



Workshop Manual

Audi A6 2011 ➤

Audi A6 China 2012 ➤

Audi A7 Sportback 2011 ➤

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

Engine ID	CLXB	CLXA							
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Edition 02.2012

List of Workshop Manual Repair GroupsList of Workshop Manual Repair Groups

Repair Group

24 - Mixture preparation - injection

28 - Ignition system



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

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24 – Mixture preparation - injection

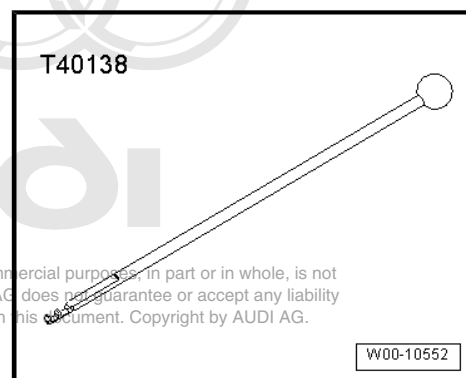
1 Safety precautions and rules for cleanliness

Overview

- ◆ ⇒ „1.1 General notes on self-diagnosis“, page 1
- ◆ ⇒ „1.2 Safety precautions when using testers and measuring instruments during a road test“, page 2
- ◆ ⇒ „1.3 Safety precautions“, page 2
- ◆ ⇒ „1.4 Safety precautions when working on vehicles with start/stop system“, page 3
- ◆ ⇒ „1.5 Rules for cleanliness when working on the injection system“, page 3
- ◆ ⇒ „1.6 Important: Required procedure prior to opening high-pressure injection system“, page 4
- ◆ ⇒ „1.7 Checking for leaks in the fuel system“, page 5
- ◆ ⇒ „1.8 Checking vacuum system“, page 5

1.1 General notes on self-diagnosis

- ◆ The engine control unit has a self-diagnosis capability. Before carrying out repairs and fault finding, the event memory must be interrogated. The vacuum hoses and connections must also be checked (unmetered air).
- ◆ Fuel hoses in engine compartment must only be secured with spring-type clips. O-type clips or screw-type clips must not be used.
- ◆ A voltage of at least 11.5 V is required for proper operation of the electrical components.
- ◆ Do not use sealants containing silicone. Particles of silicone drawn into the engine will not be burnt in the engine and will damage the Lambda probe.
- ◆ The vehicles are fitted with a crash/fuel shut-off system. This system is designed to reduce the risk of a vehicle fire after a crash by deactivating the fuel pump via the fuel pump relay.
- ◆ At the same time, this system also improves the engine's starting performance. When the driver's door is opened, the fuel pump is activated for 2 seconds in order to build up pressure in the fuel system ⇒ page 2 .
- ◆ Use release tool -T40138- to unplug connectors that cannot be accessed easily.



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

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



WARNING

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

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

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

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1.3 Safety precautions

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



WARNING

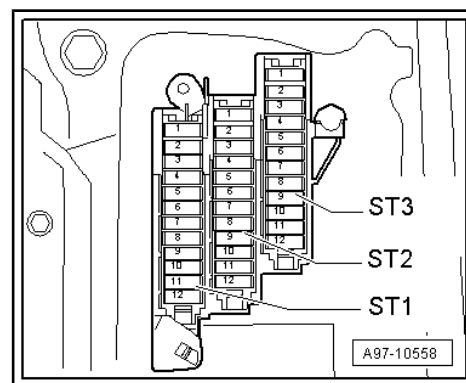
- ◆ *The fuel system operates under high pressure. The pressure in the high-pressure part of the injection system must be reduced to a residual pressure prior to opening the system ⇒ **page 4**.*
- ◆ *A clean cloth must then be wrapped around the connection and the residual pressure dissipated by carefully loosening the connection.*



Caution

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

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



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

 **WARNING**

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

- ◆ ***On vehicles with activated start/stop system (this is indicated by a message in the instrument cluster display), the engine may start automatically on demand.***
- ◆ ***Therefore it is important to ensure that the start/stop system is deactivated when performing repairs (switch off ignition, if required switch on ignition again).***

1.5 Rules for cleanliness when working on the injection system

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

- ◆ Carefully clean connection points and the surrounding area with engine cleaner or brake cleaner and dry thoroughly before opening.
- ◆ Immediately seal off open lines and connections with clean plugs.
- ◆ Place parts that have been removed on a clean surface and cover them over. Do not use fluffy cloths.
- ◆ Carefully cover or seal open components if repairs cannot be carried out immediately.
- ◆ Only install clean components; replacement parts should only be unpacked immediately prior to installation. Do not use parts

that have been previously unpacked and stored away loose (e.g. in toolboxes, etc.).

- ◆ When the system is open: Do not work with compressed air. Do not move the vehicle unless absolutely necessary.
- ◆ Protect unplugged electrical connectors against dirt and moisture and make sure connections are dry when attaching.

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



WARNING

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

- ◆ *The injection system consists of a high-pressure section (maximum approx. 120 bar) and a low-pressure section (approx. 6 bar).*
- ◆ *The fuel pressure in the high-pressure section must be reduced to a residual pressure of approx. 7 bar prior to opening the system. The procedure is described below.*

Reducing fuel pressure in high-pressure section

- Connect a vehicle diagnostic tester.
- Start engine and run at idling speed.
- Select „Engine electronics“ in vehicle self-diagnosis.
- Then select „Basic setting“.
- Select „Reducing fuel pressure in fuel rail“ from the list.
- Then select „Measured values“.
- Select „Operating instructions“ and „Fuel pressure“ from the list.
- To activate basic setting, perform „Operating instructions“ function.
- Observe fuel pressure displayed on vehicle diagnostic tester.
 - Fuel pressure will drop to a specified value.
- Switch off engine with pedals depressed.



WARNING

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

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

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

 Note

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

Additional steps required

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

1.7 Checking for leaks in the fuel system

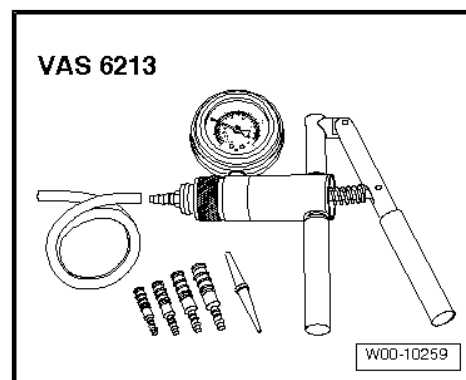
Proceed as follows:

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

1.8 Checking vacuum system

Special tools and workshop equipment required

- ◆ Hand vacuum pump -VAS 6213-



Procedure

- Check all vacuum lines in the complete vacuum system for:
 - ◆ Cracks
 - ◆ Traces of animal bites
 - ◆ Kinked or crushed lines
 - ◆ Lines porous or leaking
- Check vacuum line to solenoid valve and from solenoid valve to corresponding component.
- If a fault is stored in the event memory, check the vacuum lines leading to the corresponding component and also check the remaining vacuum lines leading to other components.
- If it is not possible to build up a vacuum with the hand vacuum pump -VAS 6213- or if the vacuum pressure drops again immediately, check the hand vacuum pump and connecting hoses for leaks.



2 Technical data

Test data	2.5 ltr. / 4V FSI
Idling speed Cannot be adjusted; regulated by idling speed stabilisation	650 ... 750 rpm ¹⁾
Fuel pressure after high-pressure pump	40 ... 120 bar
Fuel pressure before high-pressure pump	approx. 6.0 bar
• ¹⁾ Depending on demands placed on engine control unit.	



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3 Overview of fitting locations

Engine compartment (right-side)

1 - Secondary air pump motor -V101-

- ☐ Fitting location
⇒ [page 15](#)
- ☐ Removing and installing
⇒ Engine, mechanics,
Rep. gr. 26

2 - Hall sender 3 -G300-

- ☐ Fitting location
⇒ [page 12](#)
- ☐ Exploded view
⇒ [page 55](#)

3 - Lambda probe -G39- with Lambda probe heater -Z19-

- ☐ Fitting location
⇒ [page 14](#)
- ☐ Fitting location of electrical connector
⇒ [page 14](#)
- ☐ Exploded view
⇒ [page 39](#)

4 - Exhaust camshaft control valve 1 -N318-

- ☐ Fitting location
⇒ [page 12](#)
- ☐ Removing and installing
⇒ Engine, mechanics;
Rep. gr. 15

5 - Camshaft control valve 1 - N205-

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

- ☐ Fitting location ⇒ [page 14](#)
- ☐ Fitting location of connector ⇒ [page 14](#)
- ☐ Exploded view ⇒ [page 39](#)

7 - Throttle valve module -J338-

- ☐ Including throttle valve drive for electric throttle -G186-, throttle valve drive angle sender 1 for electric throttle -G187- and throttle valve drive angle sender 2 for electric throttle -G188-
- ☐ Fitting location ⇒ [page 14](#)

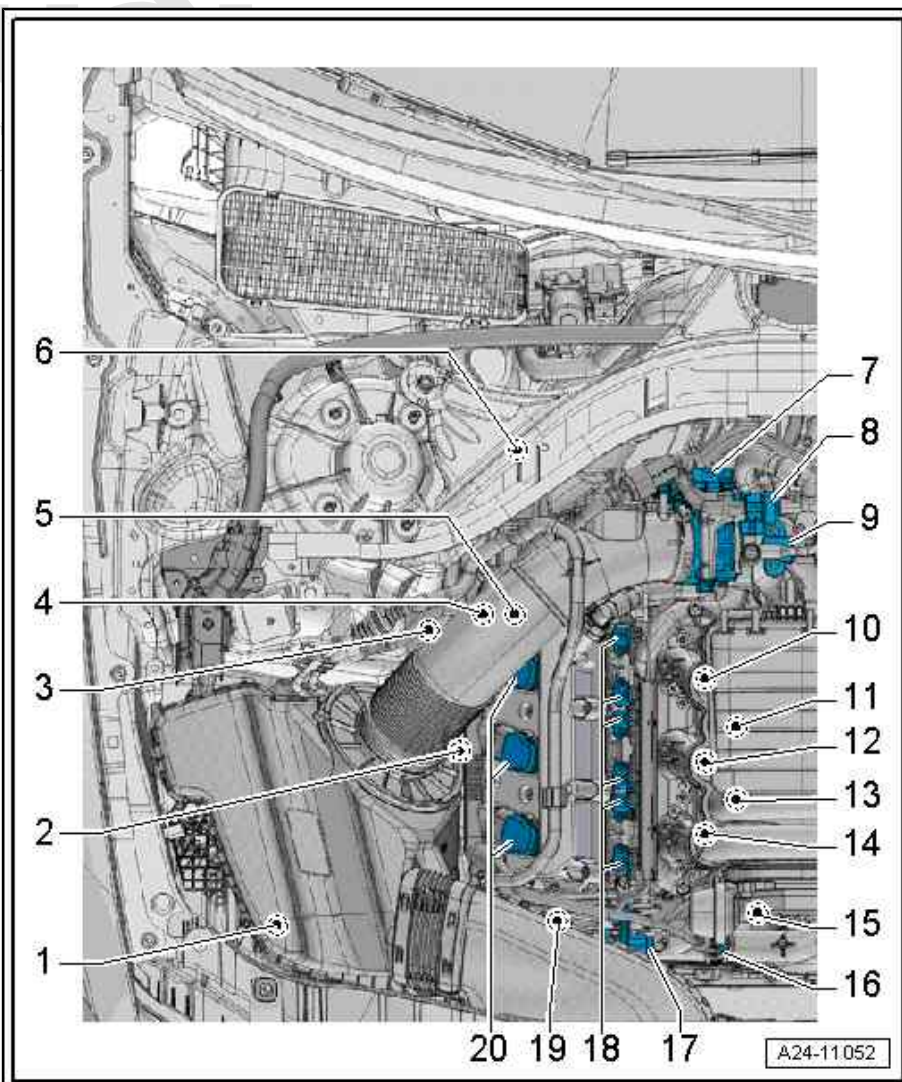
8 - Activated charcoal filter solenoid valve 1 -N80-

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

- ☐ Fitting location ⇒ [page 14](#)
- ☐ Exploded view ⇒ [page 21](#)

10 - Injector, cylinder 3 -N32-

- ☐ Fitting location ⇒ [page 12](#)
- ☐ Exploded view ⇒ [page 24](#)





11 - Knock sensor 1 -G61-

- ☐ Fitting location ⇒ [page 12](#)
- ☐ Exploded view ⇒ [page 55](#)

12 - Injector, cylinder 2 -N31-

- ☐ Fitting location ⇒ [page 12](#)
- ☐ Exploded view ⇒ [page 24](#)

13 - Temperature sender for engine temperature regulation -G694-

- ☐ Fitting location ⇒ [page 12](#)
- ☐ Removing and installing ⇒ Engine, mechanics; Rep. gr. 19

14 - Injector, cylinder 1 -N30-

- ☐ Fitting location ⇒ [page 12](#)
- ☐ Exploded view ⇒ [page 24](#)

15 - Variable intake manifold change-over valve -N156-

- ☐ Fitting location ⇒ [page 13](#)

16 - Coolant temperature sender -G62-

- ☐ Fitting location ⇒ [page 13](#)

17 - Hall sender -G40-

- ☐ Fitting location ⇒ [page 12](#)
- ☐ Exploded view ⇒ [page 55](#)

18 - Actuators for camshaft adjustment

- ☐ Actuator 1 for camshaft adjustment -F366-
 - ☐ Actuator 2 for camshaft adjustment -F367-
 - ☐ Actuator 3 for camshaft adjustment -F368-
 - ☐ Actuator 4 for camshaft adjustment -F369-
 - ☐ Actuator 5 for camshaft adjustment -F370-
 - ☐ Actuator 6 for camshaft adjustment -F371-
 - ☐ Fitting location ⇒ [page 12](#)
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19 - High-pressure pump

- ☐ With fuel pressure sender, low pressure -G410- and fuel metering valve -N290-
- ☐ Fitting location ⇒ [page 13](#)
- ☐ Exploded view ⇒ [page 31](#)

20 - 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-
- ☐ Exploded view ⇒ [page 55](#)

Engine compartment (left-side)

1 - Variable intake manifold position sender -G513-

- ☐ Fitting location
⇒ [page 13](#)

2 - Injector, cylinder 4 -N33-

- ☐ Fitting location
⇒ [page 12](#)
- ☐ Exploded view
⇒ [page 24](#)

3 - Fuel pressure sender - G247-

- ☐ Fitting location
⇒ [page 12](#)
- ☐ Exploded view
⇒ [page 24](#)

4 - Knock sensor 2 -G66-

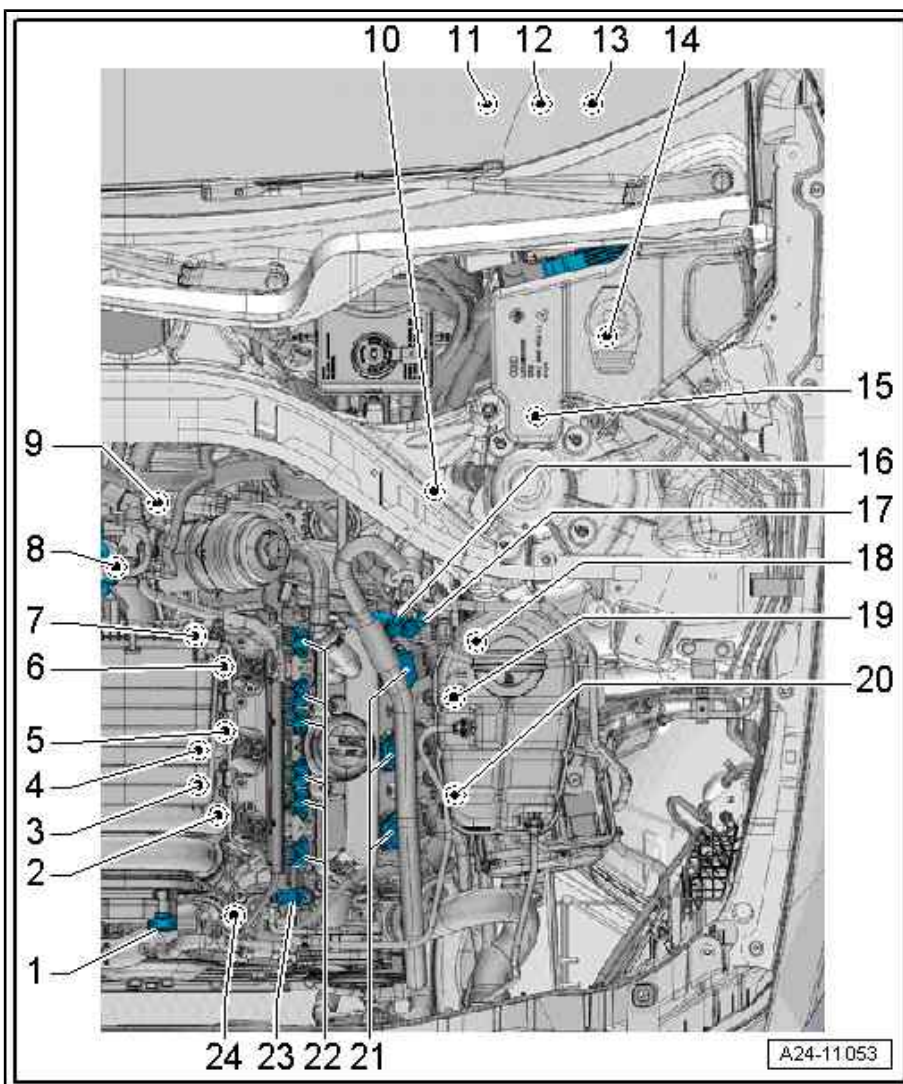
- ☐ Fitting location
⇒ [page 12](#)
- ☐ Fitting location of connector ⇒ [page 15](#)
- ☐ Exploded view
⇒ [page 55](#)

5 - Injector, cylinder 5 -N83-

- ☐ Fitting location
⇒ [page 12](#)
- ☐ Exploded view
⇒ [page 24](#)

6 - Injector, cylinder 6 -N84-

- ☐ Fitting location
⇒ [page 12](#)
- ☐ Exploded view
⇒ [page 24](#)



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

- ☐ Fitting location ⇒ [page 12](#)

8 - Engine speed sender -G28-

- ☐ Fitting location ⇒ [page 14](#)
- ☐ Exploded view ⇒ [page 55](#)

9 - Oil pressure switch -F22-

- ☐ Fitting location ⇒ [page 13](#)

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

- ☐ Fitting location ⇒ [page 15](#)
- ☐ Fitting location of electrical connector ⇒ [page 15](#)
- ☐ Exploded view ⇒ [page 39](#)

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

- ☐ Fitting location ⇒ [page 11](#)

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

- ☐ Fitting location ⇒ [page 11](#)

13 - Clutch position sender -G476-

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

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14 - Engine control unit -J623-

- ☐ Fitting location ⇒ [page 11](#)
- ☐ Removing and installing ⇒ [page 49](#)

15 - Gearbox oil cooling valve -N509-

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

16 - Camshaft control valve 2 -N208-

- ☐ Fitting location ⇒ [page 12](#)
- ☐ Removing and installing ⇒ Engine, mechanics; Rep. gr. 15

17 - Exhaust camshaft control valve 2 -N319-

- ☐ Fitting location ⇒ [page 12](#)
- ☐ Removing and installing ⇒ Engine, mechanics; Rep. gr. 15

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

- ☐ Fitting location ⇒ [page 15](#)
- ☐ Fitting location of electrical connector ⇒ [page 15](#)
- ☐ Exploded view ⇒ [page 39](#)

19 - Hall sender 4 -G301-

- ☐ Fitting location ⇒ [page 12](#)
- ☐ Exploded view ⇒ [page 55](#)

20 - Valve for oil pressure control -N428-

- ☐ Fitting location ⇒ [page 13](#)
- ☐ Removing and installing ⇒ Engine, mechanics; Rep. gr. 17

21 - Ignition coils for cylinder bank 2

- ☐ Ignition coil 4 with output stage -N292-
- ☐ Ignition coil 5 with output stage -N323-
- ☐ Ignition coil 6 with output stage -N324-
- ☐ Exploded view ⇒ [page 55](#)

22 - Actuators for camshaft adjustment

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

23 - Hall sender 2 -G163-

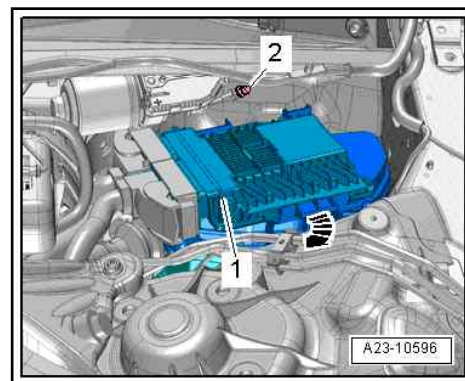
- ☐ Fitting location ⇒ [page 12](#)

24 - Coolant valve for cylinder head -N489-

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Fitting location of engine control unit -J623-

- ◆ In left electronics box in engine compartment



Fitting location of fuel pump control unit -J538-

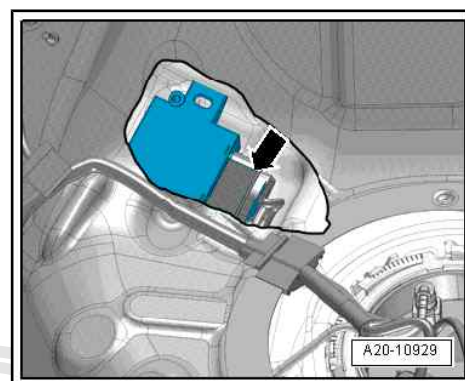
- ◆ Fuel pump control unit -J538- -arrow- is located between floor panel and fuel tank level with rear seat bench (right-side).



Note

For illustration purposes, the floor panel is cut open in the illustration.

Removing and installing ⇒ Fuel supply system, petrol engines;
 Rep. gr. 20



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

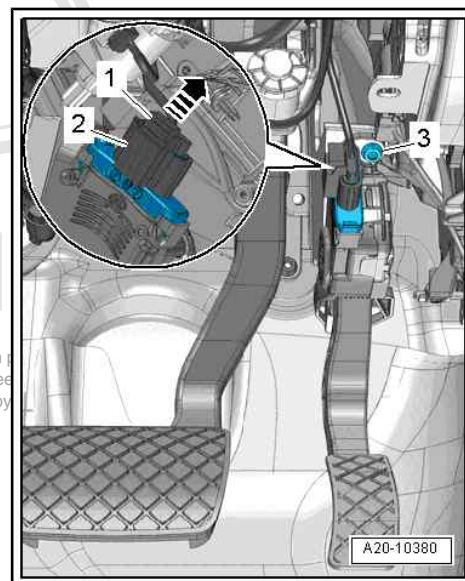
- ◆ In accelerator pedal module
- 2 - Electrical connector



Note

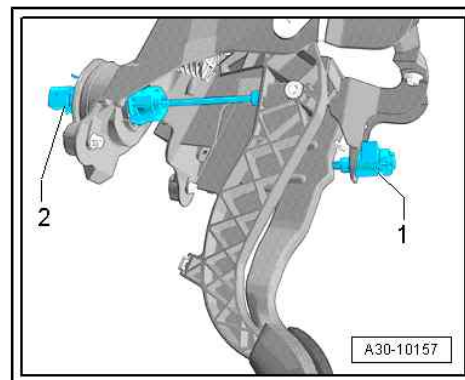
The accelerator position sender -G79- and accelerator position sender 2 -G185- are integrated in the accelerator pedal module and cannot be renewed individually.

Removing and installing ⇒ Fuel supply system, petrol engines;
 Rep. gr. 20



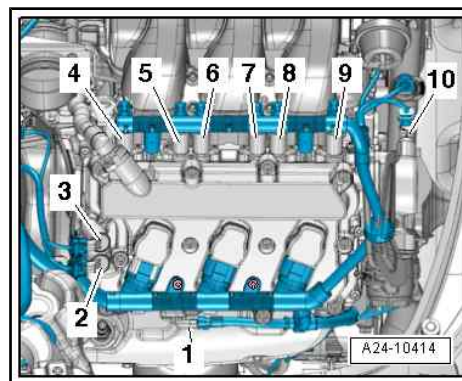
Fitting location of brake light switch -F- / brake pedal switch -F47- and clutch position sender -G476-

- 1 - Brake light switch -F- and brake pedal switch -F47-
- 2 - Functions integrated in clutch position sender -G476- (only on vehicles with manual gearbox): clutch pedal switch for engine start -F194- and clutch pedal switch -F36-



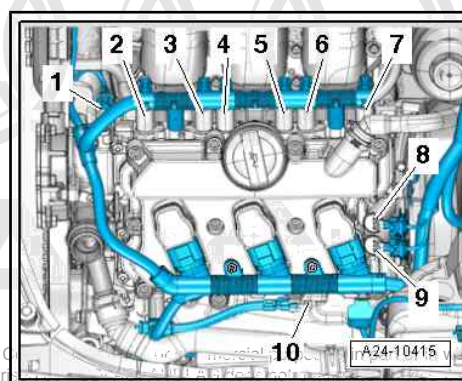
Fitting locations on cylinder bank 1 (right-side)

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



Fitting locations on cylinder bank 2 (left-side)

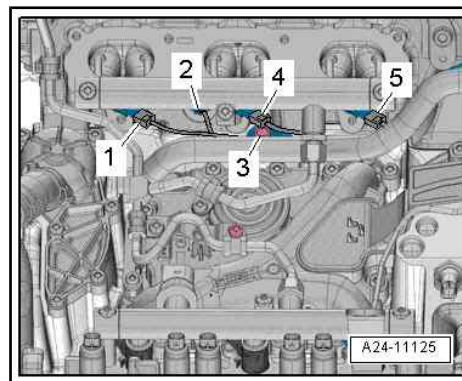
- 1 - Hall sender 2 -G163-
- 2 - Actuator 7 for camshaft adjustment -F372-
- 3 - Actuator 8 for camshaft adjustment -F373-
- 4 - Actuator 9 for camshaft adjustment -F374-
- 5 - Actuator 10 for camshaft adjustment -F375-
- 6 - Actuator 11 for camshaft adjustment -F376-
- 7 - Actuator 12 for camshaft adjustment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



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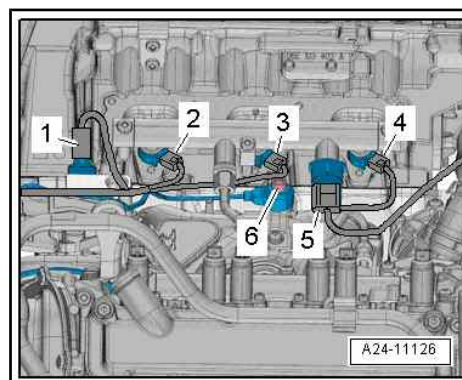
Fitting locations: components on inside of right cylinder bank 1

- 1 - Injector, cylinder 1 -N30-
- 2 - Temperature sender for engine temperature regulation -G694-
- 3 - Knock sensor 1 -G61-
- 4 - Injector, cylinder 2 -N31-
- 5 - Injector, cylinder 3 -N32-



Fitting locations: components on inside of left cylinder bank 2

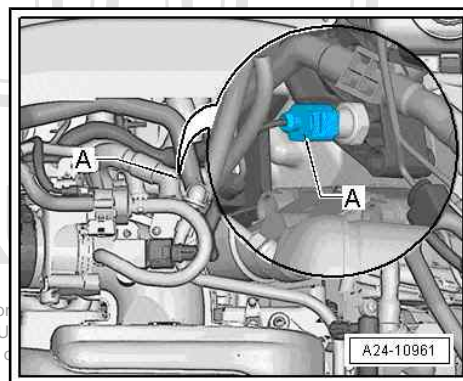
- 1 - Oil pressure switch for reduced oil pressure -F378-
- 2 - Injector, cylinder 6 -N84-
- 3 - Injector, cylinder 5 -N83-
- 4 - Injector, cylinder 4 -N33-
- 5 - Fuel pressure sender -G247-
- 6 - Knock sensor 2 -G66-



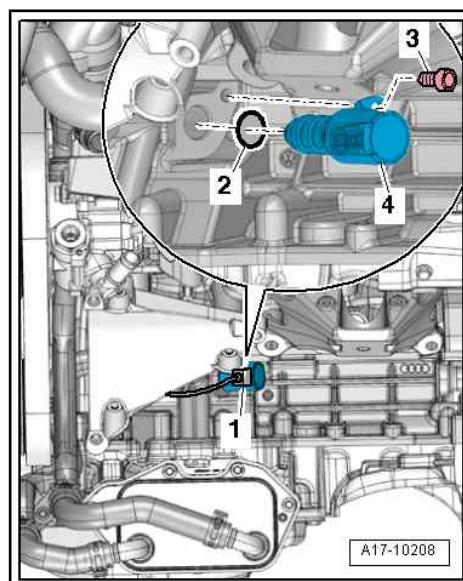
Fitting location of oil pressure switch -F22- -A-

The oil pressure switch -F22- is screwed into the oil filter flange

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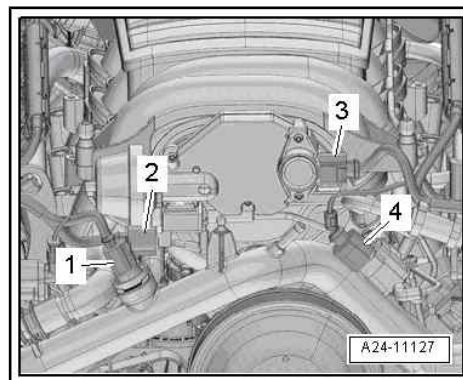


Fitting location of valve for oil pressure control -N428-



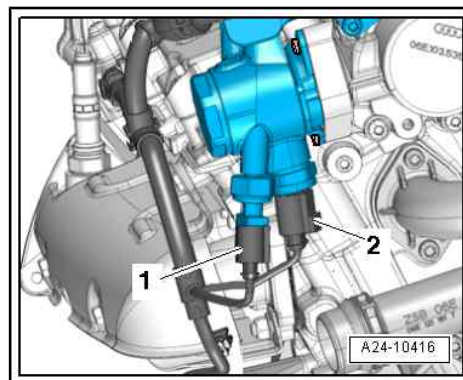
Fitting location: at front of engine

- 1 - Coolant temperature sender -G62-
- 2 - Variable intake manifold change-over valve -N156-
- 3 - Variable intake manifold position sender -G513-
- 4 - Coolant valve for cylinder head -N489-



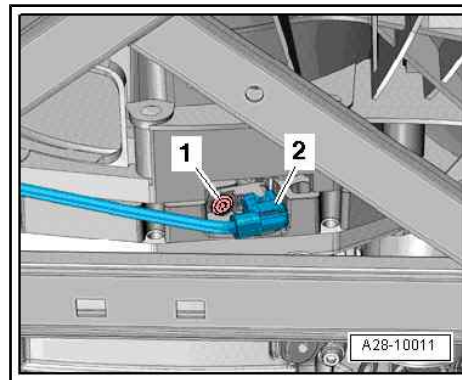
Fitting locations at high-pressure pump

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



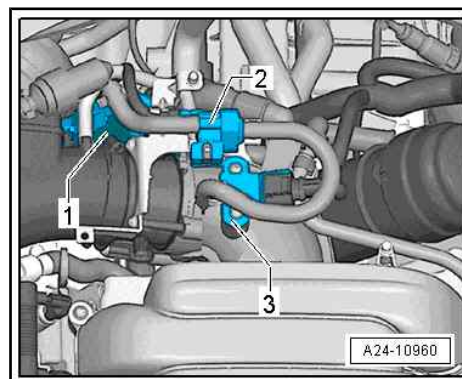
Fitting location of engine speed sender -G28-

- ◆ Bolted into gearbox from below



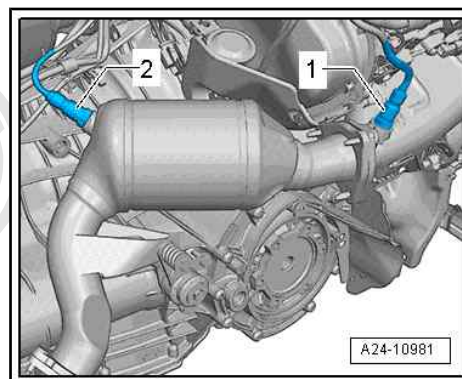
Fitting location: at rear of intake manifold

- 1 - Throttle valve module -J338-
- 2 - Activated charcoal filter solenoid valve 1 -N80-
- 3 - Intake air temperature sender -G42- / intake manifold pressure sender -G71-



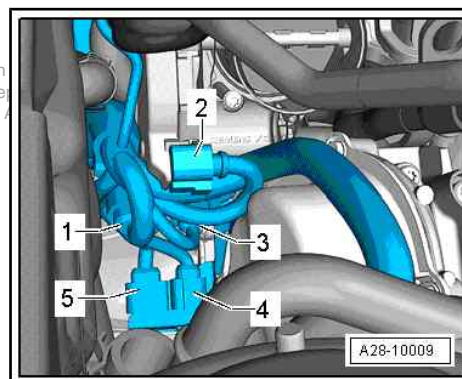
Fitting location of Lambda probes on cylinder bank 1 (right-side)

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



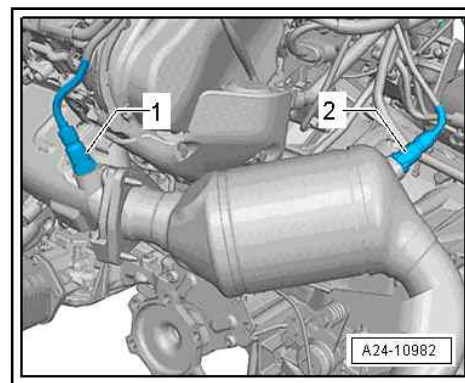
Electrical connectors for Lambda probes on cylinder bank 1 (right-side)

- 1 - For knock sensor 1 -G61-
- 2 - For throttle valve module -J338-
- 3 - For injectors
- 4 - For Lambda probe -G39-
- 5 - For Lambda probe after catalytic converter -G130-



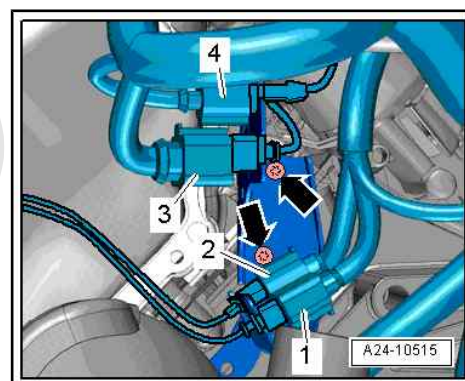
Fitting location of Lambda probes on cylinder bank 2 (left-side)

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



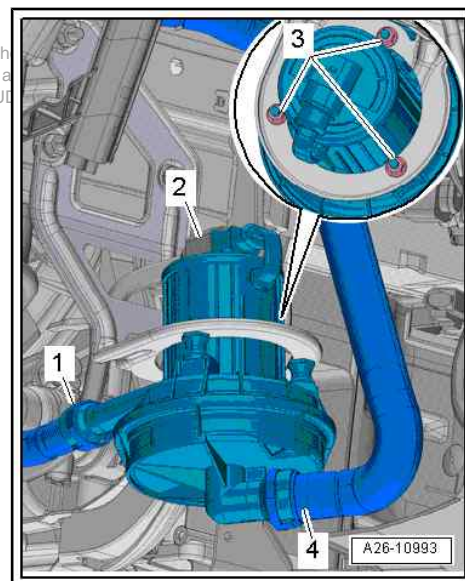
Electrical connectors for Lambda probes on cylinder bank 2 (left-side)

- 1 - For Lambda probe 2 -G131- (after catalytic converter)
- 2 - For Lambda probe 2 -G108-
- 3 - For injectors on cylinder bank 2, fuel pressure sender - G247- , oil pressure switch for reduced oil pressure -F378- and valve for oil pressure control -N428-
- 4 - For knock sensor 2 -G66-



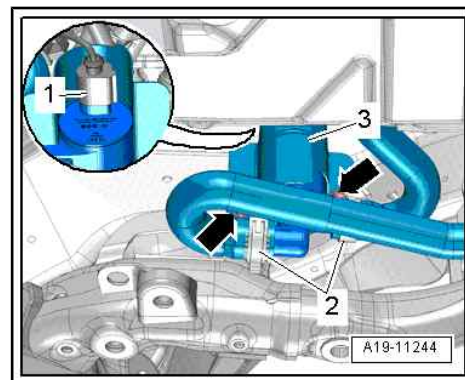
Fitting location of secondary air pump motor -V101-

- ◆ At front right in engine compartment below longitudinal member



Fitting location of gearbox oil cooling valve -N509-

- ◆ At left of subframe



4 Air cleaner

Overview

- ◆ ⇒ „4.1 Air cleaner - exploded view“, page 16
- ◆ ⇒ „4.2 Removing and installing air filter element“, page 17
- ◆ ⇒ „4.3 Removing air cleaner housing“, page 19

4.1 Air cleaner - exploded view

1 - Air duct

- ☐ Clean out salt deposits, dirt and leaves, etc.

2 - Sealing element

3 - Rubber grommet

- ☐ For air cleaner housing

4 - Air cleaner housing

- ☐ Clean out salt deposits, dirt and leaves, etc.
- ☐ Removing and installing
⇒ [page 19](#)

5 - Air filter element

- ☐ Use genuine air filter element ⇒ Electronic parts catalogue
- ☐ Change intervals ⇒ Maintenance tables
- ☐ Removing and installing
⇒ [page 17](#)

6 - Air pipe

- ☐ Tightening torque for hose clips ⇒ [page 17](#)

7 - Cover

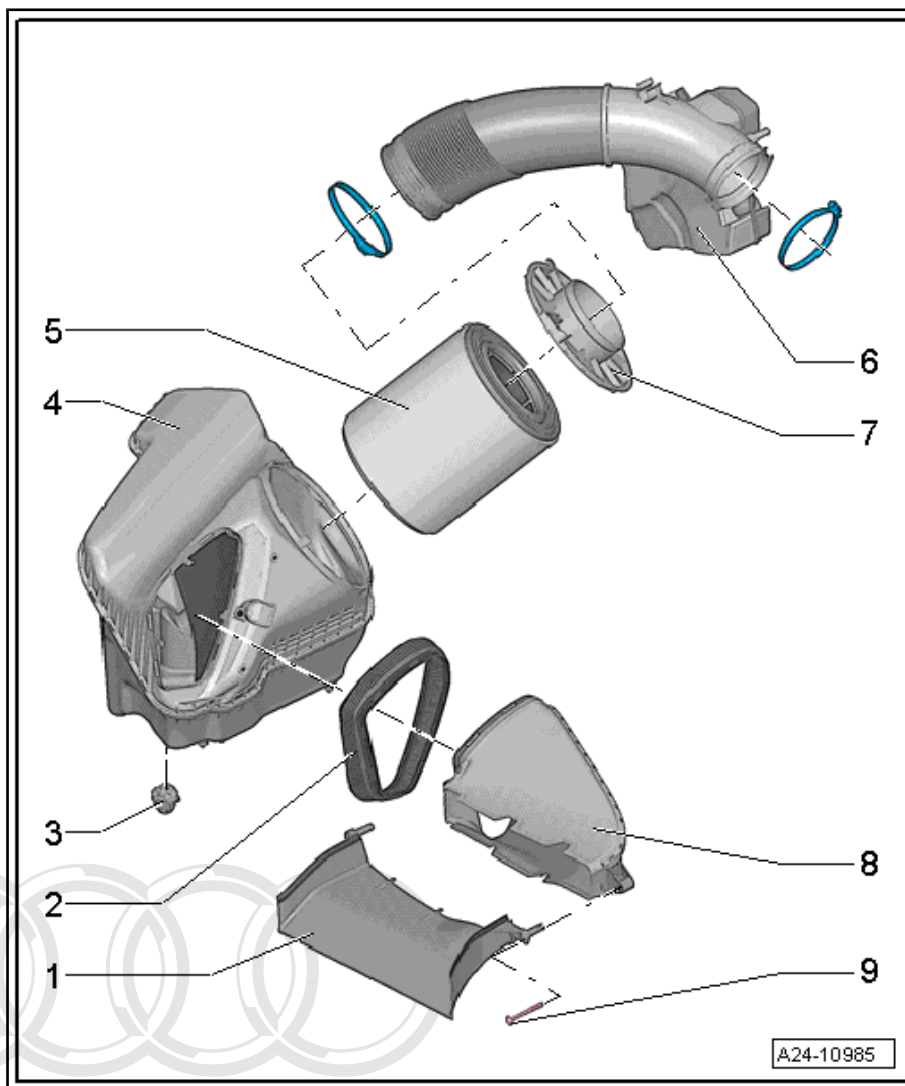
- ☐ For air cleaner housing
- ☐ Clean out salt deposits and dirt
- ☐ Removing and installing
⇒ „4.2 Removing and installing air filter element“, page 17

8 - Air duct

- ☐ Clean out salt deposits, dirt and leaves, etc.

9 - Bolt

- ☐ 1.5 Nm

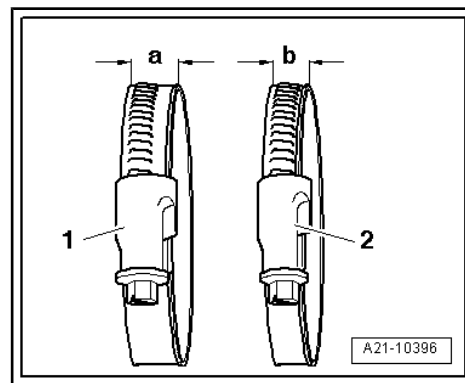


Installing air pipes and hoses with screw-type clips



Note

- ◆ *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.*



Tightening torque for

- 1 - Hose clip -a- = 13 mm wide: 5.5 Nm
- 2 - Hose clip -b- = 9 mm wide: 3.4 Nm

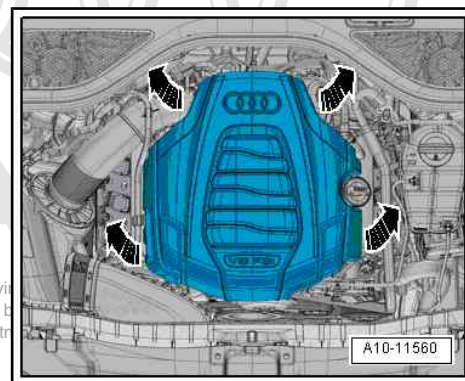
4.2 Removing and installing air filter element

Special tools and workshop equipment required

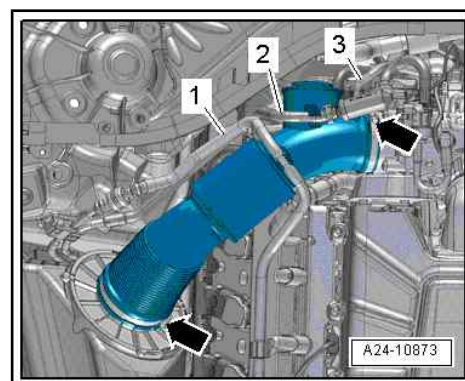
- ◆ Silicone-free lubricant

Removing

- Remove engine cover panel ⇒ Engine, mechanics; Rep. gr. 10 .



- Move fuel hose -1- and hose -2- leading to activated charcoal filter clear at air pipe.
- Detach vacuum hose -3- from connection on air pipe.
- Release hose clips -arrows- and remove air pipe.



- Release catch -1-, turn cover for air cleaner housing in anti-clockwise direction -arrow A- and detach.
- Take out air filter element.

Installing

- Tightening torques
⇒ „4.1 Air cleaner - exploded view“, page 16



Note

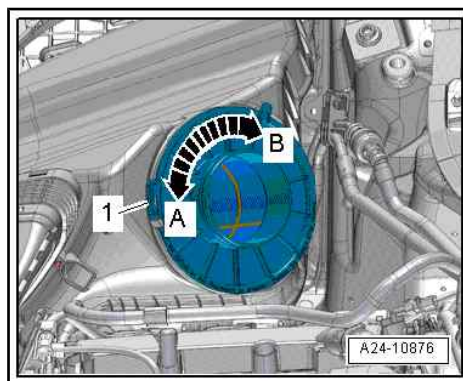
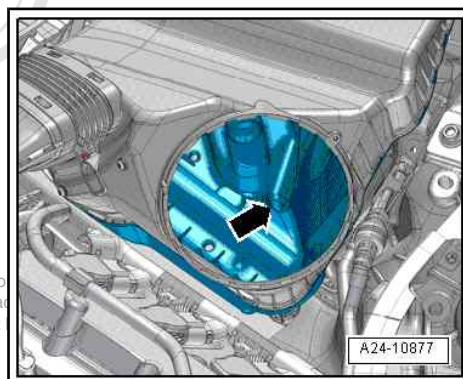
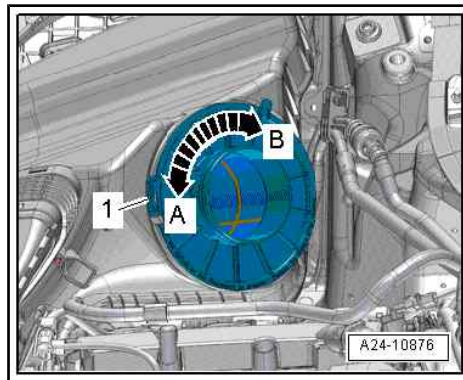
- ◆ Always use genuine part for air filter element.
- ◆ The air cleaner housing MUST be clean.
- ◆ Hose connections and hoses for charge air system must be free of oil and grease before assembly.
- ◆ Use a silicone-free lubricant when installing the air hoses.
- ◆ Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .
- ◆ 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.

- Clean salt residue, dirt and leaves out of air cleaner housing using a vacuum cleaner.
- Blow out water drain -arrow- on air cleaner housing with compressed air.
- Check for dirt and leaves in air duct going from lock carrier to air cleaner housing.

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- When installing air filter element, check that it is properly centred in retainer in air cleaner housing.
- Carefully fit cover on air cleaner housing without using force.
- Turn cover in clockwise direction -arrow B- until catch -1- engages.
- Make sure that air hose is securely fitted on air cleaner housing.

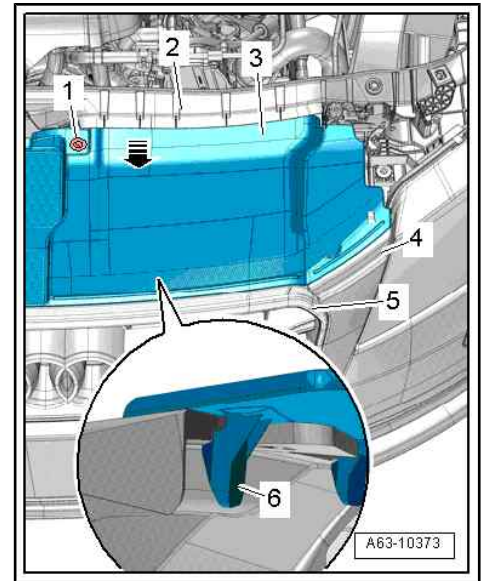
The remaining installation steps are carried out in the reverse sequence.



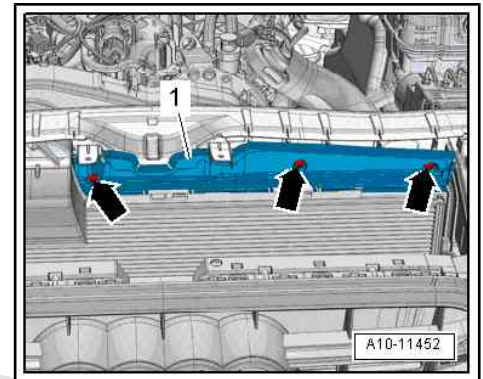
4.3 Removing air cleaner housing

Removing

- Remove lock carrier cover ⇒ General body repairs, exterior;
 Rep. gr. 63 .



- Remove bolts -arrows- and detach air duct -1-.

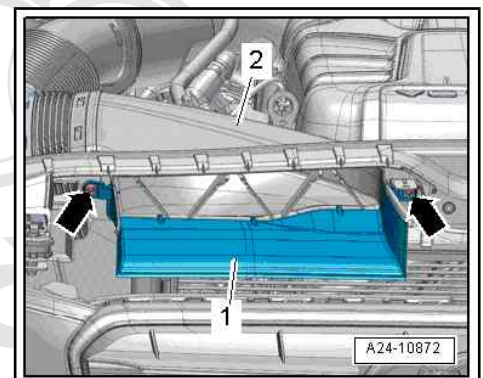


- Remove bolts -arrows- and detach air duct -2-.

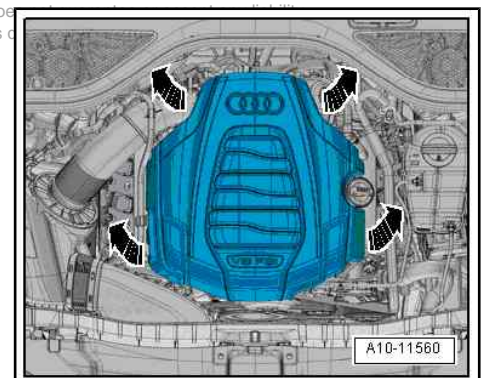


Note

Disregard -item 1-.

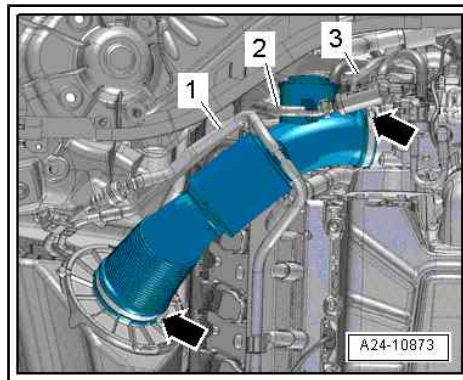


- Remove engine cover panel ⇒ Engine, mechanics; Rep. gr. 10 .



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- Move fuel hose -1- and hose -2- leading to activated charcoal filter clear at air pipe.
- Detach vacuum hose -3- from connection on air pipe.
- Release hose clips -arrows- and remove air pipe.



- Lift off air cleaner housing -1-.
- Press release tabs and disconnect secondary air hose -arrow-.

Installing

- Tightening torque
⇒ „4.1 Air cleaner - exploded view“, page 16

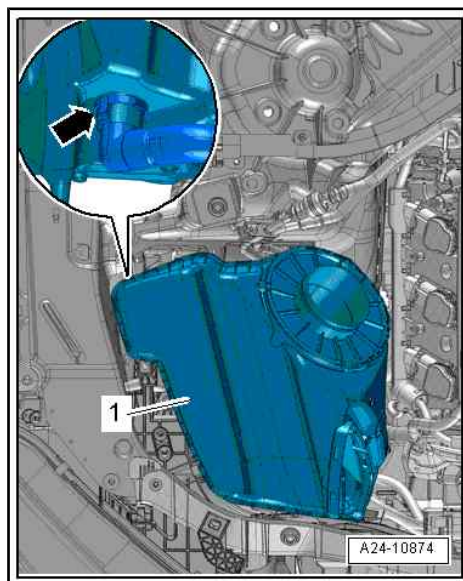


Note

- ◆ *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 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.*

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

- Install lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 .



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5 Intake manifold, fuel rail and injectors

Overview

- ◆ ⇒ „5.1 Intake manifold - exploded view“, page 21
- ◆ ⇒ „5.3 Fuel rail - exploded view“, page 24
- ◆ ⇒ „5.2 Removing and installing intake manifold“, page 22
- ◆ ⇒ „5.4 Removing and installing fuel rail“, page 25
- ◆ ⇒ „5.5 Removing and installing injectors“, page 26
- ◆ ⇒ „5.6 Removing and installing fuel pressure sender G247“, page 30

5.1 Intake manifold - exploded view

1 - Variable intake manifold change-over valve -N156-

2 - Bolt

□ 2.5 Nm

3 - Actuator for intake manifold change-over

4 - Bolt

□ 8 Nm

5 - Intake manifold

□ Removing and installing
 ⇒ page 22

6 - Seal

□ Renew

7 - Bolt

□ 6 Nm

8 - Throttle valve module - J338-

9 - Bolt

□ 3 Nm

10 - Bracket

11 - Bolt

□ 6 Nm

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

13 - O-ring

□ Renew

14 - Bolt

□ 2.5 Nm

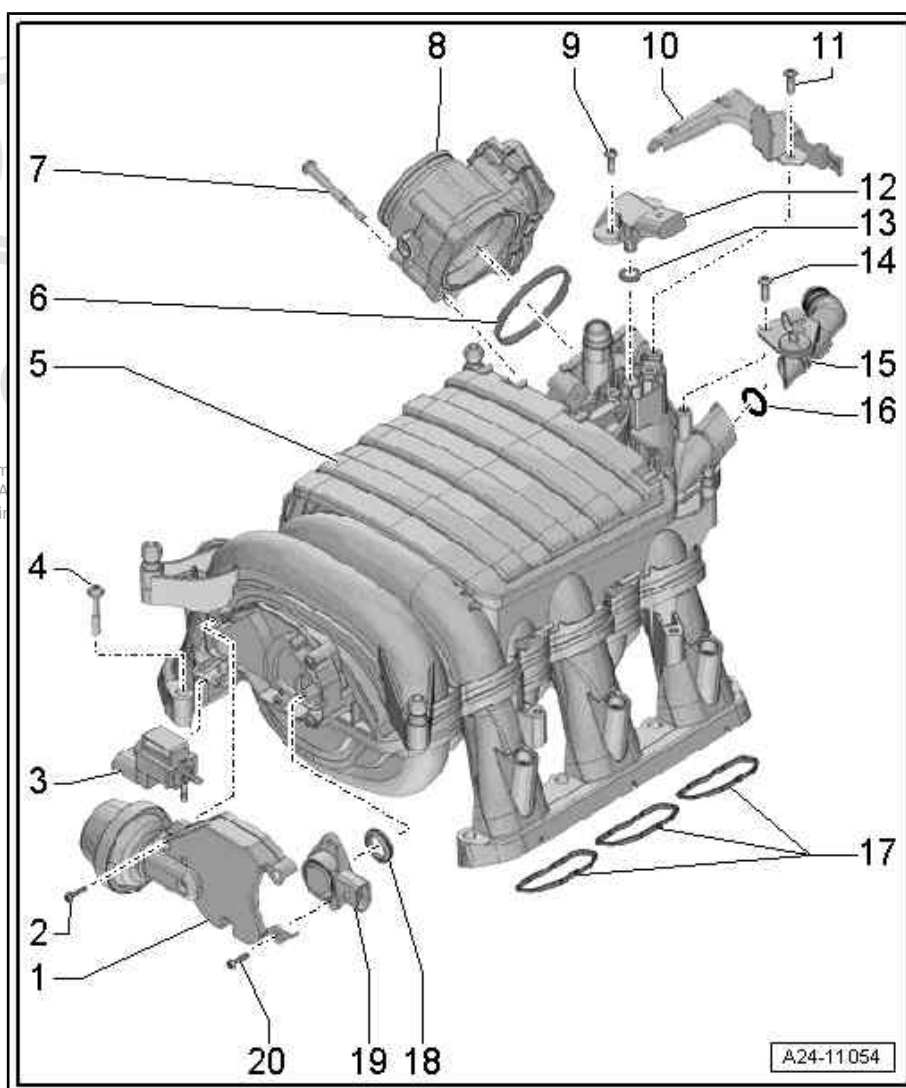
15 - Crankcase breather hose

16 - O-ring

□ Renew

17 - Gaskets

□ Renew



18 - Seal

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

19 - Variable intake manifold position sender -G513-

20 - Bolt

- ☐ 2.5 Nm

5.2 Removing and installing intake manifold

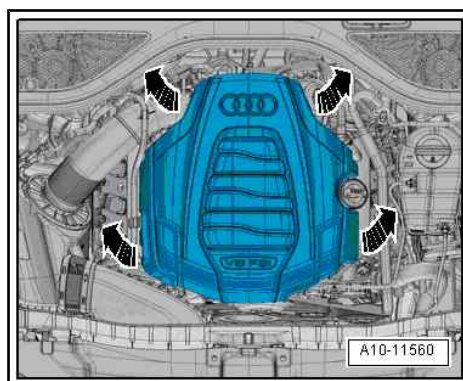
Removing



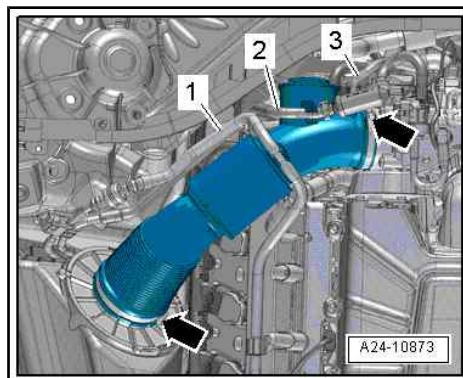
Note

Fit all cable ties in the original positions when installing.

- Remove engine cover panel ► Engine mechanics; Rep. gr. 10.



- Move fuel hose -1- and hose -2- leading to activated charcoal filter clear at air pipe.
- Detach vacuum hose -3- from connection on air pipe.
- Release hose clips -arrows- and remove air pipe.

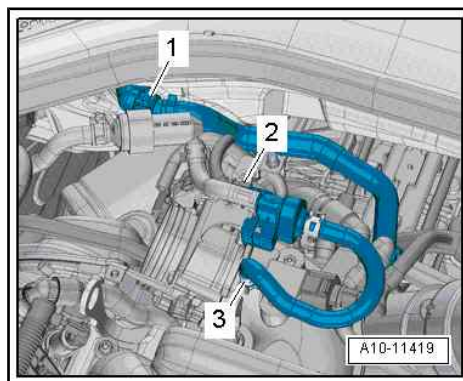


- Unplug electrical connector -2- at activated charcoal filter solenoid valve 1 -N80- and detach vacuum hose -3-.
- Detach activated charcoal filter solenoid valve 1 -N80- from bracket and move it clear to the side with hoses still attached.

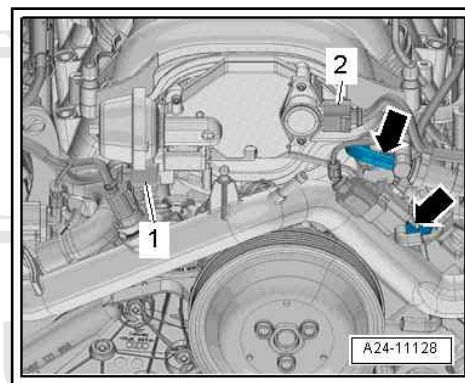


Note

Disregard -item 1-.

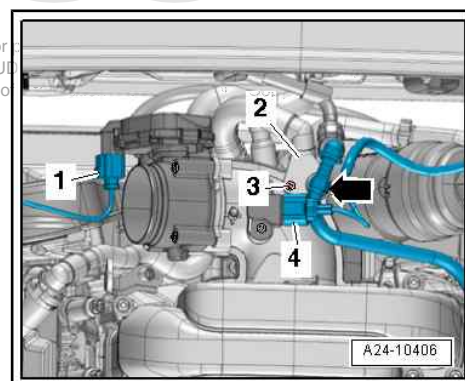


- Unplug electrical connectors at front of intake manifold.
- 1 - Variable intake manifold change-over valve -N156-
- 2 - Variable intake manifold position sender -G513-
- Move clear vacuum hoses -arrows-.



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

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- Remove bolts -arrows- and detach intake manifold.



Caution

Risk of irreparable damage to engine.

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

Installing

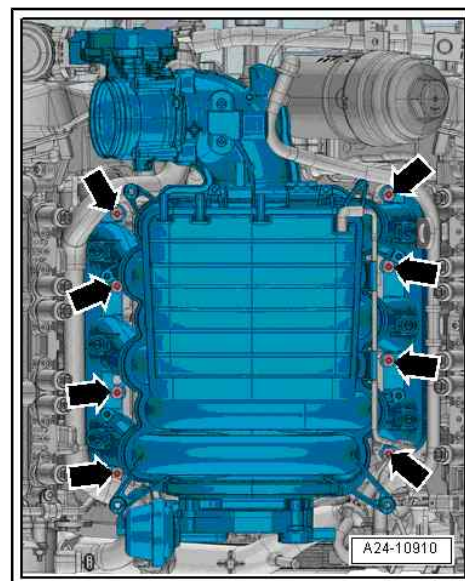
Installation is carried out in the reverse order; note the following:

- Tightening torque
 ⇒ „5.1 Intake manifold - exploded view“, page 21



Note

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



5.3 Fuel rail - exploded view

1 - Fuel pressure sender - G247-

- ☐ Removing and installing
⇒ [page 30](#)
- ☐ 20 Nm

2 - Bracket

3 - Bolts

- ☐ 9 Nm

4 - High-pressure pipe



WARNING

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

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

- ☐ Reducing fuel pressure in high-pressure section of injection system
⇒ [page 4](#)
- ☐ Do not alter shape
- ☐ Do NOT bend open retainer for fuel pipe
- ☐ If retainer has been bent open or fuel pipe has to be renewed, retainer must also be renewed
- ☐ Tightening ⇒ [page 25](#)

5 - Bolt

- ☐ 9 Nm

6 - Union nut

- ☐ Lubricate threads lightly with clean engine oil
- ☐ 25 Nm

7 - Union nut

- ☐ Lubricate threads lightly with clean engine oil
- ☐ 25 Nm

8 - Threaded connection

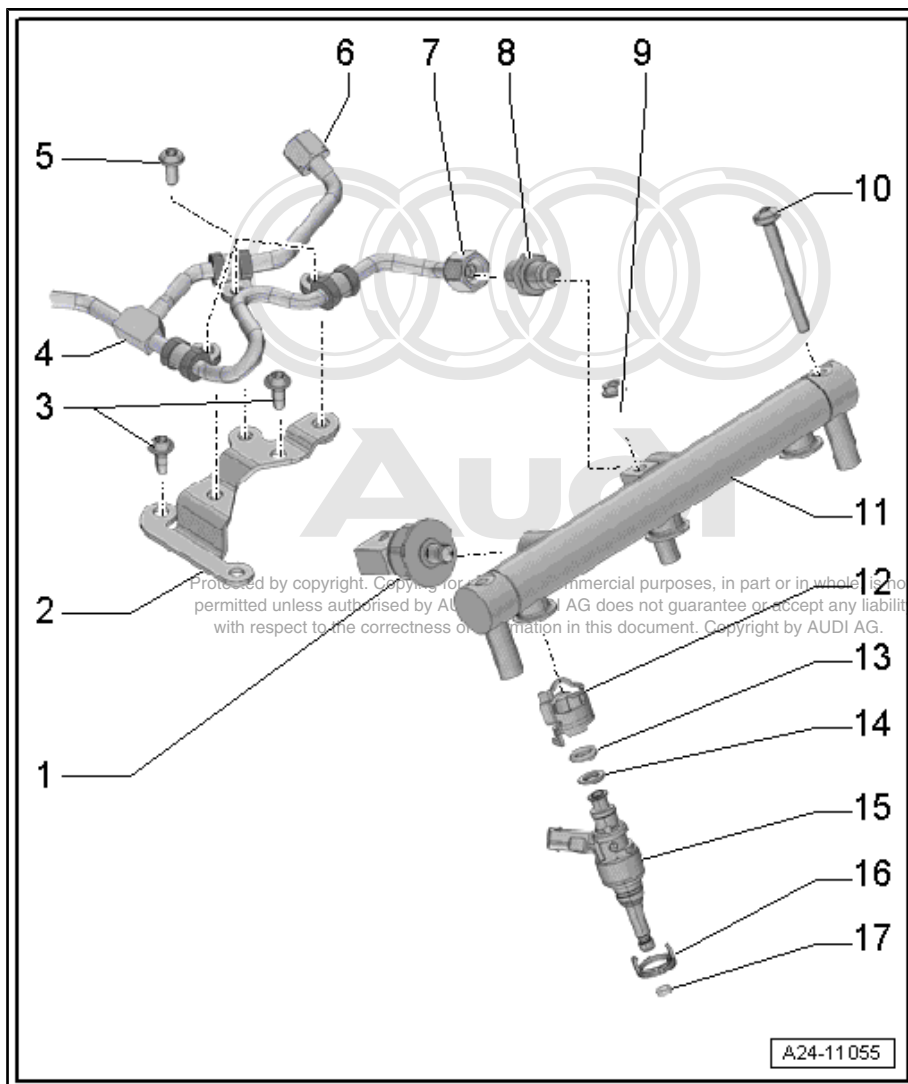
- ☐ 40 Nm

9 - Nut

- ☐ 9 Nm

10 - Bolt

- ☐ 9 Nm



11 - Fuel rail

12 - Support ring

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

13 - O-ring

- ☐ Renew
- ☐ Lubricate lightly with clean engine oil

14 - Spacer ring

- ☐ Renew if damaged

15 - Injector

Removing and installing ⇒ [page 26](#)

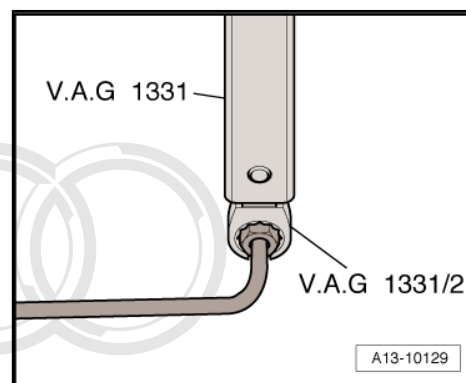
16 - Sealing element

17 - Combustion chamber ring seal

- ☐ Renewing ⇒ „5.5 Removing and installing injectors“, [page 26](#)

Installing high-pressure pipe on fuel rail

- Tighten union nut on high-pressure pipe hand-tight initially.
- Ensure that high-pressure pipe is not under tension.
- To tighten high-pressure pipe on fuel rail, use torque wrench -V.A.G 1331- with tool insert (open-end ring spanner, 17 mm) -V.A.G 1331/2- .
- Tightening torque ⇒ [Item 7 \(page 24\)](#)



5.4 Removing and installing fuel rail

Removing



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The following instructions describe the removal and installation procedures for the fuel rail on the left side. The procedure for the right side is similar.



WARNING

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

- ◆ ***The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening the system ⇒ [page 4](#) .***
- ◆ ***Wrap a clean cloth around the connection and carefully loosen the connection to allow the residual pressure to dissipate.***

- Remove intake manifold ⇒ [page 22](#) .

- Unplug electrical connector at fuel pressure sender -G247- -item 5-.
- Remove union nut -2-.
- Remove bolts -1, 4 and 6- and nut -3- and detach fuel rail.

Installing

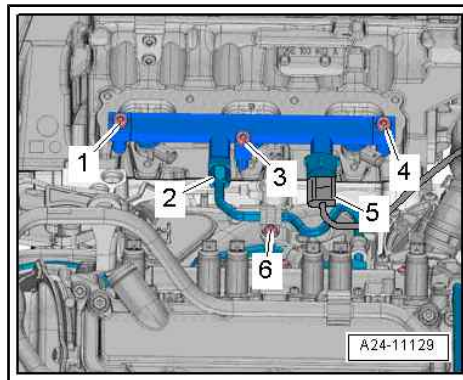
Installation is carried out in the reverse order; note the following:

- Tightening torque ⇒ „5.3 Fuel rail - exploded view“, page 24



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.*
- Press fuel rail evenly onto injectors.
- Fit high-pressure pipe on fuel rail ⇒ [page 33](#) .
- Install intake manifold ⇒ [page 22](#) .



5.5 Removing and installing injectors

Special tools and workshop equipment required

- ◆ Tool set for FSI engines -T10133-



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Removing



WARNING

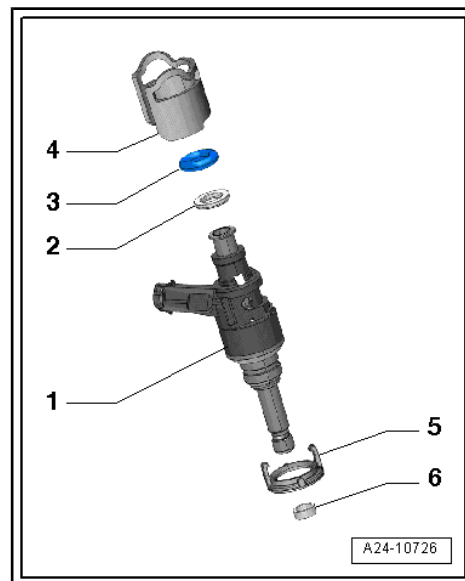
The fuel system operates at extremely high pressure. This can cause injury.

- ◆ *The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening the system ⇒ [page 4](#) .*
- ◆ *Wrap a clean cloth around the connection and carefully loosen the connection to allow the residual pressure to dissipate.*

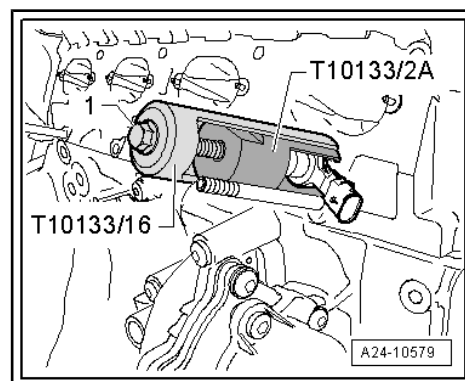
- Remove intake manifold ⇒ [page 22](#) .
- Remove fuel rail ⇒ [page 25](#) .

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

- Pull support ring -4- off injector -1-.



- 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 combustion chamber ring seal using knife or prise open with small screwdriver and then pull off forwards.



Note

Take care not to damage groove on injector. The injector must be renewed if the groove is damaged.

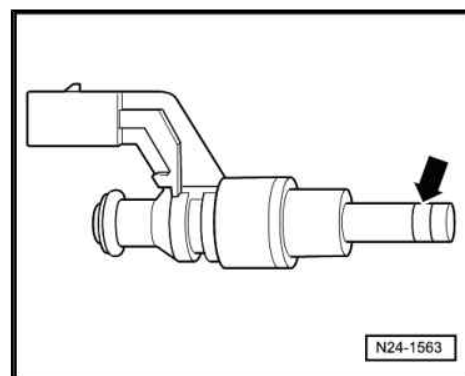
Installing



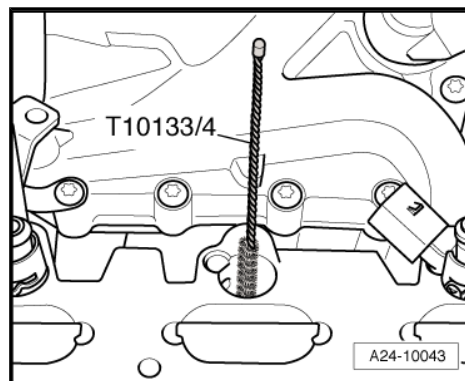
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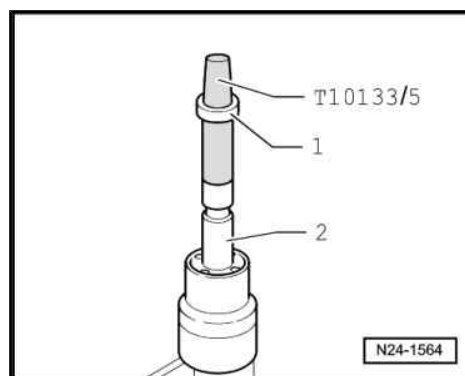
- ◆ *Renew combustion chamber ring seals and O-rings.*
- ◆ *Renew spacer ring and radial compensation element if damaged.*
- ◆ *Lightly lubricate O-rings for injectors with clean engine oil.*
- ◆ *The injector pipes must be re-installed on the same cylinders.*



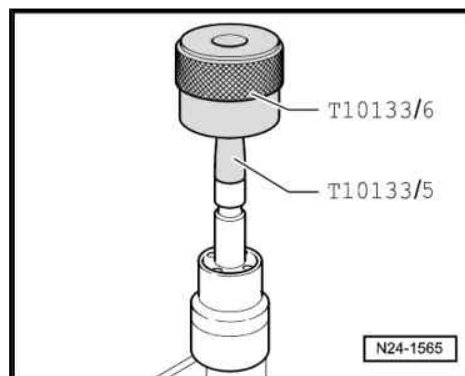
- Clean bore in cylinder head with nylon cylinder brush - T10133/4- .
- When re-installing an injector, clean any combustion residue off groove for combustion chamber ring seal and injector stem with a clean cloth.



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



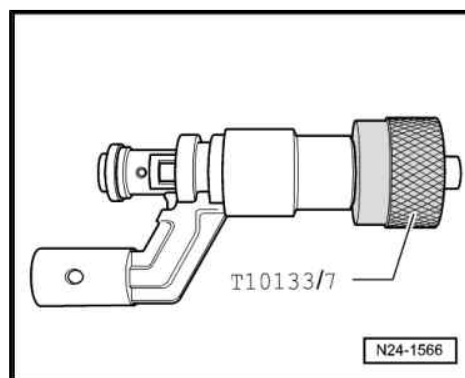
- Using assembly sleeve -T10133/6- , push combustion chamber ring seal onto assembly cone -T10133/5- as far as it will go.
- Turn round assembly sleeve -T10133/6- and slide combustion chamber ring seal into groove.



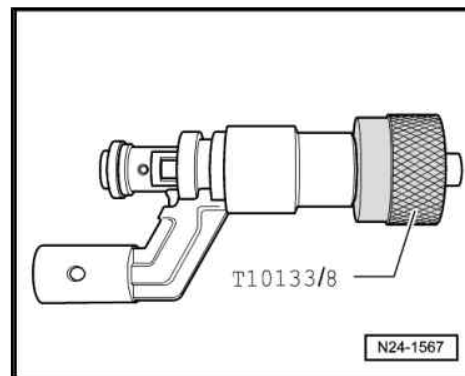
Note

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

- Push calibration sleeve -T10133/7- onto injector as far as it will go and simultaneously turn it slightly (approx. 180°).
- Pull calibration sleeve -T10133/7- off again by turning it in the opposite direction.



- Push calibration sleeve -T10133/8- onto injector as far as it will go and simultaneously turn it slightly (approx. 180°).
- Pull calibration sleeve -T10133/8- off again by turning it in the opposite direction.



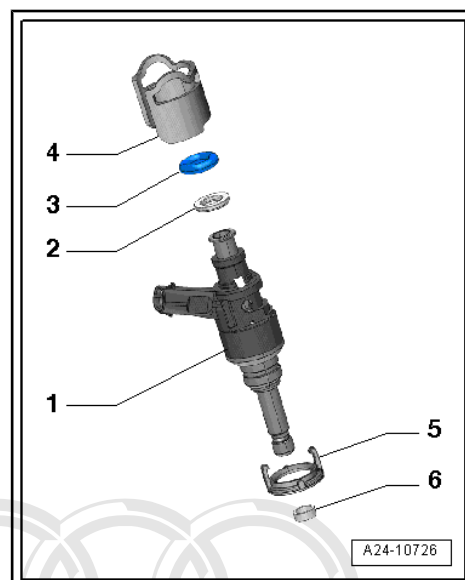
- Fit parts from repair kit onto injector -1-:
- 2 - Spacer ring
 - 3 - O-ring
 - 4 - Support ring
 - 5 - Sealing element
- To make it easier to install injector in fuel rail, lubricate new O-ring lightly with clean engine oil before installing it.



Note

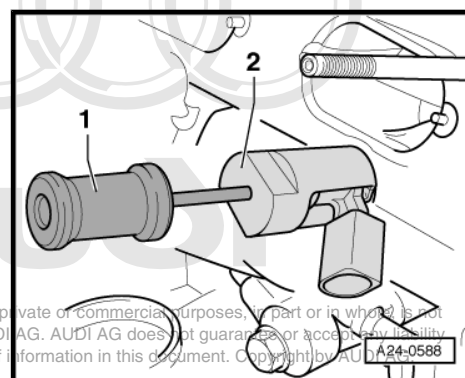
The combustion chamber ring seal -6- must not be lubricated.

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



Note

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

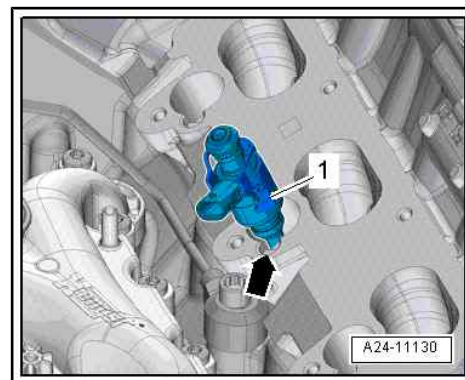


Installation position of support ring:

- Lug -1- on support ring must engage in recess -arrow- in cylinder head.

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

- Install fuel rail ➤ [page 25](#) .
- Install intake manifold ➤ [page 22](#) .



5.6 Removing and installing fuel pressure sender -G247-

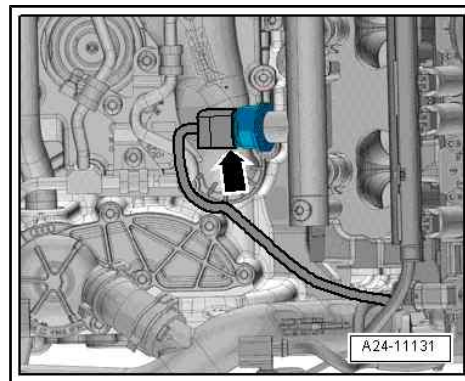
Removing

- Remove intake manifold ⇒ [page 22](#) .
- Unplug electrical connector -arrow-.
- Unscrew fuel pressure sender -G247- .

Installing

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

- Tightening torque ⇒ „5.3 Fuel rail - exploded view“, [page 24](#)
- Install intake manifold ⇒ [page 22](#) .



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6 High-pressure pump

Overview

- ◆ ⇒ „6.1 High-pressure pump - exploded view“, page 31
- ◆ ⇒ „6.2 Removing and installing high-pressure pipes“, page 33
- ◆ ⇒ „6.3 Removing and installing high-pressure pump“, page 34

6.1 High-pressure pump - exploded view

1 - Fuel pressure sender for low pressure -G410-

- ☐ 15 Nm

2 - Not fitted

3 - Bolt

- ☐ Tightening torque and sequence ⇒ page 32

4 - High-pressure pump

- ☐ With fuel metering valve -N290-
- ☐ Removing and installing ⇒ page 34
- ☐ Do not dismantle

5 - Threaded connection

- ☐ Connections must not be damaged
- ☐ 27 Nm

6 - Fuel supply hose

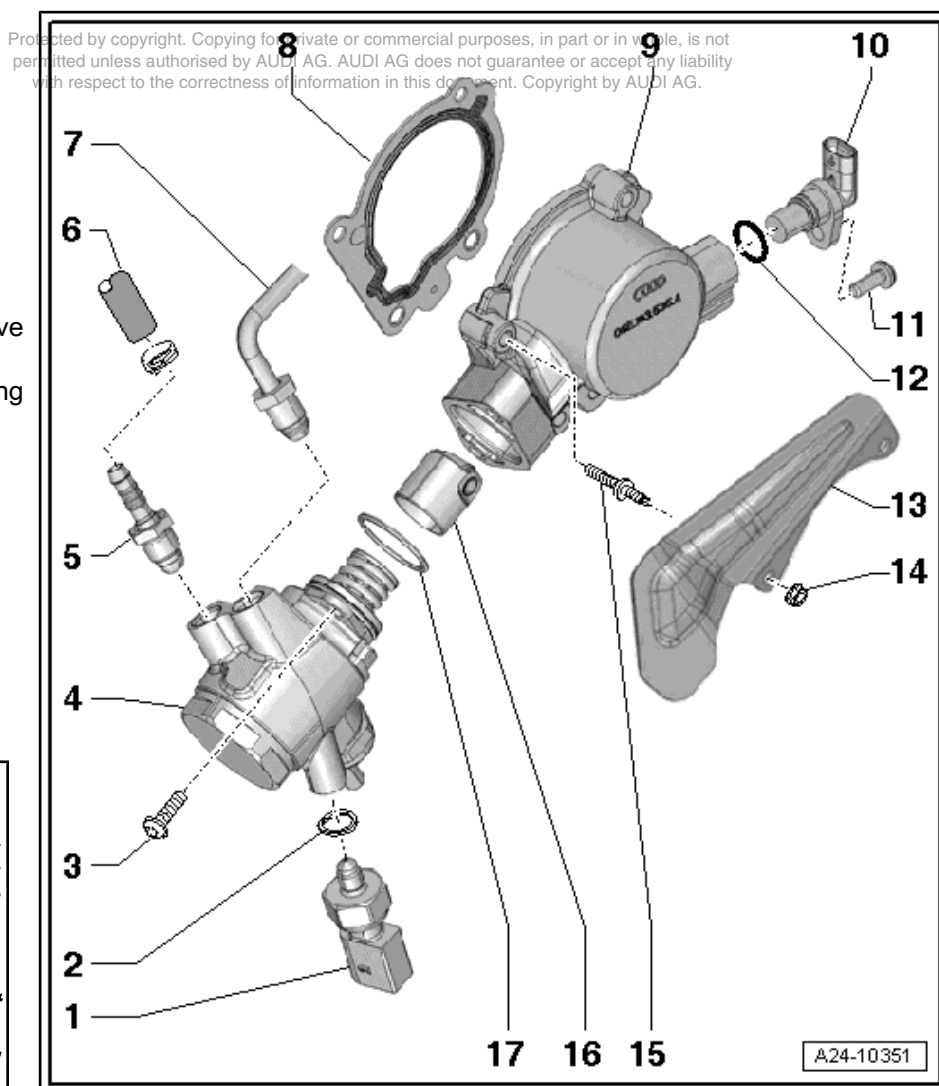
- ☐ Low-pressure section

7 - High-pressure pipe



WARNING

*The fuel system operates at extremely high pressure. This can cause injury.
The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening the system.*



- ☐ Reducing fuel pressure in high-pressure section of injection system ⇒ page 4
- ☐ Removing and installing ⇒ page 33
- ☐ Do not alter shape
- ☐ Check for damage before re-installing
- ☐ Lubricate thread of union nut with clean engine oil
- ☐ Tightening torque ⇒ page 33

8 - Gasket

- ☐ Renew



9 - Housing

10 - Hall sender -G40-

- ❑ Removing and installing ⇒ [page 59](#)

11 - Bolt

- ❑ 9 Nm

12 - O-ring

- ❑ Renew

13 - Protective plate

- ❑ For high-pressure pipe

14 - Nut

- ❑ 9 Nm

15 - Threaded pin

- ❑ 9 Nm

16 - Roller tappet

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

17 - O-ring

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

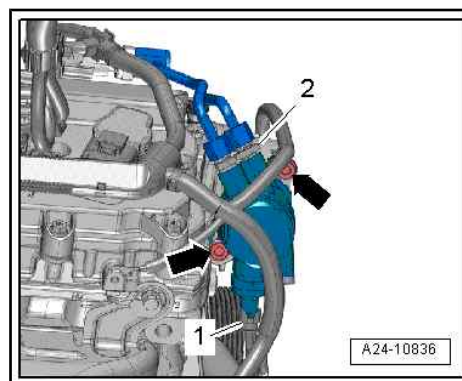


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High-pressure pump - tightening torque and sequence

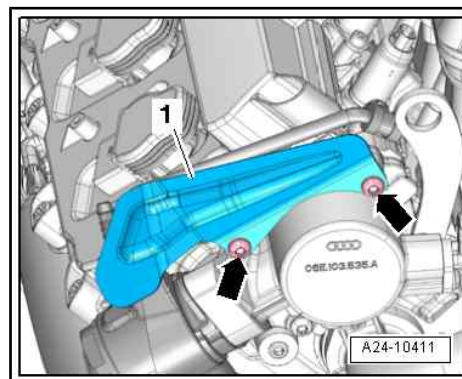
- Tighten bolts in 2 stages as follows:

Stage	Bolts	Tightening torque
1.	-arrows-	Screw in bolts by hand until they make contact
2.	-arrows-	Tighten in stages; final torque 20 Nm



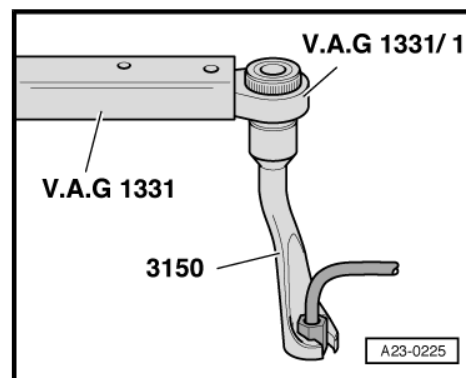
Guard plate for high-pressure pipe - tightening torque

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



Installing high-pressure pipe at high-pressure pump

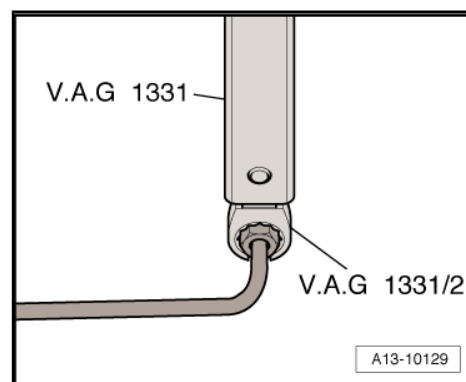
- Tighten union nut on high-pressure pipe hand-tight initially.
- Ensure that high-pressure pipe is not under tension.
- To tighten union of high-pressure pipe at high-pressure pump, use torque wrench -V.A.G 1331- with ratchet -V.A.G 1331/1- and socket, 14 mm -3150- .
- Tightening torque: 25 Nm.



6.2 Removing and installing high-pressure pipes

Special tools and workshop equipment required

- ◆ Torque wrench -V.A.G 1331-



- ◆ Tool inserts -V.A.G 1331/2-

Procedure



Note

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

- Lubricate threads of union nuts with clean engine oil.
- Hand-tighten union nuts on high-pressure pipes (ensure that pipes are not under tension).
- To tighten high-pressure pipe on fuel rail, use torque wrench -V.A.G 1331- with open-end ring spanner (tool insert -V.A.G 1331/2-).

- Tightening torques

⇒ Fig. "Installing high-pressure pipe at high-pressure pump" [page 33](#)

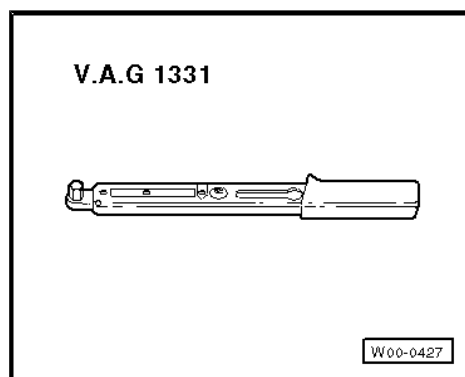
- Do not install retaining tabs until high-pressure pipes have been tightened.
- Check fuel system for leaks ⇒ [page 5](#) .

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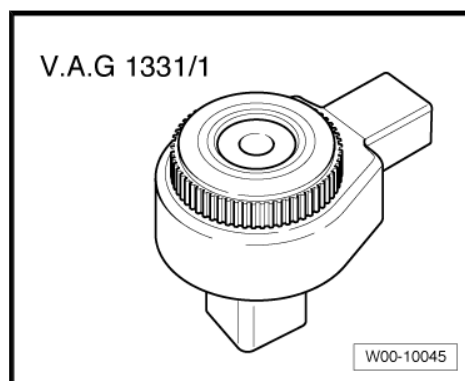
6.3 Removing and installing high-pressure pump

Special tools and workshop equipment required

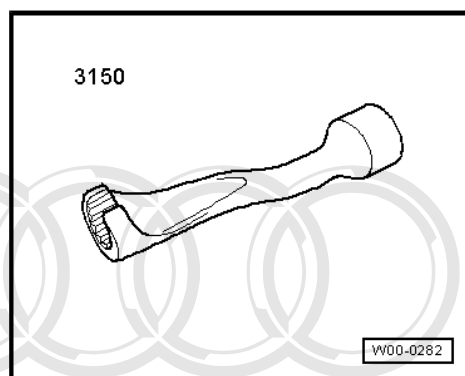
- ◆ Torque wrench -V.A.G 1331-



- ◆ Ratchet -V.A.G 1331/1-



- ◆ Socket SW 14 -3150- or flared ring spanner tool insert AF 14 -V.A.G 1331/8-



- ◆ Wrench -T40263-

- ◆ Adapter -T40272-

Removing



WARNING

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

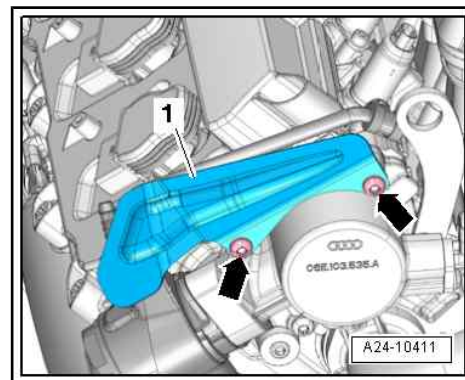
- ◆ *The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening the system ➔ [page 4](#) .*
- ◆ *Wrap a clean cloth around the connection and carefully loosen the connection to allow the residual pressure to dissipate.*

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Note

- ◆ *The high-pressure pump should only be removed and installed when the engine is cold.*
- ◆ *When installing the high-pressure fuel pump, it is essential to ensure that no dirt enters the fuel system.*
- ◆ *Use a cloth to catch escaping fuel.*
- ◆ *The O-ring must always be renewed.*
- Reduce fuel pressure in high-pressure section of injection system ➔ [page 4](#) .
- Remove air cleaner housing ➔ [page 19](#) .
- Unscrew nuts -arrows- and remove guard plate -1-.

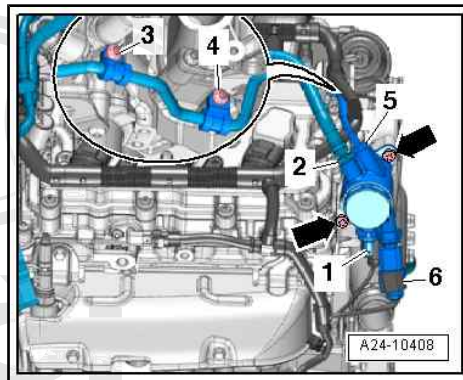


- Unplug electrical connectors -1- and -6-.
- Remove bolt -3- on retaining clip.
- Unscrew connections -2- and -5-.
- Remove bolts -arrows-.
- Carefully pull out high-pressure pump. It is possible that the roller tappet may remain lodged inside.



Note

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



- Pull roller tappet -1- out of housing.

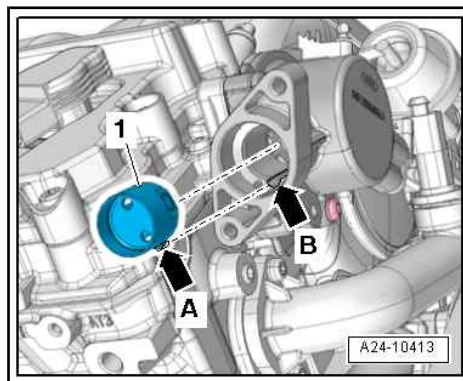
Installing

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



Note

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

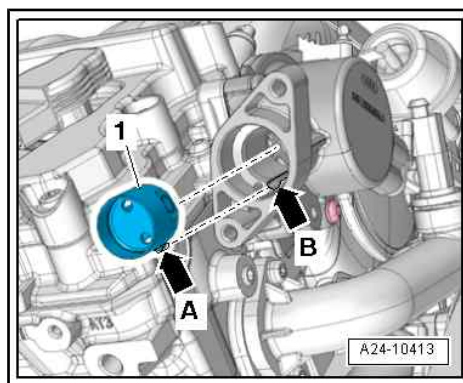


- Renew O-ring for high-pressure pump.
- Check roller tappet -1- for damage and renew if necessary.
- Lightly lubricate roller tappet with oil and insert it so that lug -arrow A- slides into guide notch -arrow B-.

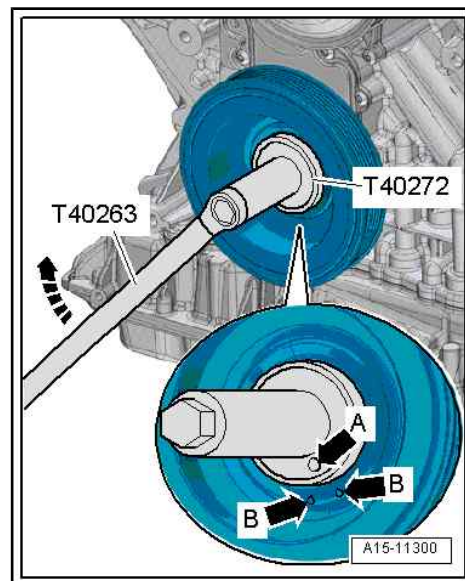


Note

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



- Fit adapter -T40272- onto wrench -T40263- .
- Position adapter on bolts of vibration damper.
- Hole -arrow A- on adapter -T40272- must be positioned between markings -arrow B- on vibration damper.
- Rotate crankshaft in direction of normal engine rotation -arrow- using wrench -T40263- and adapter -T40272- , and at the same time press roller tappet into housing until it reaches lowest point.
- Only lift high-pressure pipe slightly to fit high-pressure pump.
- Insert high-pressure pump into housing.
- Press high-pressure pump down by hand as far as possible onto stop.



- Hand-tighten the bolts -arrows- as far as the flange.
- Then initially tighten securing bolts alternately to 5 Nm (do not tilt high-pressure pump).

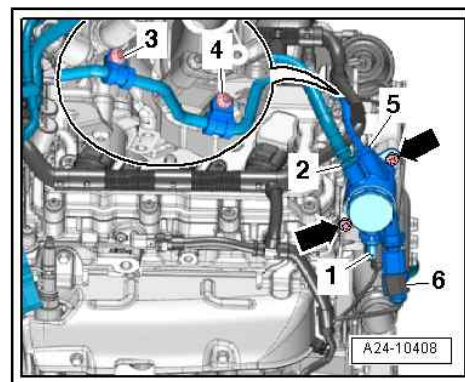
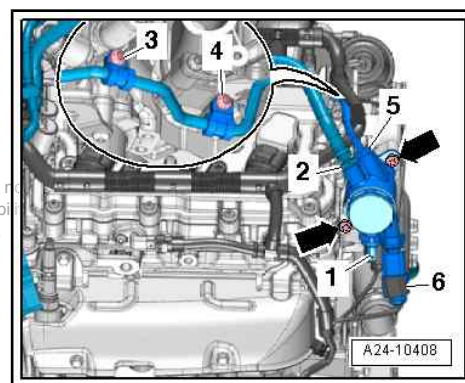


Note

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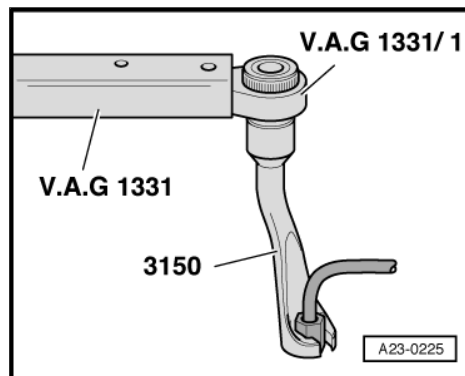
The high-pressure pump can be damaged if it is tightened too much on one side (keep it straight).

- Final tightening torque for securing bolts
 ➤ „6.1 High-pressure pump - exploded view“, page 31
- Tighten union nut -5- on fuel supply line hand-tight. Align so that parts are free of tension.
- Connect fuel supply hose -2- again.
- Tighten bolts -3- and -4- on retaining clips.
- Plug in electrical connectors -1- and -6-.

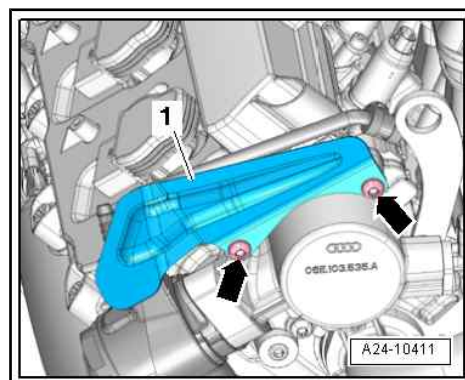




- Tighten high-pressure pipe to specified torque ⇒ [page 33](#) .



- Install guard plate -1-.
- Install air cleaner housing ⇒ [page 19](#) .
- Check fuel system for leaks ⇒ [page 5](#) .



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7 Lambda probes

Overview

- ◆ ⇒ „7.1 Lambda probes - overview“, page 39
- ◆ ⇒ „7.2 Removing and installing Lambda probes“, page 40

7.1 Lambda probes - overview



Note

- ◆ *New Lambda probes are coated with an assembly paste.*
- ◆ *In the case of a used Lambda probe, coat only the thread with high-temperature paste; refer to ⇒ [Electronic parts catalogue](#) for high-temperature paste.*
- ◆ *The assembly paste / high-temperature paste must not make contact with the slots on the Lambda probe body.*

1 - Lambda probe -G39-

- ☐ With Lambda probe heater -Z19-
- ☐ Removing and installing ⇒ [page 40](#)
- ☐ 55 Nm

2 - Lambda probe after catalytic converter -G130-

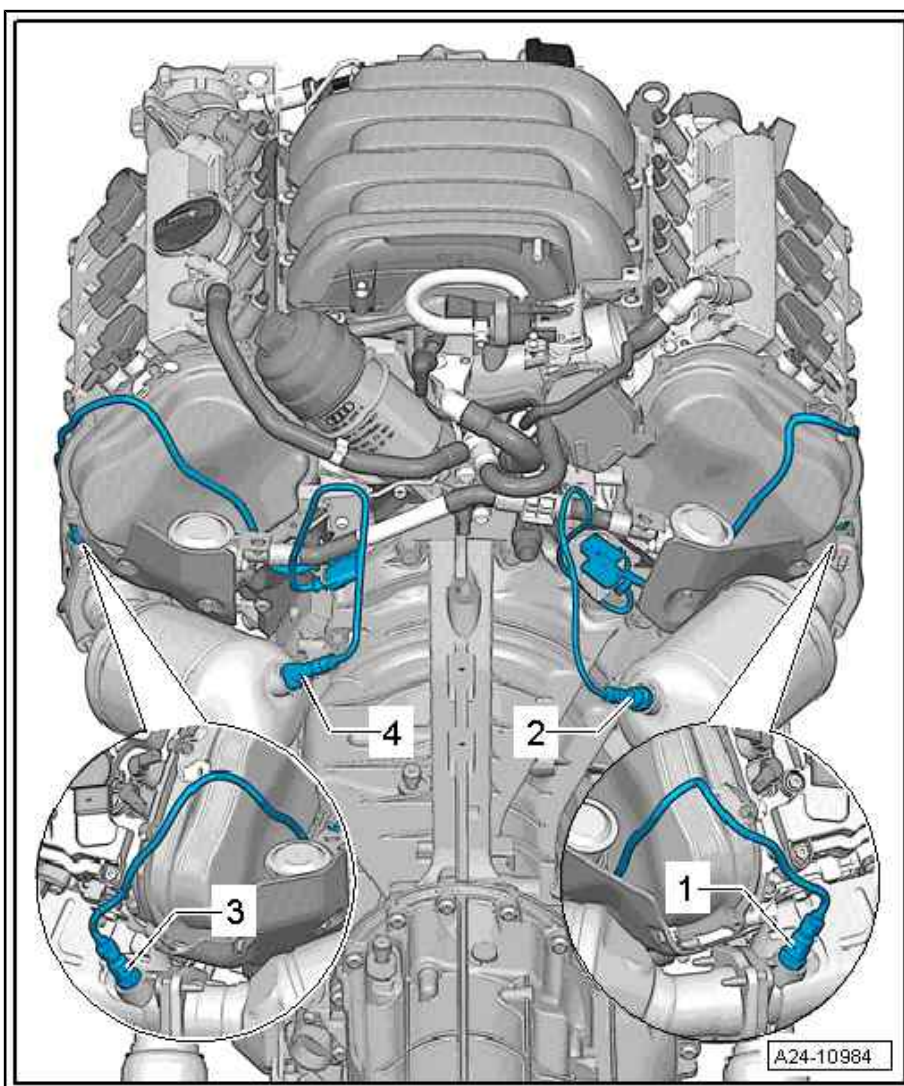
- ☐ With Lambda probe 1 heater after catalytic converter -Z29-
- ☐ Removing and installing ⇒ [page 41](#)
- ☐ 55 Nm

3 - Lambda probe 2 -G108-

- ☐ With Lambda probe heater 2 -Z28-
- ☐ Removing and installing ⇒ [page 43](#)
- ☐ 55 Nm

4 - Lambda probe 2 after catalytic converter -G131-

- ☐ With Lambda probe 2 heater after catalytic converter -Z30-
- ☐ Removing and installing ⇒ [page 43](#)
- ☐ 55 Nm



7.2 Removing and installing Lambda probes

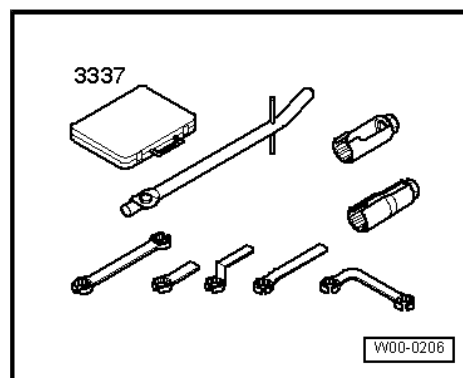
Overview

- ◆ ⇒ „7.2.1 Removing and installing Lambda probe G39 - bank 1 (right-side)“, page 40
- ◆ ⇒ „7.2.2 Removing and installing Lambda probe after catalytic converter G130 - bank 1 (right-side)“, page 41
- ◆ ⇒ „7.2.3 Removing and installing Lambda probe 2 G108 before catalytic converter - bank 2 (left-side)“, page 43
- ◆ ⇒ „7.2.4 Removing and installing Lambda probe 2 after catalytic converter G131 - bank 2 (left-side)“, page 45

7.2.1 Removing and installing Lambda probe -G39- - bank 1 (right-side)

Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set -3337-



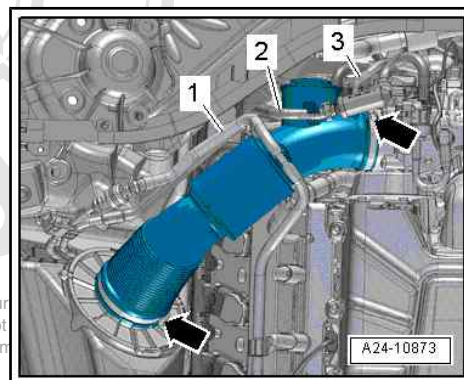
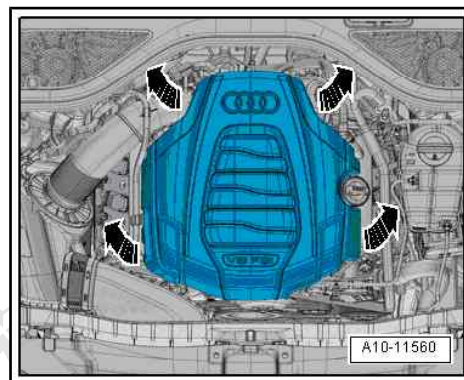
Removing



Note

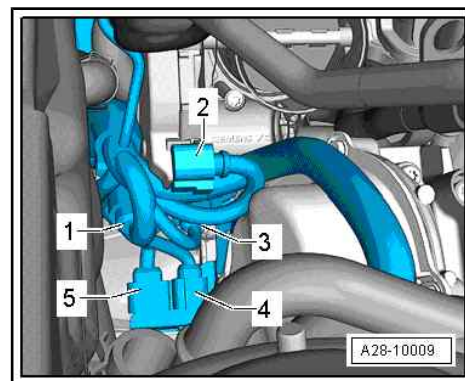
Fit all cable ties in the original positions when installing.

- Remove engine cover panel ⇒ Engine, mechanics; Rep. gr. 10 .
- Move fuel hose -1- and hose -2- from activated charcoal filter clear at air pipe.
- Detach vacuum hose -3- from connection on air pipe.
- Release hose clips -arrows- and remove air pipe.



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



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



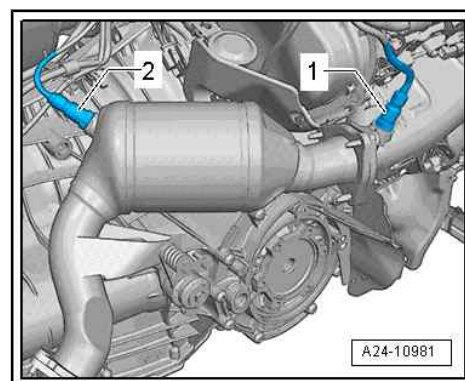
Note

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

Installing

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

- Tightening torque
 ⇒ [„7.1 Lambda probes - overview“, page 39](#)



Note

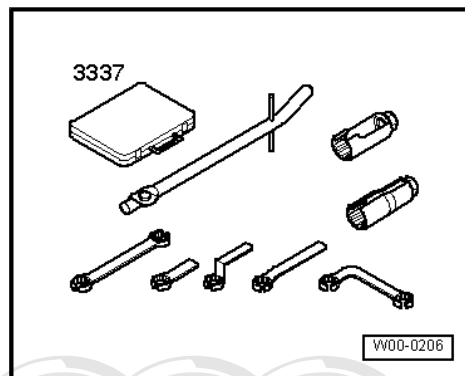
- ◆ *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- ◆ *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. High-temperature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

- Install air cleaner housing ⇒ [page 19](#) .

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

Special tools and workshop equipment required

♦ Lambda probe open ring spanner set -3337-



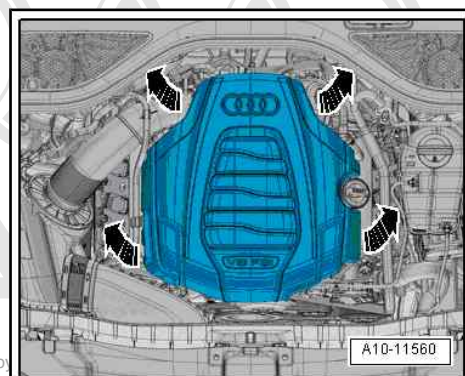
Removing



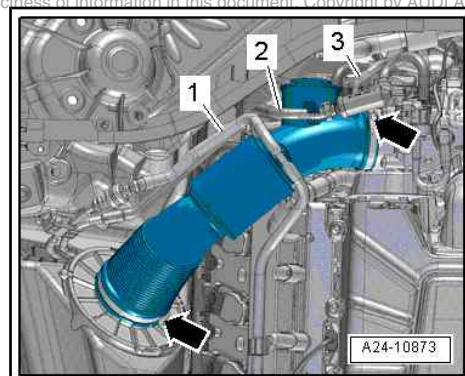
Note

Fit all cable ties in the original positions when installing.

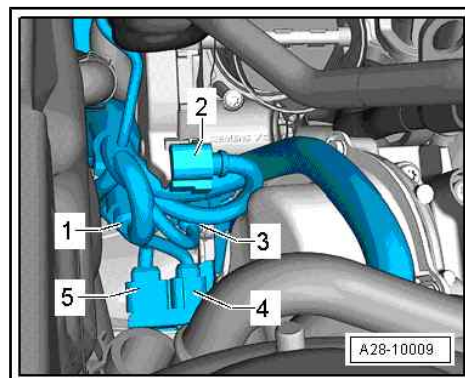
- Remove engine cover panel ⇒ Engine, mechanics; Rep. gr. 10 .



- Move fuel hose -1- and hose -2- leading to activated charcoal filter clear at air pipe.
- Detach vacuum hose -3- from connection on air pipe.
- Release hose clips -arrows- and remove air pipe.



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



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

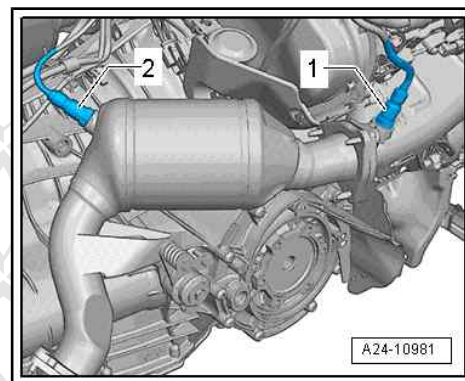
i Note

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

Installing

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

- Tightening torque
 ⇒ „7.1 Lambda probes - overview“, page 39



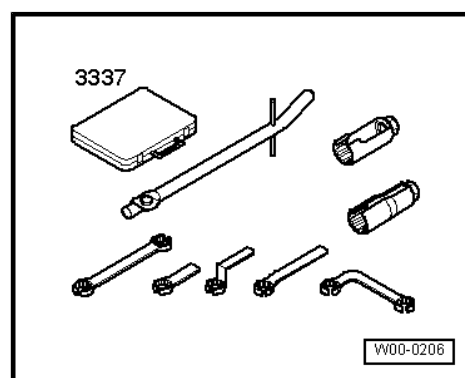
i Note

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

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

Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set -3337-

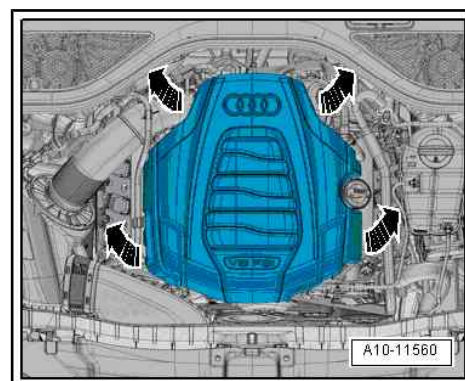


Removing

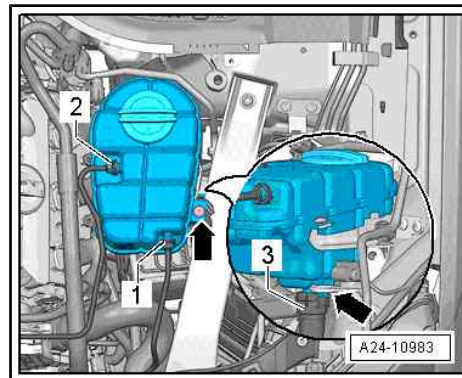
i Note

Fit all cable ties in the original positions when installing.

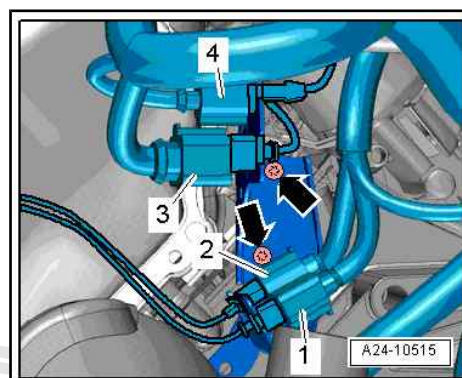
- Remove engine cover panel ⇒ Engine, mechanics; Rep. gr. 10 .



- Unbolt coolant expansion tank -arrows-.
- Unplug electrical connector for coolant shortage indicator switch -F66- at bottom of expansion tank and move expansion tank to one side with coolant hoses -1, 2 and 3- attached.



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



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

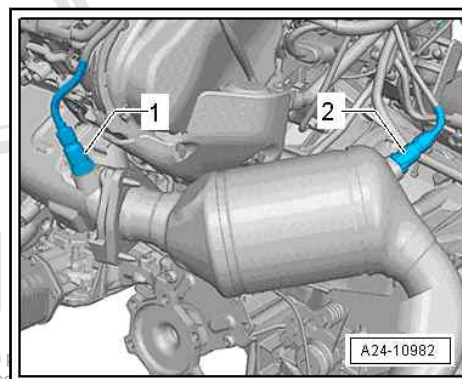
Note

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

Installing

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

- Tightening torque Protected by copyright. Copying for private or commercial purposes, in permitted unless authorised by AUDI AG. AUDI AG does not guarantee the accuracy of the information in this document. Copyright by AUDI AG.
⇒ „7.1 Lambda probes overview“, page 39



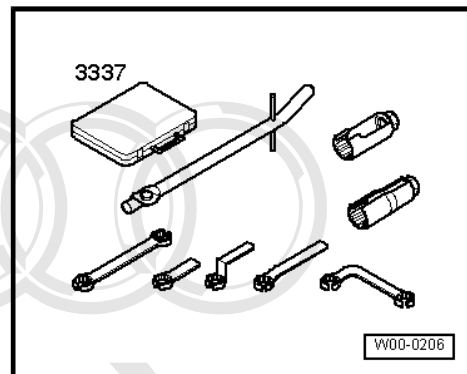
Note

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

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

Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set -3337-



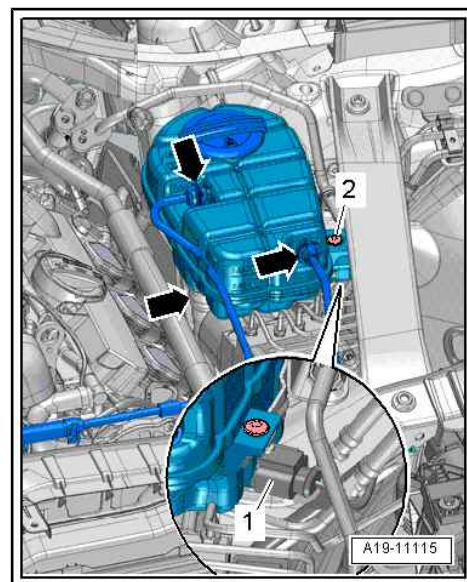
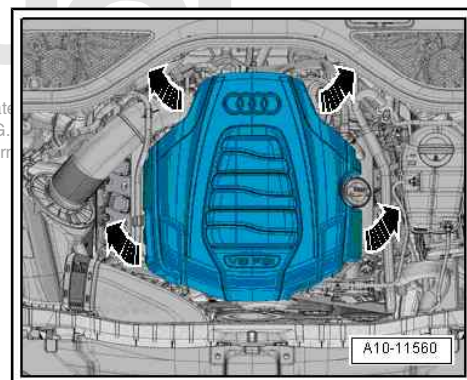
Removing



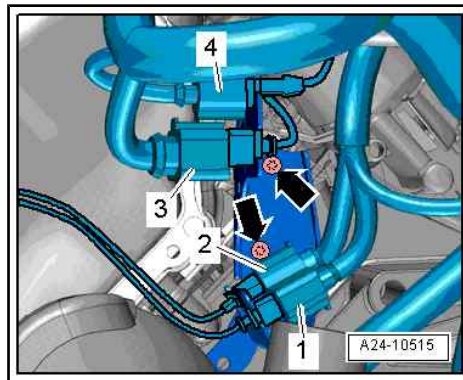
Note

Fit all cable ties in the original positions when installing.

- Remove engine cover panel ⇒ Engine, mechanics; Rep. gr. 10 .
- Unplug electrical connector -1-.
- Remove bolt -2-.
- Move coolant expansion tank to side (coolant hoses -arrows- remain connected).



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



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



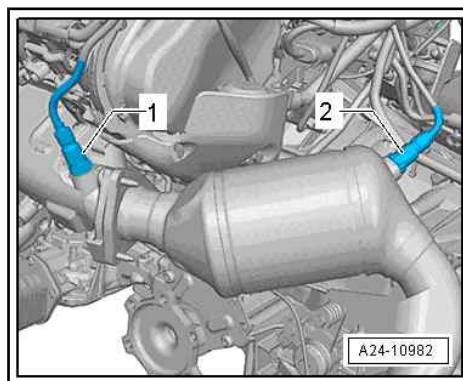
Note

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

Installing

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

- Tightening torque
⇒ „7.1 Lambda probes - overview“, page 39



Note

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

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8 Engine control unit

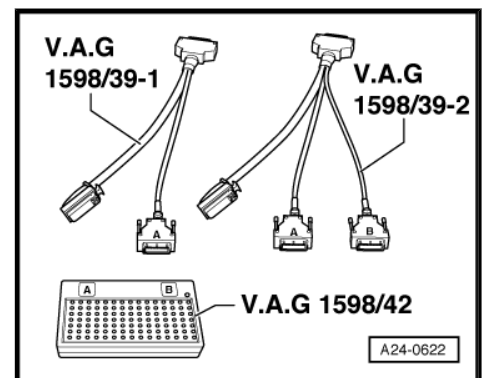
Overview

- ◆ ➤ „8.1 Wiring and component check with test box V.A.G 1598/42“, page 47
- ◆ ➤ „8.2 Removing and installing engine control unit J623“, page 49

8.1 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-

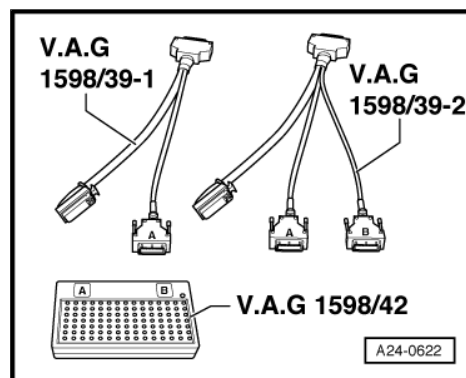


- ◆ Vehicle diagnostic tester



Note

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



Caution

Electronic components are susceptible to damage.

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

- Remove engine control unit -J623- ➔ [page 49](#)
- Connect test box -V.A.G 1598/42- to wiring harness connector. The earth clip on the test box must be connected to the negative battery terminal. The instructions for performing the individual tests indicate whether or not the engine control unit -J623- itself also needs to be connected to the test box.
- Carry out test as described in appropriate repair procedures.

Installing engine control unit

Installation is performed in the reverse sequence.

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



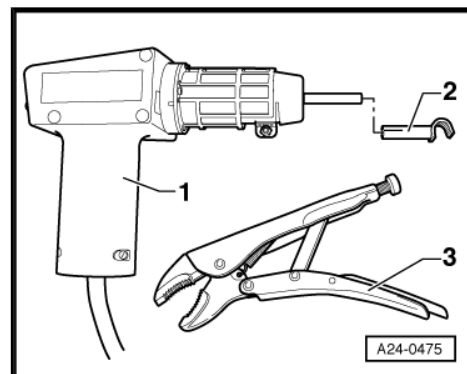
Note

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

8.2 Removing and installing engine control unit -J623-

Special tools and workshop equipment required

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

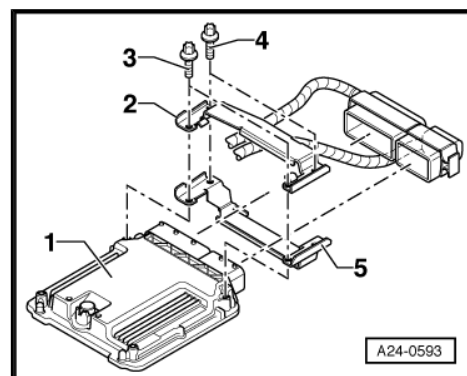


- ◆ Small, commercially available mole grips -3-



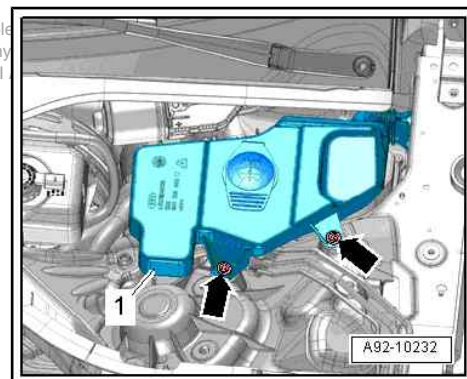
Note

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



Removing

- When renewing engine control unit, select diagnosis object „Replace engine control unit“ in „Guided Functions“ mode of vehicle diagnostic tester.
- Switch off ignition and remove ignition key.
- Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 .
- Unscrew bolts -arrows- and pull filler neck out of washer fluid reservoir and through opening in body to right side.



- Release catch -arrow- and detach engine control unit -J623- -item 1-.



Note

Disregard -item 2-.

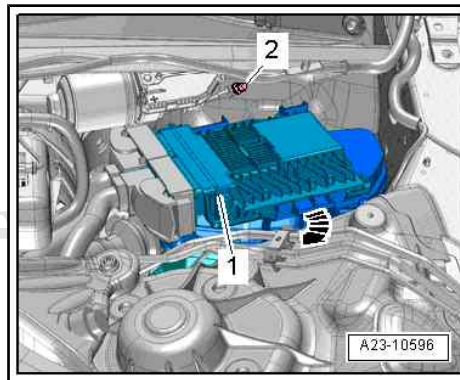
Perform the following work steps if a protective housing is fitted:



Caution

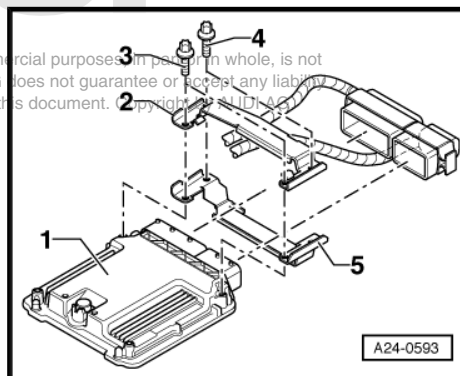
Wiring, connectors, insulation and control units can be burnt and damaged.

- ◆ *Keep exactly to the following procedure. Observe the instructions for operating the hot air blower.*

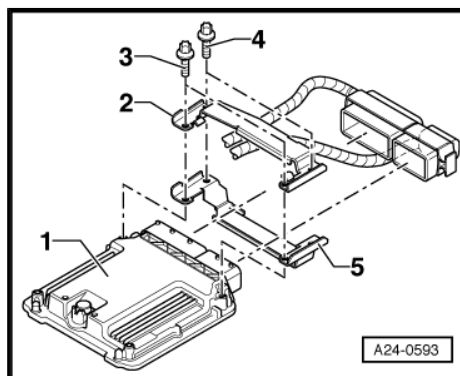


To help prevent unauthorised access to the connectors on the engine control unit, the engine control unit -1- is bolted to a protective housing -5- by means of shear bolts -3 and 4- and a locking plate -2-.

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



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

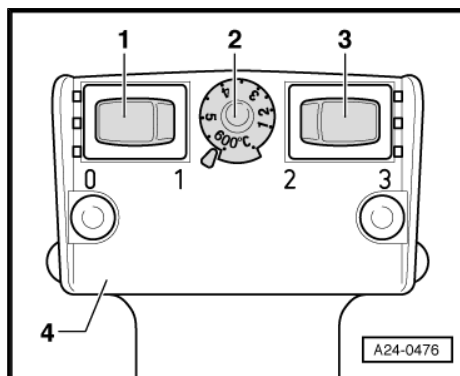


- Select settings on hot air blower as shown in illustration, i.e. set temperature potentiometer -2- to maximum heat output and two-stage air flow switch -3- to position 3.

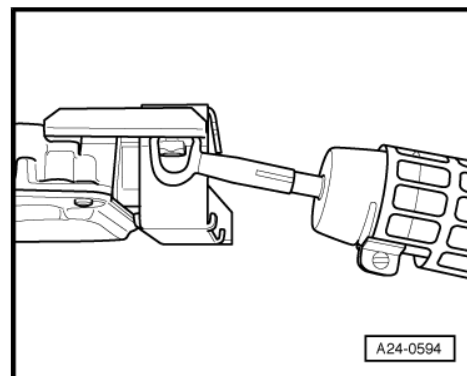


WARNING

The shear bolts and protective housing also become very hot when heating the threads of the locking mechanism. Take care to avoid burns. It is also important to ensure that only the thread is heated and none of the surrounding components if at all possible. These should be covered if necessary.



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

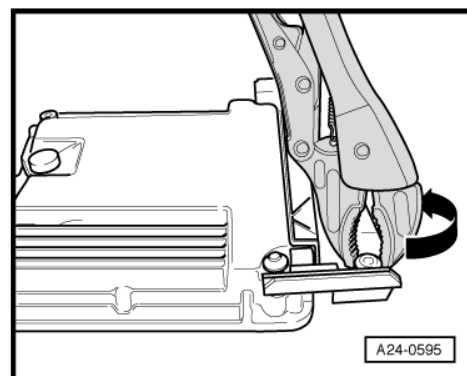


- The two shear bolts screwed into the engine control unit do not need to be heated. They should be removed without being heated.
- Detach protective housing from control unit connectors.
- Release connectors on engine control unit and unplug connectors.

Installing

Installation is performed in the reverse sequence.

- After installation, the protective housing must be re-fitted on the engine control unit -J623- .
- Clean threaded holes for shear bolts to remove any residue from locking fluid. This can be done using a thread tap.
- Always use new shear bolts.
- Install plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 .



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

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



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28 – Ignition system

1 General notes and safety precautions

Overview

- ◆ ⇒ „1.1 General notes on ignition system“, page 52
- ◆ ⇒ „1.2 Safety precautions when working on the injection and ignition system“, page 52
- ◆ ⇒ „1.3 Safety precautions when working on vehicles with start/stop system“, page 53
- ◆ ⇒ „1.4 Safety precautions when using testers and measuring instruments during a road test“, page 53

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 entries being stored in the event memory of the engine control unit. The event memory must be interrogated after completing all tests and repair work.
- ◆ If the engine starts, runs for a short period and then cuts out after completing fault finding, repairs or component tests, this may be due to the immobilizer disabling the engine control unit. The event memory of the engine control unit must then be interrogated and, if necessary, the control unit must be adapted.

1.2 Safety precautions when working on the injection and ignition system

To prevent injuries to persons and/or damage to the fuel injection and ignition system, note the following:

- ◆ Persons wearing a cardiac pacemaker must at all times maintain a safe distance from high-voltage components such as the ignition system and gas-discharge headlights.
- ◆ Do not touch or disconnect ignition wiring when the engine is running or being turned at starter speed.
- ◆ Always switch off the ignition before connecting or disconnecting electrical wiring for the injection or ignition system or tester cables.
- ◆ Always switch off ignition before washing engine.
- ◆ If you want to crank the engine at starting speed without actually starting the engine (e.g. compression test), first unplug the electrical connectors from the ignition coils ⇒ [page 56](#) .
- ◆ Also remove fuse for fuel pump control unit -J538- ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- ◆ Entries will be stored in the event memory of the engine control unit if electrical connectors have been unplugged and the engine started.



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 ⇒ Electrical system; Rep. gr. 27 .

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



WARNING

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

- ◆ *On vehicles with activated start/stop system (this is indicated by a message in the instrument cluster display), the engine may start automatically on demand.*
- ◆ *Therefore it is important to ensure that the start/stop system is deactivated when performing repairs (switch off ignition, if required switch on ignition again).*

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

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



WARNING

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

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

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



2 Servicing ignition system

Overview

- ◆ ⇒ „2.1 Test data“, page 54
- ◆ ⇒ „2.2 Ignition system - exploded view“, page 55
- ◆ ⇒ „2.3 Removing and installing ignition coils“, page 56
- ◆ ⇒ „2.4 Removing and installing knock sensors“, page 58
- ◆ ⇒ „2.5 Removing and installing Hall senders“, page 59
- ◆ ⇒ „2.6 Removing and installing engine speed sender G28“, page 61

2.1 Test data

Engine data		2.5 ltr. / 4V FSI
Idling speed		Cannot be adjusted; regulated by idling speed stabilisation
Ignition timing		Not adjustable (determined by control unit)
Ignition system		Multi-coil system with 6 ignition coils (output stages integrated) connected directly to spark plugs via spark plug connectors
Spark plugs	Designations	⇒ Data sheets for exhaust emissions test
	Removing and installing Tightening torque	⇒ Maintenance ; Booklet 411
Firing order		1-4-3-6-2-5

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2.2 Ignition system - exploded view

1 - Bolt

- ☐ 9 Nm

2 - Hall sender

- ☐ Cylinder bank 1 (right-side)

◆ Inlet side: Hall sender - G40-

◆ Exhaust side: Hall sender 3 -G300-

- ☐ Removing and installing ⇒ [page 59](#)

3 - O-ring

- ☐ Renew

4 - Knock sensor

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

◆ Cylinder bank 1 (right-side): knock sensor 1 -G61-

◆ Cylinder bank 2 (left-side): knock sensor 2 -G66-

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

5 - Bolt

- ☐ 25 Nm

6 - Spark plug

- ☐ Change interval ⇒ Maintenance tables
- ☐ Remove and install with spark plug socket and extension -3122 B- ⇒ Maintenance ; Booklet 411
- ☐ 30 Nm

7 - Ignition coil

- ☐ Ignition coil 1 with output stage -N70-
- ☐ Ignition coil 2 with output stage -N127-
- ☐ Ignition coil 3 with output stage -N291-
- ☐ Ignition coil 4 with output stage -N292-
- ☐ Ignition coil 5 with output stage -N323-
- ☐ Ignition coil 6 with output stage -N324-
- ☐ Removing and installing ⇒ [page 56](#)

8 - Bolt

- ☐ 5 Nm

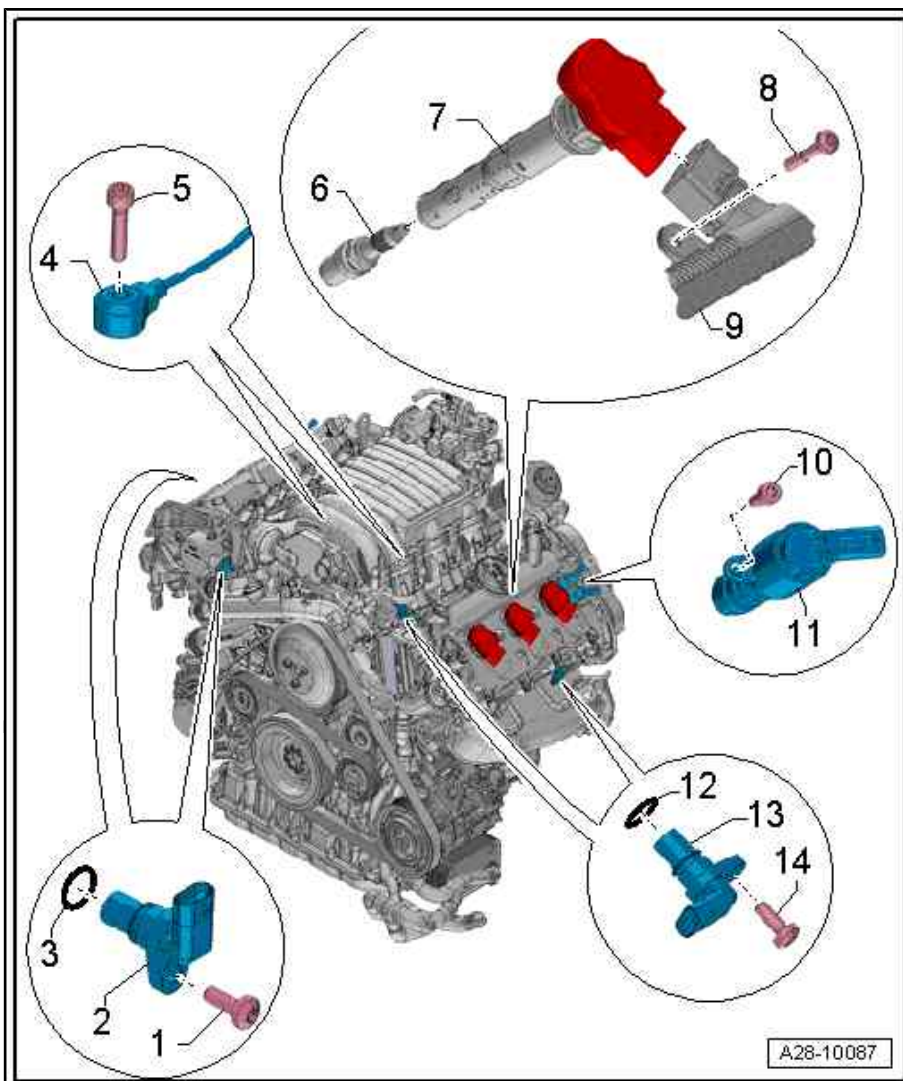
9 - Electrical wiring harness

10 - Bolt

- ☐ 9 Nm

11 - Engine speed sender -G28-

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



12 - O-ring

- ☐ Renew

13 - Hall sender

- ☐ Cylinder bank 2 (left-side)
- ◆ Inlet side: Hall sender 2 -G163-
- ◆ Exhaust side: Hall sender 4 -G301-
 - ☐ Removing and installing ⇒ [page 59](#)

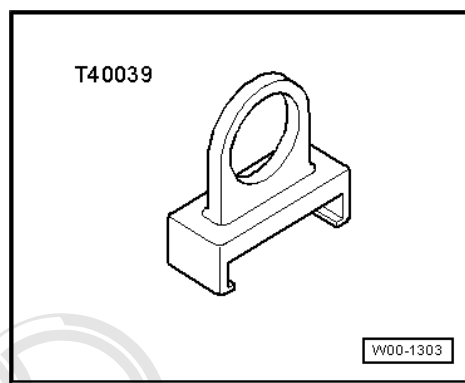
14 - Bolt

- ☐ 9 Nm

2.3 Removing and installing ignition coils

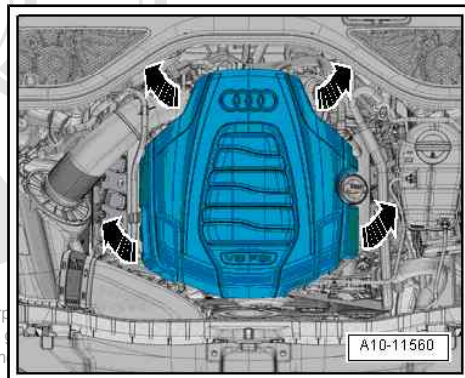
Special tools and workshop equipment required

- ◆ Puller -T40039-



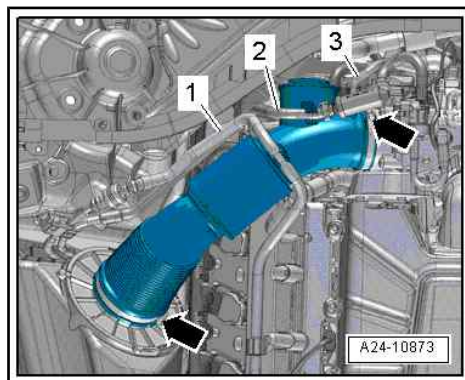
Removing

- Remove engine cover panel ⇒ Engine, mechanics; Rep. gr. 10 .



Cylinder bank 1 (right-side):

- Only remove air cleaner housing on ignition coil for cylinder 1 ⇒ [page 19](#) .
- Move fuel line -1- and line -2- leading to activated charcoal filter clear on air cleaner housing and air pipe.
- Detach vacuum hose -3- from connection on air pipe.
- Release hose clips -arrows- and remove air pipe.

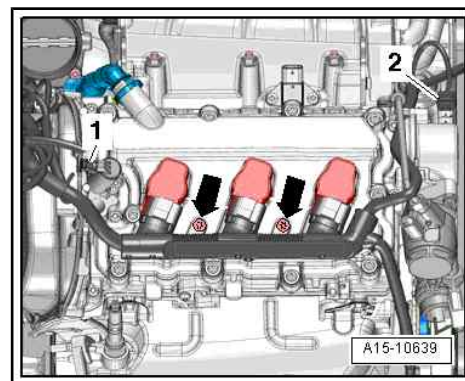


- Remove bolts -arrows- and unplug electrical connectors at ignition coils.
- Move electrical wiring harness down slightly.

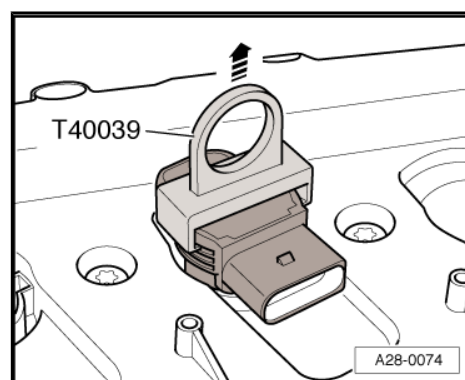


Note

Disregard -items 1, 2-.

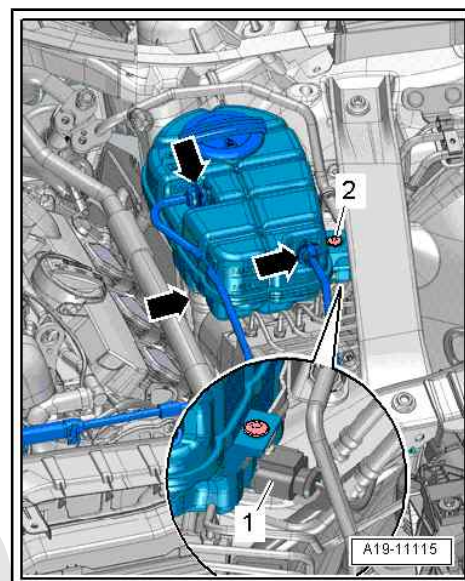


- Pull ignition coils out of spark plug holes using puller -T40039-.



Cylinder bank 2 (left-side):

- Unplug electrical connector -1-.
- Remove bolt -2-.
- Move coolant expansion tank to side (coolant hoses -arrows- remain connected).

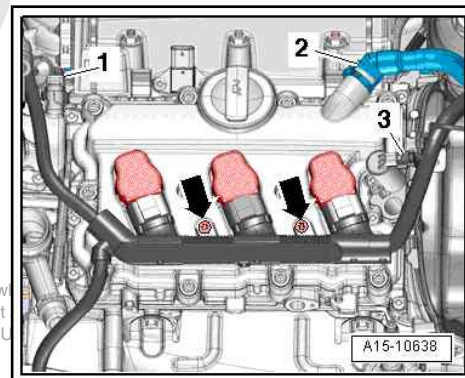


- Remove bolts -arrows- and unplug electrical connectors at ignition coils.
- Move electrical wiring harness down slightly.



Note

Disregard -items 1, 2, 3-.



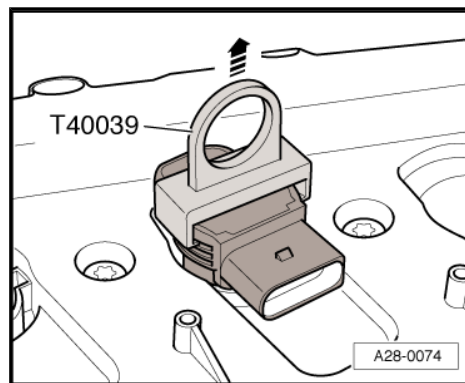
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- Pull ignition coils out of spark plug holes using puller -T40039- .

Installing

- Tightening torque ⇒ Engine, mechanics; Rep. gr. 15
- Fit all ignition coils loosely into spark plug holes.
- Align the ignition coils with the connectors and attach all connectors onto ignition coils simultaneously.
- Press ignition coils onto spark plugs by hand evenly (do NOT use tool).

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



2.4 Removing and installing knock sensors

Overview

- ♦ ⇒ „2.4.1 Removing and installing knock sensor 1 G61“, page 58
- ♦ ⇒ „2.4.2 Removing and installing knock sensor 2 G66“, page 59

2.4.1 Removing and installing knock sensor 1 -G61-

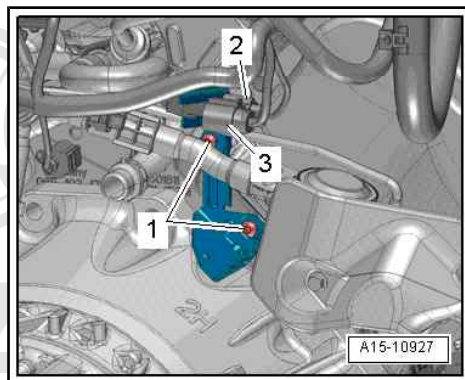
Removing

- Remove injector on cylinder 2 ⇒ page 26 .
- Take electrical connector -3- (cylinder bank 1) out of bracket.
- Detach electrical connector -2- from bracket and unplug.



Note

Disregard -item 1-.



- Unscrew bolt -1- for knock sensor 1 -G61- and detach knock sensor.



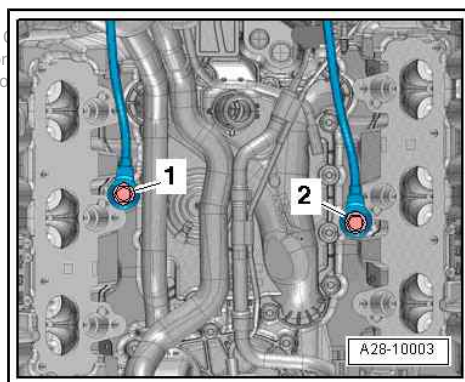
Note

Disregard -item 2-.

Installing

Install in reverse order.

- Tightening torque
⇒ „2.2 Ignition system - exploded view“, page 55



2.4.2 Removing and installing knock sensor 2 -G66-

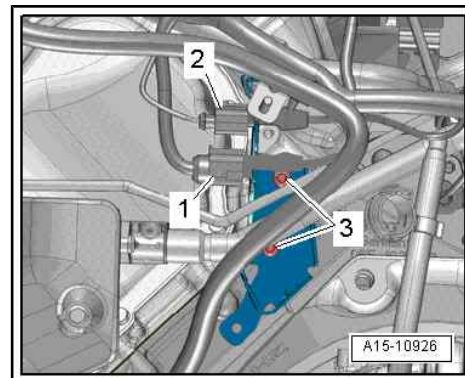
Removing

- Remove injector on cylinder 5 ➔ [page 26](#) .
- Take electrical connector -2- (cylinder bank 2) for knock sensor 2 -G66- out of bracket and unplug connector.



Note

Disregard -items 1, 3-.

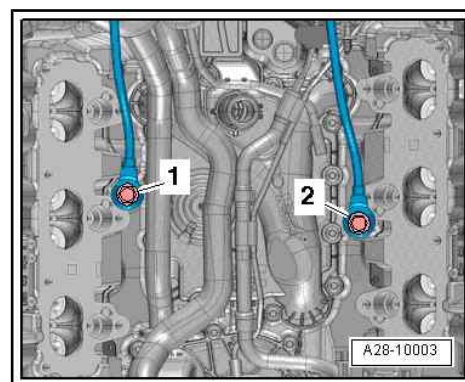


- Unscrew bolt -2- for knock sensor 2 -G66- and detach knock sensor.



Note

Disregard -item 1-.



Installing

Install in reverse order.

- Tightening torque
➔ [„2.2 Ignition system - exploded view“, page 55](#)

2.5 Removing and installing Hall senders

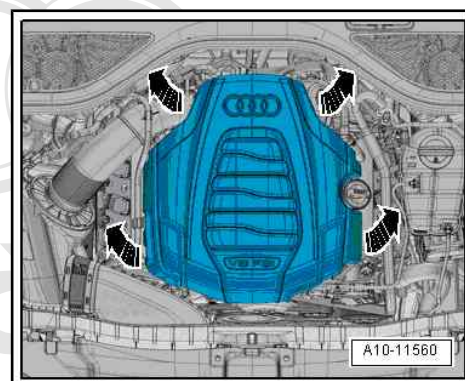
Overview

- ◆ ➔ [„2.5.1 Removing and installing Hall sender \(inlet side\) G40 / G163“, page 59](#)
- ◆ ➔ [„2.5.2 Removing and installing Hall sender \(exhaust side\) G300 / G301“, page 60](#)

2.5.1 Removing and installing Hall sender (inlet side) -G40- / -G163-

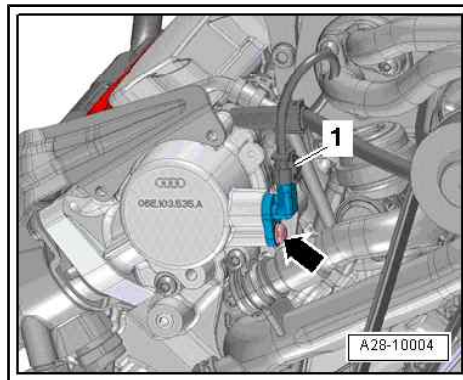
Removing

- Remove engine cover panel ➔ Engine, mechanics; Rep. gr. 10 .



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



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

Installing

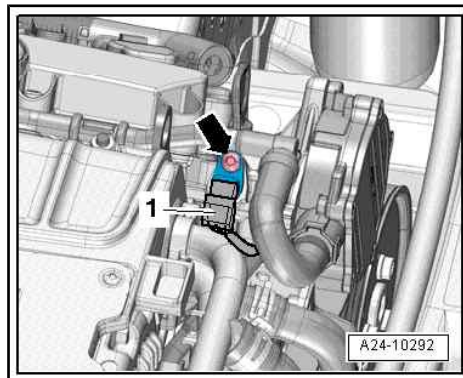
Installation is carried out in the reverse order; note the following:

- Tightening torques
⇒ „2.2 Ignition system - exploded view“, page 55



Note

Fit new O-rings.



2.5.2 Removing and installing Hall sender (exhaust side) -G300- / -G301-

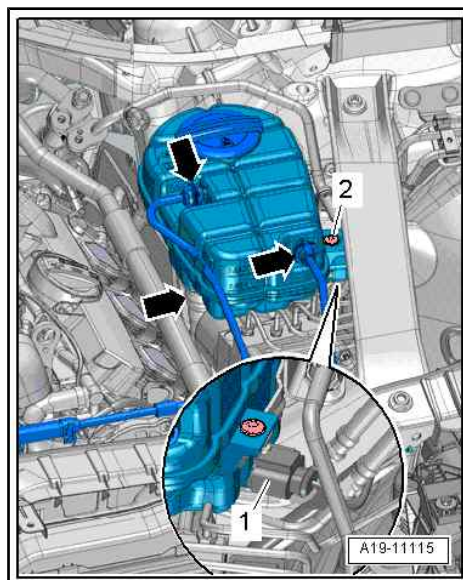
Removing

Cylinder bank 1 (right-side):

- Remove air cleaner housing ⇒ page 19 .

Cylinder bank 2 (left-side):

- Unplug electrical connector -1-.
- Remove bolt -2-.
- Move coolant expansion tank to side (coolant hoses -arrows- remain connected).



Continuation for both sides:

- Unscrew bolt -2- and detach Hall sender.



The illustration shows Hall sender 4 -G301- on cylinder bank 2 (left-side). The other Hall senders are similar.

Installing

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

- Tightening torques
⇒ „2.2 Ignition system - exploded view“, page 55



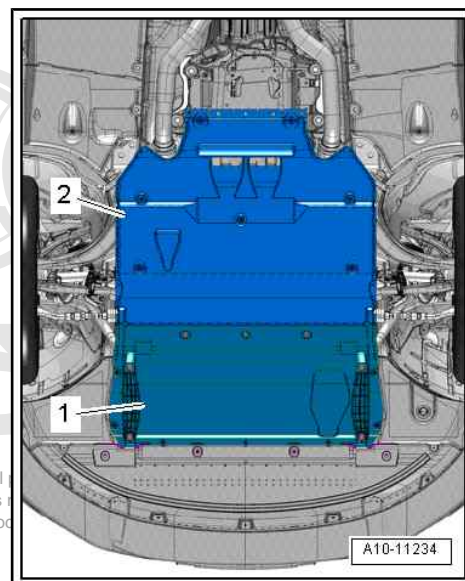
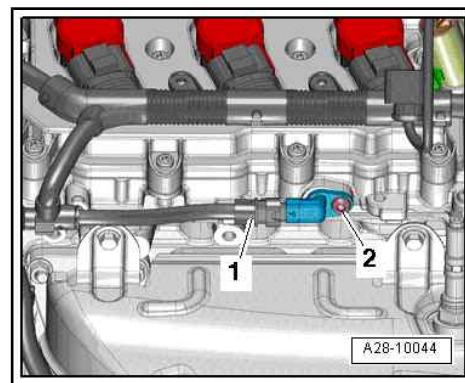
Fit new O-rings.

- Install air cleaner housing ⇒ [page 19](#) .

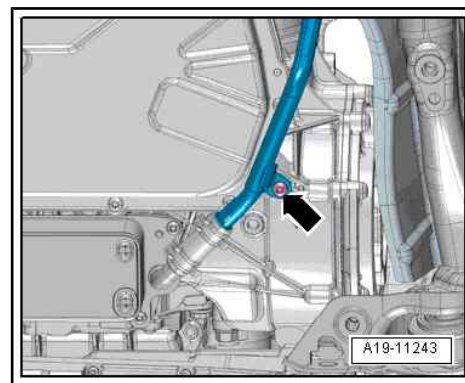
2.6 Removing and installing engine speed sender -G28-

Removing

- Remove noise insulation (rear) -2- ⇒ General body repairs, exterior; Rep. gr. 66 .



- Remove bolt -arrow- for coolant pipe on gearbox (right-side).

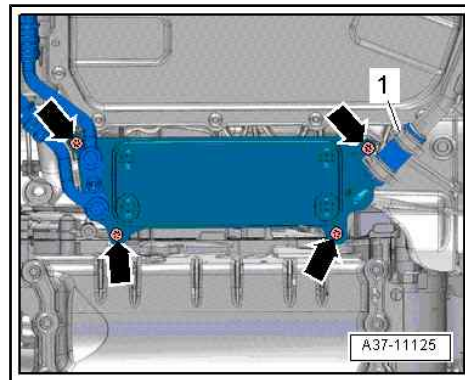


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- Remove bolts -arrows- and push ATF cooler slightly to one side.


Note

Disregard -item 1-.

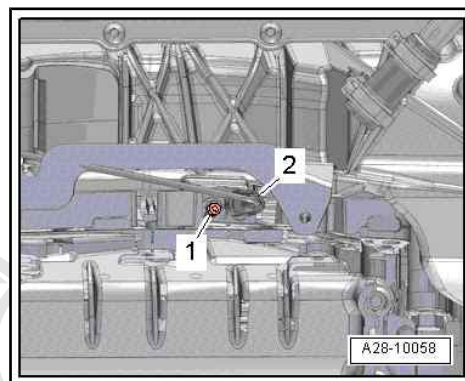


- Unplug electrical connector -2-.
- Unscrew bolt -1- and pull out engine speed sender -G28- .

Installing

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

- Tightening torque
⇒ [„2.2 Ignition system - exploded view“, page 55](#)
- Install ATF cooler ⇒ Rep. gr. 34 or ⇒ Rep. gr. 37 .
- Install coolant pipe (right-side) on gearbox ⇒ Engine, mechanics; Rep. gr. 19 .
- Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 .



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