

Workshop Manual Audi A8 2010 >

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

Engine ID	CPA A								
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Edition 06.2012



Audi

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List of Workshop Manual Repair Groups

Repair Group

24 - Mixture preparation - injection

28 - Ignition system



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

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24 – Mixture preparation - injection

1 Safety precautions and rules for cleanliness

⇒ „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

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⇒ „1.5 Rules for cleanliness when working on the injection system“, page 3

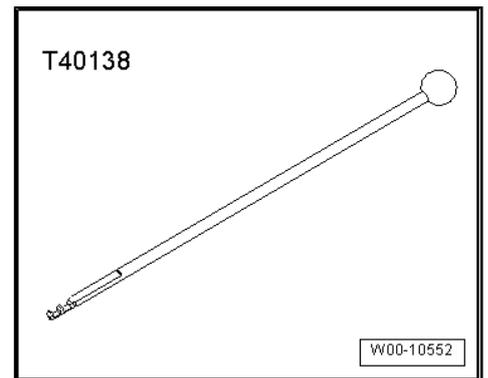
⇒ „1.6 Reducing pressure in high-pressure section of injection system“, page 4

⇒ „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.*

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

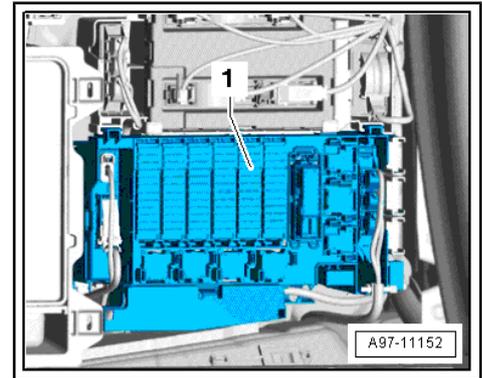
- ◆ *The fuel system operates under high pressure. The pressure in the high-pressure part of the injection system must be reduced to a residual pressure prior to opening the system ⇒ [page 4](#).*
- ◆ *A clean cloth must then be wrapped around the connection and the residual pressure dissipated by carefully 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 in -relay and fuse holder in luggage compartment (right-side)- for the fuel pump control unit -J538- must be removed as a precautionary measure before opening the fuel system, because the fuel pump will otherwise be activated by the contact switch on the driver's door. For current assignment refer to → Current flow diagrams, Electrical fault finding and Fitting locations.
- ◆ Persons wearing a cardiac pacemaker must at all times maintain a safe distance from high-voltage components such as the ignition system and xenon headlights.
- ◆ 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 the engine is to be operated at cranking speed without it starting (e.g. compression test), unplug the connectors from the ignition coils and remove the fuse for the 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

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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 Reducing pressure in high-pressure section of 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.

- ◆ *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

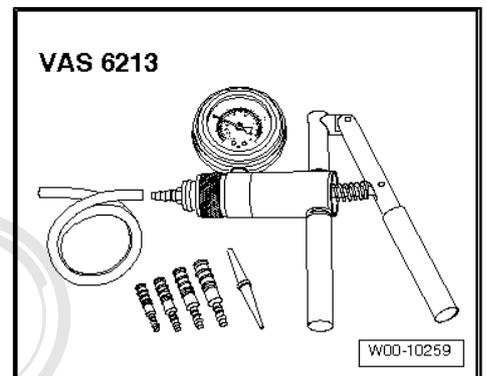
Proceed as follows:

- 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 an entry is stored in the event memory, check the vacuum lines leading to the corresponding component and also check the other vacuum lines leading to other components.
- If it is not possible to build up 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.

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2 Technical data

Test data	2.5 ltr. / 4V FSI
Idling speed Cannot be adjusted; is 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

1 - 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-
- Exploded view
[⇒ page 16](#)

2 - Activated charcoal filter solenoid valve 1 -N80-

3 - Engine control unit -J623-

- Removing and installing
[⇒ page 40](#)

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

- Exploded view
[⇒ page 16](#)

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

- Fitting location
[⇒ page 8](#)

6 - Brake light switch -F-

- Fitting location
[⇒ page 8](#)

7 - Gearbox oil cooling valve - N509-

- Fitting location
[⇒ page 8](#)
- Exploded view ⇒ Rep. gr. 19

8 - Secondary air pump motor -V101-

- Exploded view ⇒ Rep. gr. 26

9 - Variable intake manifold position sender -G513-

- Exploded view ⇒ [page 16](#)

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

- Exploded view ⇒ [page 16](#)

11 - Coolant temperature sender -G62-

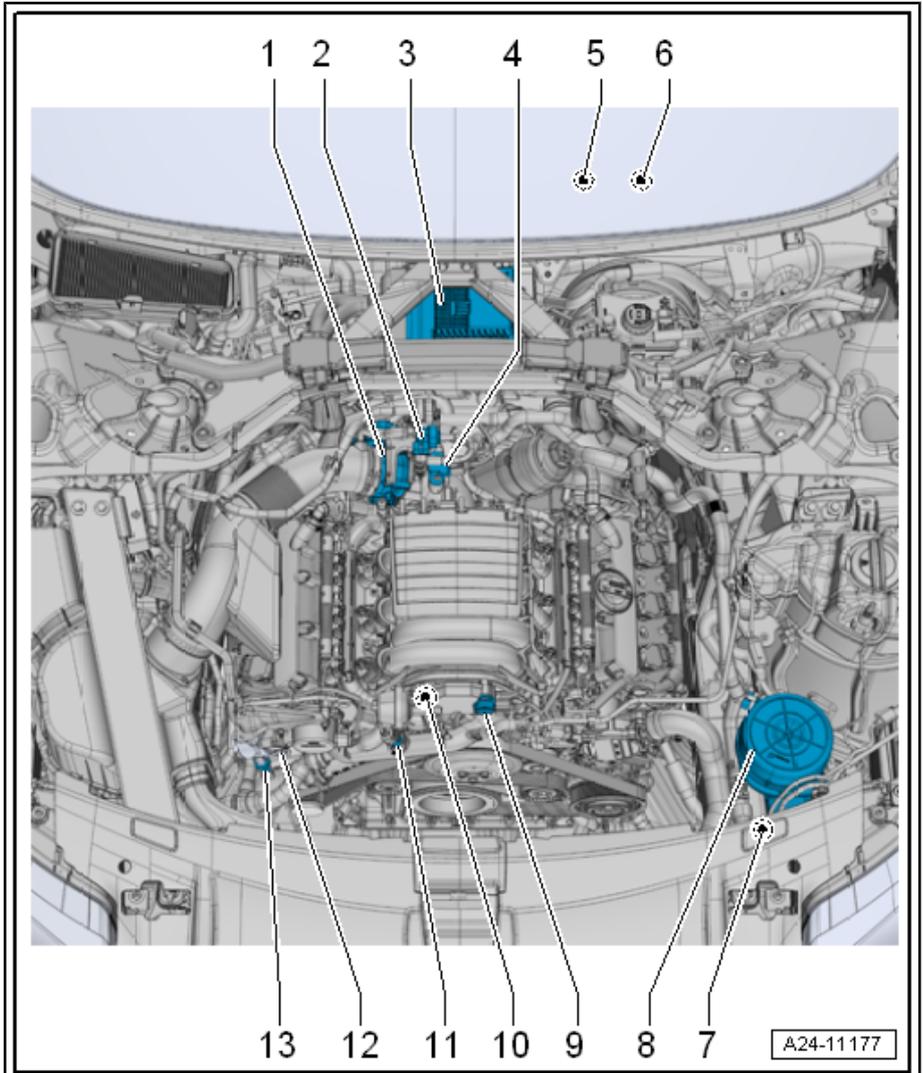
- Exploded view ⇒ Rep. gr. 19

12 - Fuel metering valve -N290-

- Integrated in high-pressure pump
- Exploded view ⇒ [page 27](#)

13 - Fuel pressure sender for low pressure -G410-

- At high-pressure pump





❑ Exploded view => [page 27](#)

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

◆ In accelerator pedal module

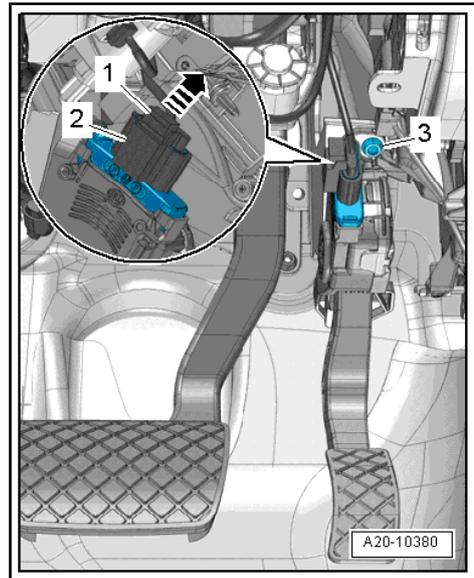
2 - Electrical connector



Note

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

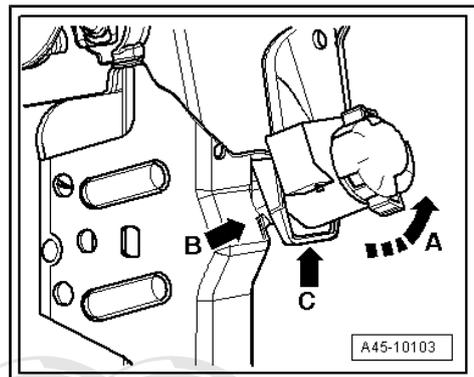
Removing and installing => Rep. gr. 20



Fitting location of brake light switch -F-

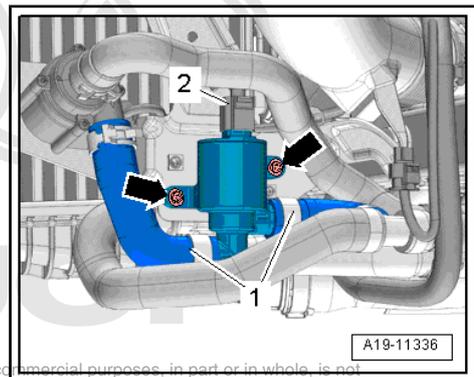
◆ In footwell on brake pedal

Removing and installing => Rep. gr. 45



Fitting location of gearbox oil cooling valve -N509-

◆ On front left below longitudinal member



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Engine (from above)

1 - Ignition coils for cylinder bank 1

- ◆ Ignition coil 1 with output stage -N70-
- ◆ Ignition coil 2 with output stage -N127-
- ◆ Ignition coil 3 with output stage -N291-
- Exploded view ⇒ [page 46](#)

2 - Exhaust camshaft control valve 1 -N318-

- Exploded view ⇒ Rep. gr. 15

3 - Camshaft control valve 1 -N205-

- Exploded view ⇒ Rep. gr. 15

4 - Injectors, cylinder bank 1

- ◆ Injector, cylinder 1 -N30-
- ◆ Injector, cylinder 2 -N31-
- ◆ Injector, cylinder 3 -N32-
- Exploded view ⇒ [page 17](#)

5 - Knock sensor 1 -G61-

- Exploded view ⇒ [page 46](#)

6 - Oil pressure switch -F22-

- Exploded view ⇒ Rep. gr. 17

7 - Knock sensor 2 -G66-

- Fitting location of connector ⇒ [page 11](#)
- Exploded view ⇒ [page 46](#)

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

- Exploded view ⇒ Rep. gr. 17

9 - Injectors, cylinder bank 2

- ◆ Injector, cylinder 4 -N33-
- ◆ Injector, cylinder 5 -N83-
- ◆ Injector, cylinder 6 -N84-
- Exploded view ⇒ [page 17](#)

10 - Camshaft control valve 2 -N208-

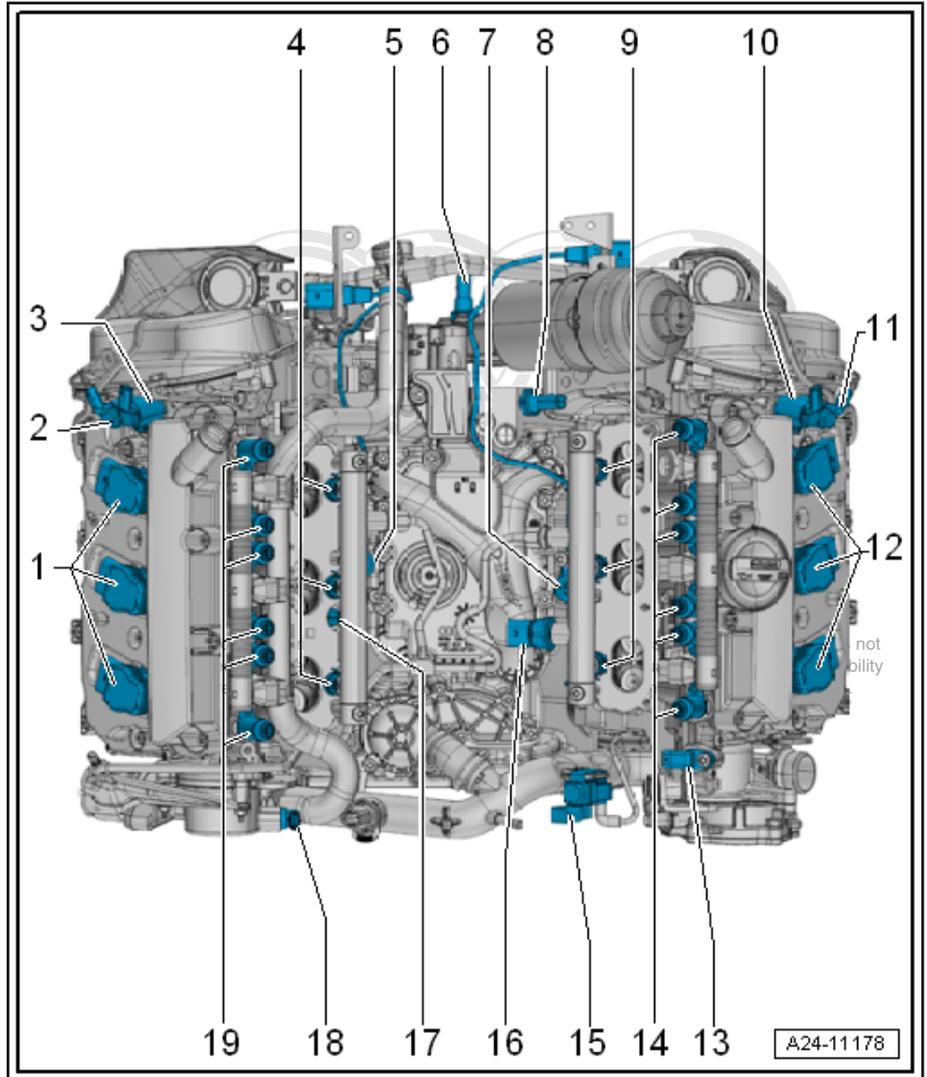
- Exploded view ⇒ Rep. gr. 15

11 - Exhaust camshaft control valve 2 -N319-

- Exploded view ⇒ Rep. gr. 15

12 - 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 46](#)





13 - Hall sender 2 -G163-

- Exploded view ⇒ [page 46](#)

14 - 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-
- Exploded view ⇒ Rep. gr. 15

15 - Solenoid for coolant circuit -N492-

16 - Fuel pressure sender -G247-

- Exploded view ⇒ [page 17](#)

17 - Temperature sender for engine temperature regulation -G694-

- Exploded view ⇒ Rep. gr. 19

18 - Hall sender -G40-

- Exploded view ⇒ [page 46](#)

19 - 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-
- Exploded view ⇒ Rep. gr. 15

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Engine (left-side)

1 - Valve for oil pressure control -N428-

- Exploded view ⇒ Rep. gr. 17

2 - Hall sender 3 -G300-

- Exploded view ⇒ [page 46](#)

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

- Fitting location of electrical connector ⇒ [page 11](#)

- Exploded view ⇒ [page 35](#)

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

- Fitting location of electrical connector ⇒ [page 11](#)

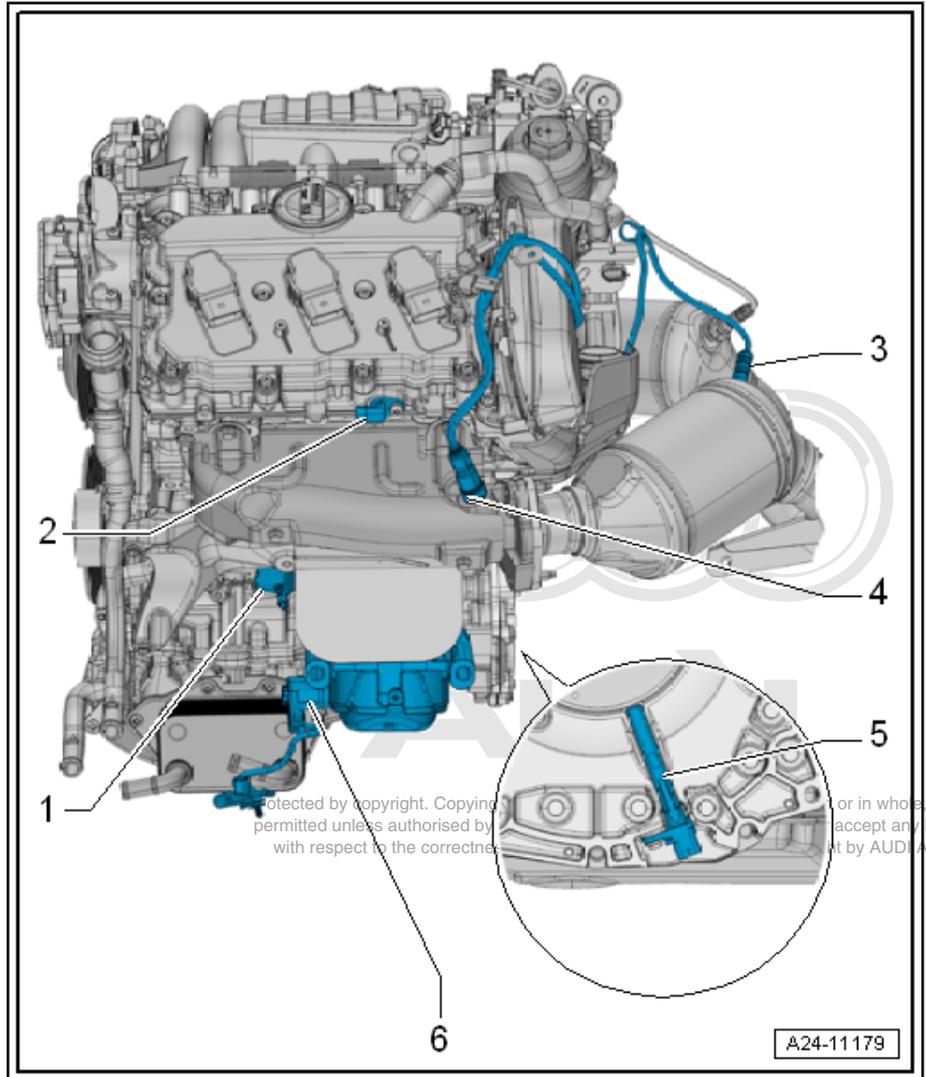
- Exploded view ⇒ [page 35](#)

5 - Engine speed sender -G28-

- Exploded view ⇒ [page 46](#)

6 - Left electrohydraulic engine mounting solenoid valve -N144-

- Integrated in engine mounting
- Exploded view ⇒ Rep. gr. 10

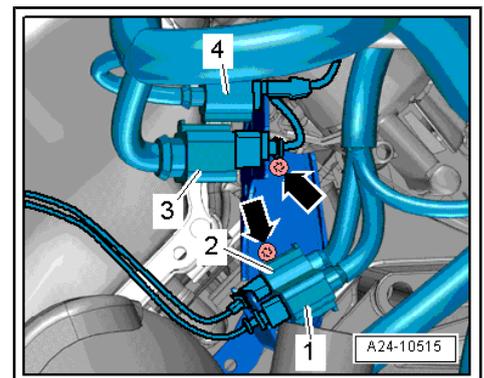


Electrical connectors on cylinder bank 2 (left-side)

- 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-



Disregard -arrows-.



Engine (right-side)



1 - Right electrohydraulic engine mounting solenoid valve -N145-

- Integrated in engine mounting
- Exploded view => Rep. gr. 10

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

- Fitting location of connector => [page 12](#)
- Exploded view => [page 35](#)

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

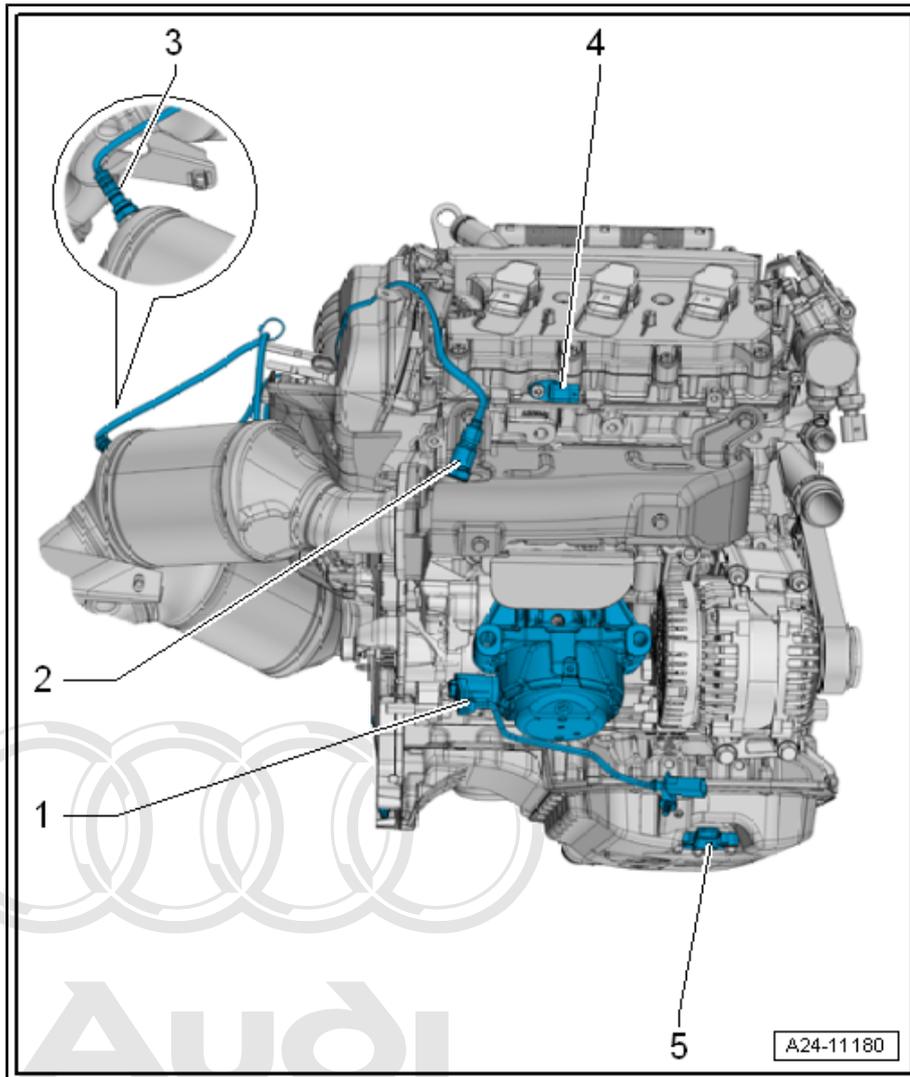
- Fitting location of electrical connector => [page 12](#)
- Exploded view => [page 35](#)

4 - Hall sender 4 -G301-

- Exploded view => [page 46](#)

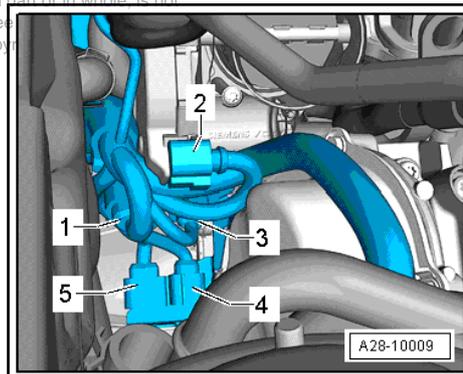
5 - Oil level and oil temperature sender -G266-

- Exploded view => Rep. gr. 17



Electrical connectors 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-



4 Air cleaner

⇒ „4.1 Air cleaner - exploded view“, page 13

⇒ „4.2 Removing and installing air cleaner housing“, page 14

4.1 Air cleaner - exploded view

1 - Bolt

- 3.5 Nm

2 - Water drain valve

3 - Rubber washer

4 - Retainer

- For air filter element
- With water drain
- Clean water drain

5 - Rubber buffer

6 - Air filter element

- Use genuine air filter element ⇒ Electronic parts catalogue
- Change intervals ⇒ Maintenance tables
- Removing and installing ⇒ Maintenance ; Booklet 410

7 - Bolt

- 2.5 Nm

8 - Air cleaner (top section)

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

9 - O-ring

- Renew if damaged

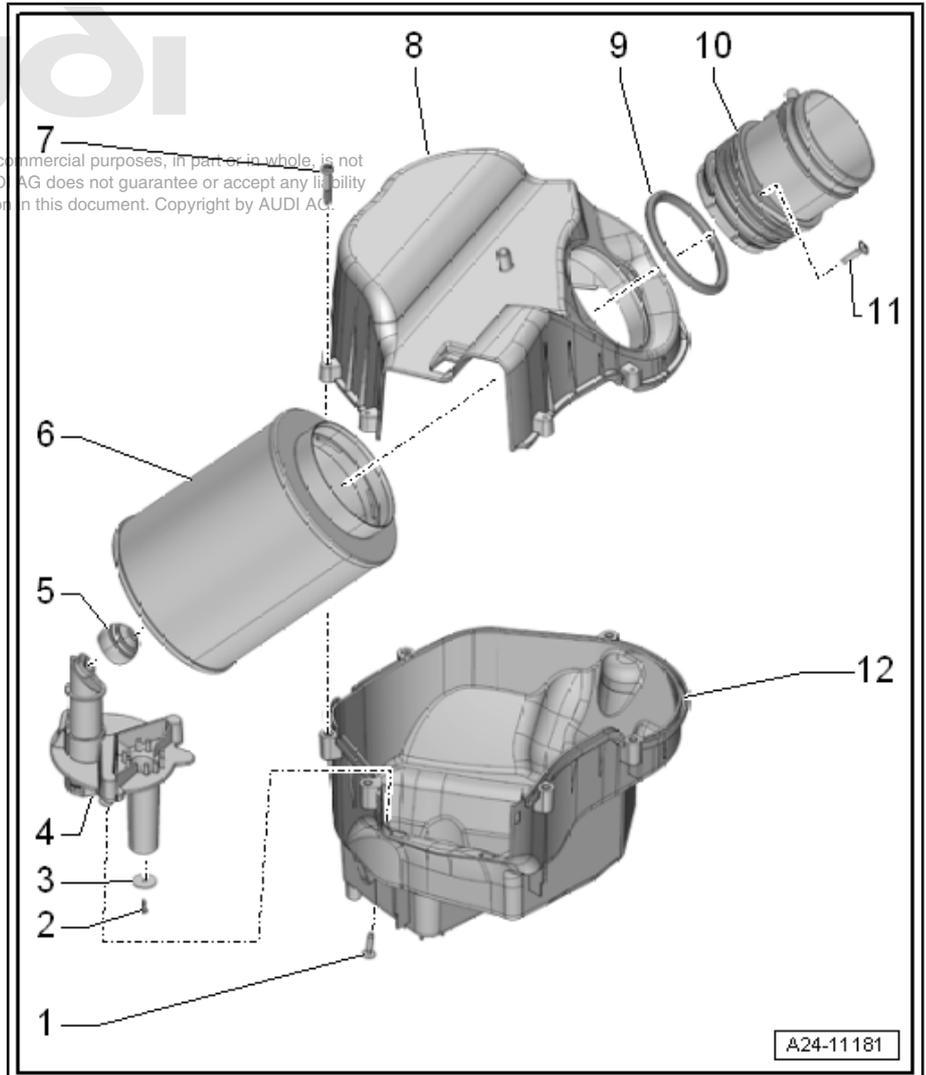
10 - Air duct

11 - Bolt

- 3.5 Nm

12 - Air cleaner housing

- Clean out salt deposits, dirt and leaves, etc.
- Removing and installing ⇒ [page 14](#)



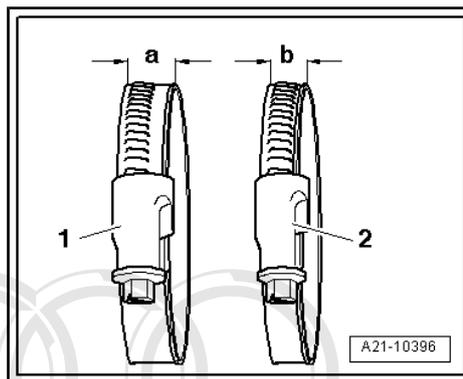


Installing air pipes and hoses with screw-type clips



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

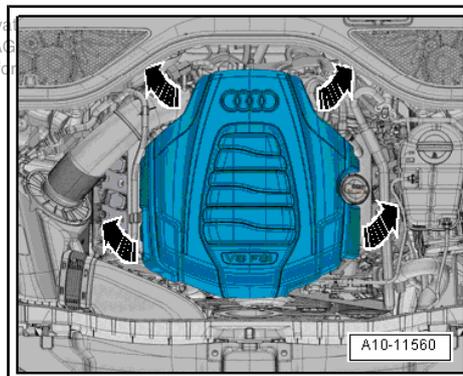
2 - Hose clip -b- = 9 mm wide: 3.4 Nm

4.2 Removing and installing air cleaner housing

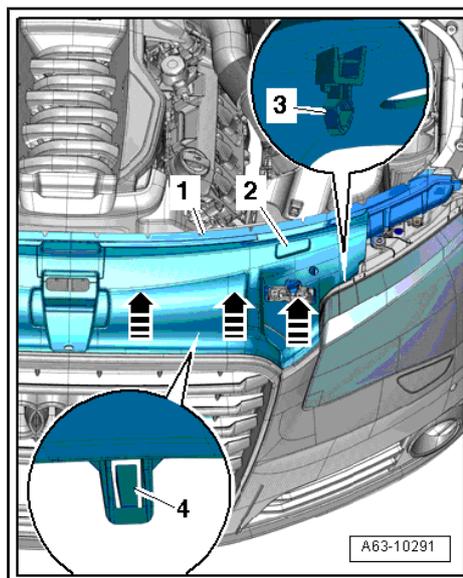
Removing

- Remove engine cover panel ⇒ Rep. gr. 10

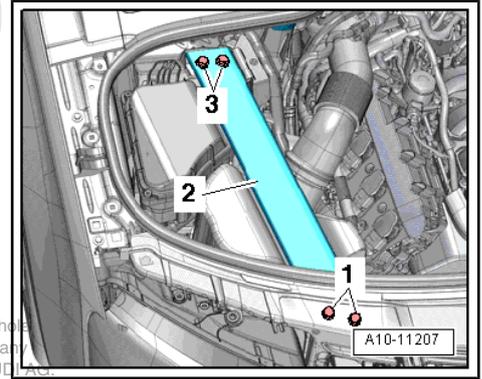
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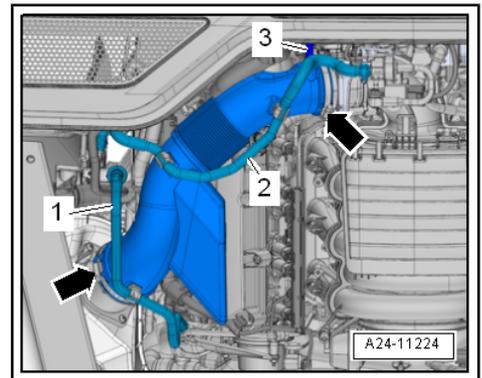
- Remove lock carrier cover -2- ⇒ Rep. gr. 63 .



- Remove bolts -1, 3- and detach longitudinal member (top right) -2-.



- 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.



- Detach air hose -2- and lift off air cleaner housing -1-.

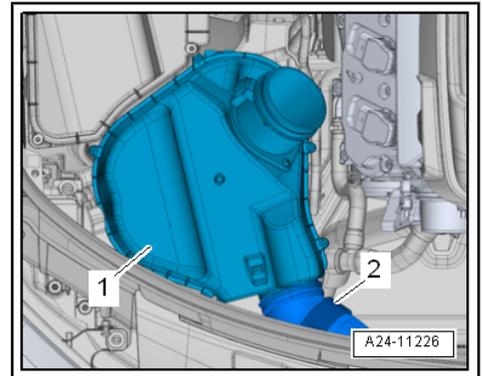
Installing

- Tightening torque
⇒ „4.1 Air cleaner - exploded view“, page 13



Note

- ◆ *The air cleaner housing MUST be clean.*
- ◆ *To prevent malfunctions, cover critical parts of the engine air intake (air mass meter, air pipes, etc.) with a clean cloth when blowing out the air cleaner housing with compressed air.*
- ◆ *Hose connections and air pipes and hoses 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 .*
- Check for salt residue, dirt and leaves in air pipe (engine intake side).
- Check for dirt and leaves in air duct going from lock carrier to air cleaner housing.



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

- Install longitudinal member (top right) ⇒ Rep. gr. 50 .
- Install lock carrier cover ⇒ Rep. gr. 63 .
- Install engine cover panel ⇒ Rep. gr. 10 .

5 Intake manifold, fuel rail and injectors

⇒ „5.1 Exploded view - intake manifold“, page 16

⇒ „5.2 Exploded view - fuel rail with injectors“, page 17

⇒ „5.2 Exploded view - fuel rail with injectors“, page 17

⇒ „5.4 Removing and installing intake manifold“, page 20

⇒ „5.5 Removing and installing fuel rail“, page 21

⇒ „5.6 Removing and installing injectors“, page 22

⇒ „5.7 Removing and installing fuel pressure sender G247“, page 26

5.1 Exploded view - intake manifold

1 - Actuator for intake manifold change-over

2 - Bolt

□ 2.5 Nm

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

4 - Bolt

□ 8 Nm

5 - Intake manifold

□ Removing and installing ⇒ page 20

6 - Seal

□ Renew after removing

7 - Bolt

□ 6 Nm

8 - Throttle valve module - J338-

□ Removing and installing ⇒ page 19

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

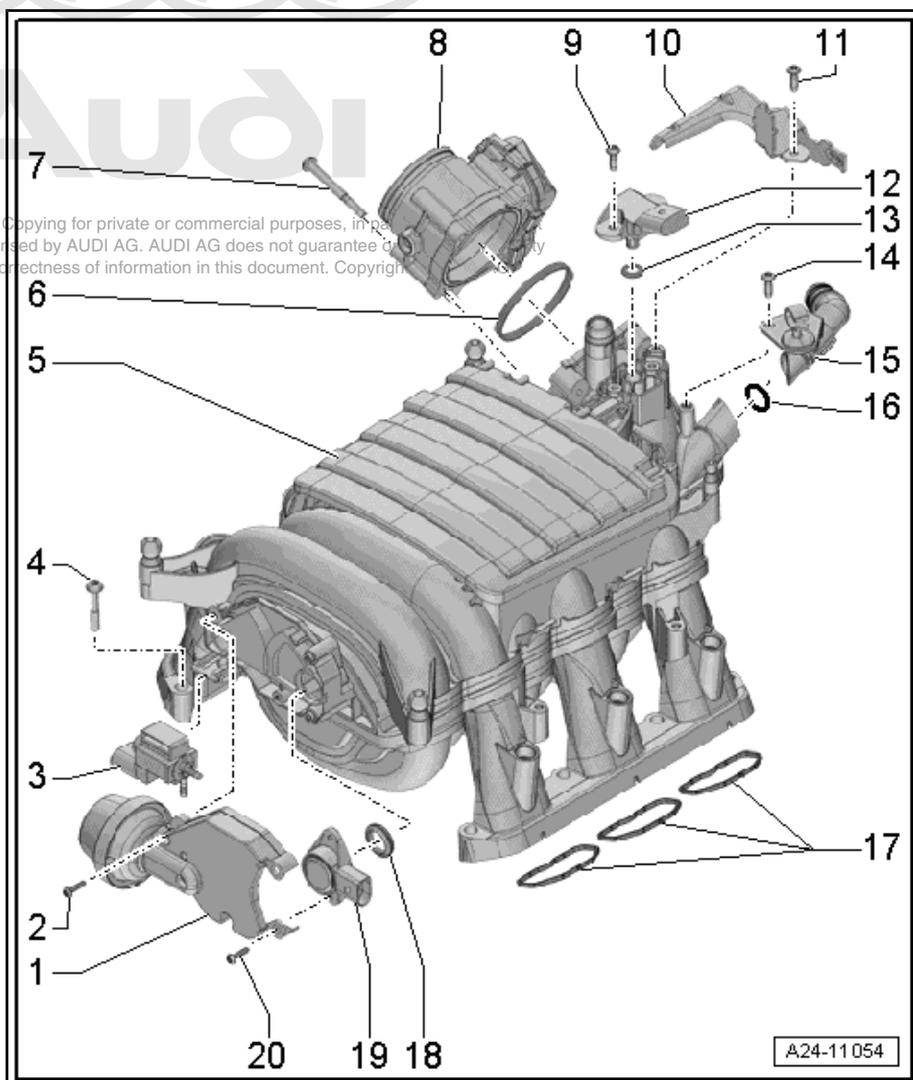
14 - Bolt

□ 2.5 Nm

15 - Connection for crankcase breather

16 - O-ring

□ Renew



17 - Gaskets

- Renew after removing

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 Exploded view - fuel rail with injectors

1 - Fuel pressure sender - G247-

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

2 - Bracket

3 - Bolts

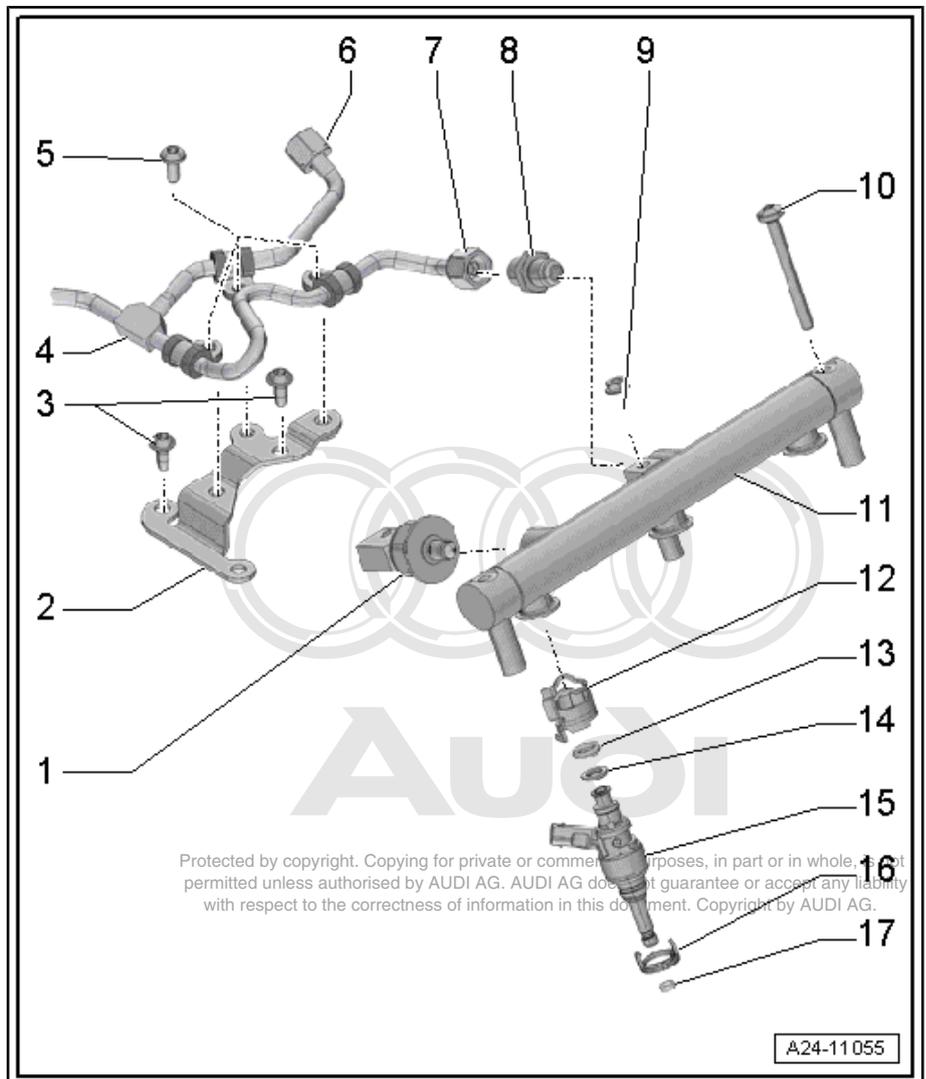
- 9 Nm

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 18](#)



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 after removing
- Lubricate lightly with clean engine oil

14 - Spacer ring

- Renew if damaged

15 - Injector

Removing and installing ⇒ [page 22](#)

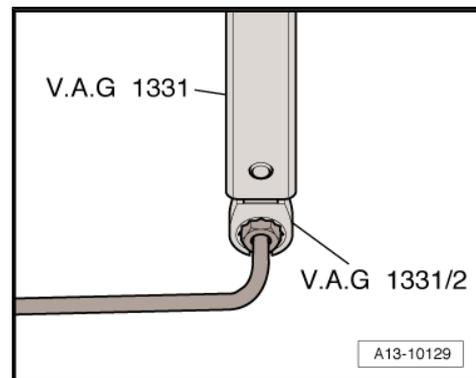
16 - Sealing element

17 - Combustion chamber ring seal

- Renewing ⇒ „5.6 Removing and installing injectors“, [page 22](#)

Installing high-pressure pipe on fuel rail

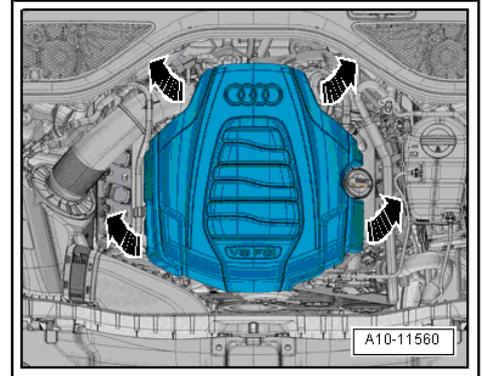
- Tighten union nut on high-pressure pipe hand-tight initially.
- Ensure that high-pressure pipe is not under tension.
- To tighten high-pressure pipe on fuel rail, use torque wrench -V.A.G 1331- with tool insert (open-end ring spanner, 17 mm) -V.A.G 1331/2- .
- Tightening torque ⇒ [Item 7 \(page 17\)](#)



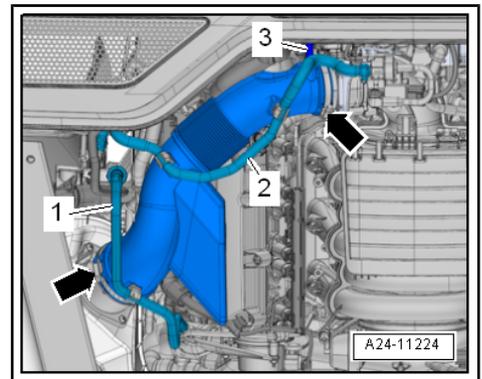
5.3 Removing and installing throttle valve module -J338-

Removing

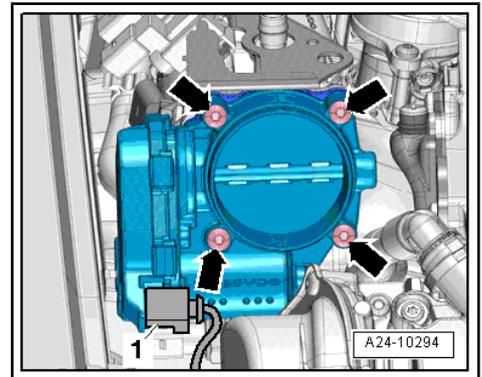
- Remove engine cover panel ⇒ Rep. gr. 10 .



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



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
 ⇒ „5.2 Exploded view - fuel rail with injectors“, page 17
- Install engine cover panel ⇒ Rep. gr. 10 .



5.4 Removing and installing intake manifold

Removing



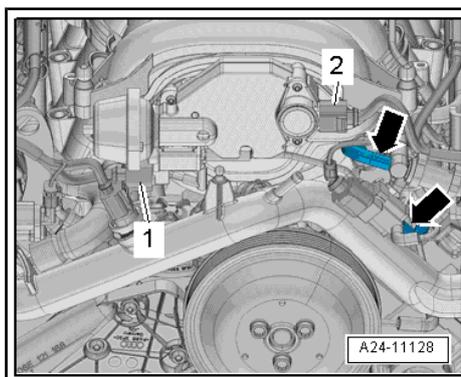
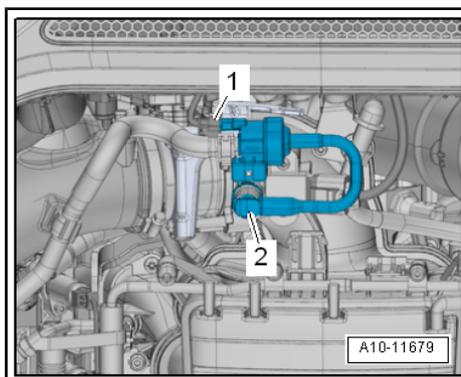
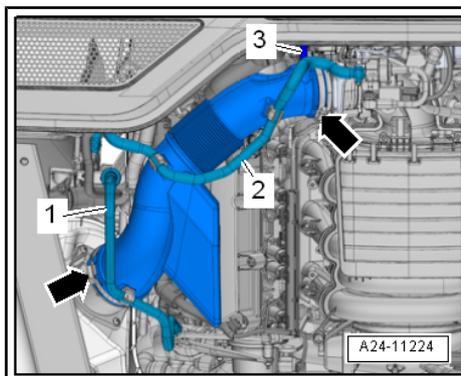
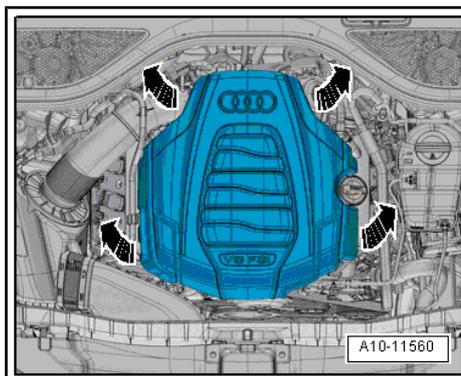
Note

Fit all cable ties in the original positions when installing.

- Remove engine cover panel ⇒ 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.

- Move clear line from activated charcoal filter at air pipe.
- Unplug electrical connector -1-.
- Press release tabs and detach vacuum hose -2-.
- Detach activated charcoal filter solenoid valve 1 -N80- from bracket and move it clear to the side with hose still attached.



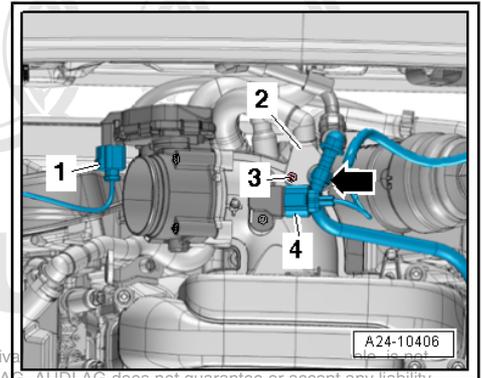
- Unplug electrical connectors at front of intake manifold.
- 1 - Variable intake manifold change-over valve -N156-
- 2 - Variable intake manifold position sender -G513-
- Move clear vacuum hoses -arrows-.

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- 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.

 **Note**

Disregard -items 1, 4-.



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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

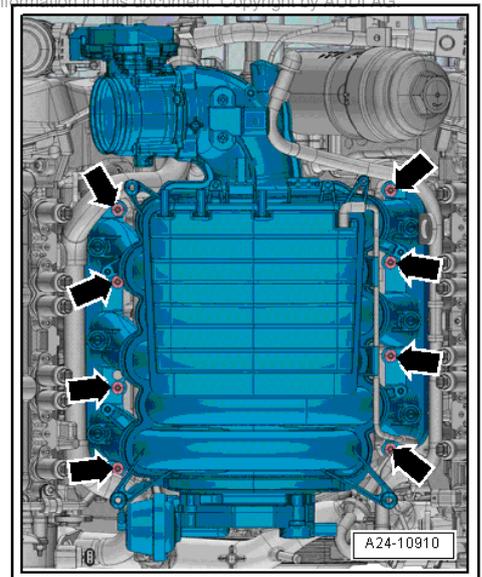
Installation is carried out in the reverse order; note the following:

- Tightening torque
⇒ „5.1 Exploded view - intake manifold“, page 16

 **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 .*

- Install engine cover panel ⇒ Rep. gr. 10 .



5.5 Removing and installing fuel rail

Removing

 **Note**

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 20](#) .
- 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.

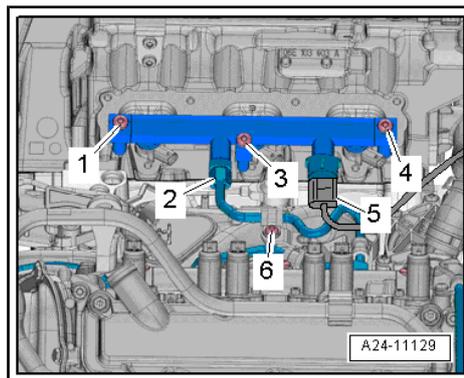
Installing

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

- Tightening torque
⇒ „5.2 Exploded view - fuel rail with injectors“, [page 17](#)

**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 29](#) .
- Install intake manifold ⇒ [page 20](#) .

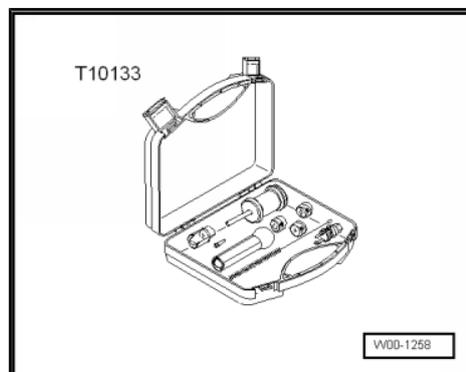


5.6 Removing and installing injectors

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Special tools and workshop equipment required

- ◆ Tool set for FSI engines -T10133-



Removing



WARNING

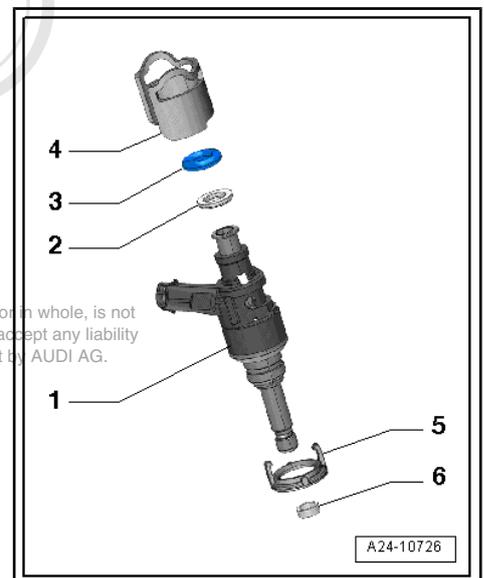
The fuel system operates at extremely high pressure. This can cause injury.

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

- Remove intake manifold ⇒ [page 20](#).
- Remove fuel rail ⇒ [page 21](#).

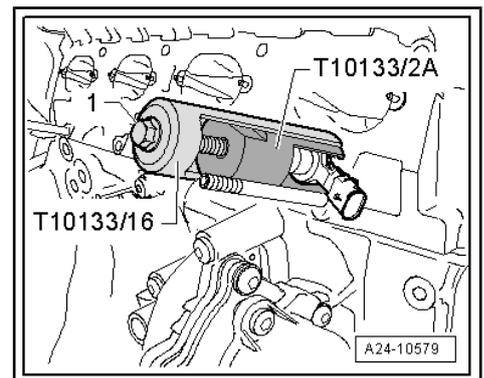
If injectors cannot be pulled out of cylinder head by hand, proceed as follows:

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



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



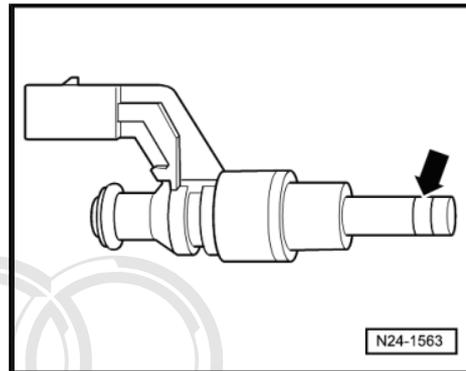


- Carefully remove old combustion chamber ring seal -arrow-. To do so, cut open combustion chamber ring seal using knife or prise open with small screwdriver and then pull off forwards.



Note

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



Installing



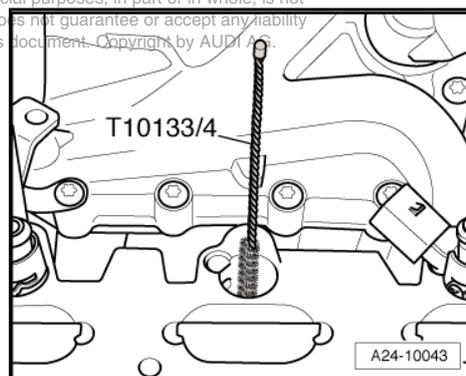
Note

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

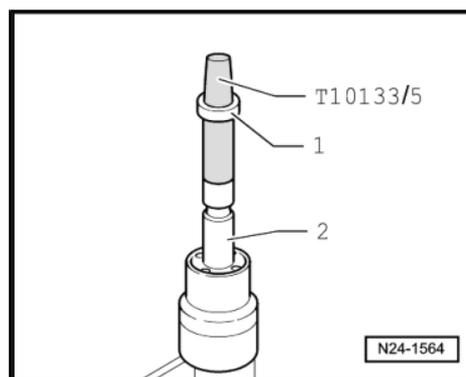
- Clean bore in cylinder head with nylon cylinder brush T10133/4- .

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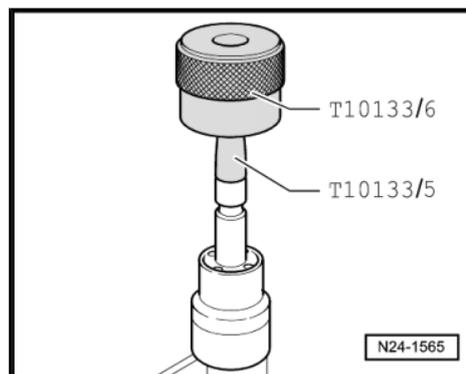
- When re-installing an injector, clean any combustion residue off groove for combustion chamber ring seal and injector stem with a clean cloth.



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



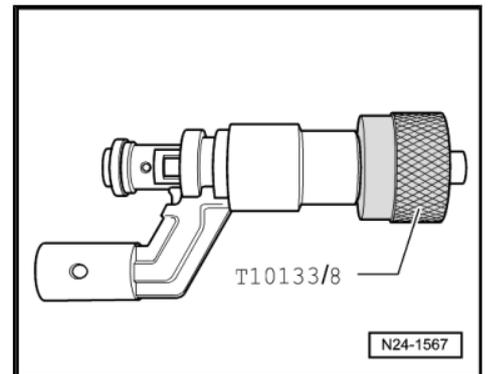
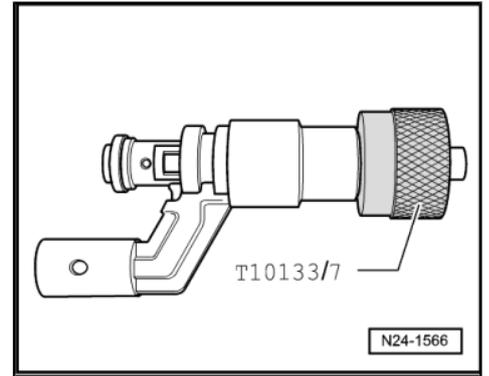
- Using assembly sleeve -T10133/6- , push combustion chamber ring seal onto assembly cone -T10133/5- as far as it will go.
- Turn round assembly sleeve -T10133/6- and slide combustion chamber ring seal into groove.



 **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-:

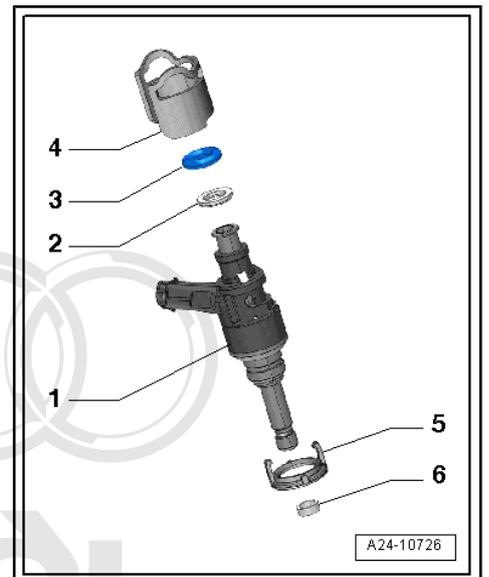
- 2 - Spacer ring
- 3 - O-ring
- 4 - Support ring
- 5 - Sealing element

- 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.

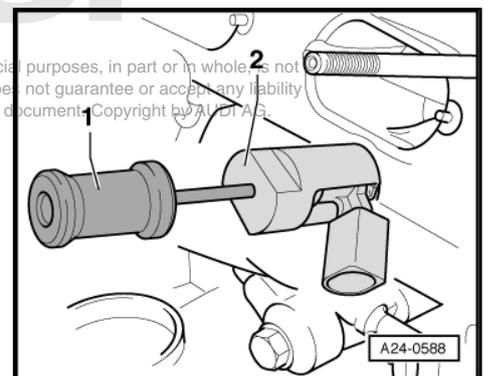
- Push injector by hand as far as it will go into aperture in cylinder head (do not use oil or grease). Ensure that the injector is properly seated in the cylinder head.



 **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- -item 2- with striker -T10133/3- -item 1- to insert the injector.*

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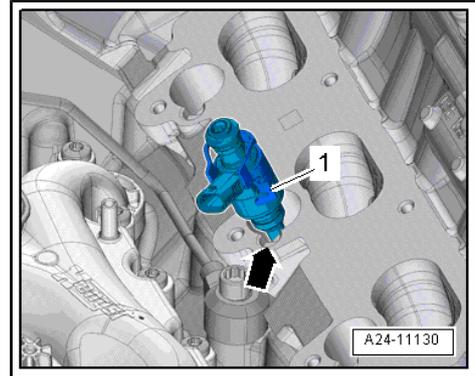


Installation position of support ring:

- 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 21](#) .
- Install intake manifold ⇒ [page 20](#) .



5.7 Removing and installing fuel pressure sender -G247-

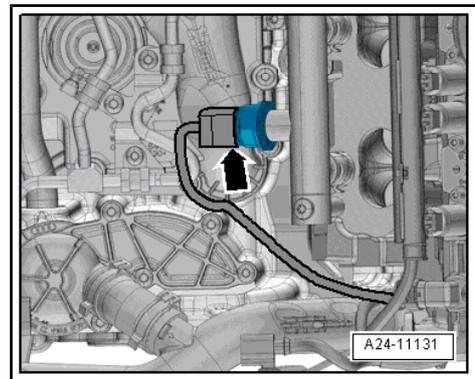
Removing

- Remove intake manifold ⇒ [page 20](#) .
- Unplug electrical connector -arrow-.
- Unscrew fuel pressure sender -G247- .

Installing

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

- Tightening torque
⇒ „5.2 Exploded view - fuel rail with injectors“, [page 17](#)
- Install intake manifold ⇒ [page 20](#) .



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6 High-pressure pump

⇒ „6.1 Exploded view - high-pressure pump“, page 27

⇒ „6.2 Removing and installing high-pressure pipes“, page 29

⇒ „6.3 Removing and installing high-pressure pump“, page 30

6.1 Exploded view - high-pressure pump

1 - Fuel pressure sender for low pressure -G410-

- 15 Nm

2 - Not fitted

3 - Bolt

- Tightening torque and sequence ⇒ [page 28](#)

4 - High-pressure pump

- With fuel metering valve -N290-
- Removing and installing ⇒ [page 30](#)
- Do not dismantle

5 - Threaded connection

- Connections must not be damaged
- 27 Nm

6 - Fuel supply hose

- Low-pressure section

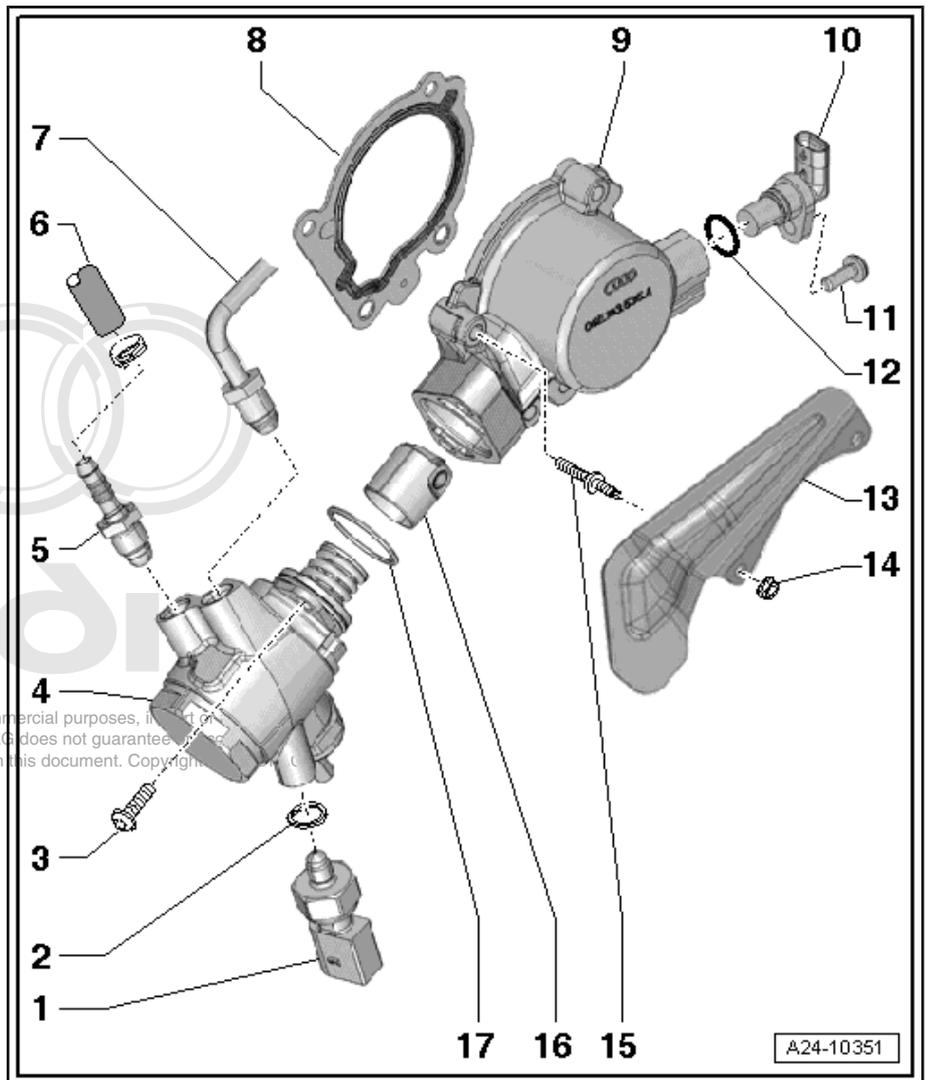
7 - High-pressure pipe

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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](#).*



- Removing and installing ⇒ [page 29](#)
- Do not alter shape
- Check for damage before re-installing
- Lubricate thread of union nut with clean engine oil
- Tightening torque ⇒ [page 29](#)

8 - Gasket

- Renew

9 - Housing

10 - Hall sender -G40-

- Removing and installing ⇒ [page 49](#)



11 - Bolt

- 9 Nm

12 - O-ring

- Renew

13 - Protective plate

- For high-pressure pipe

14 - Nut

- 9 Nm

15 - Threaded pin

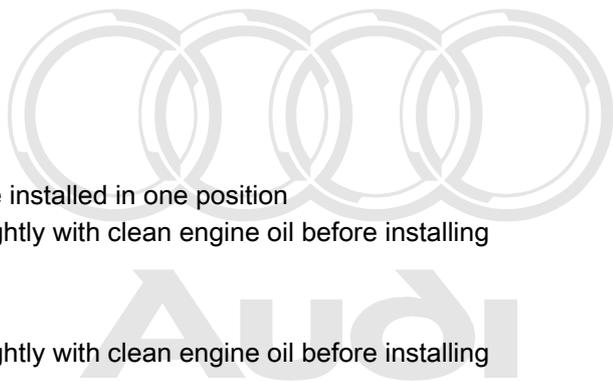
- 9 Nm

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

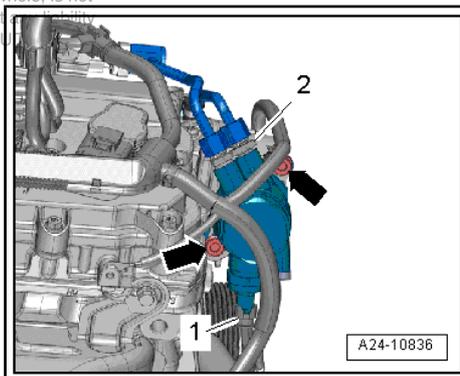


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High-pressure pump tightening torque and sequence

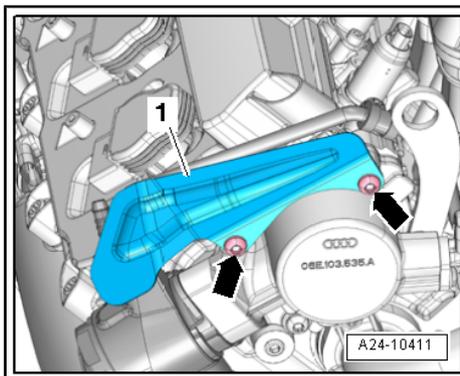
- Tighten bolts in stages as follows:

Stage	Bolts	Tightening torque
1.	-arrows-	Screw in bolts by hand until they make contact
2.	-arrows-	5 Nm
3.	-arrows-	Tighten in stages and alternately; final torque 20 Nm



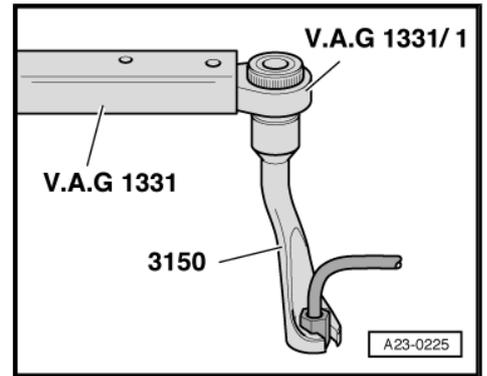
Guard plate for high-pressure pipe - tightening torque

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



Installing high-pressure pipe at high-pressure pump

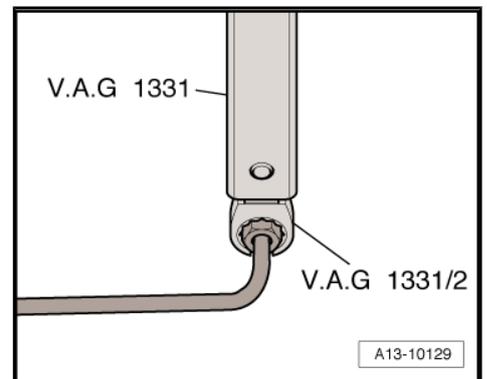
- Tighten union nut on high-pressure pipe hand-tight initially.
- Ensure that high-pressure pipe is not under tension.
- To tighten union of high-pressure pipe at high-pressure pump, use torque wrench -V.A.G 1331- with ratchet -V.A.G 1331/1- and socket, 14 mm -3150- .
- Tightening torque: 25 Nm.



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.*

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- 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 29](#)
- Do not install retaining tabs until high-pressure pipes have been tightened.
- Check fuel system for leaks ⇒ [page 5](#) .



6.3 Removing and installing high-pressure pump

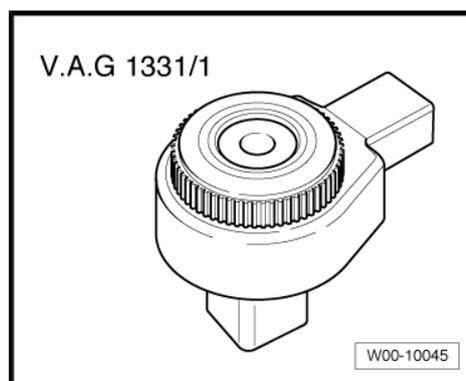
Special tools and workshop equipment required

- ◆ Torque wrench -V.A.G 1331-

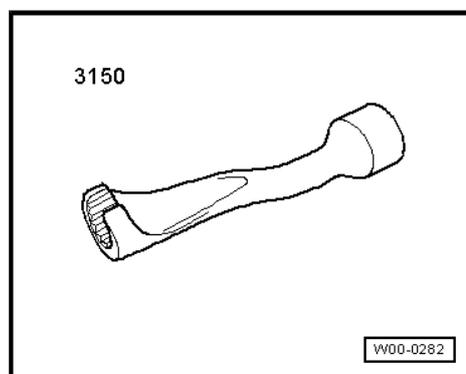
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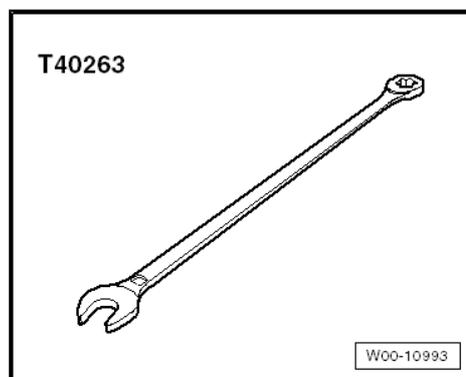
- ◆ Ratchet -V.A.G 1331/1-



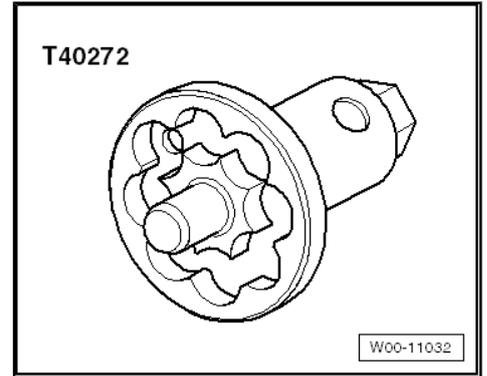
- ◆ Socket SW 14 -3150- or flared ring spanner tool insert AF 14 -V.A.G 1331/8-



- ◆ Wrench, 21 mm -T40263-



- ◆ Turning over tool -T40272-



Removing



WARNING

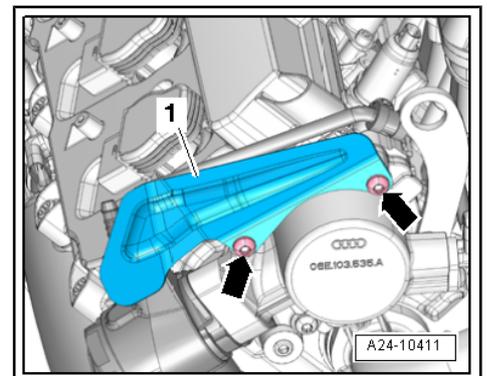
The fuel system operates at extremely high pressure. This can cause injury.

- ◆ *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.*



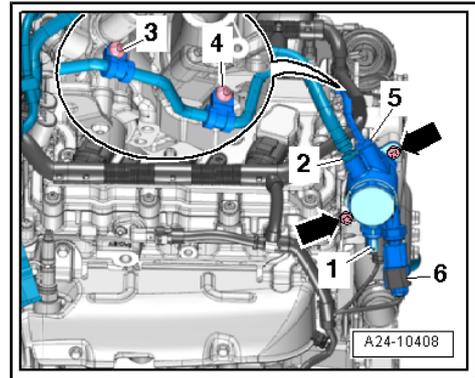
Note

- ◆ *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](#) .
- 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

- ◆ *Disregard -item 4-.*
- ◆ *Do not attempt to bend fuel lines 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

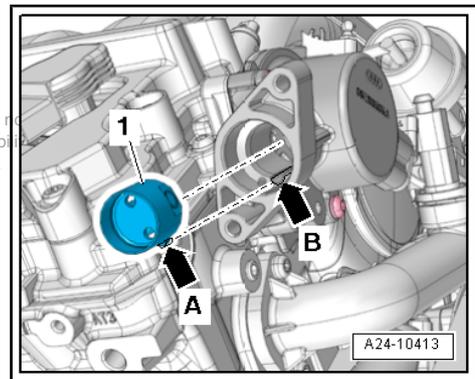
Installation is carried out in the reverse order; note the following:



Note

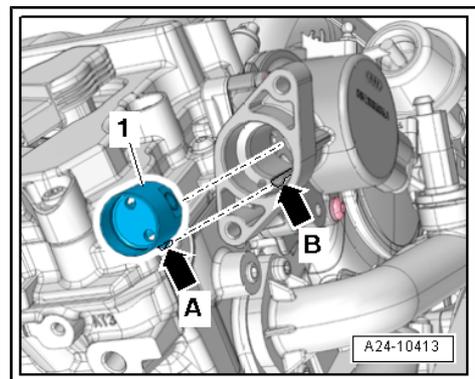
- ◆ *The connections of the high-pressure pipe must not be damaged.*
- ◆ *Do not bend fuel pipes to a different shape.*
- ◆ *Do NOT bend open retaining clamps for fuel pipe.*
- ◆ *If one of the retaining clamps has been bent open or the fuel pipe has to be renewed, the retaining clamps must also be renewed.*

- 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-.



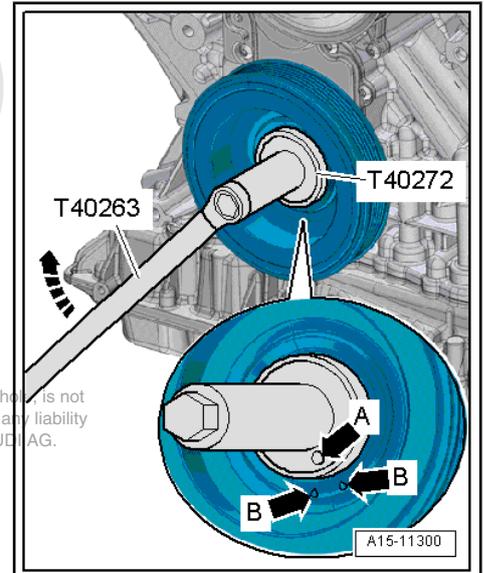
Note

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



- Fit turning over tool -T40272- onto wrench (21 mm) -T40263- .
- Position adapter on bolts of vibration damper.
- Hole -arrow A- on turning over tool -T40272- must be positioned between markings -arrows B- on vibration damper.
- Rotate crankshaft in direction of normal engine rotation -arrow- using wrench (21 mm) -T40263- and turning over tool -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.

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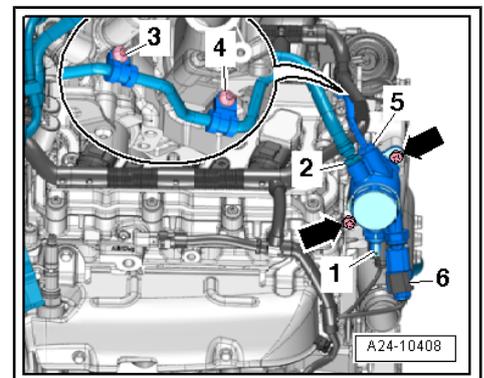


- Hand-tighten the bolts -arrows- as far as the flange.
- Then initially tighten securing bolts alternately to 5 Nm (do not tilt high-pressure pump).

i Note

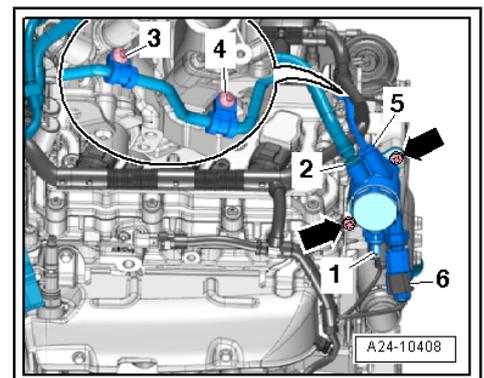
The high-pressure pump can be damaged if it is tightened too much on one side (keep it straight).

- Final tightening torque for securing bolts ⇒ „6.1 Exploded view - high-pressure pump“, page 27
- 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 bolt -3- on retaining clip.
- Plug in electrical connectors -1- and -6-.



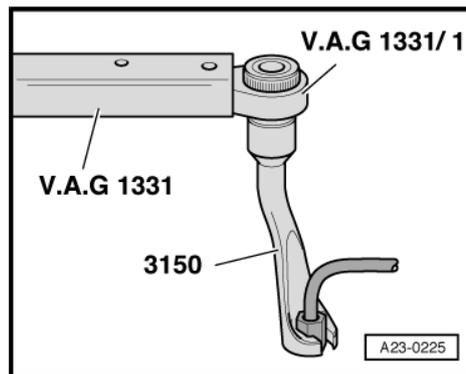
i Note

Disregard -item 4-.

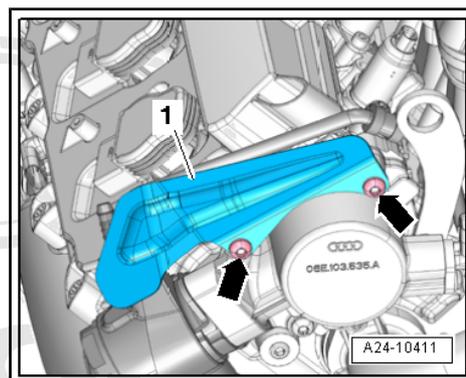




- Tighten high-pressure pipe to specified torque ⇒ [page 29](#) .



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



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7 Lambda probes

⇒ „7.1 Overview - Lambda probes“, page 35

⇒ „7.2 Removing and installing Lambda probes G39 / G130“, page 36

⇒ „7.3 Removing and installing Lambda probes G108 / G131“, page 37

7.1 Overview - Lambda probes



Note

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- ◆ *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 36
- 55 Nm

2 - Lambda probe after catalytic converter -G130-

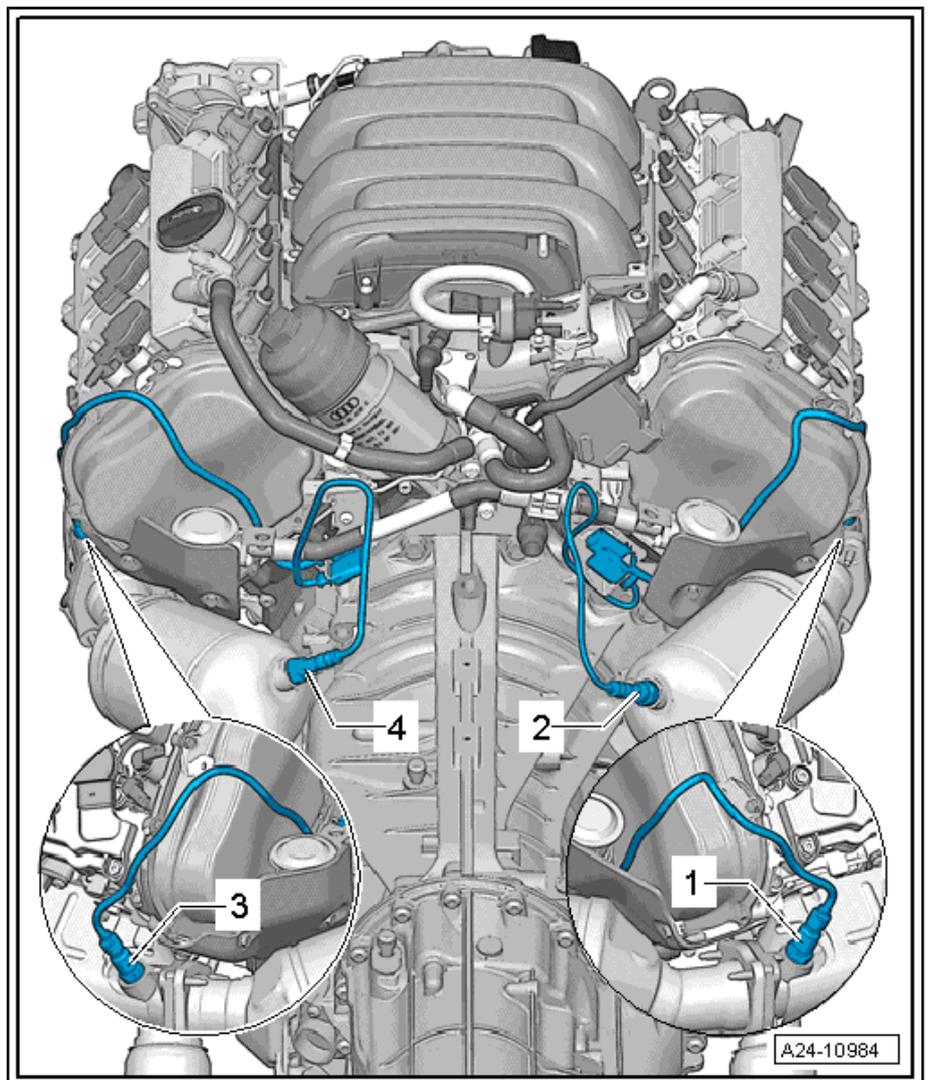
- With Lambda probe 1 heater after catalytic converter -Z29-
- Removing and installing ⇒ page 36
- 55 Nm

3 - Lambda probe 2 -G108-

- With Lambda probe heater 2 -Z28-
- Removing and installing ⇒ page 37
- 55 Nm

4 - Lambda probe 2 after catalytic converter -G131-

- With Lambda probe 2 heater after catalytic converter -Z30-
- Removing and installing ⇒ page 37
- 55 Nm



A24-10984



7.2 Removing and installing Lambda probes -G39- / -G130-

Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set -3337-



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Removing

- Remove throttle valve module -J338- => [page 19](#) .
- Remove bolts -arrows- and unplug electrical connectors at ignition coils.
- Press electrical wiring harness up slightly.

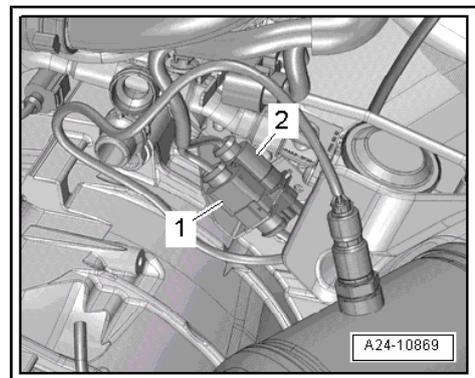
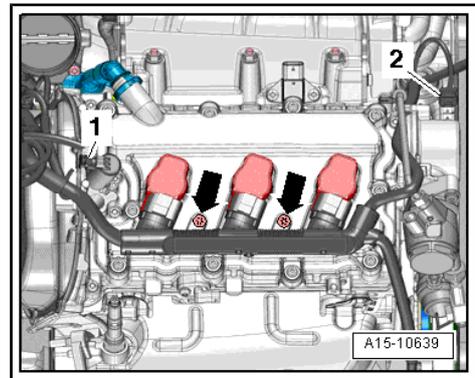
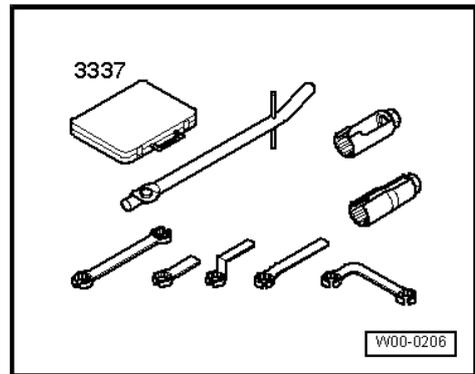


Note

Disregard -items 1, 2-

- Unplug relevant electrical connector and move electrical wiring clear:

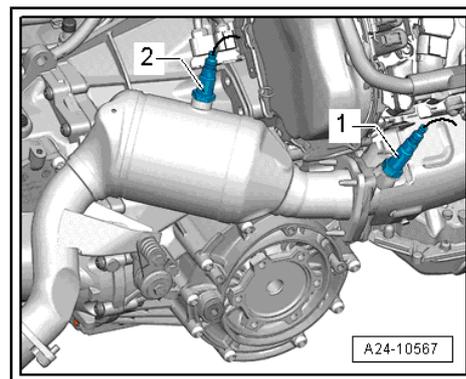
- 1 - For Lambda probe after catalytic converter -G130-
- 2 - For Lambda probe -G39-



- Unscrew relevant Lambda probes:
- 1 - Lambda probe -G39- using ring spanner -3337/7-
- 2 - Lambda probe after catalytic converter -G130- using ring spanner -3337/2-

 **Note**

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



Installing

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

- Tightening torques
 => „7.1 Overview - Lambda probes“, page 35

 **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.*

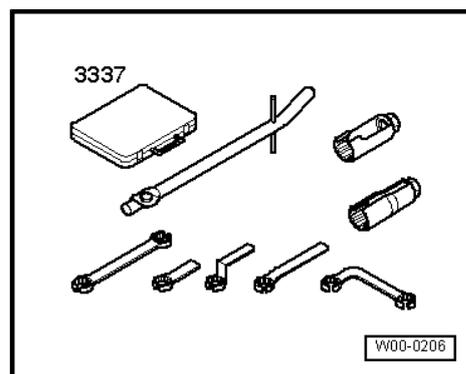
- Install throttle valve module -J338- => [page 19](#) .

7.3 Removing and installing Lambda probes -G108- / -G131-

Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set -3337-

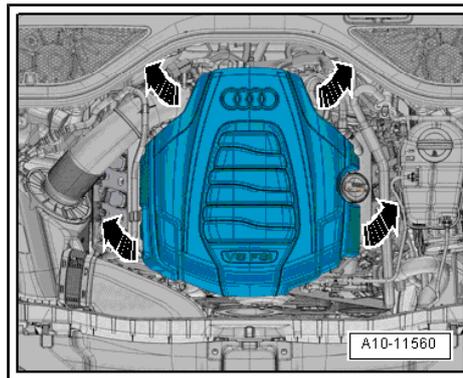
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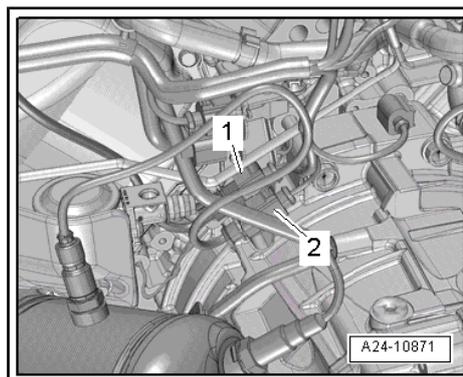
Removing

- Remove engine cover panel ⇒ Rep. gr. 10 .
- Remove plenum chamber partition panel ⇒ Rep. gr. 50 .



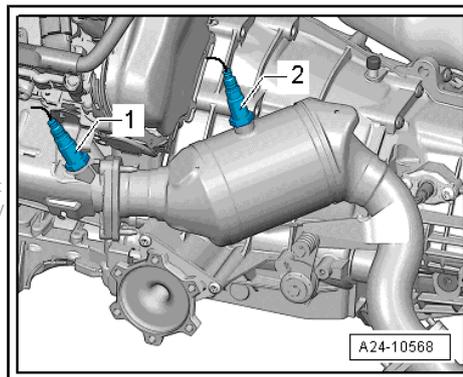
- Unplug relevant electrical connector and move electrical wiring clear:

- 1 - For Lambda probe 2 -G108-
- 2 - For Lambda probe 2 -G131- (after catalytic converter)



- Unscrew relevant Lambda probe using ring spanner -3337/7- :

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



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

Installing

- Tightening torques
⇒ „7.1 Overview - Lambda probes“, page 35

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



Note

- ◆ *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- ◆ *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the 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 plenum chamber partition panel ⇒ Rep. gr. 50 .
- Install engine cover panel ⇒ Rep. gr. 10 .

8 Engine control unit

⇒ „8.1 Wiring and component check with test box V.A.G 1598/42“
 „page 39

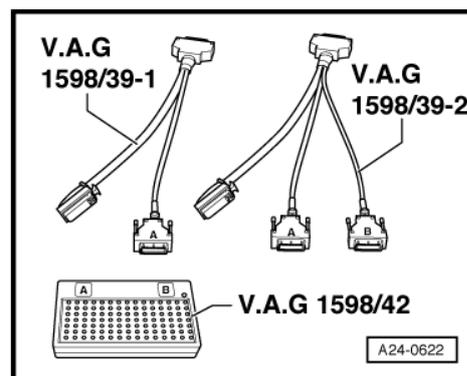
⇒ „8.2 Removing and installing engine control unit J623“
 page 40

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

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Special tools and workshop equipment required

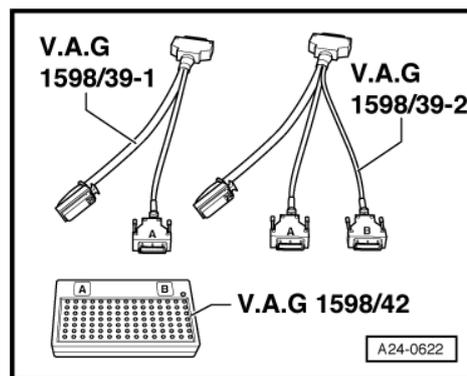
- ◆ Adapter cable -V.A.G 1598/39-1-
- ◆ Adapter cable -V.A.G 1598/39-2-
- ◆ Test box -V.A.G 1598/42-



- ◆ 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 40](#) .
- 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.
- Install engine control unit -J623- ⇒ [page 40](#) .

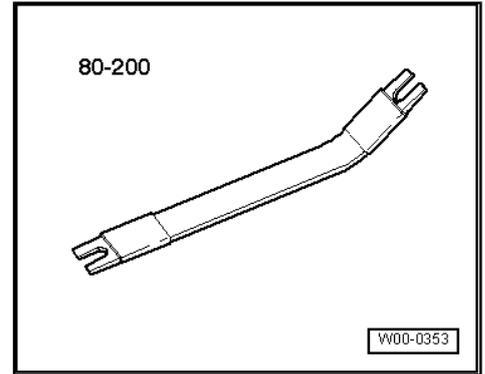
**Note**

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-

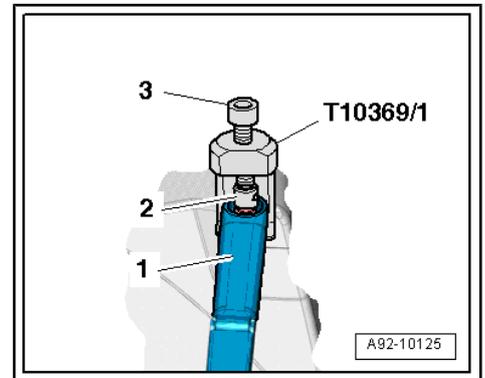
Special tools and workshop equipment required

◆ Removal lever -80 - 200-



Removing

- When renewing engine control unit, select diagnosis object „Replace engine control unit“ in „Guided Functions“ mode of vehicle diagnostic tester .
- Switch off ignition.
- Remove wiper arms ⇒ Electrical system; Rep. gr. 92 .



- Detach seal -1- from plenum chamber cover.

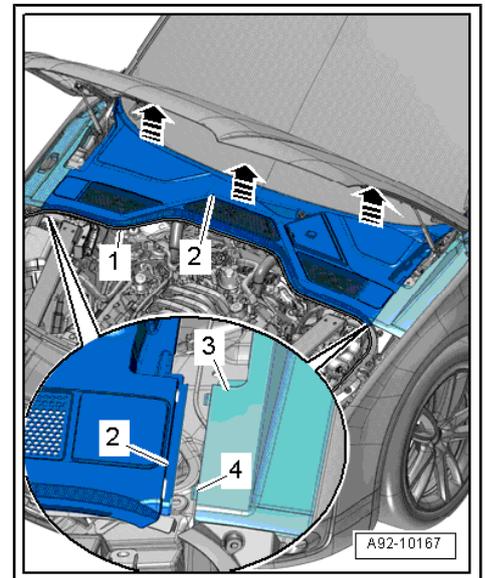
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Caution

Risk of damage to plenum chamber cover.

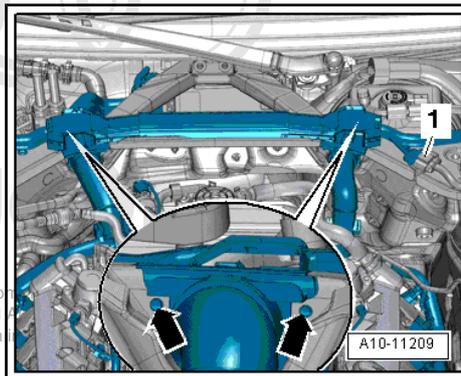
- ◆ ***Apply a small amount of soap solution to transition between windscreen and plenum chamber cover.***



- Remove plenum chamber cover -2- ⇒ Rep. gr. 50 .

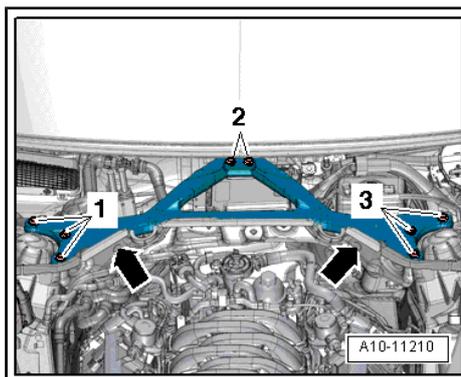


- Move clear wiring harness at plenum chamber cover on bulk-head on both sides (release catches -arrows-).
- Detach electrical connector -1- from bracket and unplug.
- Use removal lever -80 - 200- to move electrical wiring harness at body brace clear.



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- Remove bolts -1, 2, 3- and -arrows- and detach body brace.



- Release clips -arrows- and detach engine control unit -J623- item 2-.



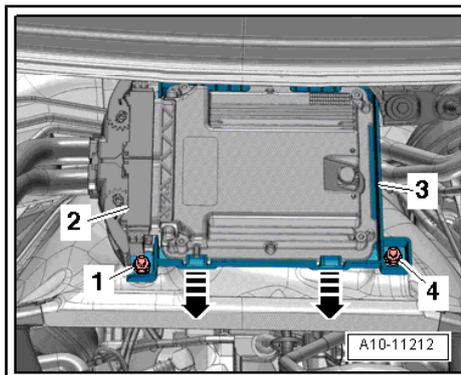
Note

Disregard -items 1, 3, 4-.

Installing

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

- Install body brace ⇒ Rep. gr. 40 .
- Install wiper arms ⇒ Electrical system; Rep. gr. 92 .
- Activate engine control unit via a vehicle diagnostic tester in „Guided Functions“ mode, „Replace engine control unit“.



28 – Ignition system

1 General notes and safety precautions

⇒ „1.1 General notes on ignition system“, page 43

⇒ „1.2 Safety precautions when working on the injection and ignition system“, page 43

⇒ „1.3 Safety precautions when working on vehicles with start/stop system“, page 44

⇒ „1.4 Safety precautions when using testers and measuring instruments during a road test“, page 44

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 xenon 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 47](#) .
- ◆ 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).*

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

⇒ „2.1 Test data“, page 45

⇒ „2.2 Exploded view - ignition system“, page 46

⇒ „2.3 Removing and installing ignition coils“, page 47

⇒ „2.4 Removing and installing knock sensors G61 / G66“, page 48

⇒ „2.5 Removing and installing Hall senders G40 / G163 / G300 / G301“, page 49

⇒ „2.6 Removing and installing engine speed sender G28“, page 50

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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	Change interval	⇒ Maintenance tables
	Removing and installing, tightening torque	⇒ Maintenance ; Booklet 410
Firing order		1-4-3-6-2-5



2.2 Exploded view - ignition system

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 49](#)

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 48](#)

5 - Bolt

- 25 Nm

6 - Spark plug

- Remove and install with spark plug socket and extension -3122 B- ⇒ Maintenance ; Booklet 410

- Tightening torque ⇒ Maintenance ; Booklet 410

- Change interval ⇒ Maintenance tables

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 47](#)

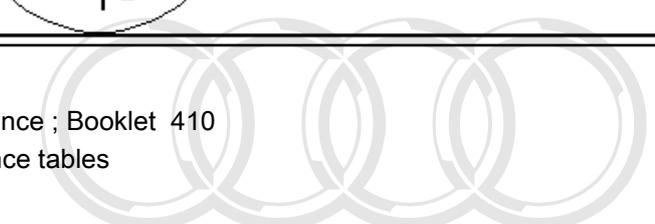
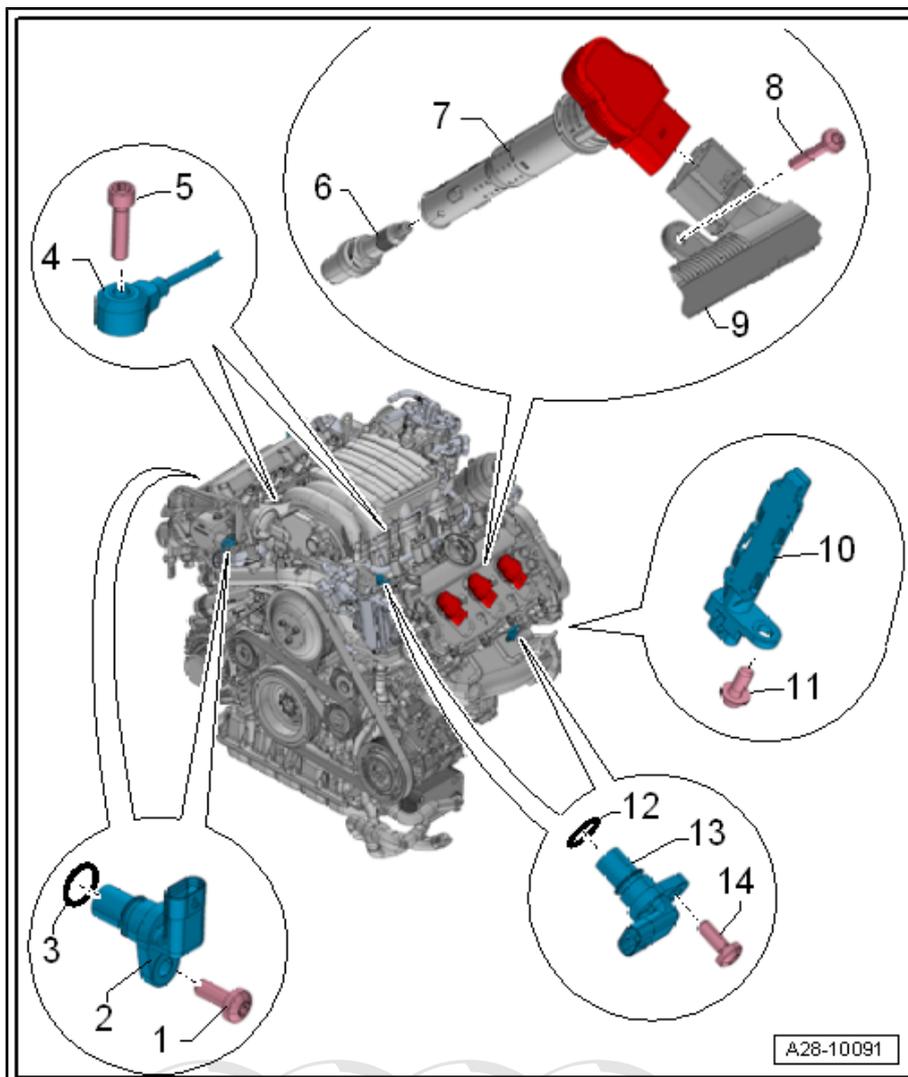
8 - Bolt

- 5 Nm

9 - Electrical wiring harness

10 - Engine speed sender -G28-

- Removing and installing ⇒ [page 50](#)



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11 - Bolt

- 9 Nm

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 49](#)

14 - Bolt

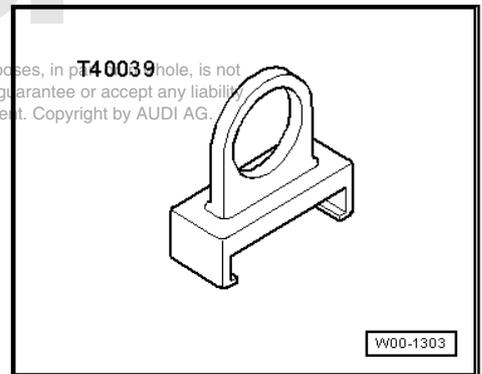
- 9 Nm

2.3 Removing and installing ignition coils

Special tools and workshop equipment required

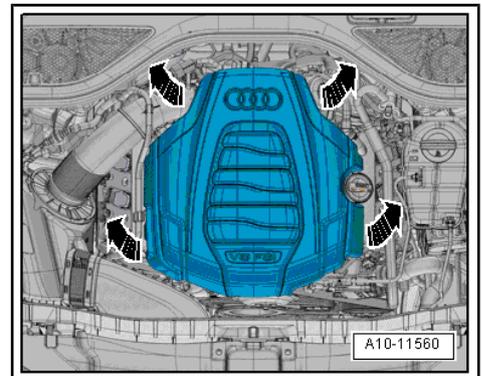
- ◆ Puller -T40039-

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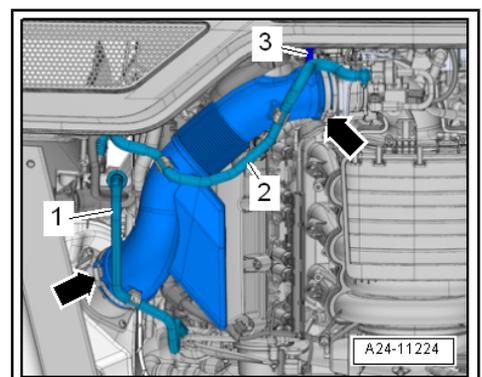
Removing

- Remove engine cover panel ⇒ Rep. gr. 10 .



Cylinder bank 1 (right-side):

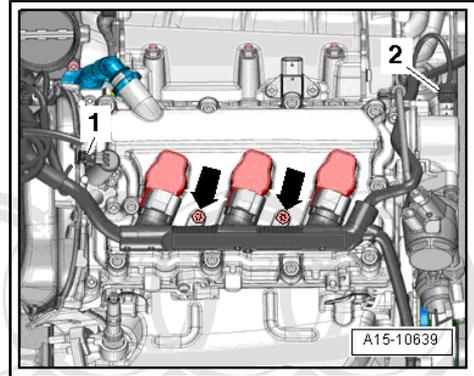
- Move fuel line -1- and line -2- leading to activated charcoal filter clear on air cleaner housing and air pipe.
- Detach vacuum hose -3- from connection on air pipe.
- Release hose clips -arrows- and remove air pipe.



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

**Note**

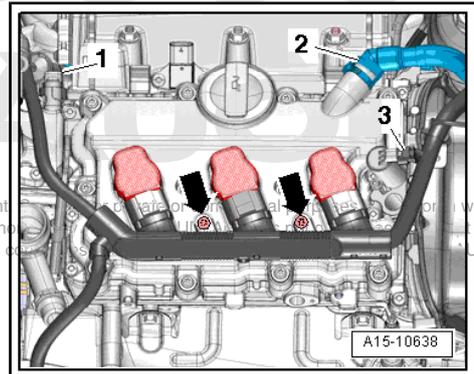
Disregard -items 1, 2-.

**Cylinder bank 2 (left-side):**

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

**Note**

Disregard -items 1, 2, 3-.



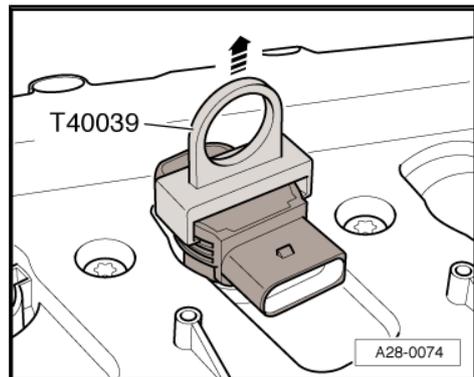
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Continuation for both sides:

- Remove ignition coils using puller -T40039- .

Installing

- Tightening torque
⇒ „2.2 Exploded view - ignition system“, page 46
- 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).



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

- Install engine cover panel ⇒ Rep. gr. 10 .

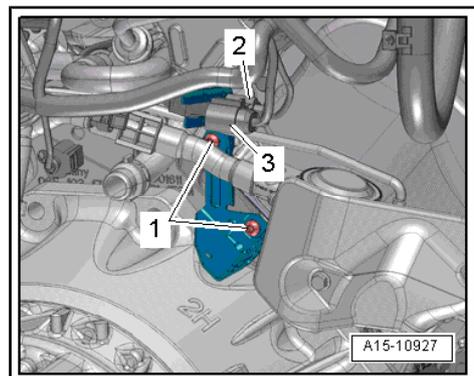
2.4 Removing and installing knock sensors -G61- / -G66-

Removing**Cylinder bank 1 (right-side):**

- Remove injector on cylinder 2 ⇒ [page 22](#) .
- Detach electrical connector -3- from bracket.
- Remove electrical connector -2- for knock sensor 1 -G61- from bracket and unplug connector.

**Note**

Disregard -item 1-.

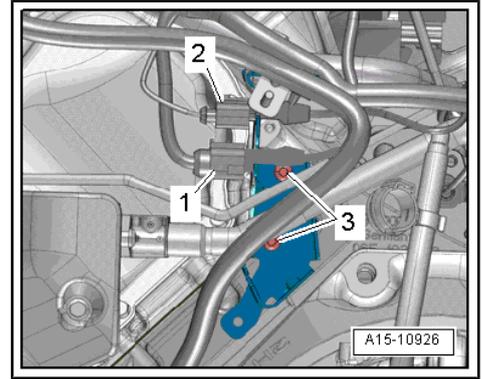


Cylinder bank 2 (left-side):

- Remove injector on cylinder 5 ⇒ [page 22](#) .
- Remove electrical connector -2- for knock sensor 2 -G66- from bracket and unplug connector.



Disregard -items 1, 3-.



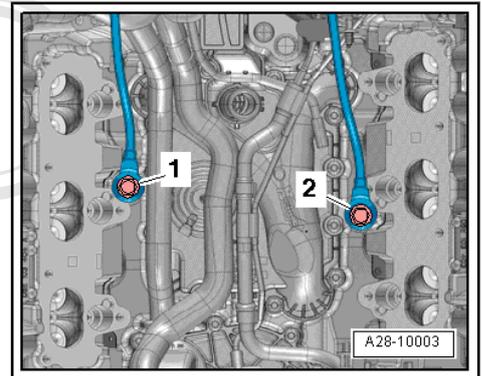
Continuation for both sides:

- Remove corresponding bolt and detach knock sensor:
- 1 - For knock sensor 1 -G61-
 - 2 - For knock sensor 2 -G66-

Installing

Install in reverse order.

- Tightening torque
 ⇒ [„2.2 Exploded view - ignition system“, page 46](#)

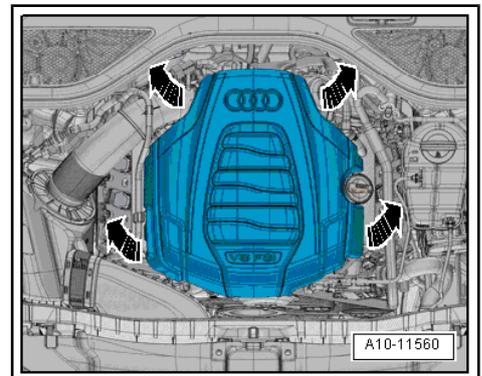


2.5 Removing and installing Hall senders
 G40- / -G163- / -G300- / -G301-

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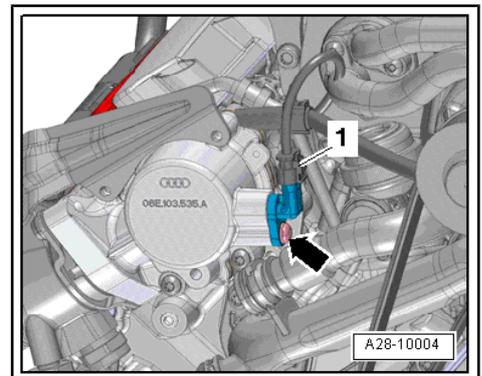
Removing Hall sender (inlet side)

- Remove engine cover panel ⇒ Rep. gr. 10 .



Hall sender -G40- :

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



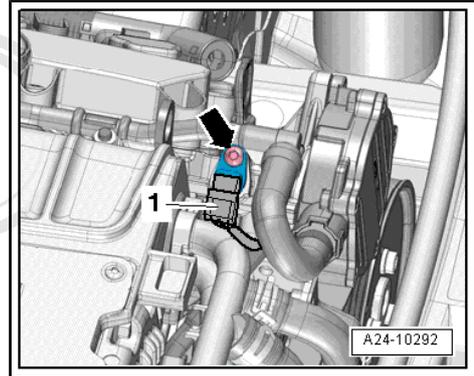


Hall sender 2 -G163- :

- Unplug electrical connector -1-.
- Remove bolt -arrow- and detach Hall sender 2 -G163- .

Removing Hall sender (exhaust side)

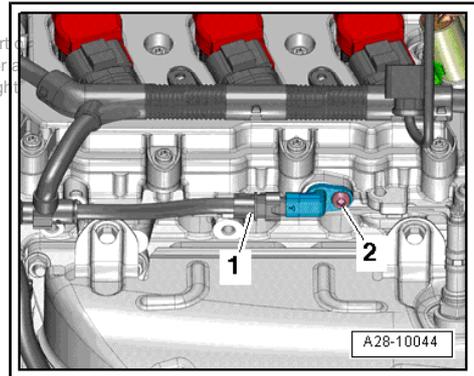
- Cylinder bank 1 (right-side): Remove air cleaner housing
⇒ [page 14](#) .



Hall sender 3 -G300- / Hall sender 4 -G301- :

- Unplug electrical connector -1-.
- Unscrew bolt -2- and detach Hall sender.

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Note

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 Exploded view - ignition system“, page 46](#) .
- ⇒ [„4.1 Air cleaner - exploded view“, page 13](#)



Note

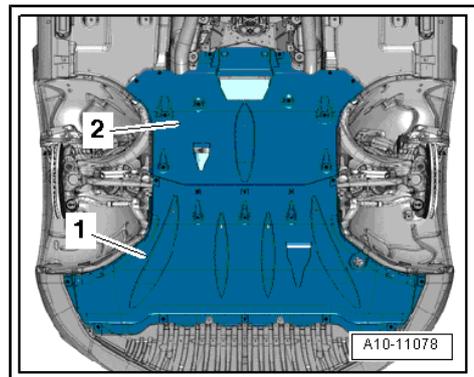
Fit new O-rings.

- Install engine cover panel ⇒ Rep. gr. 10 .

2.6 Removing and installing engine speed sender -G28-

Removing

- Remove rear noise insulation panel -2- ⇒ Rep. gr. 66 .

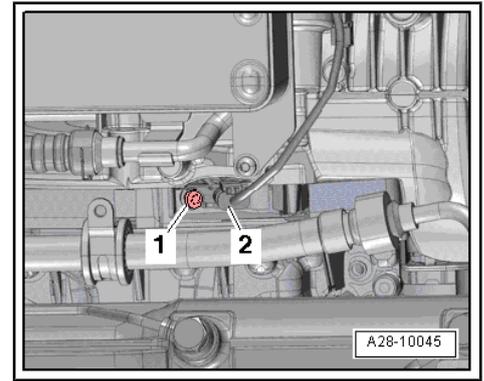


- Unplug electrical connector -2-.
- Unscrew bolt -1- and pull out engine speed sender -G28- .

Installing

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

- Tightening torque
⇒ „2.2 Exploded view - ignition system“, page 46
- Install noise insulation ⇒ Rep. gr. 66 .



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