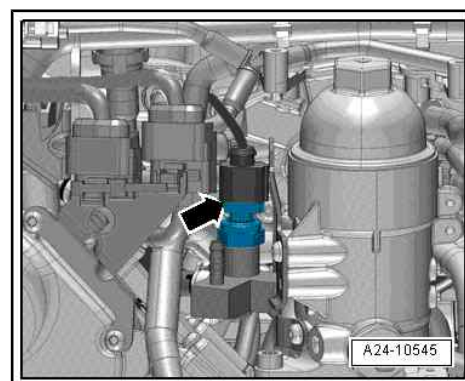
◆ At front of engine

1 - Coolant temperature sender - G62-

2 - Connector

**Fitting location of fuel pressure sender for low-pressure section - G410-**

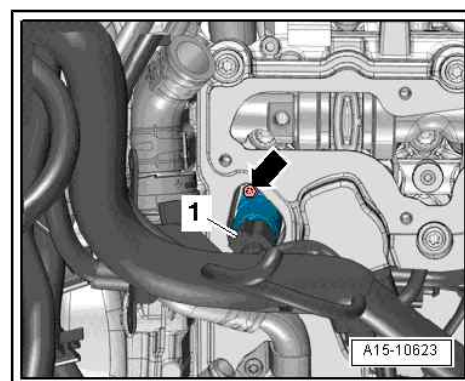
◆ On left next to oil filter housing -arrow-



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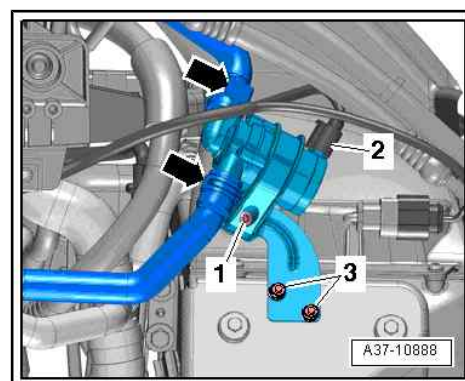
Fitting location of exhaust camshaft control valve 1 - N318- (right-side), exhaust camshaft control valve 2 - N319- (left-side)

◆ At rear top of cylinder head -1-

**Fitting location of circulation pump 2 - V403-**

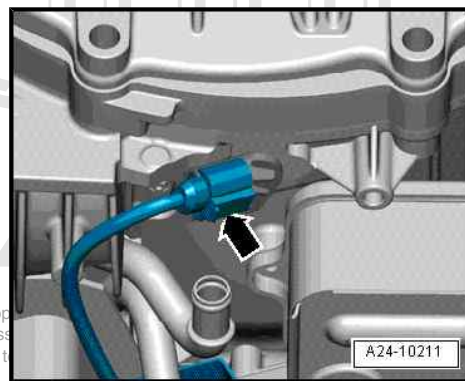
◆ Below charge air cooler (left-side)

2 - Circulation pump 2 - V403-



Fitting location of engine speed sender - G28-

- ◆ At bottom of gearbox -arrow-



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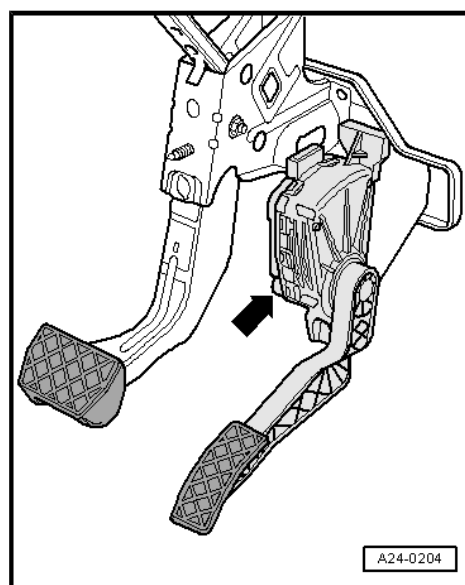
Fitting location of accelerator position sender - G79- / accelerator position sender 2 - G185-

- ◆ 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.



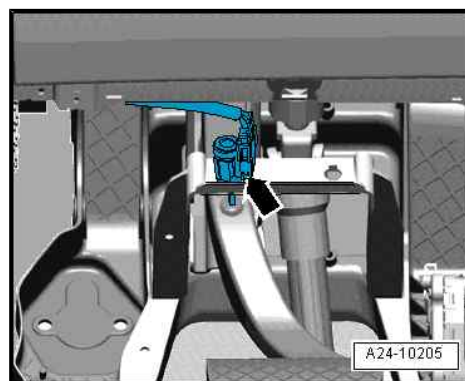
Fitting location of brake light switch - F- / brake pedal switch - F47-

- ◆ On pedal bracket -arrow-



Note

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



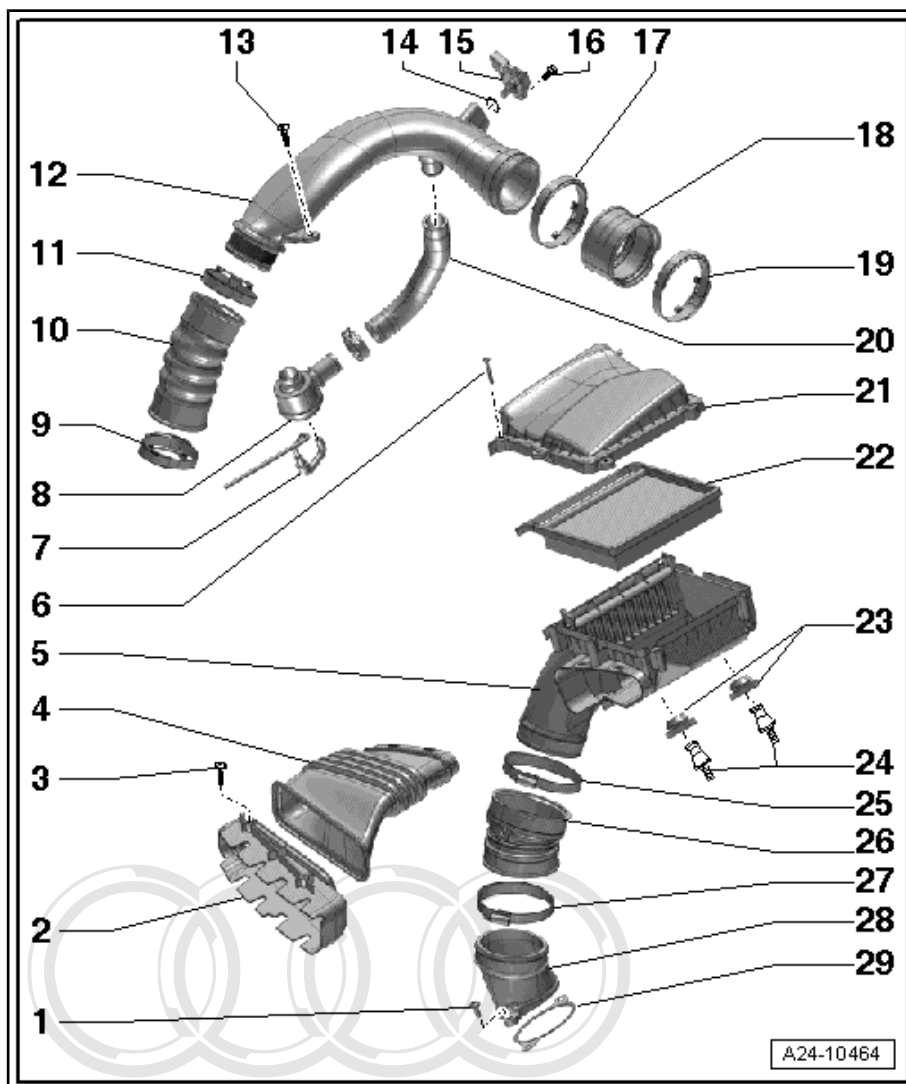
3.3 Exploded view - air cleaner



Note

The illustration shows the air cleaner housing on the left side.

- 1 - Bolt**
☐ 9 Nm
- 2 - Air duct**
☐ To lock carrier
☐ Clean out dirt, leaves and salt deposits
- 3 - Bolt**
☐ 1.5 Nm
- 4 - Air duct**
☐ To lock carrier
☐ Clean out dirt, leaves and salt deposits
- 5 - Air cleaner housing (bottom section)**
☐ Removing and installing ⇒ [page 20](#)
☐ Clean out dirt, leaves and salt deposits
☐ Check water drain for dirt and clean as necessary.
- 6 - Bolt**
☐ 4.5 Nm
- 7 - Vacuum hose**
☐ From turbocharger air recirculation valve - N249- to mechanical air recirculation valve
- 8 - Mechanical air recirculation valve**



- 9 - Hose clip**
☐ Specified installation position ⇒ [page 23](#)

10 - Air hose

- 11 - Hose clip**
☐ Specified installation position ⇒ [page 23](#)

12 - Air pipe

- 13 - Bolt**
☐ 5 Nm

- 14 - O-ring**
☐ Renew

15 - Charge pressure sender

- ☐ Charge pressure sender - G31- (right-side), charge pressure sender 2 - G447- (left-side)
☐ Removing and installing ⇒ Rep. gr. 21

- 16 - Bolt**
☐ 4.5 Nm

- 17 - Hose clip**
☐ Specified installation position ⇒ [page 23](#)

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18 - Air hose

19 - Hose clip

- ☐ Specified installation position ⇒ [page 23](#)

20 - Air hose

21 - Air cleaner housing (top section)

- ☐ Removing and installing ⇒ [page 18](#)
- ☐ Clean out dirt, leaves and salt deposits

22 - Air filter element

- ☐ Use genuine air filter element ⇒ Electronic parts catalogue
- ☐ Maintenance intervals ⇒ Maintenance tables ⇒ Maintenance ; Booklet 405
- ☐ Removing and installing ⇒ [page 18](#)
- ☐ Clean snow screen (if fitted)

23 - Bracket

- ☐ For air cleaner housing

24 - Grommet

25 - Bush

26 - Bolt

- ☐ 5 Nm

27 - Nut

- ☐ 5.5 Nm

28 - Grommets

29 - Retaining pin

- ☐ For bottom section of air cleaner housing

30 - Hose clip

- ☐ Specified installation position ⇒ [page 23](#)

31 - Air hose

32 - Hose clip

- ☐ Specified installation position ⇒ [page 23](#)

33 - Intermediate flange

- ☐ To turbocharger

34 - Gasket

- ☐ Renew

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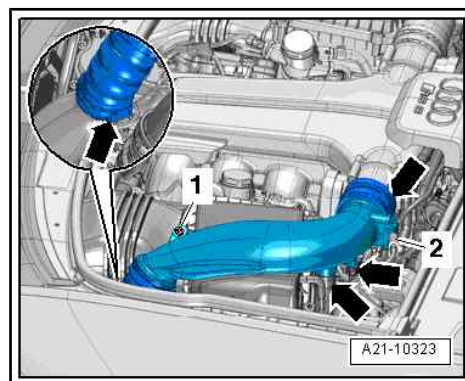
3.4 Removing and installing air filter element

Removing

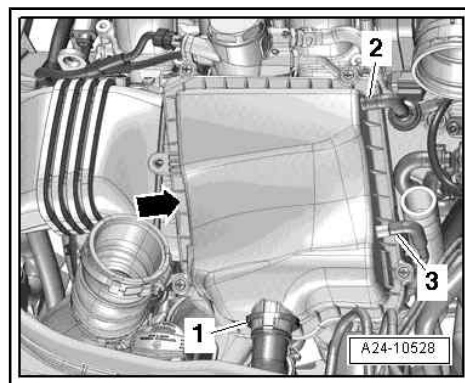
Proceed as follows:

Air cleaner housing on left side:

- Remove bolt -1- and unplug electrical connector at charge pressure sender 2 - G447- .
- Release hose clips -arrows- and remove air pipe (left-side).



- Press release tabs and disconnect air hose -1-.
- Detach hoses -2- and -3- from top section of air cleaner housing.
- Unscrew top section of air cleaner housing -arrow- and remove air filter element.



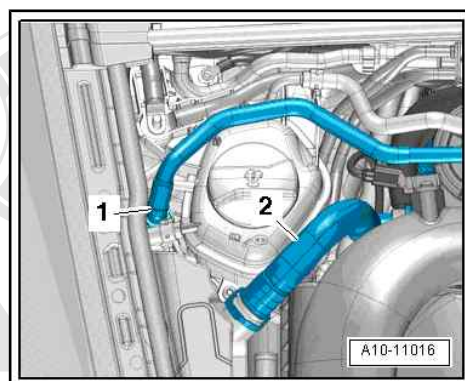
Air cleaner housing on right side:

- Press release tabs and detach crankcase breather hose -2-.

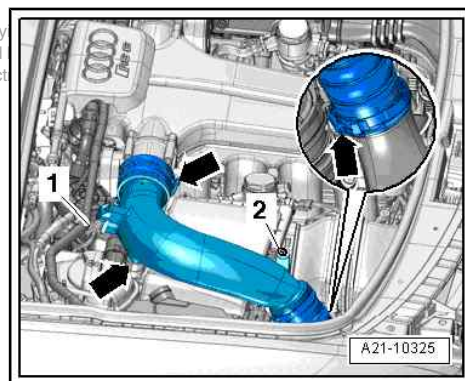


Note

Disregard item -1-.



- Unscrew bolt -2- and unplug electrical connector -1- for charge pressure sender - G31- .
- Release hose clips -arrows- and remove air pipe (right-side).



- Detach breather hose -1- from top section of air cleaner housing.
- Unscrew top section of air cleaner housing -arrow- and remove air filter element.

Installing

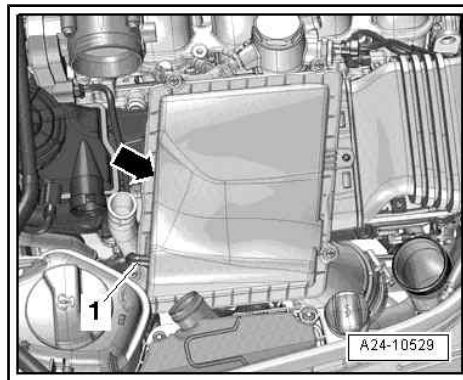
- Tightening torque ⇒ [page 16](#)



Note

- ◆ Always use genuine part for air filter element.
 - ◆ Hose connections and hoses in intake system must be free of oil and grease before assembly. Do not use any lubricants containing silicone when assembling.
 - ◆ The air cleaner housing **MUST** be clean.
 - ◆ Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ *Electronic parts catalogue*.
 - ◆ To ensure that the air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.
 - ◆ To ensure that the crash sensors have sufficient clearance, it is important to observe the correct installation position for the hose clips at the air pipes ⇒ [page 23](#).
 - ◆ To prevent malfunctions, cover all critical parts of the engine air intake tract (intake pipes, etc.) with a clean cloth when blowing out the air cleaner housing with compressed air.
 - ◆ Observe environmental requirements for disposal.
- Blow out water drain (small hole in bottom section of air cleaner housing) with compressed air.
 - Clean salt residue, dirt and leaves out of air cleaner housing (top and bottom sections) using a vacuum cleaner.
 - Check for salt residue, dirt and leaves in air hose (engine intake side).
 - Check for dirt and leaves in air duct going from lock carrier to air cleaner housing.
 - When installing the air filter element, check that it is properly centred in the retainer in the bottom section of the air cleaner housing.
 - Fit the top section of the air cleaner housing carefully on the bottom section, without using force. Make sure that the top section of the air cleaner housing is fitted straight on the air filter element (note the position of the sealing lip on the air filter element).

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



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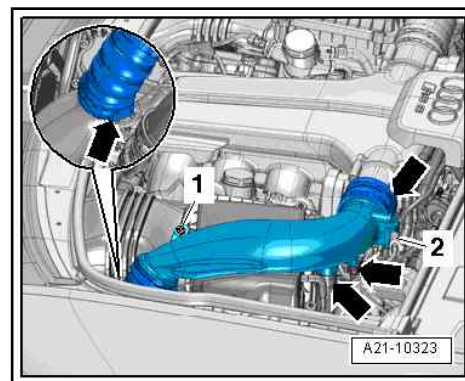
3.5 Removing and installing air cleaner housing

Removing

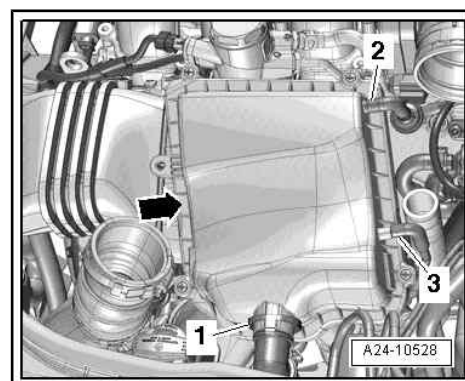
Proceed as follows:

Air cleaner housing on left side:

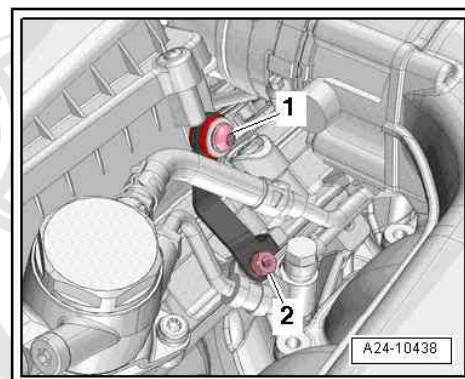
- Remove bolt -1- and unplug electrical connector at charge pressure sender 2 - G447- .
- Release hose clips -arrows- and remove air pipe (left-side).



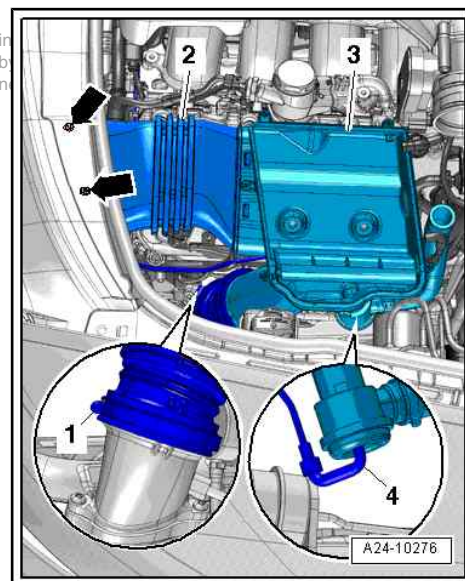
- Press release tabs and disconnect air hose -1-.
- Detach hoses -2- and -3- from top section of air cleaner housing -arrow-.



- Unscrew bolt -1- and nut -2- and remove bracket for air cleaner housing.



- Release hose clip -1- and remove bolts -arrows-.
- Take out air cleaner housing -3- with air duct -2- and detach vacuum hose -4- from mechanical air recirculation valve.



Air cleaner housing on right side:

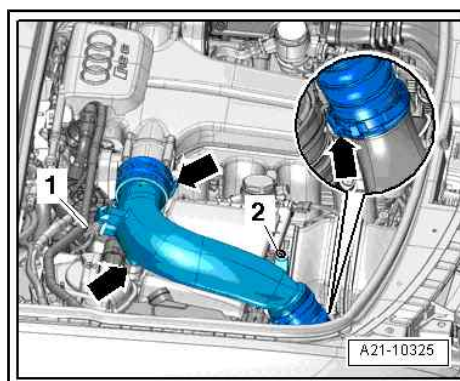
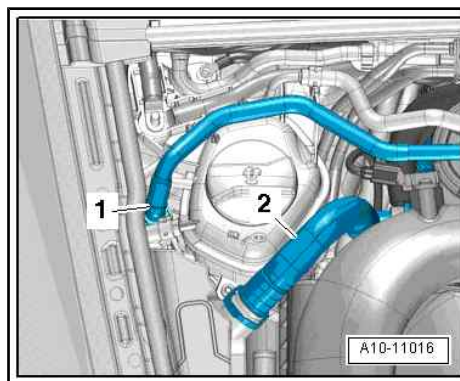
- Press release tabs and detach crankcase breather hose -2-.



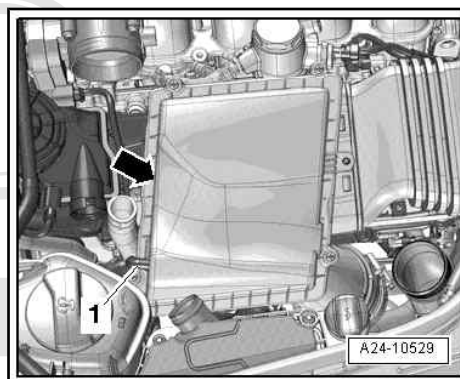
Note

Disregard item -1-.

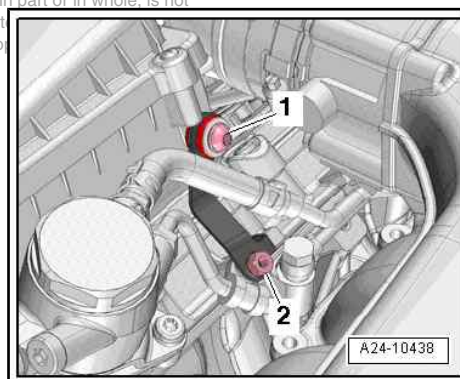
- Unscrew bolt -2- and unplug electrical connector -1- for charge pressure sender - G31- .
- Release hose clips -arrows- and remove air pipe (right-side).



- Detach breather hose -1- from top section of air cleaner housing -arrow-.



- Unscrew bolt -1- and nut -2- and remove bracket for air cleaner housing.



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- Unscrew bolts -arrows- and release hose clip -4-.
- Detach air cleaner housing -2- from air duct -3-.
- Disconnect vacuum hose -1- from mechanical air recirculation valve.
- Detach air duct.

Installing

- Tightening torque ➔ [page 16](#)



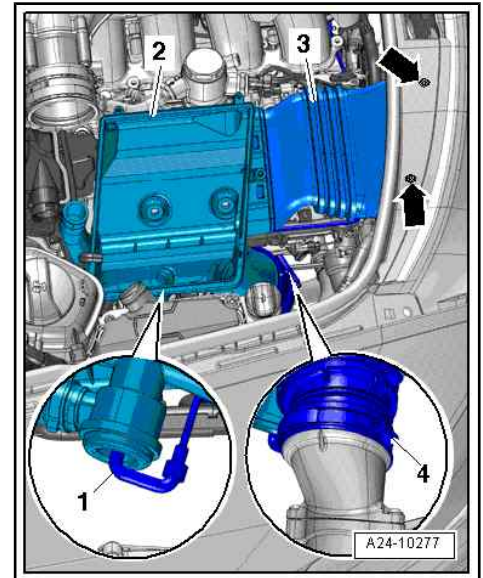
Note

- ◆ *If the top section of the air cleaner housing has been removed, observe the instructions for installing the air filter element ➔ [page 18](#).*
 - ◆ *Hose connections and hoses in intake system must be free of oil and grease before assembly. Do not use any lubricants containing silicone when assembling.*
 - ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ➔ *Electronic parts catalogue*.*
 - ◆ *To ensure that the air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*
 - ◆ *To ensure that the crash sensors have sufficient clearance, it is important to observe the correct installation position for the hose clips at the air pipes ➔ [page 23](#).*
- Check for salt residue, dirt and leaves in air hose (engine intake side).
 - Check for dirt and leaves in air duct going from lock carrier to air cleaner housing.

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

3.6 Installing air hoses and hose clips

To ensure that the crash sensors have sufficient clearance, it is important to observe the correct installation position for the hose clips at the air pipes.



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Fitting air hose (left-side) between air cleaner housing and turbo-charger

-1- Intermediate flange

- ◆ To turbocharger

-2- Hose clip

- ◆ With locating device
- ◆ Do not detach from air hose
- ◆ Installation position as marked on air hose (triangular notch) and as shown in illustration
- ◆ Spray rust remover onto worm thread of used hose clips before installing
- ◆ 5.5 Nm

-3- Air hose

- ◆ Installation markings -item 6- and -item 7- must align
- ◆ Do not use any lubricant when installing

-4- Hose clip

- ◆ With locating device
- ◆ Do not detach from air hose
- ◆ Installation position as marked on air hose (triangular notch) and as shown in illustration
- ◆ Spray rust remover onto worm thread of used hose clips before installing
- ◆ 5.5 Nm

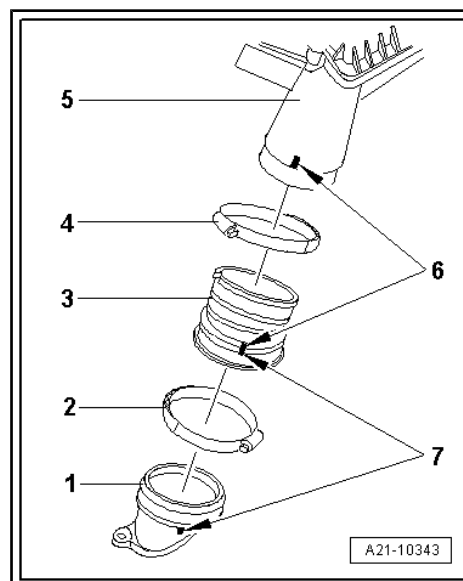
-5- Air cleaner housing

-6- Installation marking

- ◆ Installation markings on air cleaner housing and air hose must align

-7- Installation marking

- ◆ Installation markings on intermediate flange and air hose must align



Fitting air hose (left-side) between turbocharger and charge air cooler (left-side)**-1- Hose clip**

- ◆ With locating device
- ◆ Do not detach from air hose
- ◆ Installation position as marked on air hose (triangular notch) and as shown in illustration
- ◆ Spray rust remover onto worm thread of used hose clips before installing
- ◆ 5.5 Nm

-2- Air hose

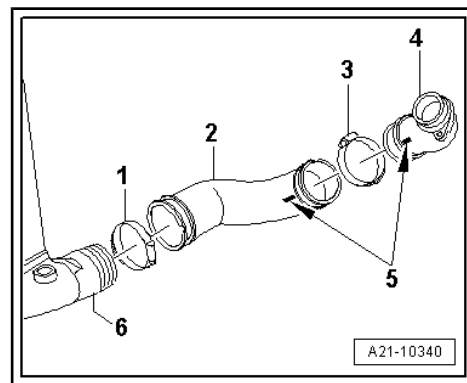
- ◆ Installation markings -item 5- must align
- ◆ Do not use any lubricant when installing

-3- Hose clip

- ◆ With locating device
- ◆ Do not detach from air hose
- ◆ Installation position as marked on air hose (triangular notch) and as shown in illustration
- ◆ Spray rust remover onto worm thread of used hose clips before installing
- ◆ 5.5 Nm

-4- Connection for turbocharger**-5- Installation markings**

- ◆ Installation markings on connection for turbocharger and air hose must align

-6- Charge air cooler

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Fitting air hose (left-side) between charge air cooler (left-side) and air pipe (left-side)

-1- Charge air cooler

-2- Hose clip

- ◆ With locating device
- ◆ Do not detach from air hose
- ◆ Installation position as marked on air hose (triangular notch) and as shown in illustration
- ◆ Spray rust remover onto worm thread of used hose clips before installing

◆ 5.5 Nm

-3- Air hose

- ◆ Installation markings -item 6- must align
- ◆ Do not use any lubricant when installing

-4- Hose clip

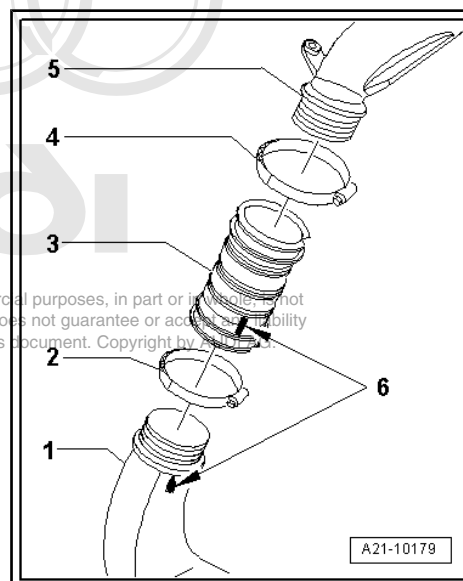
- ◆ With locating device
- ◆ Do not detach from air hose
- ◆ Installation position as marked on air hose (triangular notch) and as shown in illustration
- ◆ Spray rust remover onto worm thread of used hose clips before installing

◆ 5.5 Nm

-5- Air pipe (left-side)

-6- Installation markings

- ◆ Installation markings on charge air cooler and air hose must align



Fitting air hose (left-side) between air pipe and throttle valve module 2 - J544-

-1- Throttle valve module 2 - J544-

-2- Installation markings

- ◆ Installation markings on air hose and throttle valve module must align

-3- Air hose

- ◆ Observe installation marking -item 2-: thick white line on air hose must point towards marking on throttle valve module 2 - J544-
- ◆ For installation on left side of vehicle, the letter "L" -item 7- must be legible from the front
- ◆ Do not use any lubricant when installing

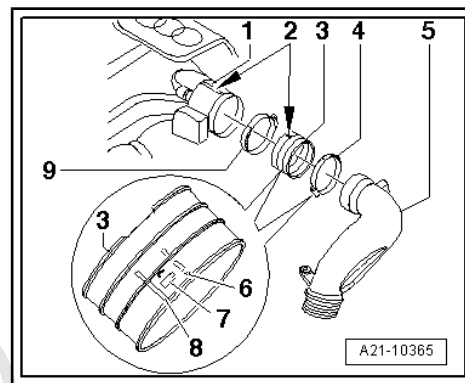
-4- Hose clip

- ◆ Width 12 mm
- ◆ Installation position as marked on air hose and as shown in illustration
- ◆ Fit worm drive of hose clip on dotted line -6- on air hose. When tightened, worm drive of hose clip is drawn to continuous line -8-
- ◆ Spray rust remover onto worm thread of used hose clips before installing
- ◆ Before tightening, slide hose clip as far as stop towards end of hose
- ◆ Tighten to 5.5 Nm; wait 5 minutes to allow parts to settle and then tighten again to 5.5 Nm

-5- Air pipe (left-side)

-9- Hose clip

- ◆ Width 9 mm
- ◆ Installation position as marked on air hose and as shown in illustration
- ◆ Fit worm drive of hose clip on dotted line on air hose. When tightened, worm drive of hose clip is drawn to continuous line
- ◆ Spray rust remover onto worm thread of used hose clips before installing
- ◆ Before tightening, slide hose clip as far as stop towards end of hose
- ◆ Tighten to 3.5 ... 4 Nm; wait 5 minutes to allow parts to settle and then tighten again to 3.5 ... 4 Nm



Fitting air hose (right-side) between air cleaner housing and turbocharger

-1- Installation marking

- ◆ Installation markings on intermediate flange and air hose must align

-2- Installation marking

- ◆ Installation markings on air cleaner housing and air hose must align

-3- Air cleaner housing

-4- Hose clip

- ◆ With locating device
- ◆ Do not detach from air hose
- ◆ Installation position as marked on air hose (triangular notch) and as shown in illustration
- ◆ Spray rust remover onto worm thread of used hose clips before installing
- ◆ 5.5 Nm

-5- Air hose

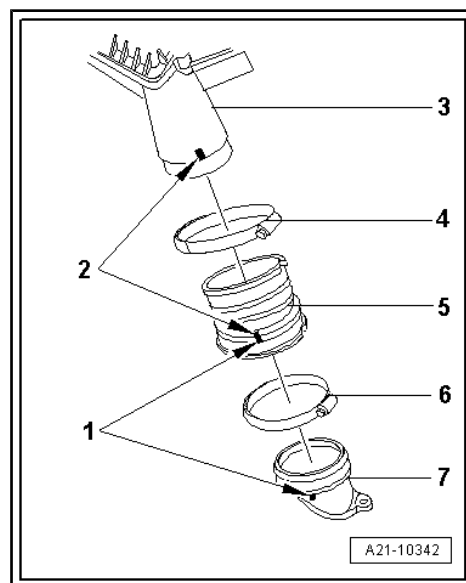
- ◆ Installation markings -item 1- and -item 2- must align
- ◆ Do not use any lubricant when installing

-6- Hose clip

- ◆ With locating device
- ◆ Do not detach from air hose
- ◆ Installation position as marked on air hose (triangular notch) and as shown in illustration
- ◆ Intermediate flange
- ◆ Spray rust remover onto worm thread of used hose clips before installing
- ◆ 5.5 Nm

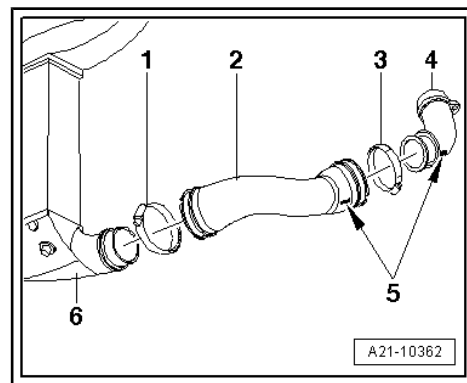
-7- Intermediate flange

- ◆ To turbocharger



Fitting air hose (right-side) between turbocharger and charge air cooler (right-side)**-1- Hose clip**

- ◆ With locating device
- ◆ Do not detach from air hose
- ◆ Installation position as marked on air hose (triangular notch) and as shown in illustration
- ◆ Spray rust remover onto worm thread of used hose clips before installing
- ◆ 5.5 Nm

**-2- Air hose**

- ◆ Installation markings -item 5- must align
- ◆ Do not use any lubricant when installing

-3- Hose clip

- ◆ With locating device
- ◆ Do not detach from air hose
- ◆ Installation position as marked on air hose (triangular notch) and as shown in illustration
- ◆ Spray rust remover onto worm thread of used hose clips before installing
- ◆ 5.5 Nm

-4- Connection for turbocharger**-5- Installation markings**

- ◆ Installation markings on connection for turbocharger and air hose must align

-6- Charge air cooler

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Fitting air hose (right-side) between charge air cooler (right-side) and air pipe (right-side)

-1- Charge air cooler

-2- Hose clip

- ◆ With locating device
- ◆ Do not detach from air hose
- ◆ Installation position as marked on air hose (triangular notch) and as shown in illustration
- ◆ Spray rust remover onto worm thread of used hose clips before installing
- ◆ 5.5 Nm

-3- Air hose

- ◆ Observe installation markings -item 6-
- ◆ Do not use any lubricant when installing

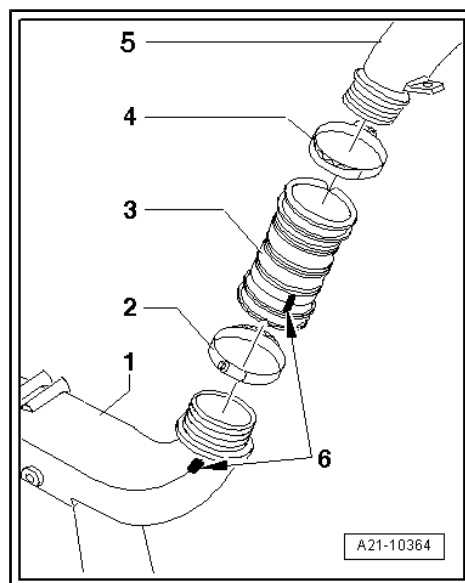
-4- Hose clip

- ◆ With locating device
- ◆ Do not detach from air hose
- ◆ Installation position as marked on air hose (triangular notch) and as shown in illustration
- ◆ Spray rust remover onto worm thread of used hose clips before installing
- ◆ 5.5 Nm

-5- Air pipe (right-side)

-6- Installation markings

- ◆ Installation markings on charge air cooler and air hose must align



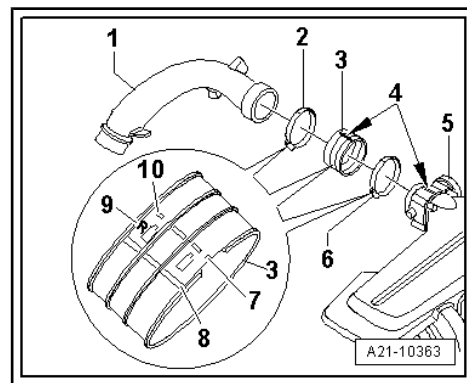
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Fitting air hose (right-side) between air pipe and throttle valve module - J338-

-1- Air pipe (right-side)

-2- Hose clip

- ◆ Width 12 mm
- ◆ Installation position as marked on air hose and as shown in illustration
- ◆ Fit worm drive of hose clip on dotted line -10- on air hose. When tightened, worm drive of hose clip is drawn to continuous line -8-
- ◆ Spray rust remover onto worm thread of used hose clips before installing
- ◆ Before tightening, slide hose clip as far as stop towards end of hose
- ◆ Tighten to 5.5 Nm; wait 5 minutes to allow parts to settle and then tighten again to 5.5 Nm



-3- Air hose

- ◆ Observe installation marking -item 4-: thick white line on air hose must point towards marking on throttle valve module - J338-
- ◆ For installation on right side of vehicle, the letter "R" -item 9- must be legible from the front
- ◆ Do not use any lubricant when installing

-4- Installation markings

- ◆ Installation markings on air hose and throttle valve module must align

-5- Throttle valve module - J338-

-6- Hose clip

- ◆ Width 9 mm
- ◆ Installation position as marked on air hose and as shown in illustration
- ◆ Fit worm drive of hose clip on dotted line -7- on air hose. When tightened, worm drive of hose clip is drawn to continuous line -8-
- ◆ Spray rust remover onto worm thread of used hose clips before installing
- ◆ Before tightening, slide hose clip as far as stop towards end of hose
- ◆ Tighten to 3.5 ... 4 Nm; wait 5 minutes to allow parts to settle and then tighten again to 3.5 ... 4 Nm

3.7 Intake manifold (top section) - exploded view

1 - Turbocharger air recirculation valve - N249-

2 - Bolt

- ☐ 9 Nm

3 - O-ring

- ☐ Renew

4 - Bolt

- ☐ Renew
- ☐ 9 Nm

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

6 - Bolts

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

7 - Ball stud

8 - Gasket

- ☐ Renew

9 - Throttle valve module - J338-

- ☐ Removing and installing ⇒ [page 33](#)
- ☐ After renewing, perform "Adaption" in "Guided Functions" ⇒ Vehicle diagnostic tester

10 - Bolt

- ☐ 9 Nm

11 - Ball stud

- ☐ 3 Nm

12 - Gasket

- ☐ Renew

13 - Cover

- ☐ With hose connection

14 - Ball stud

15 - Bolt

- ☐ 9 Nm

16 - Intake manifold (top section)

- ☐ Removing and installing ⇒ [page 34](#)

17 - Gasket

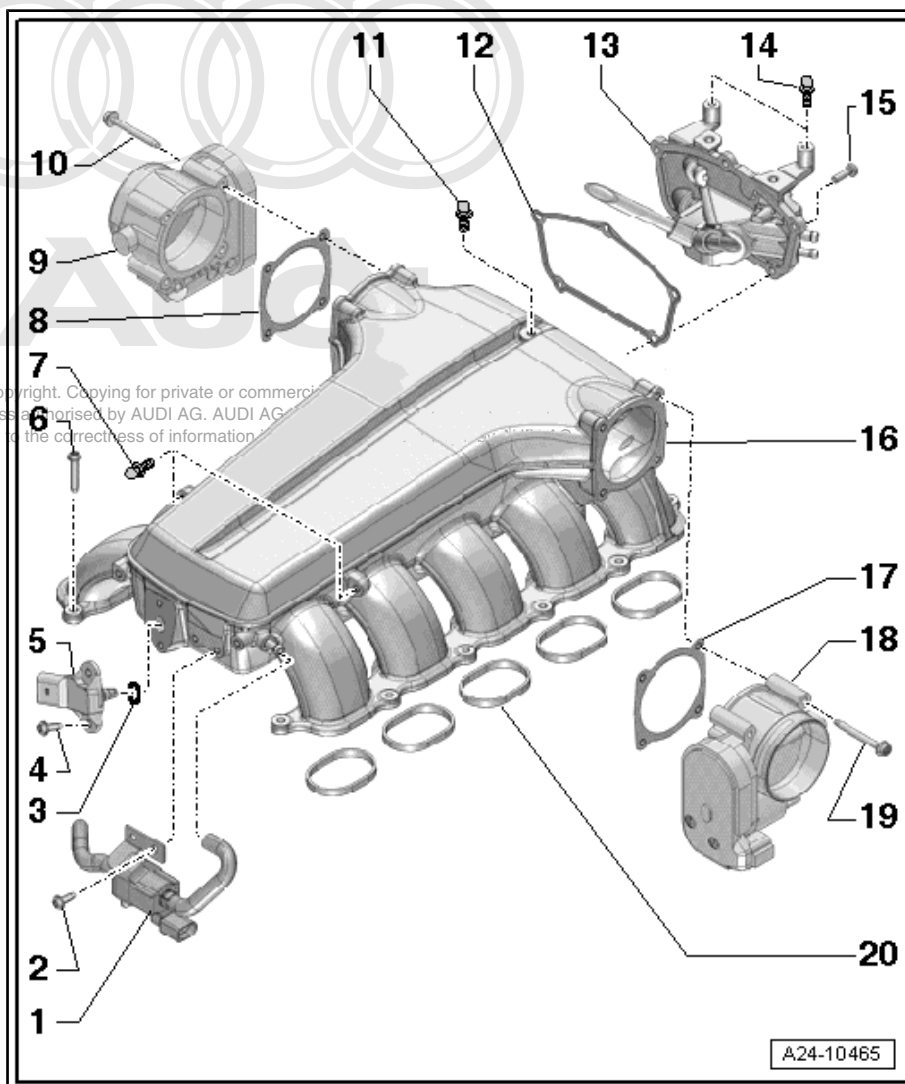
- ☐ Renew

18 - Throttle valve module 2 - J544-

- ☐ Removing and installing ⇒ [page 33](#)
- ☐ After renewing, perform "Adaption" in "Guided Functions" ⇒ Vehicle diagnostic tester

19 - Bolt

- ☐ 9 Nm



20 - Gasket

- ☐ Renew

3.8 Removing and installing throttle valve module -J338- / -J544-

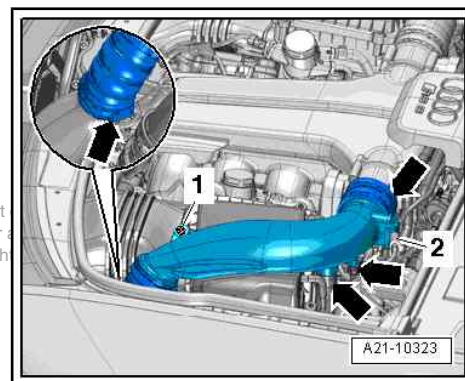
Removing

Proceed as follows:

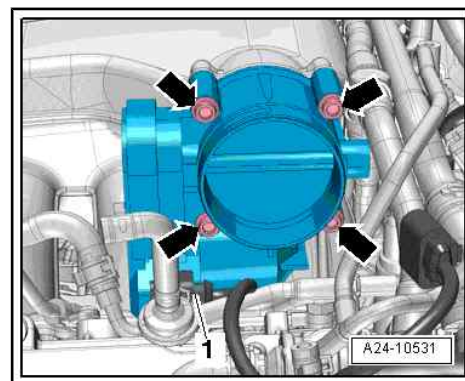
Throttle valve module 2 - J544- (left-side):

- Unscrew bolt -1- and unplug electrical connector -2- for charge pressure sender 2 - G447- .

- Release hose clips -arrows- and remove air pipe (left-side)



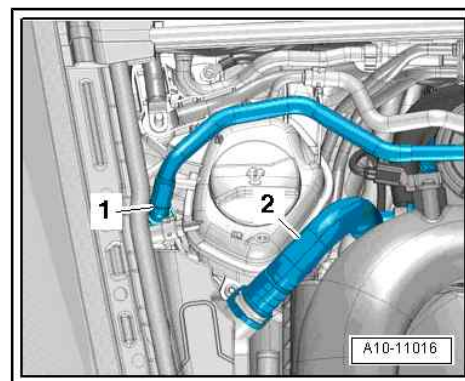
- Unplug electrical connector -1-.
- Remove bolts -arrows- and detach throttle valve module 2 - J544- .

**Throttle valve module - J338- (right-side):**

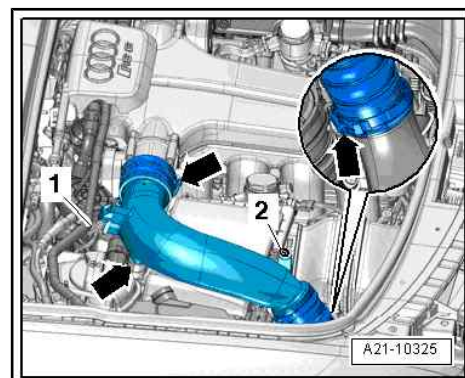
- Press release tabs -arrows- and remove air hose -2-.

**Note**

Disregard item -1-.



- Unscrew bolt -2- and unplug electrical connector -1- for charge pressure sender - G31- .
- Release hose clips -arrows- and remove air pipe (right-side).



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

Installing

- Tightening torque ⇒ [page 31](#)

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



Note

- ◆ *Renew gasket.*
- ◆ *Hose connections and air pipes and hoses must be free of oil and grease before assembly.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- ◆ *To ensure that the air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*
- ◆ *To ensure that the crash sensors have sufficient clearance, it is important to observe the correct installation position for the hose clips at the air pipes ⇒ [page 23](#) .*

- After renewing, perform "Adaption" in "Guided Functions"

⇒ **Vehicle diagnostic tester.**

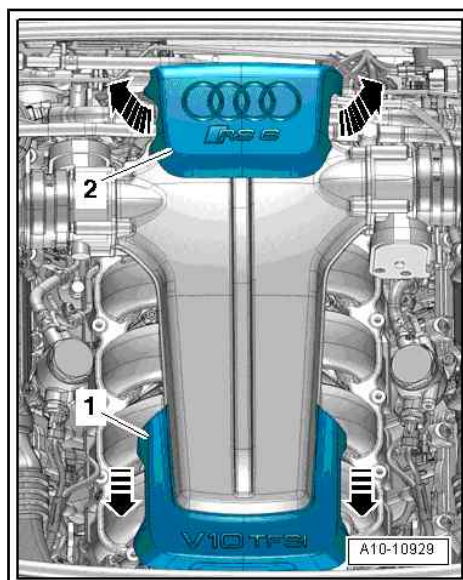
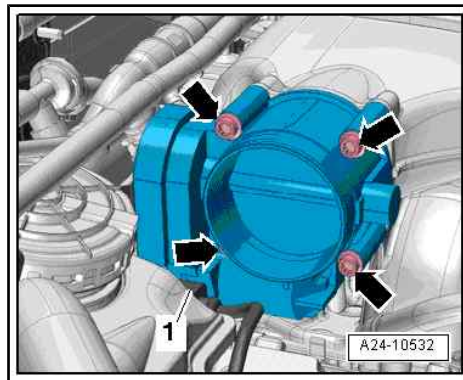
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3.9 Removing and installing intake manifold (top section)

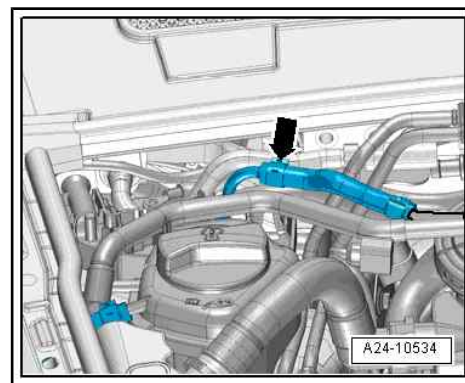
Removing

Proceed as follows:

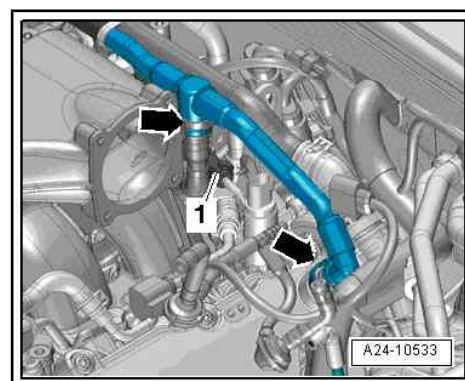
- Drain coolant ⇒ Rep. gr. 19 .
- Pull off engine cover panel (front) -1- towards front and pull off engine cover panel (rear) -2- upwards -arrows-.
- Remove throttle valve modules ⇒ [page 33](#) .



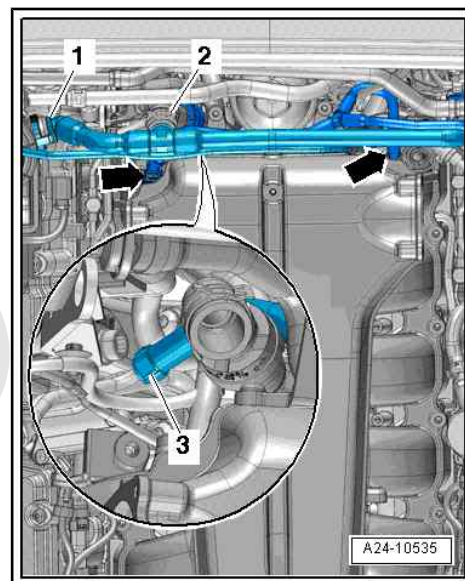
- Disconnect coolant hose -arrow-.



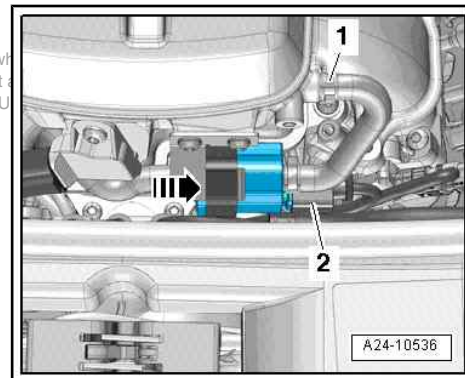
- Remove crankcase breather hose -arrows- by pressing release tabs.
- Disconnect coolant hose -1-.



- Press release tabs and disconnect crankcase breather hose -1-.
- Detach crankcase breather hose -2- and move clear to one side.
- Press release tabs and disconnect hoses -arrows- from intake manifold (top section).
- Disconnect coolant hose -3-.



- Detach vacuum hose -1-.
- Detach turbocharger air recirculation valve - N249- -item 2- from retainer -arrow-.



- Remove bolts for intake manifold (top section) in the sequence -12 ... 1-.
- Take intake manifold (top section) out of engine compartment.



Caution

Risk of irreparable damage to engine.

- ◆ **Block off the intake manifolds (bottom section) with clean cloths to prevent small objects from dropping into the engine through the intake ports in the cylinder heads.**

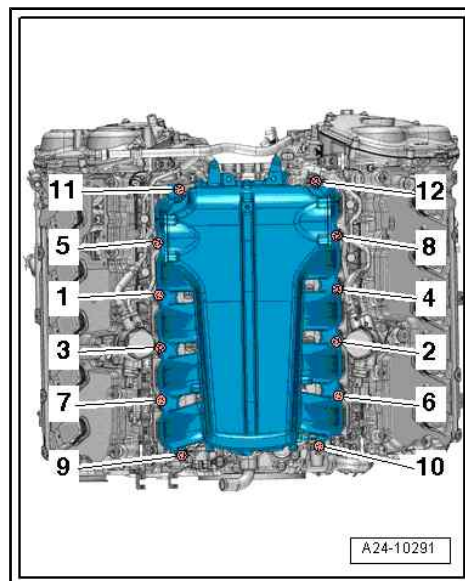
Installing

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



Note

- ◆ **Renew gaskets 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.**
- Tighten bolts for intake manifold (top section) ⇒ [page 31](#) .
- Install throttle valve modules ⇒ [page 33](#) .
- Fill up with coolant ⇒ Rep. gr. 19 .



3.10 Exploded view - intake manifold (bottom section), fuel rail and injectors



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1 - Gaskets

- ☐ Renew

2 - Intake manifold (bottom section)

- ☐ With vacuum unit for intake manifold flaps
- ☐ When installing intake manifold (bottom section), intake manifold flaps must be in output position (intake channel fully open)
- ☐ Removing and installing ⇒ [page 38](#)

3 - Bolt

- ☐ 2.5 Nm

4 - Intake manifold flap potentiometer

- ☐ Intake manifold flap potentiometer - G336- (right-side), intake manifold flap potentiometer 2 - G512- (left-side)
- ☐ After renewing, perform "Adaption" in "Guided Functions" ⇒ Vehicle diagnostic tester

5 - Seal

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

6 - Vacuum hose

- ☐ From intake manifold flap valve - N316-

7 - Fuel rail

- ☐ Removing and installing ⇒ [page 38](#)

8 - Threaded connection

- ☐ 40 Nm

9 - Sleeve**10 - Bolt**

- ☐ Tightening torque and sequence ⇒ [page 38](#)

11 - Nut

- ☐ 9 Nm

12 - Bolt

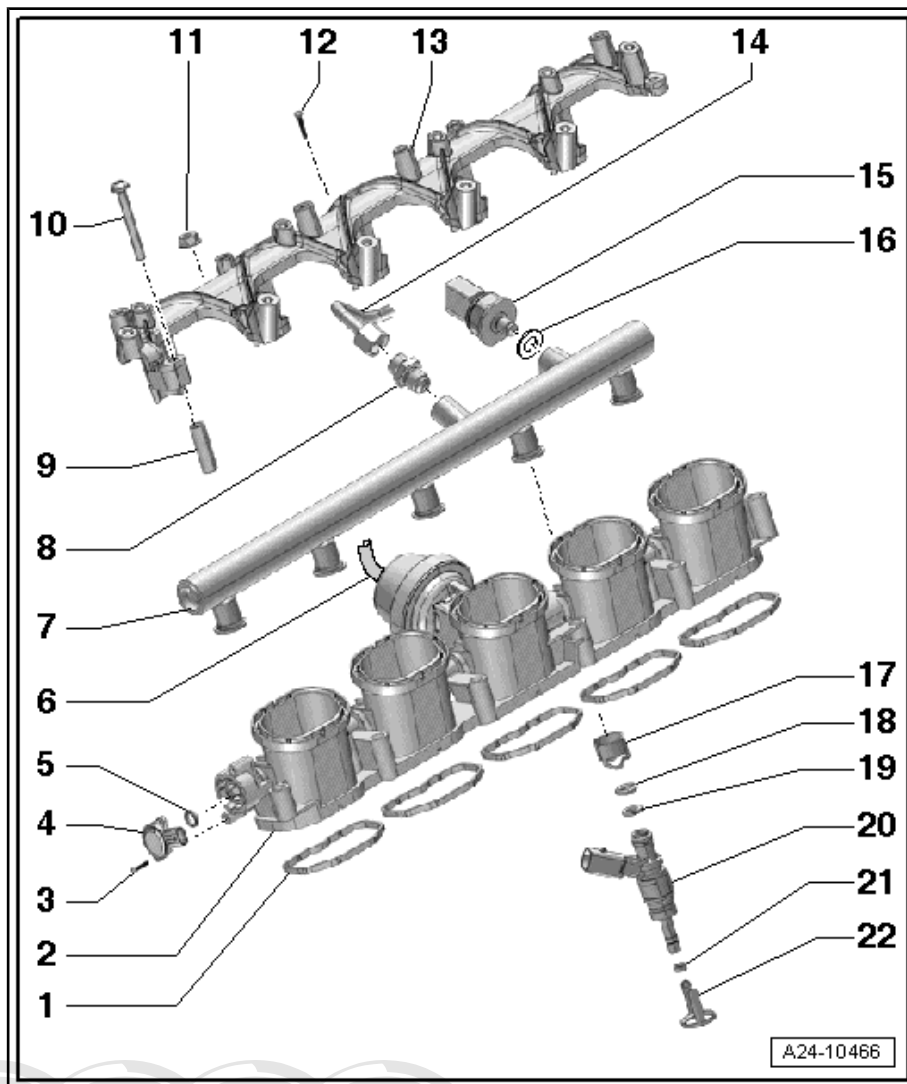
- ☐ 1 Nm

13 - Retaining clip

- ☐ For fuel rail

14 - High-pressure pipe

- ☐ Connections must not be damaged
- ☐ Do not alter shape
- ☐ Removing and installing ⇒ [page 49](#)
- ☐ 27 Nm



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15 - Fuel pressure sender

- ☐ Fuel pressure sender - G247- (right-side), fuel pressure sender 2 - G624- (left-side)
- ☐ Removing and installing ⇒ [page 42](#)
- ☐ 25 Nm

16 - Seal

- ☐ Renew

17 - Support ring

- ☐ Renew
- ☐ Via this support ring, the fuel rail exerts the clamping force that holds the injector in the cylinder head
- ☐ Clipped to -item 22-

18 - O-ring

- ☐ Renew
- ☐ Lubricate lightly with clean engine oil

19 - Spacer ring

- ☐ Renew if damaged

20 - Injector

- ☐ Removing and installing ⇒ [page 42](#)

21 - Combustion chamber ring seal

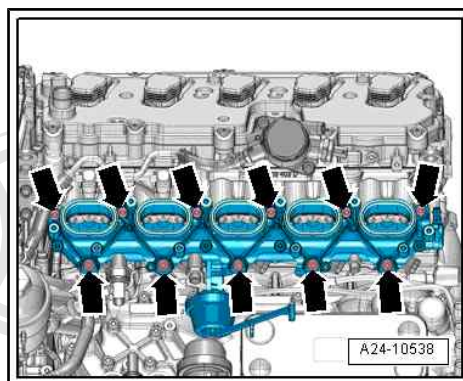
- ☐ Do not apply grease to ring seal or use any other lubricants
- ☐ Renewing ⇒ [“3.13 Removing and installing injectors”, page 42](#)

22 - Radial compensation element

- ☐ Renew if damaged
- ☐ Clip onto support ring -item 16-

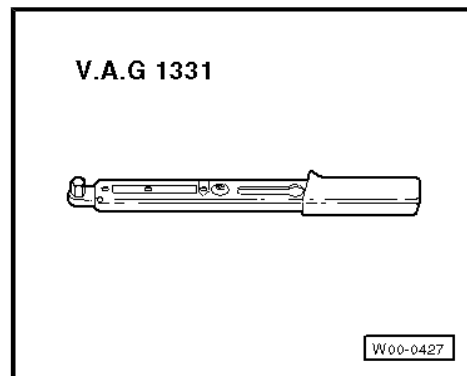
Intake manifold (bottom section) - tightening torque and sequence

- Tighten bolts and nuts -arrows- for intake manifold (bottom section) in stages and in diagonal sequence; final torque 9 Nm.

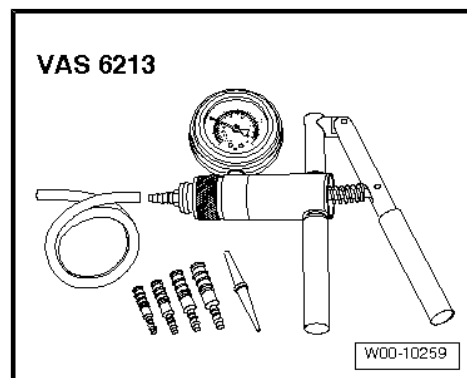
**3.11 Removing and installing intake manifold (bottom section) with fuel rail****Special tools and workshop equipment required**

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- ◆ Torque wrench - V.A.G 1331-



- ◆ Tool insert (open-end ring spanner, 17 mm) -V.A.G 1331/2-
- ◆ Hand vacuum pump - VAS 6213-



Removing



Note

The following description is for removing and installing the intake manifold (bottom section) on the left side. The procedure on the right side is similar.

- Remove intake manifold (top section) ⇒ [page 34](#) .
- Unplug electrical connectors -3- and -4-.
- Disconnect vacuum hoses -1, 2, 5-.
- Remove bolts -arrows- and detach vacuum reservoir.

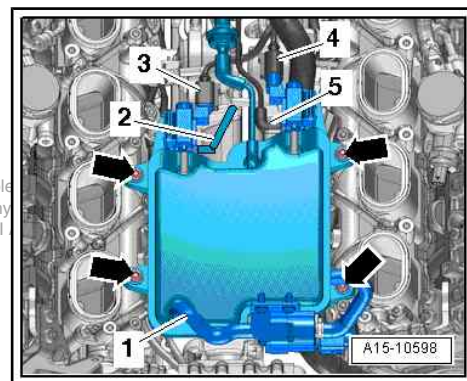


WARNING

The fuel system is pressurised.

Risk of injury as fuel may spray out.

- Put on safety goggles.
- Put on protective gloves.
- Release pressure (wrap clean cloth around connection and open connection carefully).



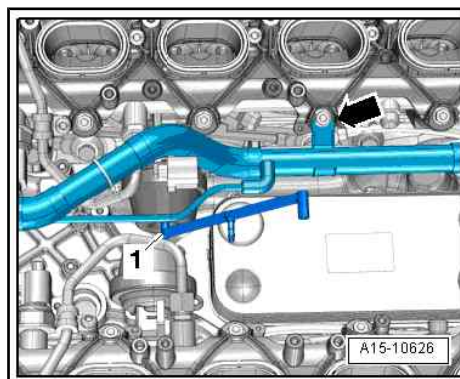
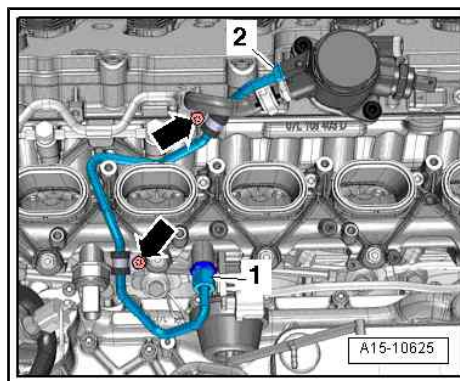
- Wrap clean cloth around connection and unscrew connection -2-.
- Unscrew union nut -1-; to do so, counterhold at threaded connection.
- Remove bolts -arrows-.



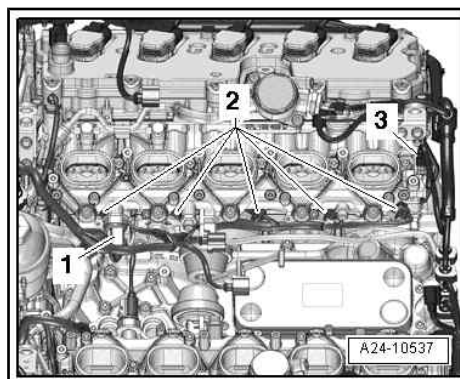
Note

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

- Move clear secondary air hose -arrow- and detach vacuum hose -1- from vacuum unit.



- Unplug electrical connectors and move clear:
- 1 - For fuel pressure sender 2 - G624-
- 2 - For injectors
- 3 - For intake manifold flap potentiometer 2 - G512-



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**Note**

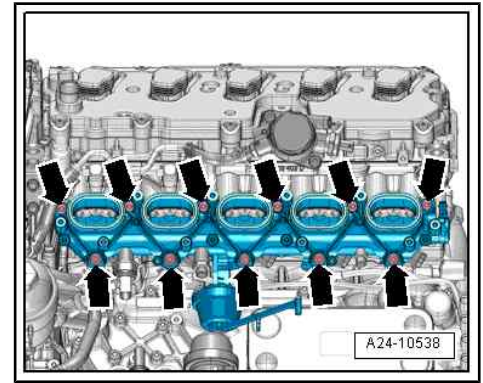
Lay cloths under the fuel rail to catch escaping fuel.

- Remove bolts and nuts -arrows- and detach intake manifold (bottom section) with fuel rail.

**Caution**

Risk of irreparable damage to engine.

- ◆ ***Block off the intake manifolds (bottom section) with clean cloths to prevent small objects from dropping into the engine through the intake ports in the cylinder heads.***

**Installing**

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

**Note**

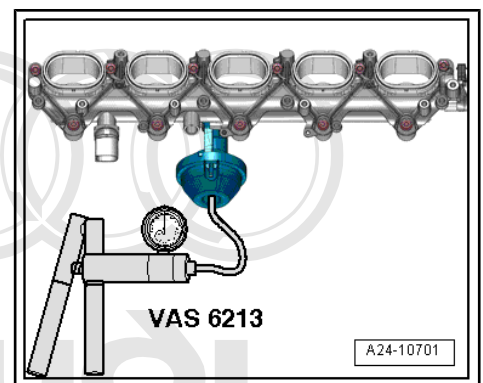
- ◆ *If an injector has been pulled out of the cylinder head, the teflon ring seal must be renewed.*
- ◆ *Renew gaskets and O-rings.*
- ◆ *Lubricate O-rings of injectors lightly with clean engine oil.*

**Caution**

Risk of damage to intake manifold flaps.

- ◆ ***If the intake manifold flaps are closed, they can catch on the guide plates in the cylinder head when the intake manifold (bottom section) is installed.***

- Connect hand vacuum pump - VAS 6213- to vacuum unit for actuating intake manifold flaps, as shown in illustration.
- Operate hand vacuum pump to produce a vacuum.
- This will cause the intake manifold flaps to open.
- Install intake manifold (bottom section) and press fuel rail evenly onto injectors.
- Tighten bolts and nuts for intake manifold (bottom section) [⇒ page 38](#).
- Install high-pressure pipe [⇒ page 49](#).
- Install intake manifold (top section) [⇒ page 34](#).



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3.12 Removing and installing fuel pressure sender -G247- / -G624-

Removing

Proceed as follows:

- Remove intake manifold (top section) ⇒ [page 34](#) .
- Unplug electrical connector -arrow-.
- Unscrew fuel pressure sender.

Installing

- Tightening torque ⇒ [page 48](#)

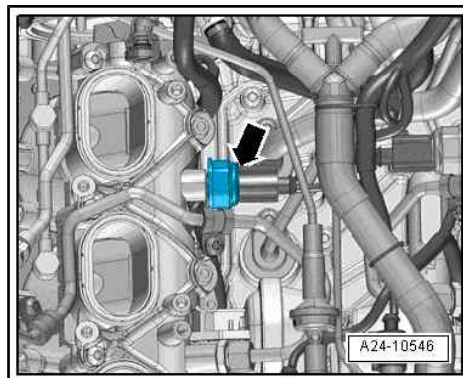
Installation is carried out in the reverse order; note the following:



Note

Renew seal.

- Install intake manifold (top section) ⇒ [page 34](#) .

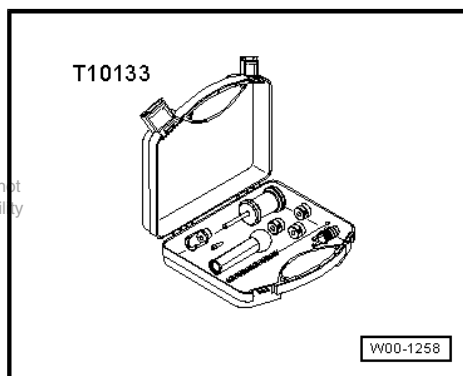


3.13 Removing and installing injectors

Special tools and workshop equipment required

- ◆ Tool set - T10133-

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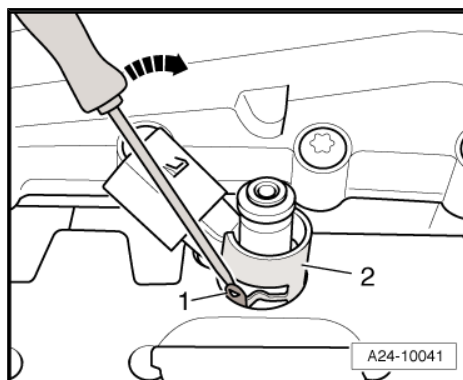
Removing

Proceed as follows:

- Remove intake manifold (bottom section) ⇒ [page 38](#) .

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

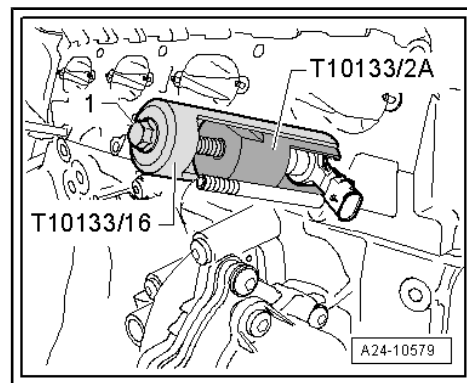
- Use a screwdriver to bend retainer tabs -1- of radial compensation element to side -arrow- and pull support ring -2- off injector.
- Remove O-ring from injector.



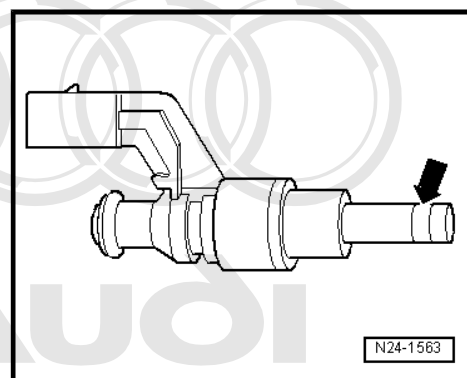
Note

Illustration shows cylinder head on left side.

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



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

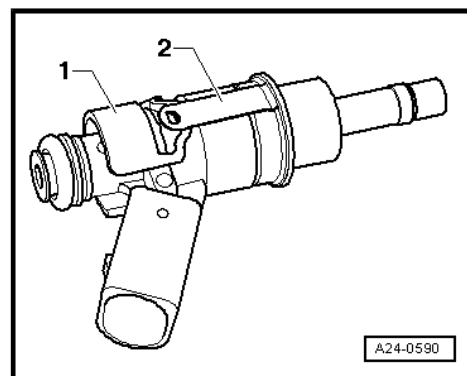
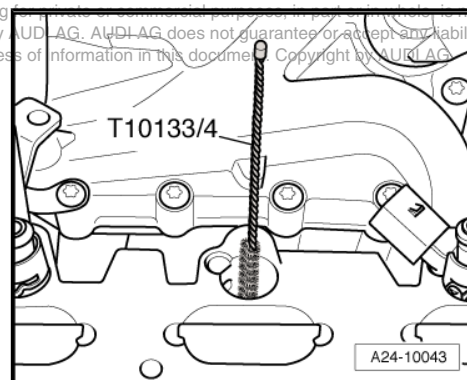


Installing

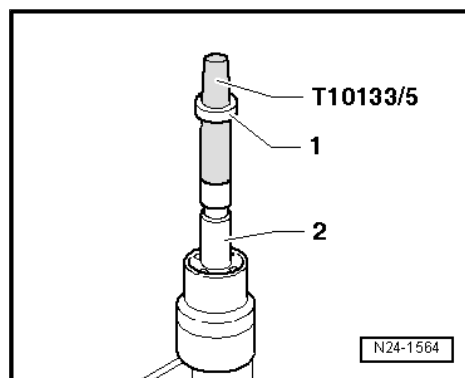
Note

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

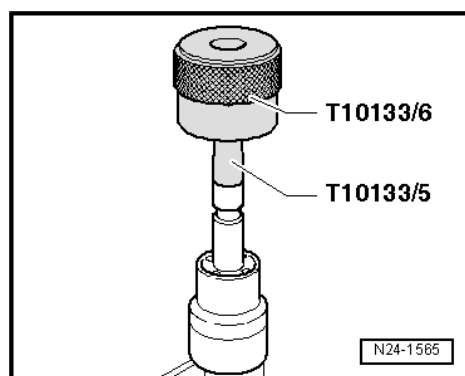
- Clean bore in cylinder head with nylon cylinder brush - T10133/4- .
- Clip radial compensation element -2- into support ring -1-.
- When re-installing an injector, clean any combustion residue off groove for combustion chamber ring seal and injector stem with a clean cloth.



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



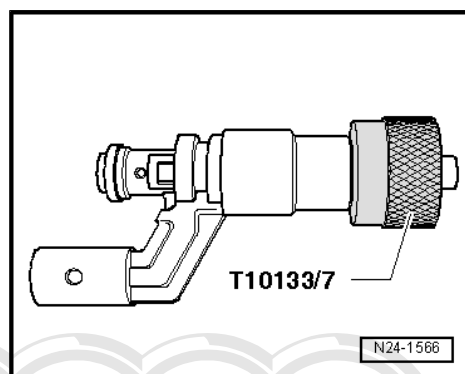
- Push combustion chamber ring seal onto assembly cone - T10133/6- as far as it will go using assembly sleeve - T10133/5- .
- Turn assembly sleeve -T10133/6- upside down and push combustion chamber ring seal into sealing ring groove.



Note

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

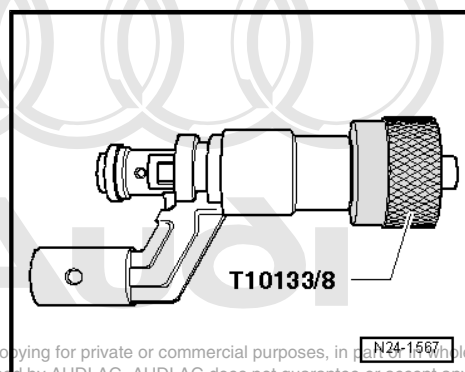
- Push calibration sleeve -T10133/7- onto injector as far as it will go and simultaneously turn it slightly (approx. 180°).
- Pull calibration sleeve -T10133/7- off again by turning it in the opposite direction.
- Push calibration sleeve -T10133/8- onto injector as far as it will go and simultaneously turn it slightly (approx. 180°).
- Pull calibration sleeve -T10133/8- off again by turning it in the opposite direction.
- Lubricate new O-ring lightly with clean engine oil before installing.



Note

The combustion chamber ring seal must not be lubricated.

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



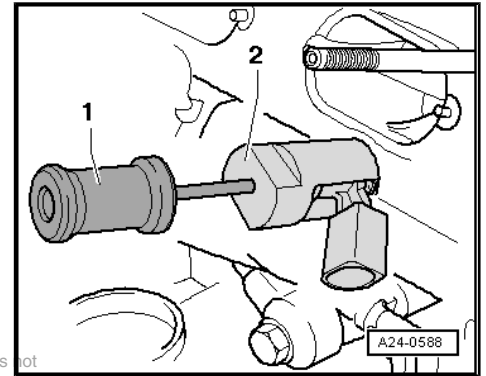
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**Note**

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

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

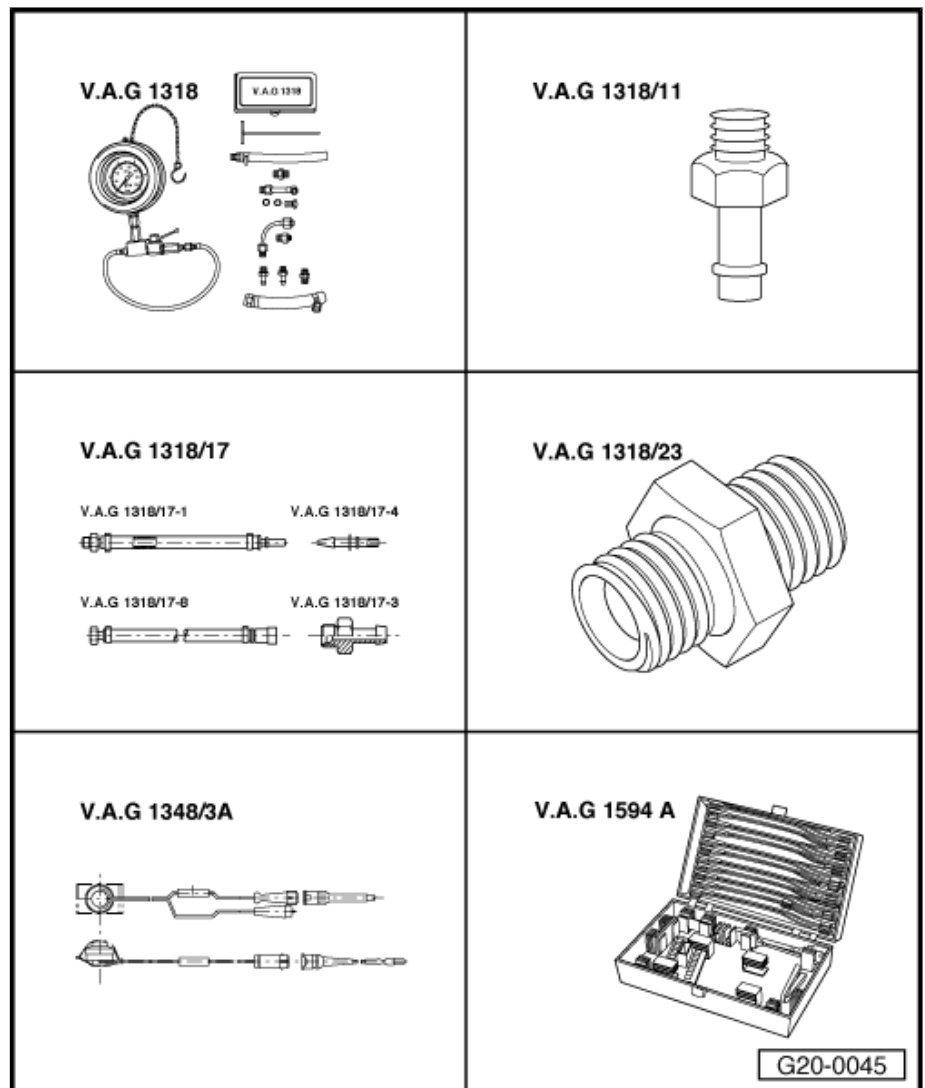
- Install intake manifold (bottom section) ➔ [page 38](#) .



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

Special tools and workshop equipment required

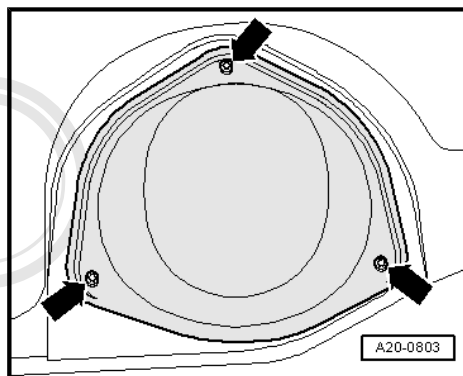
- ◆ K-Jetronic pressure tester - V.A.G 1318-
- ◆ Adapter - V.A.G 1318/11-
- ◆ Adapter -V.A.G 1318/17-1- from adapter set - V.A.G 1318/17-
- ◆ Connector - V.A.G 1318/23-
- ◆ Remote control - V.A.G 1348/3A- for V.A.G 1348 with adapter cable -V.A.G 1348/3-3-
- ◆ Auxiliary measuring set - V.A.G 1594C-
- ◆ Fuel-resistant container



Procedure

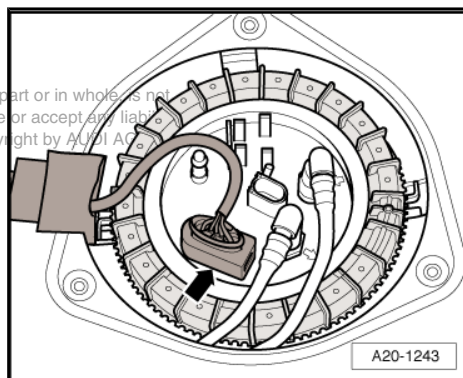
Proceed as follows:

- Remove rear seat bench ⇒ Rep. gr. 72 .
- Unscrew bolts -arrows- and remove cover for flange (right-side).

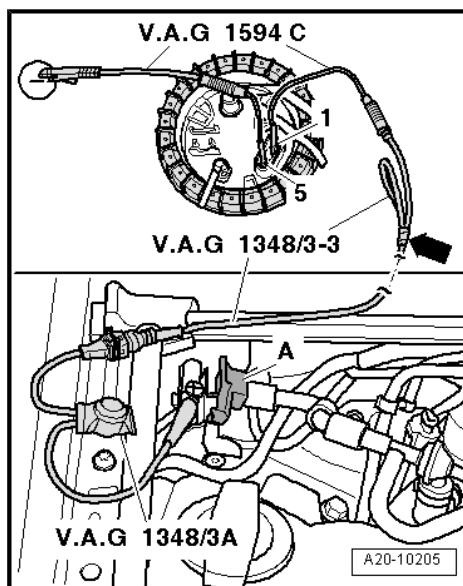


- Unplug electrical connector -arrow- on flange.

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- 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.
- Open cover -A- above positive terminal.
- Connect crocodile clip to positive terminal.
- Connect contact -5- to vehicle body (earth) using a test lead from auxiliary measuring set - V.A.G 1594C- .
- Remove filler cap from fuel filler neck.

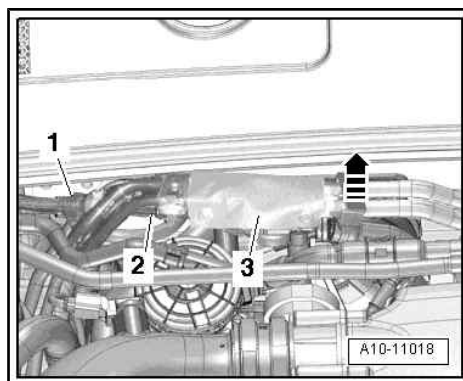


- Open retainer for hoses -arrow-.
- Detach protective sleeve -3-.



Note

Disregard -items 1 and 2-.



- Screw connector - V.A.G 1318/23- and adapter -V.A.G 1318/17-1- onto K-Jetronic pressure tester - V.A.G 1318- .

**WARNING**

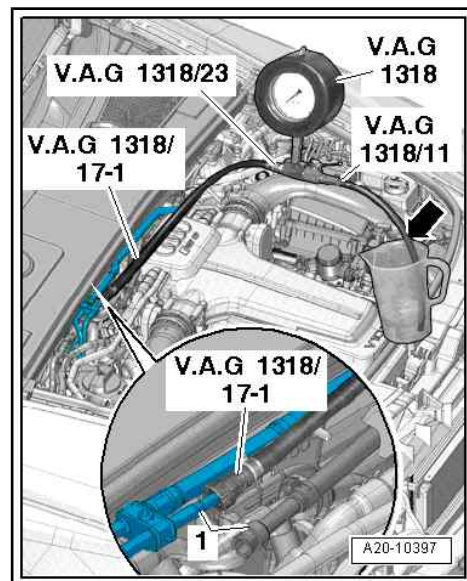
Risk of injury - fuel system operates under high pressure.

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

- Pull release tab and disconnect fuel line -1-.
- Fit adapter -V.A.G 1318/17-1- onto disconnected fuel pipe.

Checking fuel pressure

- Screw adapter - V.A.G 1318/11- onto K-Jetronic pressure tester - V.A.G 1318- . Attach test hose -arrow- and hold end of hose in container.
- Open cut-off valve on pressure tester.
 - Lever points in direction of flow.
- Bleed fuel system by pressing remote control briefly.



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- Close cut-off valve on pressure tester.
- Lever is at right angle to direction of flow -arrow-.
- Press switch on remote control until pressure tester shows no further increase in pressure.
- Specification: approx. 5 bar
- If reading does not match specification, check delivery rate of fuel pump ⇒ Rep. gr. 20 .

Checking residual pressure

- Check for leaks and check residual pressure by watching pressure drop on pressure tester.
- After 10 minutes pressure should still be at least 3.75 bar.

If the residual pressure drops below 3.75 bar:

- ◆ Check union between pressure tester and fuel line for leaks.
- ◆ Check pressure tester for leaks.
- ◆ Check fuel lines and their connections for leaks.
- ◆ Renew fuel filter with integrated fuel pressure regulator ⇒ Rep. gr. 20 .
- ◆ Renew fuel pump ⇒ Rep. gr. 20 .

Assembling

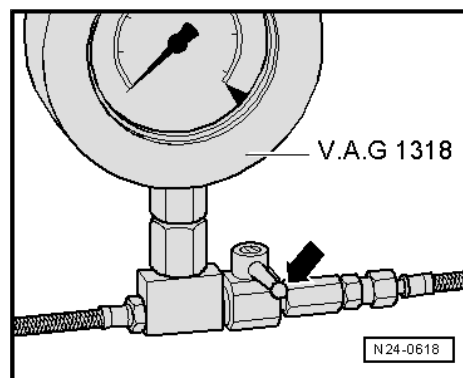
Installation is carried out in the reverse order; note the following:



WARNING

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

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



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

3.15 Exploded view - high-pressure pump

1 - Fuel supply hose

- ☐ Connections must not be damaged

2 - High-pressure pipe

- ☐ Connections must not be damaged
- ☐ Do not alter shape
- ☐ Removing and installing
⇒ [page 49](#)

3 - Bolt

- ☐ 9 Nm

4 - Union nut

- ☐ Connections must not be damaged
- ☐ 27 Nm

5 - Bolt

- ☐ 22 Nm

6 - High-pressure pump

- ☐ Removing and installing
⇒ [page 51](#)

7 - Seal

- ☐ Renew

8 - Screw plug

- ☐ Renew
- ☐ 15 Nm

9 - Threaded connection

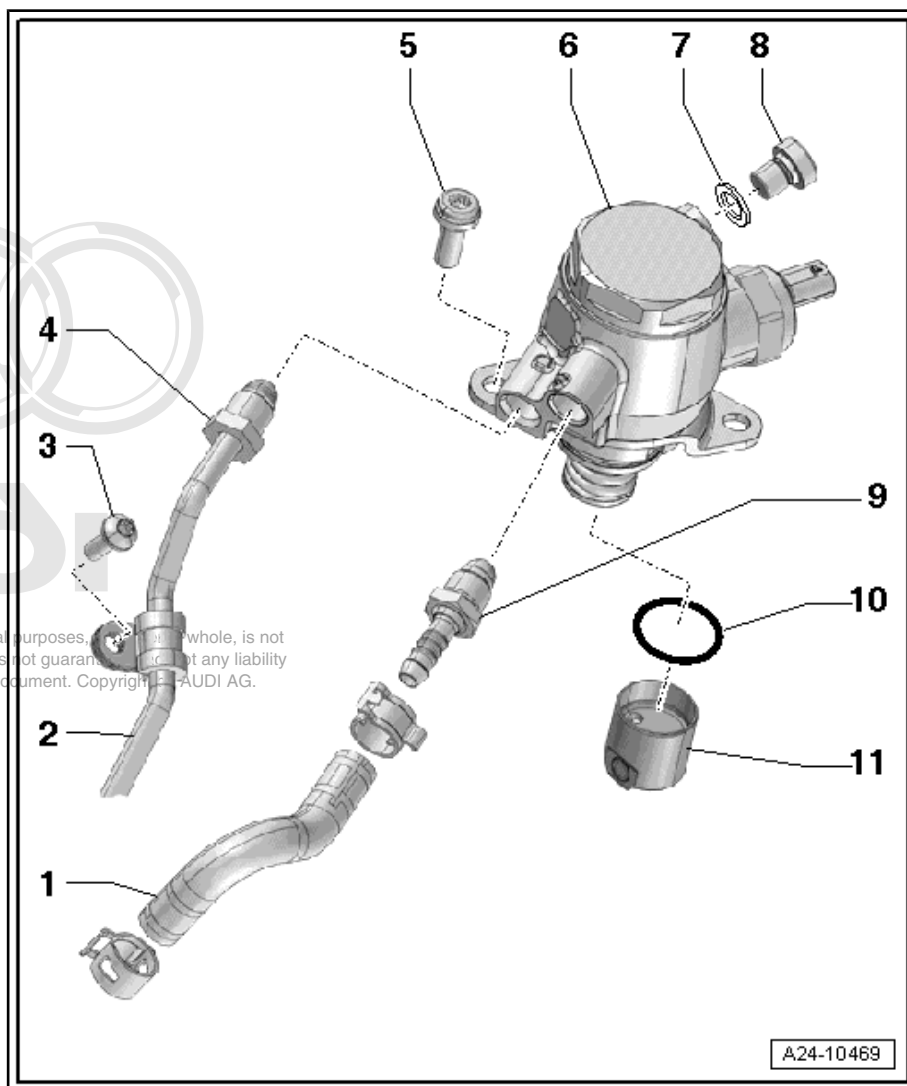
- ☐ Connections must not be damaged
- ☐ 27 Nm

10 - O-ring

- ☐ Renew

11 - Roller tappet

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

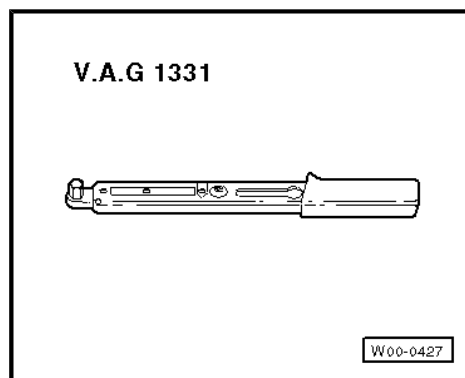


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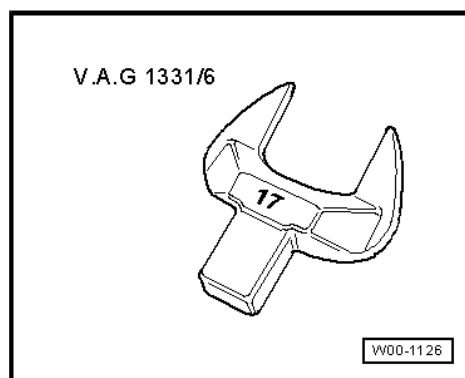
3.16 Removing and installing high-pressure pipe

Special tools and workshop equipment required

◆ Torque wrench - V.A.G 1331-



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



Removing

- Remove intake manifold (top section) ⇒ [page 34](#) .



Note

The following description is for removing and installing the high-pressure pipe on the left side. The procedure on the right side is similar.



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The fuel system is pressurised.

Risk of injury as fuel may spray out.

- Put on safety goggles.
- Put on protective gloves.
- Release pressure (wrap clean cloth around connection and open connection carefully).

- Wrap clean cloth around connection and unscrew connection -2-.

- Unscrew bolts -arrows- and connection -2-.
- Unscrew union nut -1-; to do so, counterhold at threaded connection.

**Note**

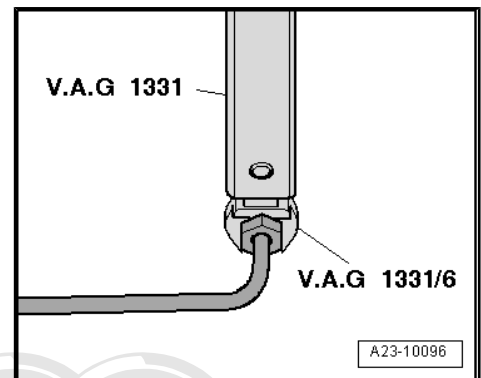
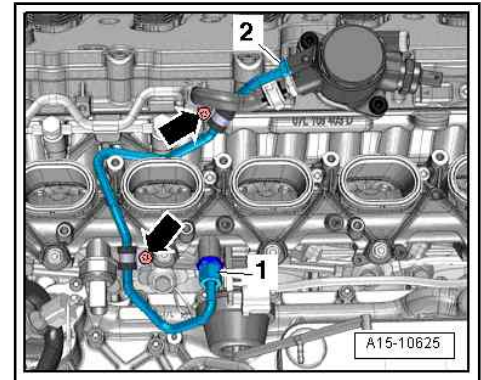
Do not attempt to bend high-pressure pipe to a different shape.

Installing

- Tightening torque ⇒ [page 48](#)

**Note**

- ◆ *The connections of the high-pressure pipe must not be damaged.*
- ◆ *Do not attempt to bend high-pressure pipe to a different shape.*
- First tighten union nut by hand until it makes contact, making sure that high-pressure pipe is not under tension.
- Tighten union nut with torque wrench - V.A.G 1331- and tool insert, AF 17 - V.A.G 1331/6- ; to do so, counterhold at hexagon flats of threaded connection on rail element with an open-end spanner.
- Do not tighten bolt for retainer until high-pressure pipe has been tightened.
- Install intake manifold (top section) ⇒ [page 34](#) .



3.17 Removing and installing high-pressure pump

Removing**Note**

The following description is for removing and installing high-pressure pump (left-side).

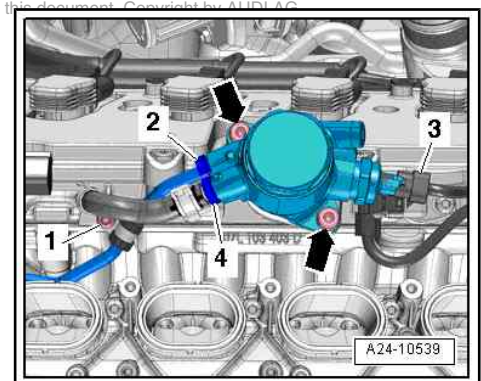
- Disconnect earth wire at battery with ignition switched off ⇒ Rep. gr. 27 .
- Unplug electrical connector -3-.

**WARNING**

The fuel system is pressurised.

Risk of injury as fuel may spray out.

- *Put on safety goggles.*
- *Put on protective gloves.*
- *Release pressure (wrap clean cloth around connection and open connection carefully).*



- Unscrew bolt -1- at retainer for high-pressure pipe.
- Wrap clean cloth around connection and unscrew connections -2- and -4-, and move fuel supply hose to one side.
- Remove bolts -arrows-.
- Only lift high-pressure pipe slightly to detach high-pressure pump.

Installing

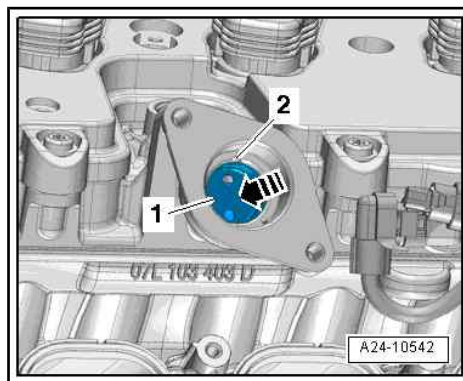
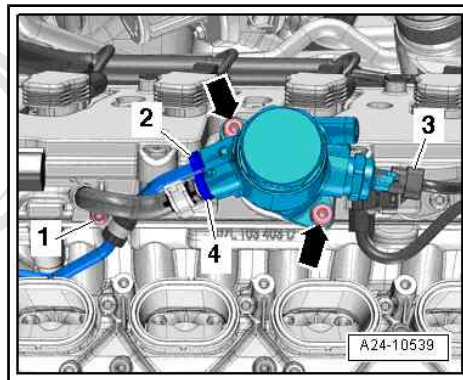
- Tightening torques ⇒ [page 36](#) , ⇒ [page 48](#) .



Note

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

- Check roller tappet -1- for damage and renew if necessary.
- Lightly lubricate roller tappet with oil and fit in cylinder head so that guide -2- is in correct position -arrow-.
- Fit high-pressure pump and press downwards in guide as far as stop.
- At the same time tighten bolts alternately in small steps.
- Install high-pressure pipe ⇒ [page 49](#) .



3.18 Overview - Lambda probes



Note

- ◆ *New Lambda probes are coated with an assembly paste.*
- ◆ *If reinstalling the old Lambda probes, coat the threads with high-temperature paste ⇒ Electronic parts catalogue .*
- ◆ *The assembly paste/high-temperature paste must not get into the slots on the probe body.*

I - Starter catalytic converter, cylinder bank 1

II - Main catalytic converter, cylinder bank 1

III - Starter catalytic converter, cylinder bank 2

IV - Main catalytic converter, cylinder bank 2

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

- ☐ Cylinder bank 2
- ☐ Fitting location of electrical connector
⇒ [page 54](#)
- ☐ Removing and installing
⇒ [page 54](#)
- ☐ 55 Nm

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

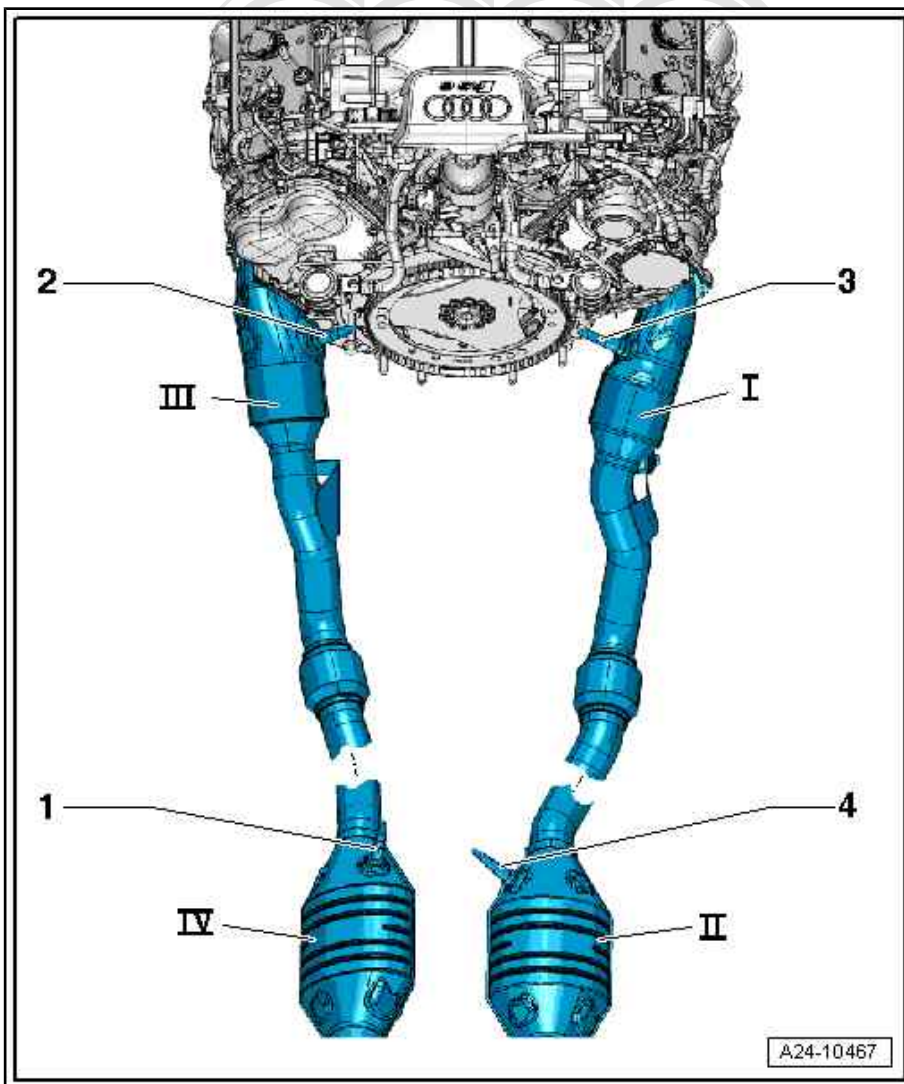
- ☐ Cylinder bank 2
- ☐ Fitting location of electrical connector
⇒ [page 54](#)
- ☐ Removing and installing
⇒ [page 54](#)
- ☐ 55 Nm

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

- ☐ Cylinder bank 1
- ☐ Fitting location of electrical connector ⇒ [page 54](#)
- ☐ Removing and installing ⇒ [page 54](#)
- ☐ 55 Nm

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

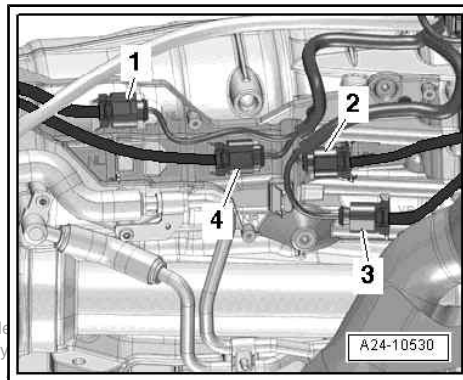
- ☐ Cylinder bank 1
- ☐ Fitting location of electrical connector ⇒ [page 54](#)
- ☐ Removing and installing ⇒ [page 54](#)
- ☐ 55 Nm



Fitting location of electrical connectors for Lambda probes -G39-, -G108-, -G130-, -G131-

◆ On right side of gearbox

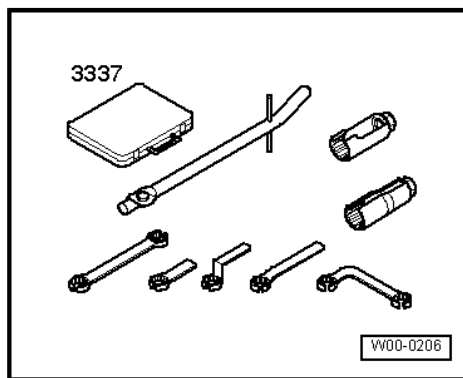
- 1 - Connector (brown) for Lambda probe 2 after catalytic converter - G131- with Lambda probe 2 heater after catalytic converter - Z30-
- 2 - Connector (brown) for Lambda probe 2 - G108- with Lambda probe 2 heater - Z28-
- 3 - Connector (black) for Lambda probe - G39- with Lambda probe heater - Z19-
- 4 - Connector (black) for Lambda probe after catalytic converter - G130- with Lambda probe 1 heater after catalytic converter - Z29-



3.19 Removing and installing Lambda probes -G39- / -G108- / -G130- / -G131-

Special tools and workshop equipment required

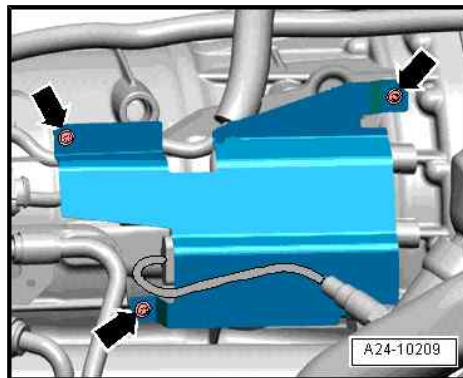
- ◆ Lambda probe open ring spanner set - 3337-



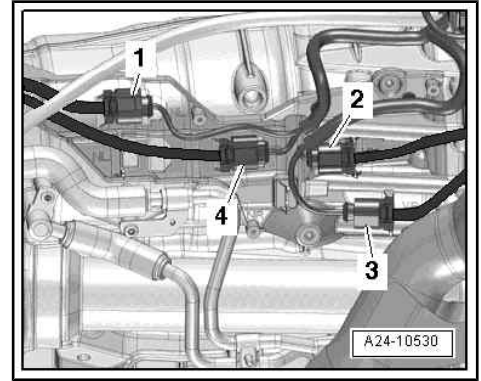
Removing

Proceed as follows:

- Engine removed and in position on scissor-type assembly platform - VAS 6131 A- ⇒ Rep. gr. 10 with gearbox attached.
- Unscrew bolts -arrows- and detach heat shield for electrical connectors for Lambda probes (right-side) from gearbox.

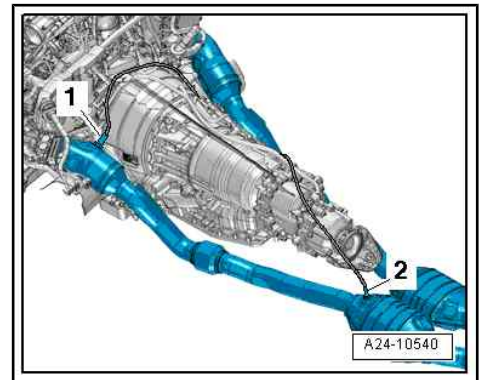


- Remove corresponding electrical connector for Lambda probe from bracket on gearbox.
- 1 - Connector (brown) for Lambda probe 2 after catalytic converter - G131- with Lambda probe 2 heater after catalytic converter - Z30-
- 2 - Connector (brown) for Lambda probe 2 - G108- with Lambda probe 2 heater - Z28-
- 3 - Connector (black) for Lambda probe - G39- with Lambda probe heater - Z19-
- 4 - Connector (black) for Lambda probe after catalytic converter - G130- with Lambda probe 1 heater after catalytic converter - Z29-
- Unplug electrical connector and move electrical wiring clear.



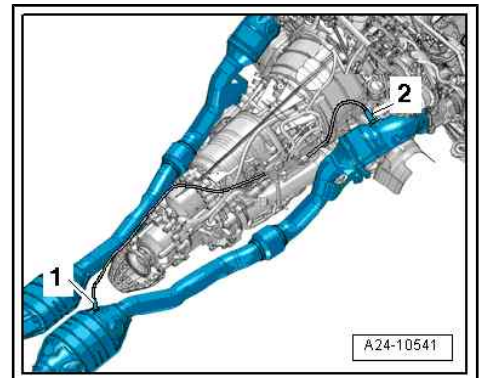
Exhaust pipe (left-side):

- Unscrew corresponding Lambda probe using Lambda probe open ring spanner set - 3337- .
- 1 - Lambda probe 2 - G108- (before catalytic converter)
- 2 - Lambda probe 2 after catalytic converter - G131-



Exhaust pipe (right-side):

- Unscrew corresponding Lambda probe using Lambda probe open ring spanner set - 3337- .
- 1 - Lambda probe after catalytic converter - G130-
- 2 - Lambda probe - G39- (before catalytic converter)



Installing

- Tightening torque ⇒ [page 52](#)

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



Note

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

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4 Engine control units

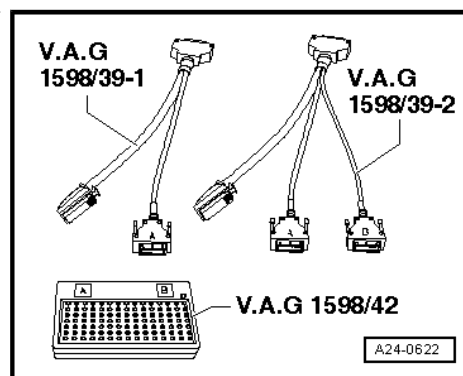
4.1 Wiring and component check with test box - V.A.G 1598/42-

Special tools and workshop equipment required

◆ Adapter cable - V.A.G 1598/39-1-

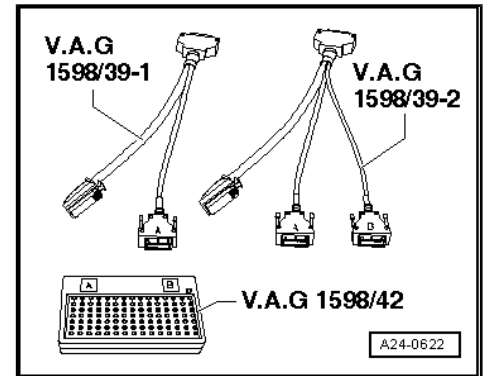
◆ Adapter cable - V.A.G 1598/39-2-

◆ Test box - V.A.G 1598/42-



**Note**

- ◆ The test box - V.A.G 1598/42- has 105 sockets. It can be connected to one of the engine control units via 2 different adapter leads.
- ◆ Each 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 1527B- to connect test equipment (e.g. voltage tester - V.A.G 1526C- , hand-held multimeter - V.A.G 1594C- etc.).

**Procedure**

Proceed as follows:

- To unplug 60-pin and 94-pin connectors, remove engine control unit ⇒ [page 58](#) .

**Caution**

Electronic components are susceptible to damage.

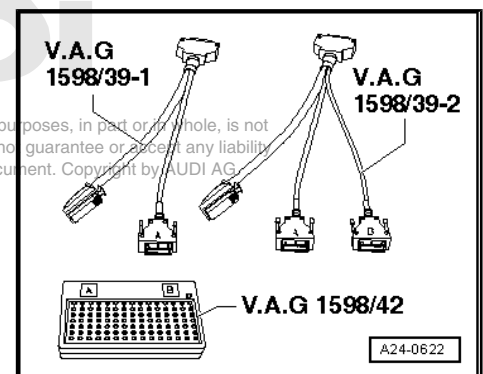
- ◆ **Select the appropriate measuring range before connecting the test leads and observe test requirements.**

- Connect test box - V.A.G 1598/42- to wiring harness with adapter lead - V.A.G 1598/39-1- or adapter lead -V.A.G 1598/39-2- .
- Connect earth clip of test box to negative terminal of battery.

**Note**

The instructions for performing the individual tests indicate whether or not the engine control unit itself also needs to be connected to the test box.

- Carry out test as described in repair procedure.
- Install engine control unit after finishing test ⇒ [page 58](#) .
- Perform "Generating readiness code" in "Guided Functions" ⇒ Vehicle diagnostic tester.



4.2 Removing and installing engine control units -J623- / -J624-



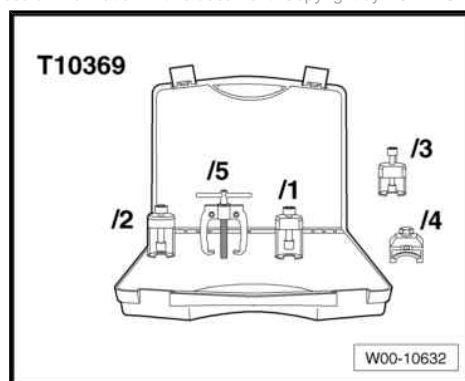
Note

- ◆ *Two engine control units are responsible for engine management. Both 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.*

Special tools and workshop equipment required

- ◆ Puller - T10369-

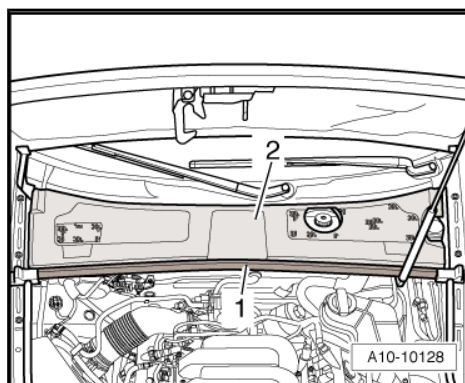
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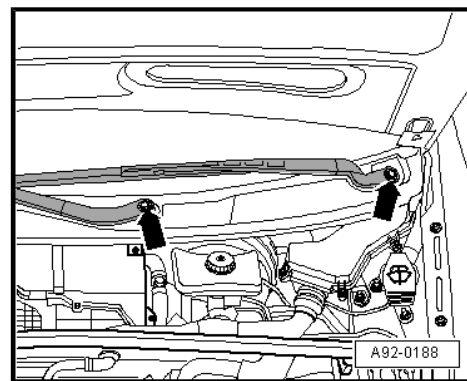
Removing

Proceed as follows:

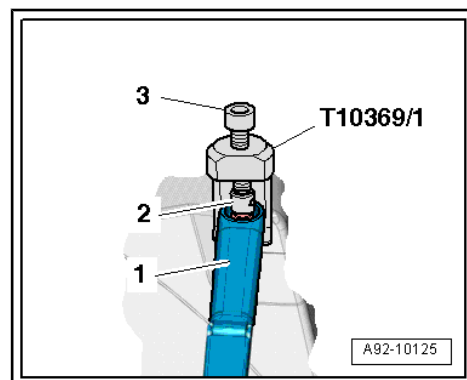
- When renewing an engine control unit, perform “Replace engine control unit” in “Guided Functions” ⇒ Vehicle diagnostic tester.
- Switch off ignition and take out ignition key.
- Pull off seal -1- and remove plenum chamber cover -2-.



- Pry off caps on windscreen wiper arms with a screwdriver.
- Loosen nuts -arrows- several turns.



- Apply puller -T10369/1- to wiper arm -1- as shown in illustration.
- Apply thrust piece -2- onto wiper shaft.
- Turn bolt -3- in clockwise direction until wiper arm is pulled off wiper shaft.
- Remove nuts and detach wiper arms.

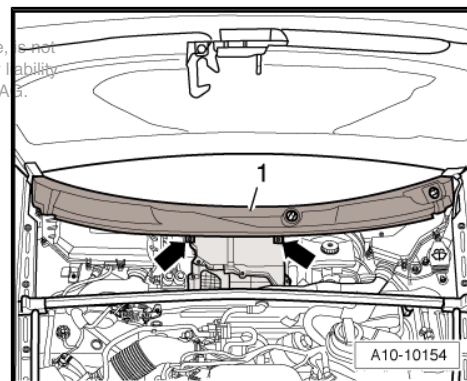


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Risk of damage to cowl panel grille.

- ◆ *To avoid cracking the cowl panel grille -1- during removal, apply a small amount of soap solution to the joint between the windscreen and the cowl panel grille and pull the grille vertically up out of the fastening strip, starting from the edge of the windscreen.*



- Unscrew bolts -arrows- and remove cowl panel grille from windscreen.

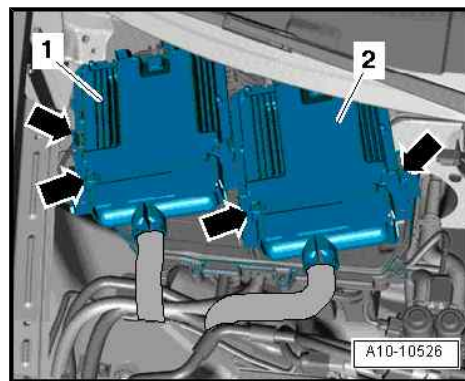
**Note**

The two engine control units are identical from the outside. The engine control units must be marked before removal so that they are not interchanged later on.

**WARNING**

Risk of burns at the pump valve unit for the heating system (left-side in front of electronics box).

- ◆ ***Wear protective gloves when working near the pump valve unit for the heating system.***



- Release retaining clips -arrows- and detach engine control units -1- and -2-.

**Note**

When the connectors are disconnected from the engine control unit, the learnt values are erased but the contents of the fault memory remain intact.

Installing

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

- When renewing an engine control unit, perform “Replace engine control unit” in “Guided Functions” ⇒ Vehicle diagnostic tester.



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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.
- ◆ Certain tests may lead to faults being stored in the engine control unit. The fault memory must be interrogated after completing all tests and repair work. If faults are stored:
 - Perform “Generating readiness code” in “Guided Functions”
 - ⇒ Vehicle diagnostic tester.
- ◆ If the engine starts, runs for a short period and then cuts out after completing fault finding, repairs or component tests, this may be due to the immobiliser disabling the engine control unit. The fault memory must then be interrogated and, if necessary, the control unit must be adapted.

1.2 Safety precautions

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

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WARNING

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

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

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

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

- ◆ Persons wearing a cardiac pacemaker must at all times maintain a safe distance from high-voltage components such as the ignition system and gas-discharge headlights.
- ◆ Always switch off the ignition before connecting or disconnecting electrical wiring for the injection or ignition system or tester cables.
- ◆ Do not touch or disconnect ignition wiring when the engine is running or being turned at cranking speed.
- ◆ Always switch off ignition before washing engine.
- ◆ If you want to turn the engine at cranking speed without actually starting it (e.g. compression test), first unplug the con-



nectors from the ignition coils and the injectors. After completing the work, interrogate and erase the fault memory.

- ◆ Certain tests may lead to faults being stored in the engine control unit. The fault memory must be interrogated after completing all tests and repair work. If faults are stored:
- Perform “Generating readiness code” in “Guided Functions”
⇒ Vehicle diagnostic tester.



Caution

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

- ◆ ***Observe notes on procedure for disconnecting the battery.***
- ◆ ***Always switch off the ignition before disconnecting the battery.***

- Disconnect battery ⇒ Rep. gr. 27 .



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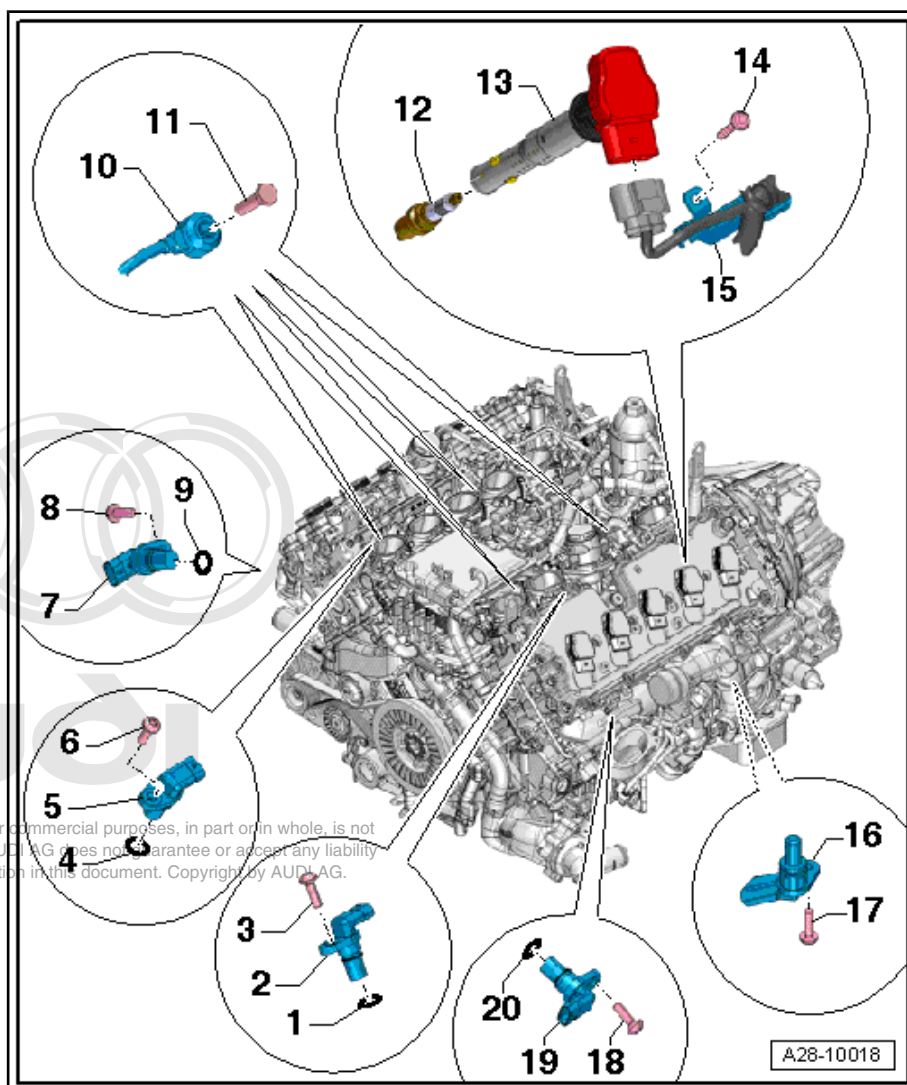
2 Servicing ignition system

2.1 Test data

		5.0 ltr. TFSI engine
Idling speed Cannot be adjusted; regulated by idling speed stabilisation		approx. 650 rpm ¹⁾
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
Firing order		1-6-5-10-2-7-3-8-4-9
¹⁾ Approx. 630 rpm when gear is engaged.		

2.2 Exploded view - ignition system

- 1 - O-ring
 - ☐ Renew
- 2 - Hall sender 2 - G163-
 - ☐ Removing and installing
⇒ [page 71](#)
- 3 - Bolt
 - ☐ 9 Nm
- 4 - O-ring
 - ☐ Renew
- 5 - Hall sender - G40-
 - ☐ Removing and installing
⇒ [page 71](#)
- 6 - Bolt
 - ☐ 9 Nm
- 7 - Hall sender 3 - G300-
 - ☐ Removing and installing
⇒ [page 71](#)
- 8 - Bolt
 - ☐ 9 Nm
- 9 - O-ring
 - ☐ Renew
- 10 - Knock sensor
 - ☐ Fitting location and allocation for connector
⇒ [page 64](#)
 - ☐ Removing and installing
⇒ [page 71](#)



11 - Bolt

- ☐ 25 Nm

12 - Spark plug

- ☐ Change interval ⇒ Maintenance tables
- ☐ Tightening torque ⇒ Maintenance ; Booklet 405

13 - Ignition coil

- ☐ For cylinders 1 ... 5, removing and installing ⇒ [page 64](#)
- ☐ For cylinders 6 ... 9, removing and installing ⇒ [page 65](#)
- ☐ For cylinder 10, removing and installing ⇒ [page 66](#)

14 - Bolt

- ☐ 5 Nm

15 - Electrical wiring harness

16 - Engine speed sender - G28-

- ☐ Removing and installing ⇒ [page 72](#)

17 - Bolt

- ☐ 25 Nm

18 - Bolt

- ☐ 9 Nm

19 - Hall sender 4 - G301-

- ☐ Removing and installing ⇒ [page 71](#)

20 - O-ring

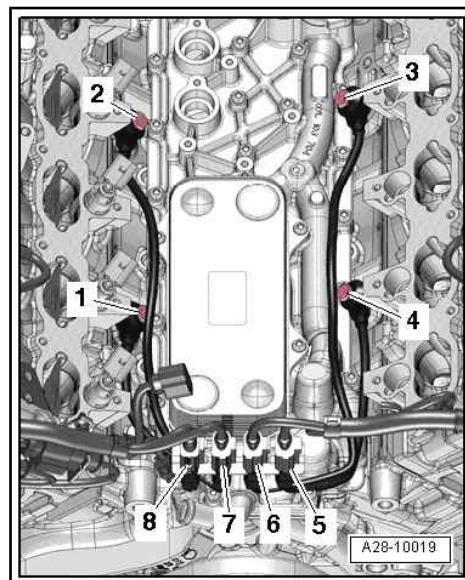
- ☐ Renew

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Fitting location of knock sensors and allocation for connectors

- ◆ Below intake manifold

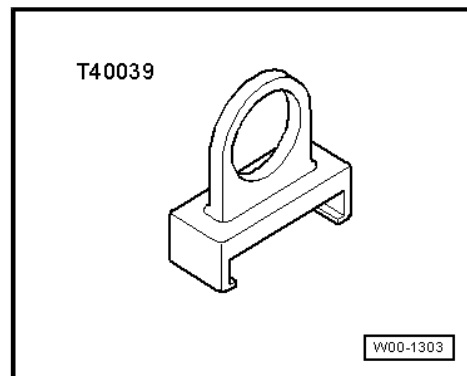
- 1 - Knock sensor 1 - G61-
- 2 - Knock sensor 2 - G66-
- 3 - Knock sensor 4 - G199-
- 4 - Knock sensor 3 - G198-
- 5 - Connector (blue) for knock sensor 3 - G198-
- 6 - Connector (orange) for knock sensor 4 - G199-
- 7 - Connector (grey) for knock sensor 2 - G66-
- 8 - Connector (black) for knock sensor 1 - G61-



2.3 Removing and installing ignition coils (cylinders 1 ... 5)

Special tools and workshop equipment required

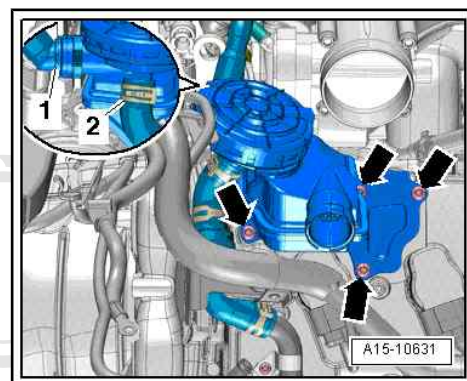
◆ Puller - T40039-



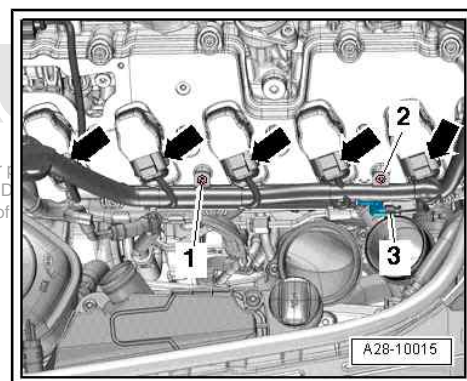
Removing

Proceed as follows:

- Remove air cleaner housing (right-side) ⇒ [page 20](#) .
- Press release tabs and disconnect air hose -1-.
- Remove bolts -arrows-.
- Detach pressure control valve for crankcase breather system from air hose -2-.



- Remove bolts -1- and -2-.
- Unplug electrical connectors at ignition coils -arrows- and at Hall sender 2 - G163- -item 3-.
- Move electrical wiring harness clear to side.



- Remove ignition coils using puller - T40039- .

Installing

- Tightening torque ⇒ [page 63](#)

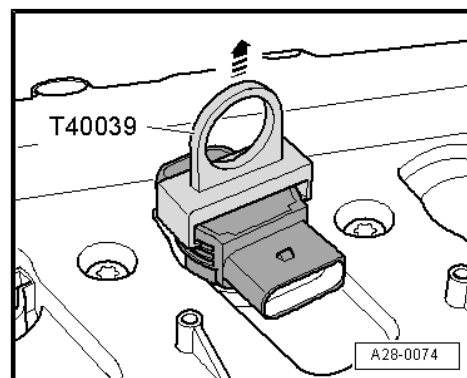
Installation is carried out in the reverse order; note the following:



Note

Renew gaskets and O-rings.

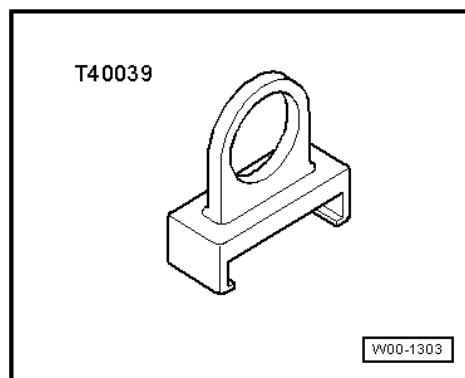
- Install air cleaner housing (right-side) ⇒ [page 20](#) .



2.4 Removing and installing ignition coils (cylinders 6 ... 9)

Special tools and workshop equipment required

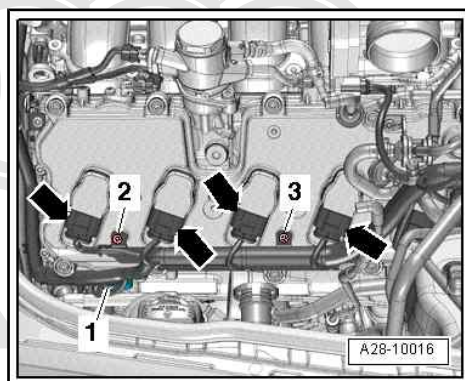
◆ Puller - T40039-



Removing

Proceed as follows:

- Remove air cleaner housing (left-side) ⇒ [page 20](#) .
- Remove bolts -2- and -3-.
- Unplug electrical connectors at ignition coils -arrows- and at Hall sender 4 - G301- -item 1-.
- Move electrical wiring harness clear to side.



- Remove ignition coils using puller - T40039- .

Installing

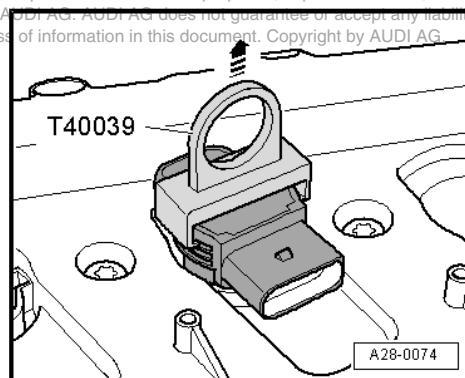
- Tightening torque ⇒ [page 63](#)

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



Renew gaskets and O-rings.

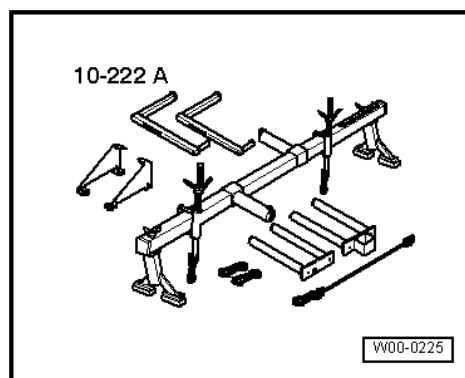
- Install air cleaner housing (left-side) ⇒ [page 20](#) .



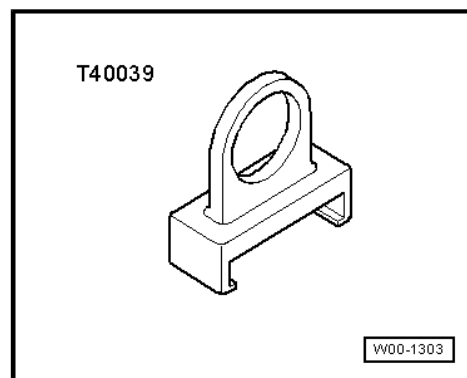
2.5 Removing and installing ignition coil (cylinder 10)

Special tools and workshop equipment required

- ◆ Support bracket - 10 - 222 A-

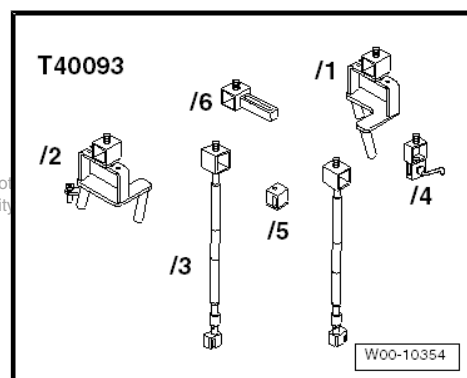


◆ Puller - T40039-



◆ Engine support bracket (supplementary set) - T40093-

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Removing

Proceed as follows:



Caution

Electronic components are susceptible to damage.

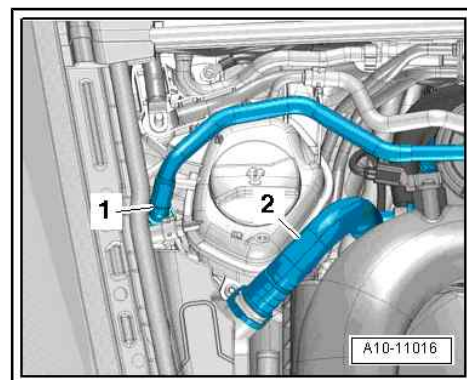
◆ *Observe notes on procedure for disconnecting the battery.*

- Disconnect battery ⇒ Rep. gr. 27 .
- Remove air cleaner housing (left and right) ⇒ [page 20](#) .
- Press release tabs and disconnect crankcase breather hose -1-.

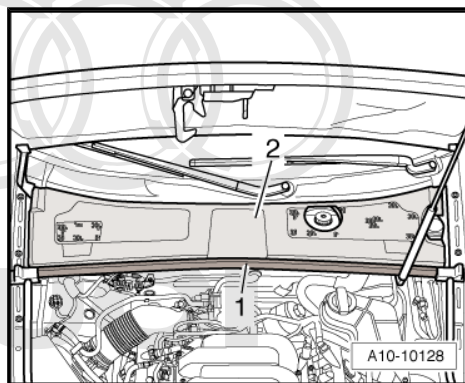


Note

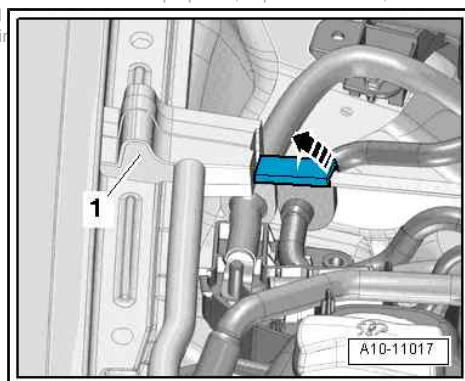
Disregard item -2-.



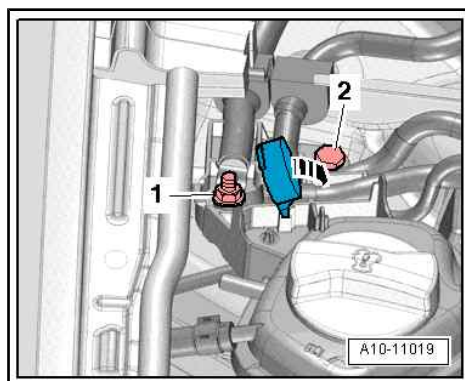
- Pull off seal -1- and remove plenum chamber cover -2-.



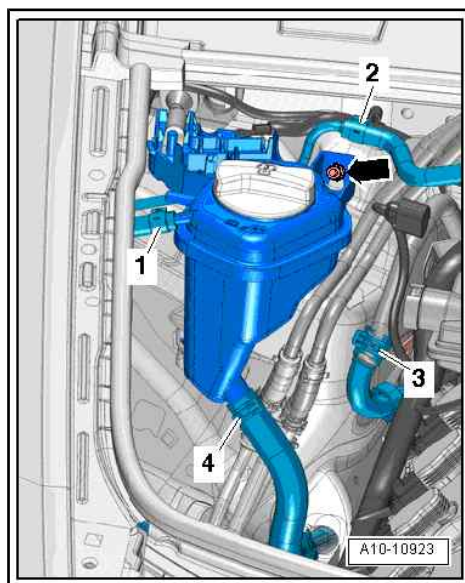
- Detach sealing element -1-.
- Release wiring bracket and open -arrow-.



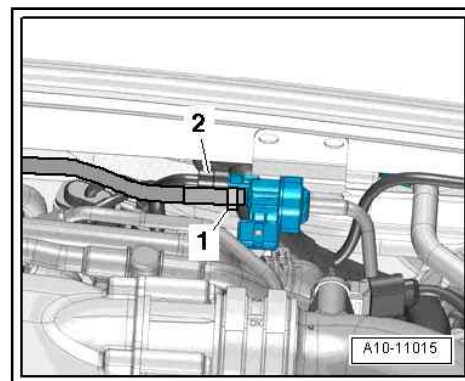
- Open cover above positive terminal -arrow-.
- Unscrew nut -1- for positive terminal “+” and move earth wiring clear.
- Unscrew negative terminal “-” -item 2- and move electrical wiring clear.



- Unscrew nut -arrow- and move coolant filler tank to side with coolant hoses -1 ... 4- connected.



- Take activated charcoal filter solenoid valve 1 - N80- -item 2- out of bracket and press to one side with electrical wiring and vacuum hose -1- connected.

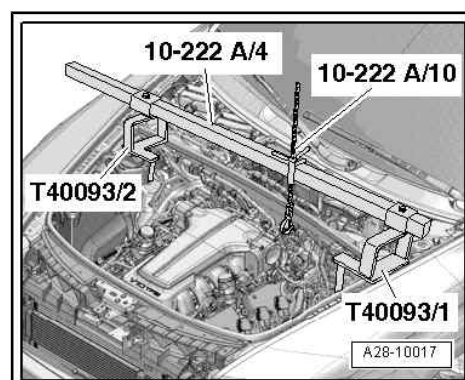


- Set up adapter - 10 - 222 A /4- with supports -T40093/1- and -T40093/2- on suspension turrets (left and right) as illustrated.

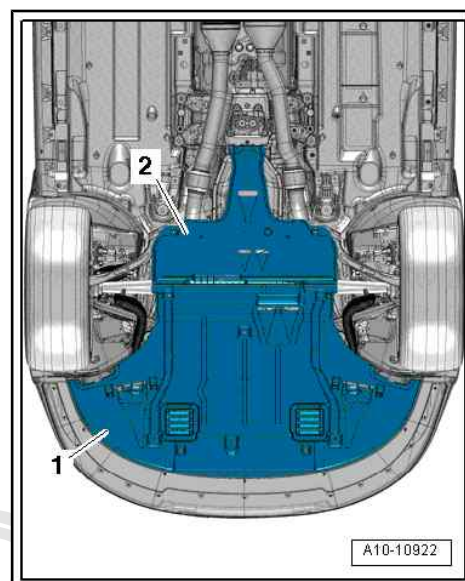
**Note**

Supports are marked for left and right side of vehicle.

- Engage hook - 10 - 222 A /10- at engine lifting eye (left-side).



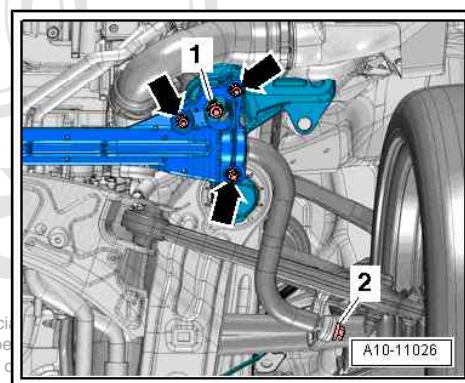
- Remove noise insulation panels -1- and -2- ⇒ Rep. gr. 50 .



- Unscrew nuts -1- on both sides evenly.

**Note**

Disregard items marked -2- and -arrows-.



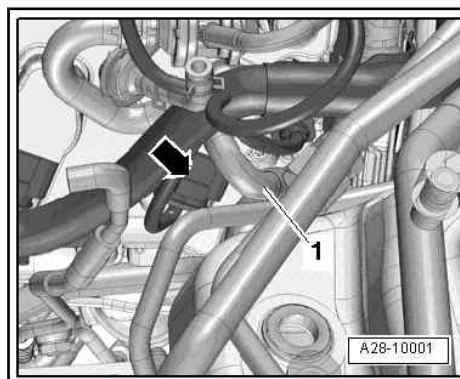
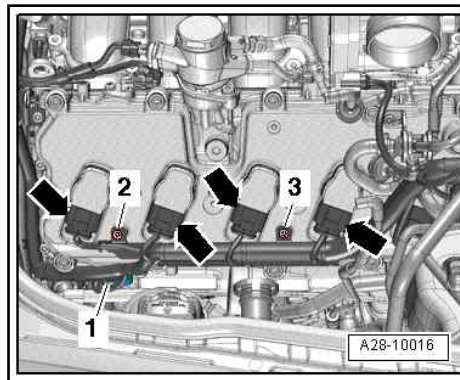
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- Remove bolts -2- and -3-.
- Unplug electrical connectors at ignition coils -arrows- and at Hall sender 4 - G301- -item 1-.
- Move electrical wiring harness clear to side.

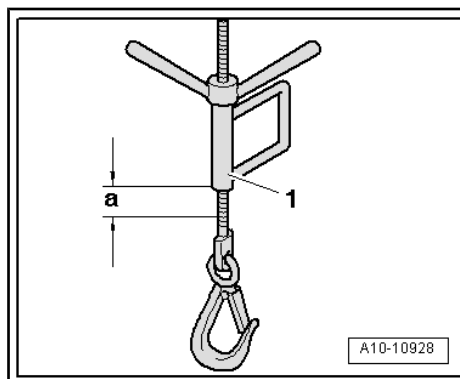
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- Unplug electrical connector -arrow- at ignition coil for cylinder 10.
- Detach air intake hose -1-.



- Use spindle (left-side) to raise engine through distance -a-.
- Dimension -a- = 25 mm



- Remove ignition coil using puller - T40039- .

Installing

- Tightening torque ⇒ [page 63](#)

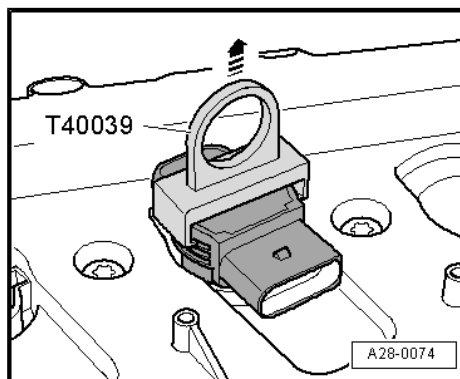
Installation is carried out in the reverse order; note the following:



Note

Renew gaskets and O-rings.

- Install engine mounting (left-side) ⇒ Rep. gr. 10 .
- Install air cleaner housing (left and right) ⇒ [page 20](#) .
- Observe notes on procedure for connecting the battery ⇒ Rep. gr. 27 .

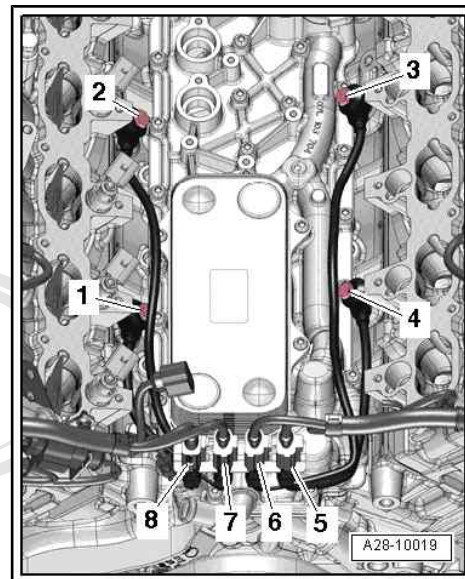


2.6 Removing and installing knock sensors -G61- / -G66- / -G198- / -G199-

Removing

Proceed as follows:

- Remove corresponding intake manifold (bottom section)
⇒ [page 38](#).
- Unplug corresponding electrical connector:
 - 5 - Blue connector for knock sensor 3 - G198-
 - 6 - Orange connector for knock sensor 4 - G199-
 - 7 - Grey connector for knock sensor 2 - G66-
 - 8 - Black connector for knock sensor 1 - G61-
- Remove corresponding bolt and detach knock sensor:
 - 1 - Knock sensor 1 - G61-
 - 2 - Knock sensor 2 - G66-
 - 3 - Knock sensor 4 - G199-
 - 4 - Knock sensor 3 - G198-



Installing

- Tightening torque ⇒ [page 63](#).
- Installation is carried out in the reverse order, note the following:
- Install intake manifold (bottom section) ⇒ [page 38](#).

2.7 Removing and installing Hall senders - G40- / -G163- / -G300- / -G301-

Removing

Proceed as follows:

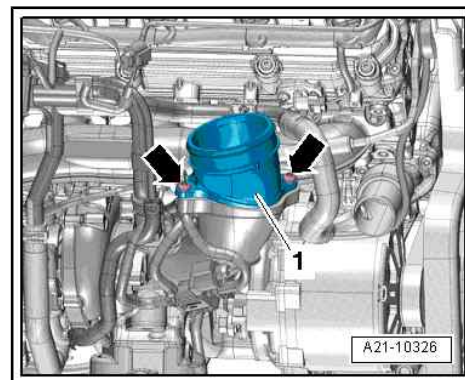


Note

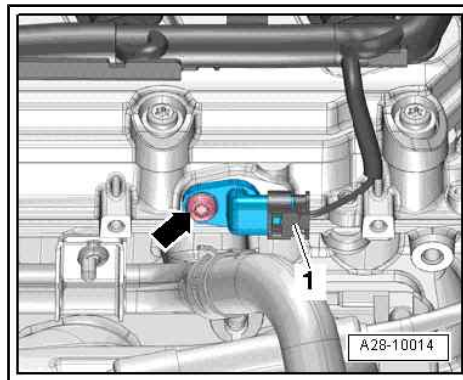
The following description is for removing and installing at the cylinder bank 1 (right-side).

Hall sender for exhaust camshaft:

- Remove air cleaner housing ⇒ [page 20](#).
- Unscrew bolts -arrows- and remove intermediate flange -1-.



- Unplug electrical connector -1-.
- Remove bolt -arrow- and detach Hall sender 3 - G300- .



Hall sender for inlet camshaft:

- Unplug electrical connector -1-.
- Unscrew bolt -arrow- and remove Hall sender - G40- .

Installing

- Tightening torque ⇒ [page 63](#)

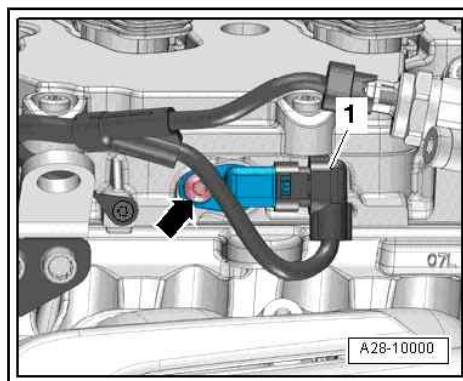
Installation is carried out in the reverse order; note the following:



Note

Renew gaskets and O-rings.

- Install intermediate flange ⇒ [page 16](#) .
- Install air cleaner housing ⇒ [page 20](#) .

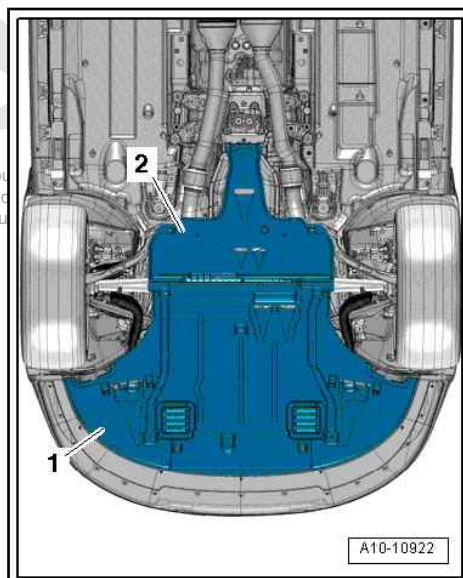


2.8 Removing and installing engine speed sender - G28-

Removing

- Remove noise insulation panels -1- and -2- ⇒ Rep. gr. 50 .

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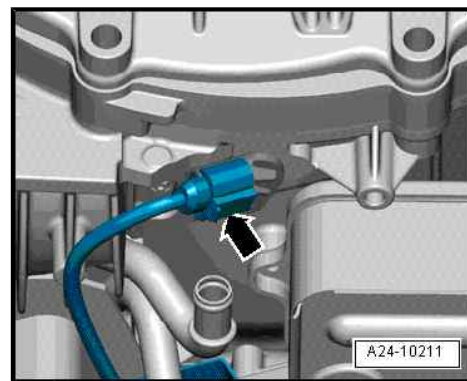
- Unplug electrical connector at engine speed sender - G28-
-arrow- at bottom of gearbox.
- Remove bolt and detach engine speed sender - G28- .

Installing

- Tightening torque ⇒ [page 63](#)

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

- Install noise insulation panels ⇒ Rep. gr. 50 .



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