

Workshop Manual Audi A1 2011 ➤

**Direct petrol injection and ignition system (4-cyl. 1.4 ltr.
4-valve turbo with timing chain)**

Engine ID	CAX A	CNV A							
-----------	----------	----------	--	--	--	--	--	--	--

Edition 06.2011

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

List of Workshop Manual Repair GroupsList of Workshop Manual Repair GroupsList of Workshop Manual Repair Groups

Repair Group

24 - Mixture preparation - injection

28 - Ignition system



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

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.

All rights reserved.
No reproduction without prior agreement from publisher.

Copyright © 2011 Audi AG, Ingolstadt

D3E802996E4



Contents

24 - Mixture preparation - injection	1
1 Safety precautions and rules for cleanliness	1
1.1 General notes on self-diagnosis	1
1.2 Safety precautions when using testers and measuring instruments during a road test	2
1.3 Safety precautions when working on vehicles with start/stop system	2
1.4 Safety precautions when working on the fuel system	2
1.5 Safety precautions when working on the ignition system	3
1.6 Rules for cleanliness and instructions for working on fuel system	3
1.7 Reducing pressure in high-pressure section of injection system	4
1.8 Checking for leaks in the fuel system	5
1.9 Checking vacuum system	5
2 Technical data	6
3 Overview of fitting locations	7
4 Air cleaner	12
4.1 Air cleaner - exploded view	12
4.2 Removing and installing engine cover panel	13
4.3 Removing and installing air filter element	13
4.4 Removing and installing air cleaner housing	15
5 Intake manifold	16
5.1 Intake manifold (top section) - exploded view	16
5.2 Removing and installing intake manifold (top section)	17
5.3 Intake manifold (bottom section), fuel rail, injector - exploded view	19
5.4 Removing and installing intake manifold (bottom section) with fuel rail	20
6 High-pressure pump	22
6.1 High-pressure pump - exploded view	22
6.2 Removing and installing high-pressure pump	24
7 Injectors	28
7.1 Removing and installing injectors	28
8 Components of injection system	33
8.1 Removing and installing fuel pressure sender G247	33
8.2 Checking fuel pressure and residual pressure (up to high-pressure pump)	34
8.3 Removing and installing high-pressure pipe	37
8.4 Removing and installing intake air temperature sender G42 / intake manifold pressure sender G71	38
8.5 Removing and installing throttle valve module J338	38
8.6 Cleaning throttle valve module J338	41
9 Lambda probes	42
9.1 Lambda probe - overview	42
9.2 Removing and installing Lambda probe G39 and Lambda probe heater Z19 before catalytic converter	43
9.3 Removing and installing Lambda probe after catalytic converter G130 and Lambda probe 1 heater after catalytic converter Z29	44
10 Engine control unit	46
10.1 Wiring and component check with test box V.A.G 1598/42	46
10.2 Removing and installing engine control unit J623	47
28 - Ignition system	51
1 General notes and safety precautions	51
1.1 General notes on ignition system	51
1.2 Safety precautions when using testers and measuring instruments during a road test	51
1.3 Safety precautions when working on the injection and ignition system	52
1.4 Safety precautions when working on vehicles with start/stop system	52



2	Servicing ignition system	53
2.1	Test data	53
2.2	Ignition system - exploded view	54
2.3	Removing and installing ignition coils with output stages	54
2.4	Removing and installing knock sensor 1 G61	56
2.5	Removing and installing Hall sender G40	56
2.6	Removing and installing engine speed sender G28	56

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

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 when working on vehicles with start/stop system“, page 2

⇒ „1.5 Safety precautions when working on the ignition system“, page 3

⇒ „1.4 Safety precautions when working on the fuel system“, page 2

⇒ „1.6 Rules for cleanliness and instructions for working on fuel system“, page 3

⇒ „1.7 Reducing pressure in high-pressure section of injection system“, page 4

⇒ „1.8 Checking for leaks in the fuel system“, page 5

⇒ „1.9 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 probes.
- ◆ 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 control unit.
- ◆ 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](#).

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 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).*

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability for the correctness of information in this document. Copyright by AUDI AG.

1.4 Safety precautions when working on the fuel system

When working on the fuel system note the following warnings:



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; for the correct procedure see [⇒ page 4](#).*
- ◆ *The connection must be opened IMMEDIATELY after reducing the pressure; wrap a cloth around the connection and allow the residual pressure (approx. 7 bar) to dissipate.*

1.5 Safety precautions when working on the 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.
- ◆ Always switch off the ignition before connecting or disconnecting electrical wiring for the injection or ignition system or tester cables.
- ◆ For safety reasons, the battery must be disconnected before opening the fuel system to prevent the fuel pump from being activated by the contact switch on the driver's door.
- ◆ Do not open any fuel line connections while the engine is running.
- ◆ 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 54](#) .
- ◆ Also remove fuse for fuel pump control unit -J538- ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- ◆ Entries are stored in the event memory of the engine control unit if electrical connectors were unplugged and the engine was started: „Generate readiness code“ in „Guided Functions“ ⇒ Vehicle diagnostic tester .



Caution

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

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

– Disconnect battery ⇒ Electrical system; Rep. gr. 27 .

1.6 Rules for cleanliness and instructions for working on fuel 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.
- ◆ Plug open lines and connections with suitable protective caps immediately.
- ◆ 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.

1.7 Reducing pressure in high-pressure section of injection system

Special tools and workshop equipment required

- ◆ ⇒ Vehicle diagnostic tester



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. 7 bar).***
- ◆ ***Prior to opening the high-pressure section (e.g. when removing the high-pressure pump, fuel rail, injectors, fuel pipes or fuel pressure sender -G247-), the fuel pressure in the high-pressure section must be reduced to a specified level. The procedure is described below.***

Procedure

- 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 „Fuel pressure“ from the list.
- Activate basic setting by pressing „Start“ button.
- Observe fuel pressure displayed on ⇒ Vehicle diagnostic tester.
- Fuel pressure will drop to a specified value.
- Switch off ignition.

The fuel rail is still filled with fuel, however it is no longer under high pressure.



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.*
- ◆ *The ignition must not be switched on again from this point on as this would increase the pressure again.*

Additional steps required

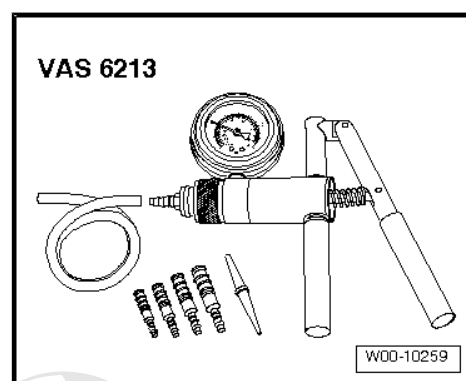
- Erase event memory and generate readiness code in engine control unit in „Guided Functions“ mode.

1.8 Checking for leaks in the fuel system

- 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.

1.9 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

1.4 ltr. TFSI engine		
Idling speed		Cannot be adjusted; regulated by idling speed stabilisation
Maximum rpm governed by deactivation of fuel injectors		6500 rpm
Fuel pressure	Fuel pressure of fuel system pressurisation pump - G6- upstream of high-pressure pump	3 to 7 bar
	Pressure in high-pressure fuel circuit (generated by mechanical single-plunger high-pressure pump) at a coolant temperature of approx. 85°C	approx. 35 bar at idling speed approx. 140 bar in certain parts of operating range



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

3 Overview of fitting locations

Engine compartment

1 - Brake vacuum pump -V192-

2 - Camshaft control valve 1 - N205-

- ☐ Removing and installing
 ⇒ Rep. gr. 15

3 - Injector, cylinder 1 -N30-

- ☐ Exploded view
 ⇒ [page 19](#)

4 - Injector, cylinder 2 -N31-

- ☐ Exploded view
 ⇒ [page 19](#)

5 - Injector, cylinder 3 -N32-

- ☐ Exploded view
 ⇒ [page 19](#)

6 - Injector, cylinder 4 -N33-

- ☐ Exploded view
 ⇒ [page 19](#)

7 - Brake servo pressure sensor -G294-

- ☐ Fitting location
 ⇒ [page 10](#)

8 - Brake light switch - F- / brake pedal switch -F63-

- ☐ Fitting location
 ⇒ [page 10](#)
- ☐ Removing and installing
 ⇒ Rep. gr. 45

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

- ☐ Fitting location
 ⇒ [page 10](#)

10 - Clutch position sender -G476-

- ☐ For vehicles with manual gearbox
- ☐ Fitting location ⇒ [page 10](#)

11 - Engine control unit -J623-

- ☐ Fitting location ⇒ [page 9](#)

12 - Hall sender -G40-

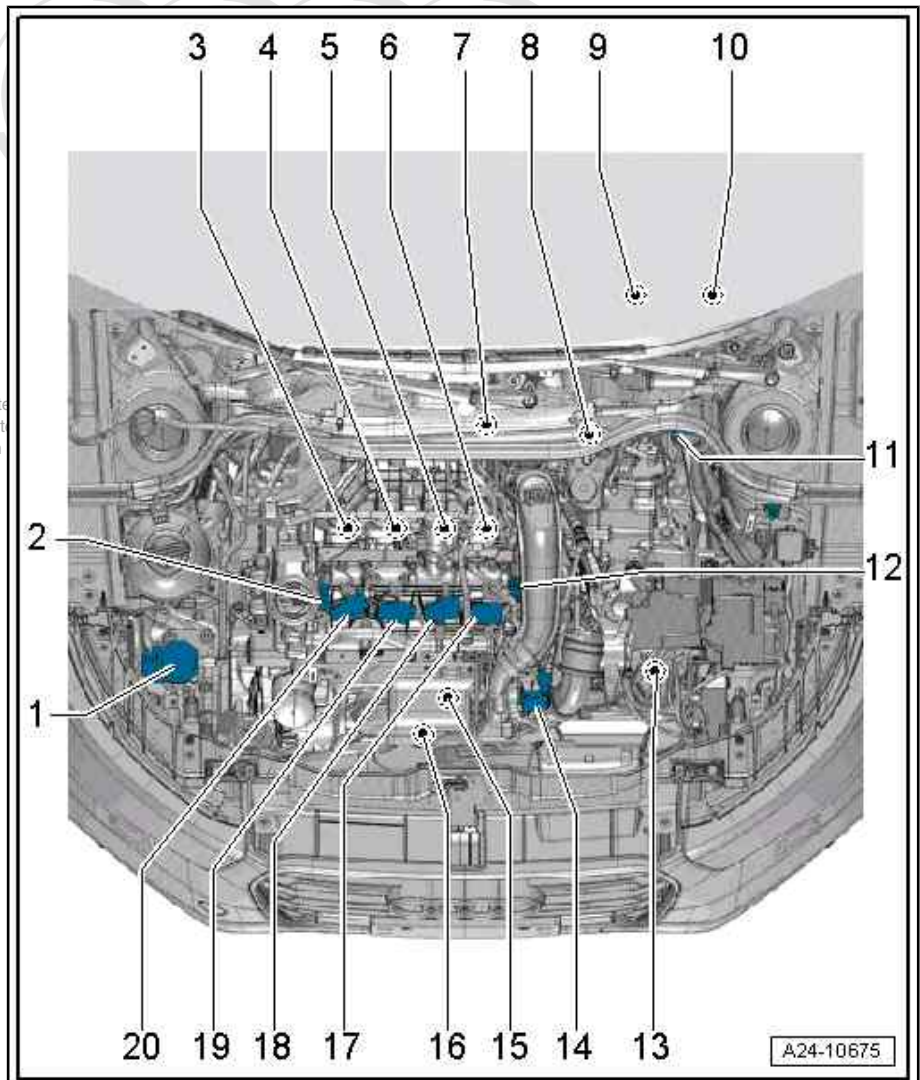
- ☐ Camshaft position sensor
- ☐ Exploded view ⇒ [page 54](#)

13 - Gearbox neutral position sender -G701-

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

14 - Turbocharger air recirculation valve -N249-

- ☐ Removing and installing ⇒ Rep. gr. 21



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

- ☐ Exploded view ⇒ [page 42](#)

16 - Lambda probe -G39- with Lambda probe heater -Z19-

- ☐ Exploded view ⇒ [page 42](#)

17 - Ignition coil 4 with output stage -N292-

- ☐ Exploded view ⇒ [page 54](#)

18 - Ignition coil 3 with output stage -N291-

- ☐ Exploded view ⇒ [page 54](#)

19 - Ignition coil 2 with output stage -N127-

- ☐ Exploded view ⇒ [page 54](#)

20 - Ignition coil 1 with output stage -N70-

- ☐ Exploded view ⇒ [page 54](#)

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Engine (intake side)

1 - Knock sensor 1 -G61-

- ☐ Exploded view ⇒ [page 54](#)
- ☐ Removing and installing ⇒ [page 56](#)

2 - Throttle valve module - J338-

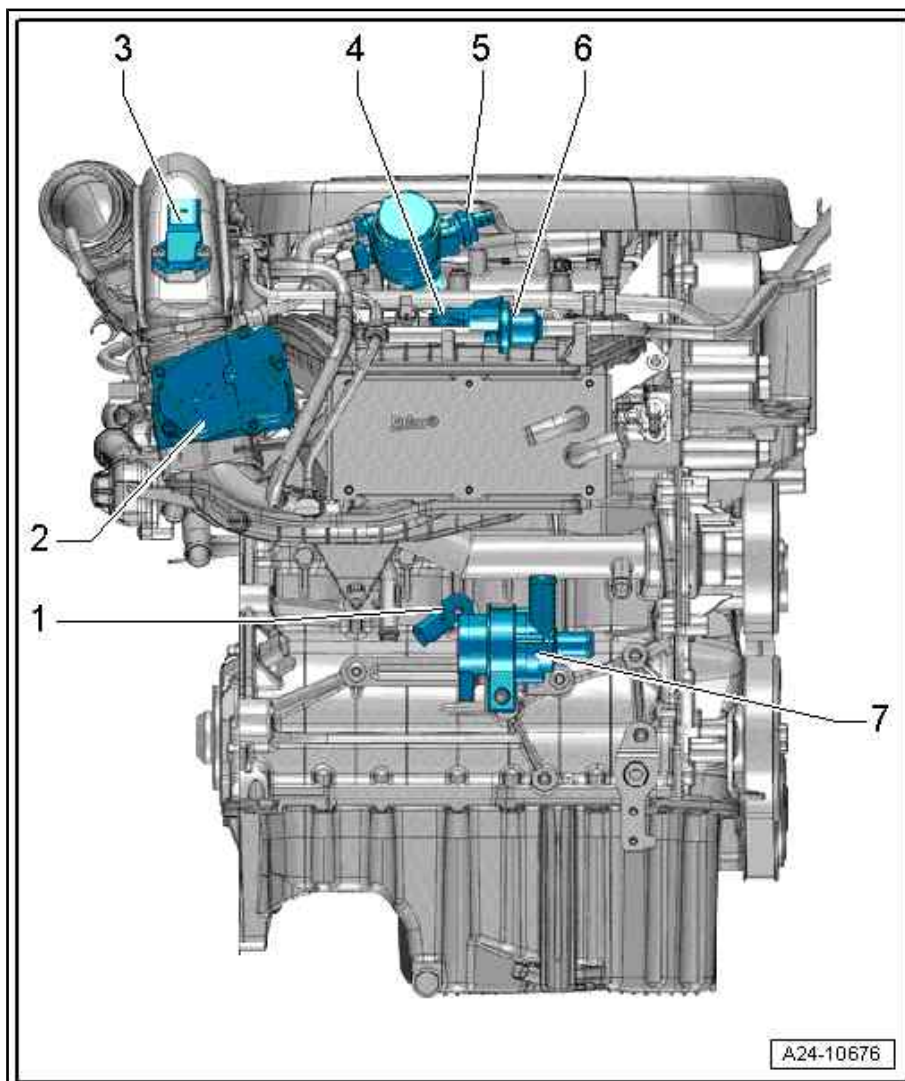
- ☐ Including throttle valve drive for electric throttle -G186-, throttle valve drive angle sender 1 for electric throttle -G187- and throttle valve drive angle sender 2 for electric throttle -G188-
- ☐ After throttle valve module -J338- or engine control unit has been renewed, throttle valve module must be re-adapted to engine control unit -J623- using ⇒ Vehicle diagnostic tester
- ☐ Exploded view ⇒ [page 16](#)

3 - Charge pressure sender - G31- / intake air temperature sender 2 -G299-

- ☐ Removing and installing ⇒ Rep. gr. 21

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

5 - Fuel pressure regulating



valve -N276-

6 - Activated charcoal filter solenoid valve 1 -N80-

7 - Coolant circulation pump -V50-

□ Removing and installing ⇒ Rep. gr. 19

Engine (gearbox end)

1 - Charge pressure control solenoid valve -N75-

2 - Oil pressure switch -F1-

□ Removing, installing and checking ⇒ Rep. gr. 17

3 - Coolant temperature sender -G62-

□ Removing and installing ⇒ Rep. gr. 19

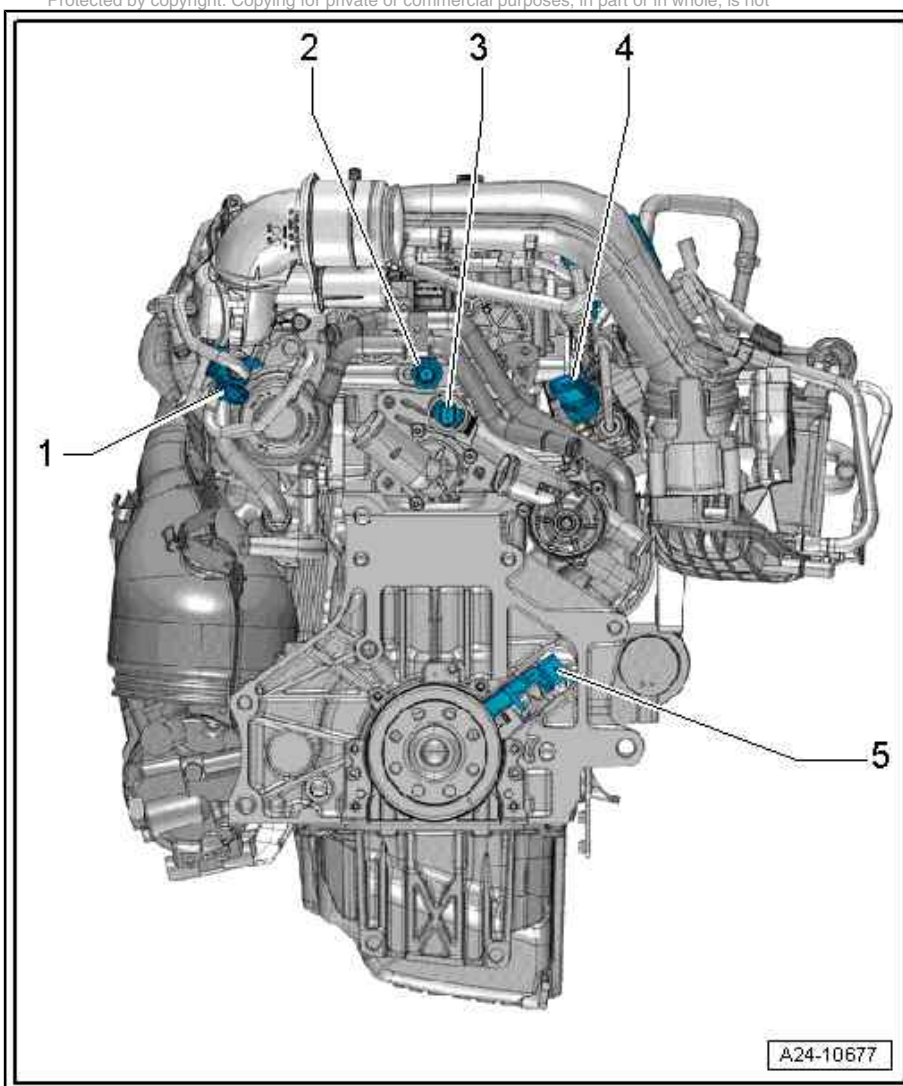
4 - Fuel pressure sender -G247-

□ Exploded view
⇒ [page 19](#)

5 - Engine speed sender -G28-

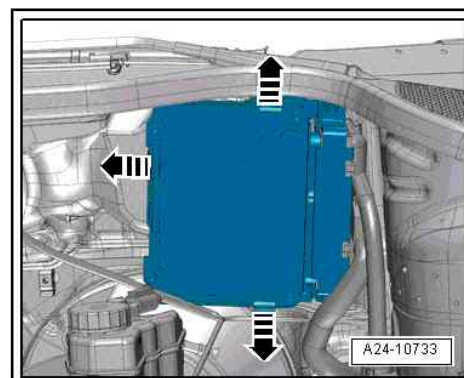
□ Exploded view
⇒ [page 54](#)

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not



Fitting location of engine control unit -J623-

◆ At plenum chamber partition panel (left-side)



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

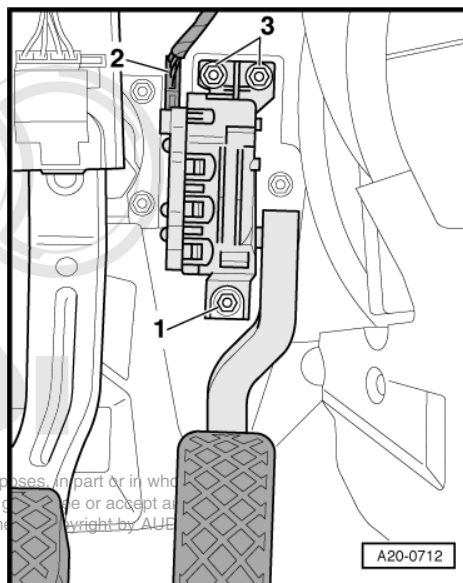
2 - Electrical connector for accelerator pedal module



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

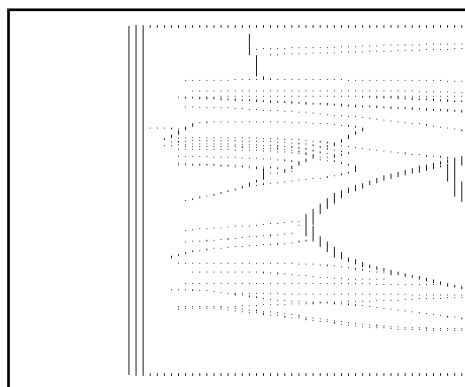


Protected by copyright. Copying for private or commercial purposes, in part or in whole, is permitted unless authorised by AUDI AG. AUDI AG does not guarantee the accuracy or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Fitting location of brake light switch -F- / brake pedal switch -F63-

◆ On brake master cylinder

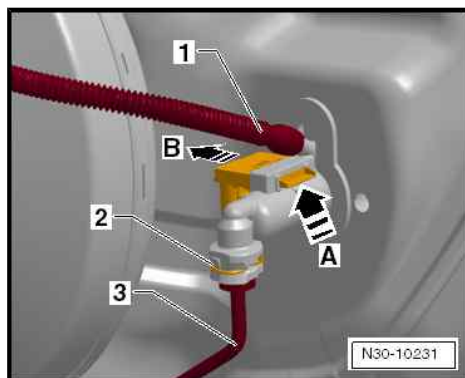
C - Brake light switch -F- / brake pedal switch -F63-



Fitting location of clutch position sender -G476-

◆ On clutch master cylinder, next to brake servo

Removing and installing ⇒ Rep. gr. 30



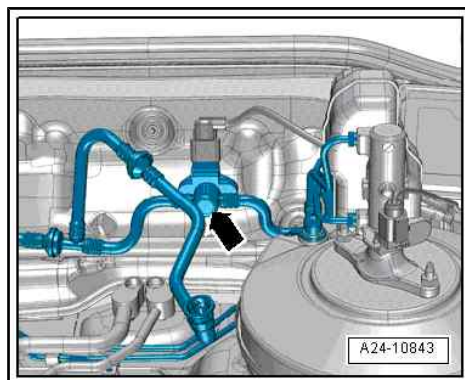
Fitting location of brake servo pressure sensor -G294-

◆ Next to brake servo -arrow-



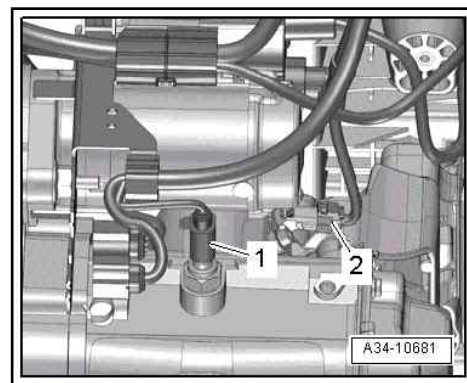
Note

The illustration shows the brake servo pressure sensor -G294- from underneath.



Fitting location of gearbox neutral position sender -G701-

- 1 - Electrical connector for gearbox neutral position sender - G701-
- ◆ At front of manual gearbox



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

4 Air cleaner

Overview

⇒ „4.1 Air cleaner - exploded view“, page 12

⇒ „4.2 Removing and installing engine cover panel“, page 13

⇒ „4.3 Removing and installing air filter element“, page 13

⇒ „4.4 Removing and installing air cleaner housing“, page 15

4.1 Air cleaner - exploded view

1 - Connection

2 - Air duct

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

3 - Air cleaner (bottom section)

- ☐ Clean out salt deposits, dirt and leaves, etc.
- ☐ Removing and installing
⇒ „4.4 Removing and installing air cleaner housing“, page 15

4 - Vacuum hose

- ☐ Renew if damaged

5 - Air hose

6 - Air cleaner (top section)

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

7 - Bolt

- ☐ 1.6 Nm

8 - Air filter element

- ☐ Use genuine air filter element ⇒ Electronic parts catalogue
- ☐ Change intervals ⇒ Maintenance tables
- ☐ Removing and installing
⇒ page 13

9 - O-ring

- ☐ Renew if damaged
- ☐ Use lubricant when installing

10 - Rubber buffer

- ☐ Clipped onto air cleaner (bottom section)

11 - Bracket

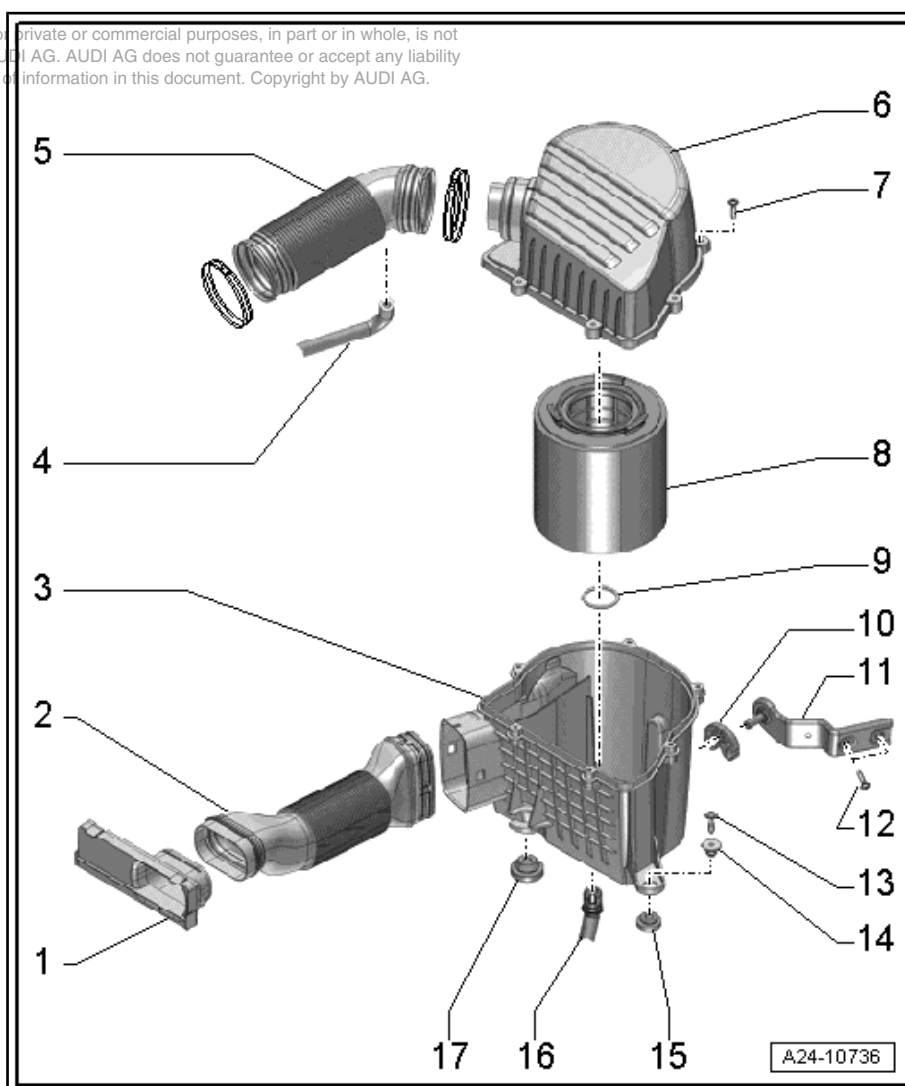
- ☐ For air cleaner (bottom section)

12 - Bolt

- ☐ 9 Nm

13 - Bolt

- ☐ 9 Nm



14 - Sleeve

15 - Grommet

16 - Water drain hose

□ Clean

17 - Rubber buffer

4.2 Removing and installing engine cover panel

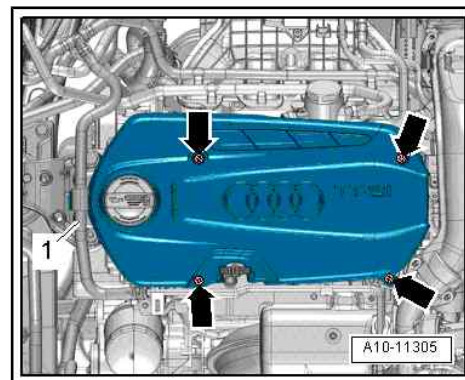
Removing

- Disengage coolant hose -1- at engine cover panel.
- Unscrew bolts -arrows- and remove engine cover panel.

Installing

Install in reverse order.

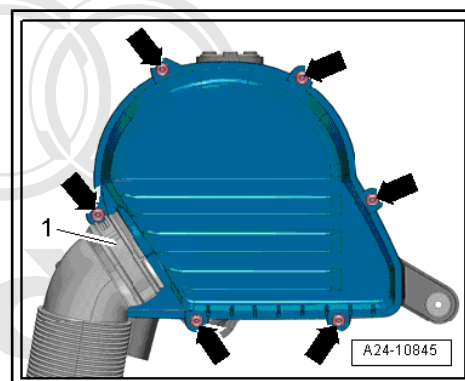
- Tightening torque ⇒ Rep. gr. 15



4.3 Removing and installing air filter element

Removing

- Release hose clip -1- and detach air duct.
- Unscrew bolts -arrows- and detach air cleaner (top section).



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- Turn air filter element in anti-clockwise direction -arrow A- and detach it.

Installing

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

- Tightening torques
⇒ „4.1 Air cleaner - exploded view“, page 12

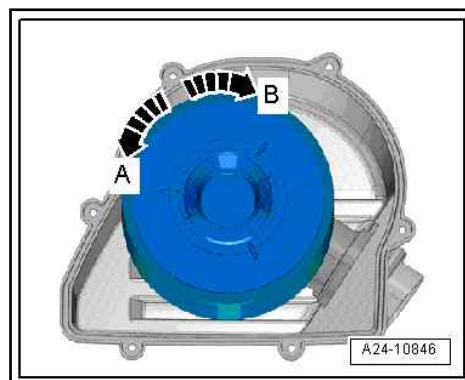
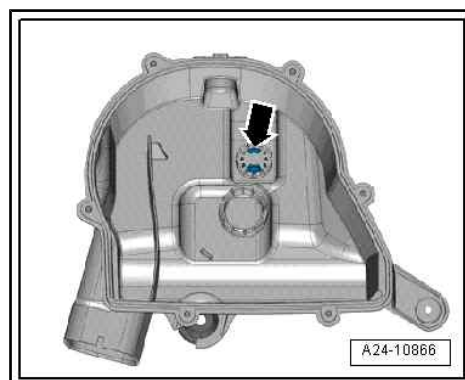
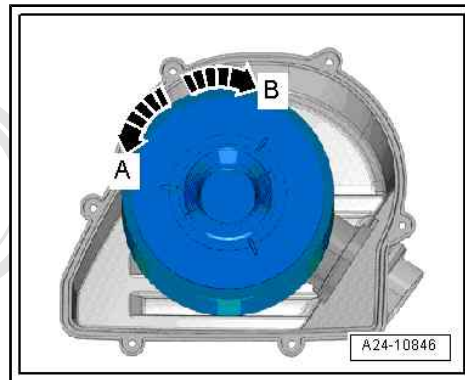


Note

- ◆ *Always use genuine part for air filter element.*
- ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly. Do not use any lubricants containing silicone when assembling.*
- ◆ *The air cleaner housing must be clean.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue*
- ◆ *To prevent malfunctions, cover all critical parts of the engine air intake tract with a clean cloth when blowing out the air cleaner housing with compressed air.*
- ◆ *Please observe requirements for disposal.*

- Check for salt residue, dirt and leaves in air intake hose (engine intake side).
- Check for dirt in air intake hose from air duct.
- Clean water drain -arrow- and air cleaner (bottom section).
- When installing the air filter element, check that it is properly centred in the retainer in the air cleaner (bottom section).

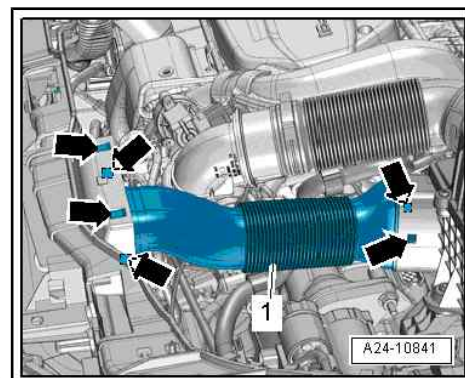
- Turn air filter element in clockwise direction -arrow B- so that it engages.
- Carefully fit top section of air cleaner onto bottom section, without using any force.
- Make sure that air hose is securely fitted on air cleaner (top section).



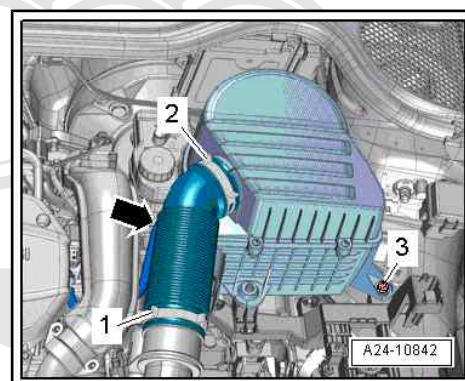
4.4 Removing and installing air cleaner housing

Removing

- Release fasteners -arrows- and detach air duct -1-.



- Release hose clip -1- and detach air hose from turbocharger.
- Disconnect vacuum hose -arrow-.
- Unscrew bolt -3- and detach air cleaner housing.



Note

Disregard -item 2-.

Installing



Note

- ◆ Always use genuine part for air filter element.
- ◆ Hose connections and hoses for charge air system must be free of oil and grease before assembly. Do not use any lubricants containing silicone when assembling.
- ◆ The air cleaner housing must be clean.
- ◆ Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue
- ◆ To prevent malfunctions, cover all critical parts of the engine air intake tract with a clean cloth when blowing out the air cleaner housing with compressed air.
- ◆ Please observe requirements for disposal.

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

5 Intake manifold

Overview

⇒ „5.1 Intake manifold (top section) - exploded view“, page 16

⇒ „5.2 Removing and installing intake manifold (top section)“, page 17

⇒ „5.3 Intake manifold (bottom section), fuel rail, injector - exploded view“, page 19

⇒ „5.4 Removing and installing intake manifold (bottom section) with fuel rail“, page 20

5.1 Intake manifold (top section) - exploded view

1 - Vacuum hose

- ☐ To brake servo
- ☐ Press release tabs to detach

2 - O-ring

- ☐ Renew

3 - Intake manifold (top section)

- ☐ Removing and installing ⇒ [page 17](#)

4 - Bolt

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

5 - Gaskets

- ☐ Renew

6 - Seal

- ☐ Renew

7 - Throttle valve module - J338-

- ☐ Removing and installing ⇒ [page 38](#)
- ☐ Cleaning ⇒ [page 41](#)
- ☐ After renewing, erase learnt values and adapt engine control unit - J623- ⇒ vehicle diagnostic tester

8 - Bolt

- ☐ 7 Nm

9 - Bracket

10 - Bolt

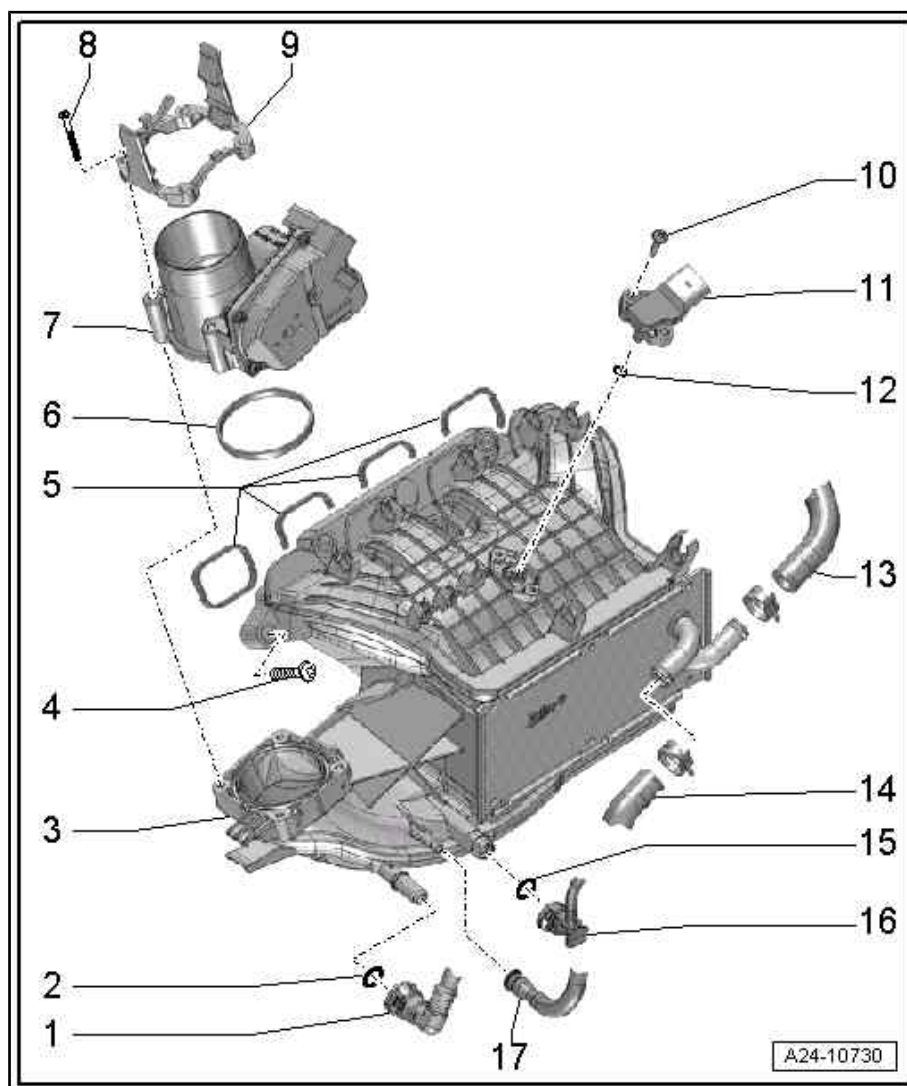
- ☐ 5 Nm

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

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

12 - O-ring

- ☐ Renew



13 - Coolant hose

14 - Coolant hose

15 - O-ring

- ☐ Renew

16 - Vacuum hose

- ☐ From activated charcoal filter
- ☐ Press release ring to detach

17 - Vacuum hose

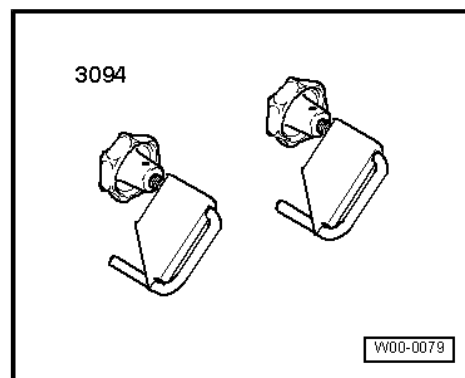
- ☐ For crankcase breather

5.2 Removing and installing intake manifold (top section)

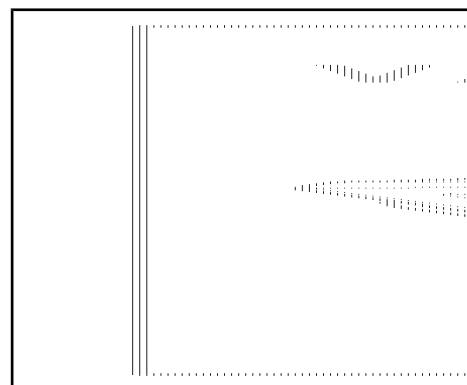
Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of the information in this document. Copyright © 2011 AUDI AG.

Special tools and workshop equipment required

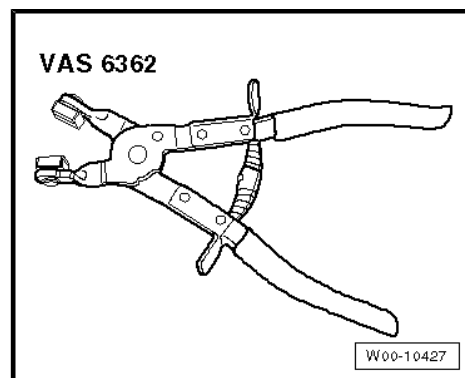
- ◆ Hose clamps for hoses up to 25 mm -3094-



- ◆ Drip tray for workshop hoist -VAS 6208-

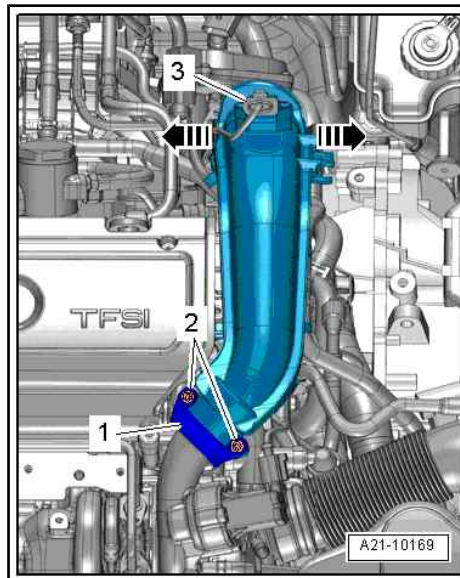


- ◆ Hose clip pliers -VAS 6362-

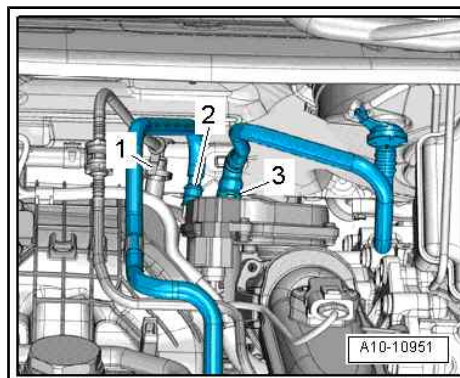


Removing

- Unscrew bolts -2- and detach retaining bracket -1-.
- Unplug electrical connector -3- at charge pressure sender -G31- / intake air temperature sender 2 -G299- .
- Release retainers -arrow- and detach pressure pipe first from throttle valve module -J338- and then from turbocharger.
- Move hoses on pressure pipe clear.



- Press release tabs and disconnect vacuum line -1 and 3-.
- Detach vacuum line -2-.

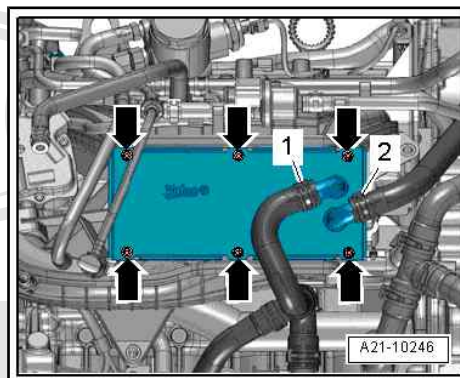


- Place drip tray for workshop hoist -VAS 6208- beneath engine.
- Use hose clamps up to 25 mm -3094- to clamp off coolant hoses -1 and 2- and detach coolant hoses from charge air cooler.

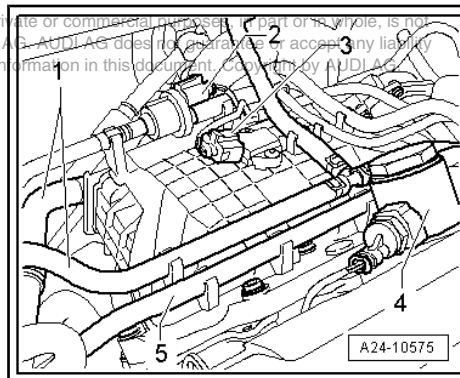


Note

Arrows show securing bolts for charge air cooler. Disregard.



- Unplug electrical connector at intake manifold pressure sender -G71- -3-.
- Move activated charcoal filter solenoid valve 1 -N80- -2- clear to one side (do not disconnect hoses and electrical connector).
- Move clear hoses -1 and 5- at intake manifold.



- Unscrew bolts securing manifold.
- Carefully remove intake manifold upwards.

Installing

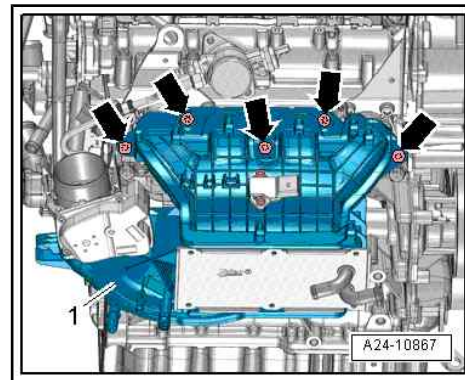
Installation is carried out in the reverse order; note the following:

- Tightening torques
⇒ „5.1 Intake manifold (top section) - exploded view“,
[page 16](#)



Note

- ◆ After installing intake manifold check coolant level, refer to engine - mechanics ⇒ Rep. gr. 19.
- ◆ Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue.



5.3 Intake manifold (bottom section), fuel rail, injector - exploded view

1 - Intake manifold (bottom section)

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

2 - Connection

- ☐ For high-pressure pipe
- ☐ 80 Nm

3 - Fuel pressure sender G247-

- ☐ Removing and installing
⇒ [page 33](#)
- ☐ Lubricate threads
- ☐ 22 Nm

4 - Gasket

- ☐ Renew

5 - Bolt

- ☐ Starting from centre, tighten in stages
- ☐ 20 Nm

6 - O-ring

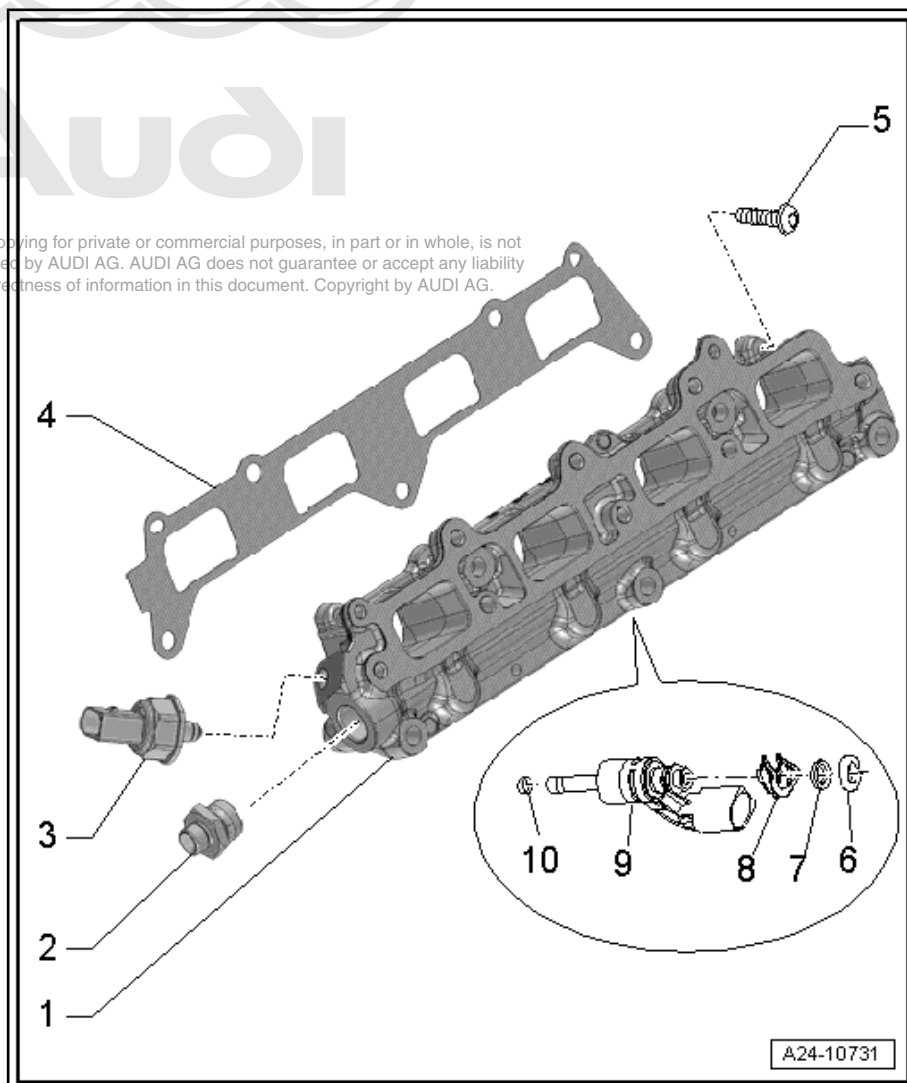
- ☐ Renew
- ☐ Before installing, lubricate lightly with clean engine oil

7 - Support ring

- ☐ Renew

8 - Spring element

- ☐ Always renew if intake manifold (bottom section) is removed
- ☐ Check for correct fit on injector



9 - Injector

- ☐ Injector, cylinder 1 -N30-
- ☐ Injector, cylinder 2 -N31-
- ☐ Injector, cylinder 3 -N32-
- ☐ Injector, cylinder 4 -N33-
- ☐ Removing and installing ⇒ [page 28](#)

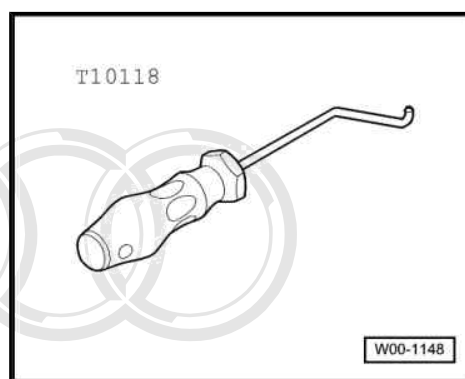
10 - Combustion chamber ring seal

- ☐ Renewing ⇒ „7.1 Removing and installing injectors“, [page 28](#)

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

Special tools and workshop equipment required

- ◆ Assembly tool -T10118-



Removing

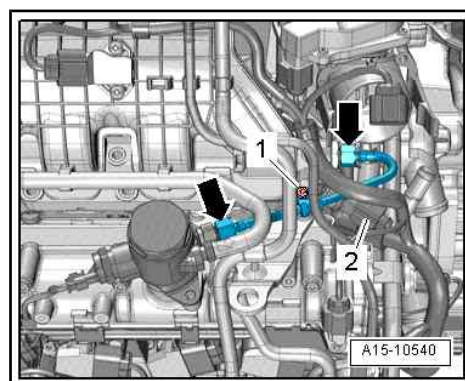


WARNING

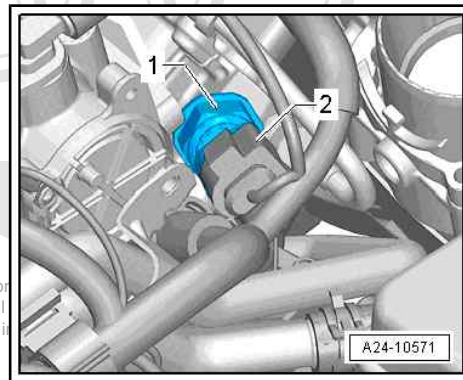
The fuel system is pressurised. The fuel pressure in the high-pressure part of the injection system must be reduced to a residual pressure prior to opening; for procedure see ⇒ [page 4](#).

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted without the written consent of AUDI AG. AUDI AG does not guarantee or accept any liability for the correctness of the information in this document. Copyright by AUDI AG.

- Remove intake manifold ⇒ [page 17](#) .
- Remove union nuts -arrows- and bolt -1- and detach high-pressure pipe.



- Unplug electrical connector -2- at fuel pressure sender -G247- -1-.

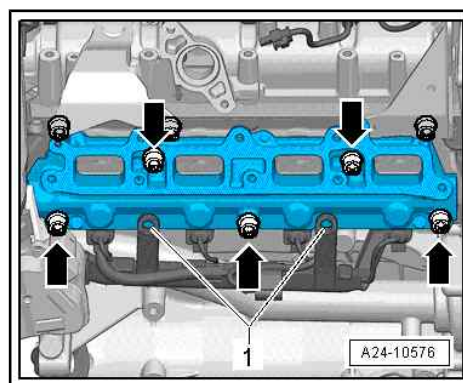


Protected by copyright. Copying for private use is permitted unless authorised by AUDI AG. The copyright holder assumes no responsibility with respect to the correctness of illustrations.

- Pull wiring duct for injectors out of both clips -1-.
- Unscrew securing bolts -arrows- from intake manifold (bottom section).
- Detach intake manifold (bottom section) carefully from injectors.

Installing

- The remaining installation steps are carried out in the reverse sequence.
- Tightening torque
⇒ „5.3 Intake manifold (bottom section), fuel rail, injector - exploded view“, page 19



Note

Make sure that injectors are installed correctly.

- Install intake manifold (top section) ⇒ [page 17](#) .



6 High-pressure pump

Overview

⇒ „6.1 High-pressure pump - exploded view“, page 22

⇒ „6.2 Removing and installing high-pressure pump“, page 24

6.1 High-pressure pump - exploded view



Note

Observe installation instructions for high-pressure pump.



WARNING

Fuel system operates under high pressure. Always dissipate fuel pressure prior to opening fuel system. For procedure, refer to ⇒ [page 4](#)



Note

Observe installation instructions for high-pressure pump.



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

1 - Bolts for high-pressure pump

- ☐ Hand-tighten in diagonal sequence, then tighten to 5 Nm
- ☐ Final torque: 20 Nm
- ☐ Do not tilt high-pressure pump

2 - Connecting piece for fuel supply line from fuel tank

3 - Spring-type clip

- ☐ Remove and install using hose clip pliers -VAS 6340-

4 - Fuel supply line

- ☐ From fuel tank

5 - 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.

- ☐ Do not alter shape
- ☐ Tighten bracket for fuel supply line to 8 Nm
- ☐ Check for damage before re-installing
- ☐ Lubricate thread of union nut with fuel
- ☐ 25 Nm

6 - High-pressure pipe

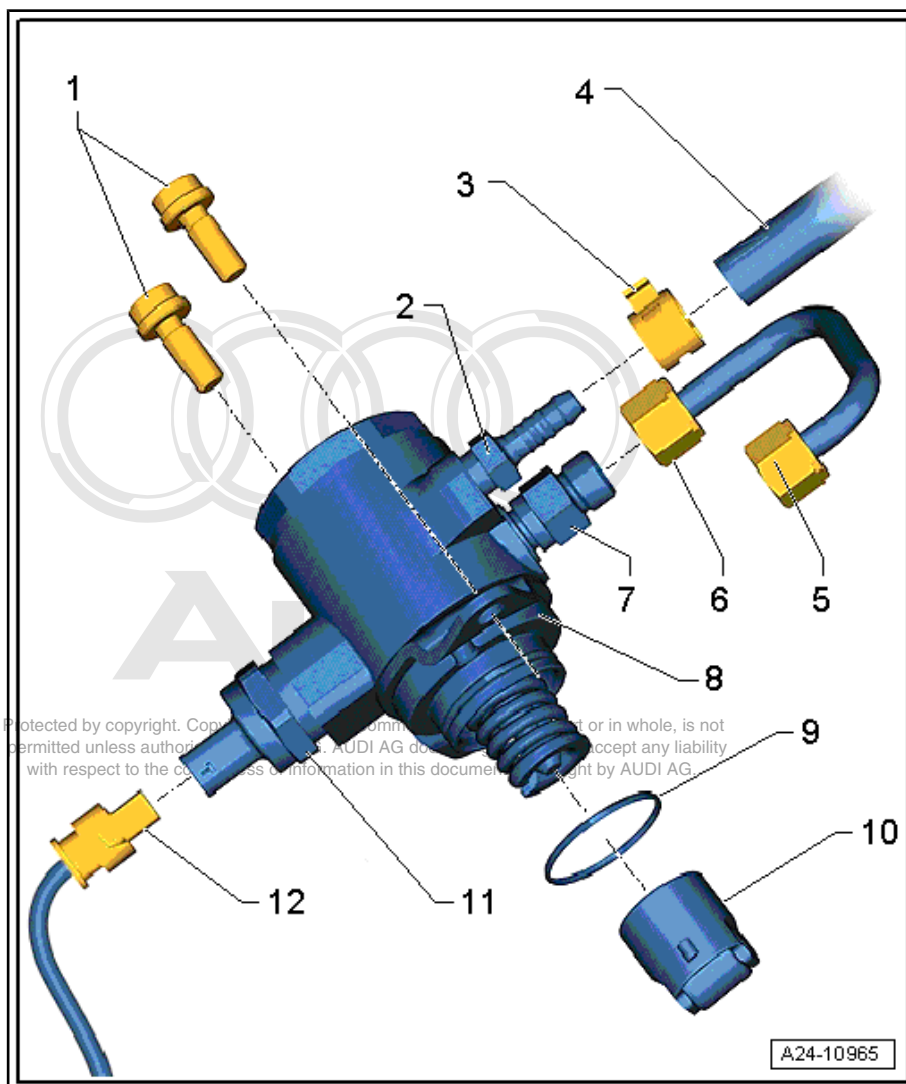


WARNING

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

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

- ☐ Do not alter shape
- ☐ Counterhold at connecting piece when loosening union nut
- ☐ Renew connecting piece -item 7- and tighten to 30 Nm
- ☐ Tighten bracket for fuel supply line to 8 Nm
- ☐ Check for damage before re-installing
- ☐ Lubricate thread of union nut with fuel



- ❑ 25 Nm

7 - Connection

- ❑ Check tightening torque: 30 Nm

8 - High-pressure pump with fuel pressure regulating valve -N276-

- ❑ An electric fuel pump (fitted in fuel tank) supplies fuel to the mechanical high-pressure pump
- ❑ When installing the high-pressure fuel pump, it is essential to ensure that no dirt enters the fuel system.
- ❑ The fuel system must not be under pressure when installing the high-pressure pump; procedure for reducing fuel pressure ⇒ [page 4](#)
- ❑ Fuel pipes must be free of tension when installed.
- ❑ When connector is unplugged, high-pressure pump switches to full delivery (approx. 140 bar)



Caution

When removing or installing the high-pressure pump, take hold of it only by the housing.

If the piston spring assembly of the high-pressure pump comes loose, the high-pressure pump will leak and must be renewed.

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- ❑ Removing and installing ⇒ [page 24](#)

9 - O-ring

- ❑ Renew
- ❑ When installing lubricate lightly with engine oil

10 - Roller tappet

- ❑ May possibly remain lodged in camshaft housing when high-pressure pump is removed
- ❑ When installing lubricate lightly with engine oil

11 - Fuel pressure regulating valve -N276-

12 - Electrical connector for fuel pressure regulating valve -N276-

6.2 Removing and installing high-pressure pump

Removing



Note

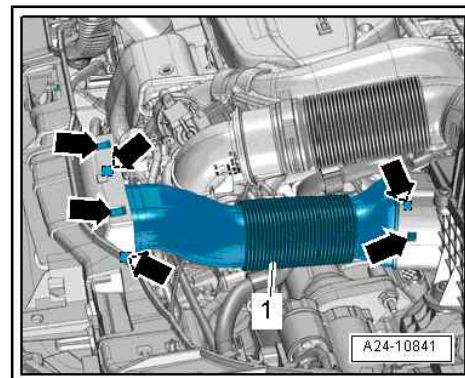
- ◆ *The high-pressure fuel pump should only be removed and installed when the engine is cold.*
- ◆ *When installing the high-pressure fuel pump, it is essential to ensure that no dirt enters the fuel system.*
- ◆ *Use a cloth to catch escaping fuel.*
- ◆ *The O-ring must always be renewed.*
- ◆ *Always ensure that the high-pressure fuel pipes are free of tension when tightening the connections.*



WARNING

Fuel system operates under high pressure. Always dissipate fuel pressure prior to opening fuel system. For procedure, refer to ⇒ [page 4](#).

- Release fasteners -arrows- and detach air duct -1-.

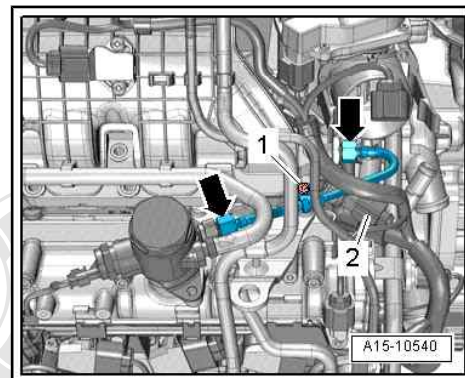


- Remove union nuts -arrows- and bolt -1- and detach high-pressure pipe.



Note

- ◆ Do NOT bend open bracket for fuel line.
- ◆ If bracket has been bent open or fuel line has to be renewed, bracket must also be renewed.



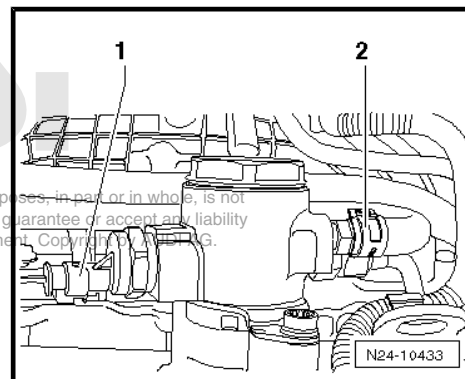
- Detach fuel supply line -2- from high-pressure pump.



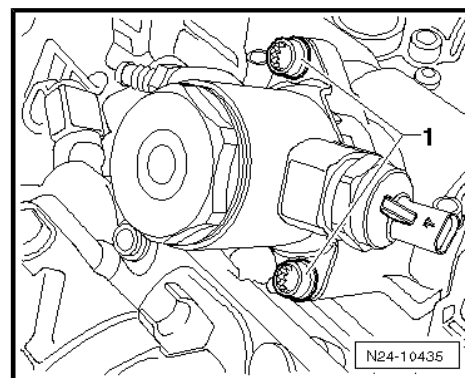
Note

Use a cloth to catch escaping fuel.

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright © 2011 Audi AG.



- Unscrew securing bolts -1- evenly.



- Pull high-pressure pump -3- and roller tappet -1- out of camshaft housing.



Caution

When removing or installing the high-pressure pump, take hold of it only by the housing.

If the piston spring assembly of the high-pressure pump comes loose, the high-pressure pump will leak and must be renewed.

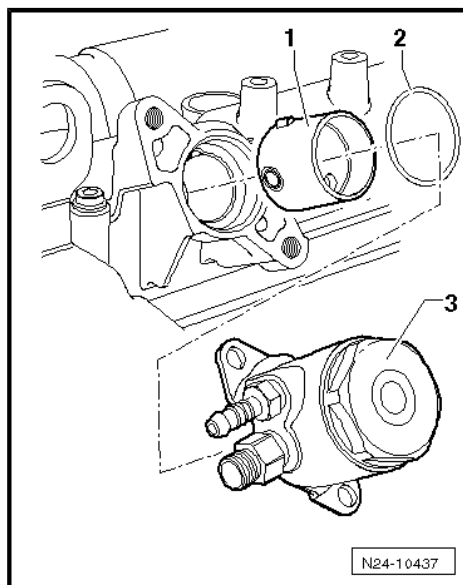
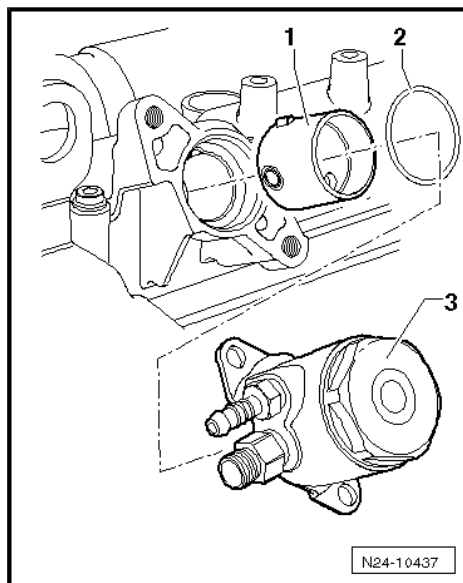
Installing Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



Note

Renew O-ring for high-pressure pump.

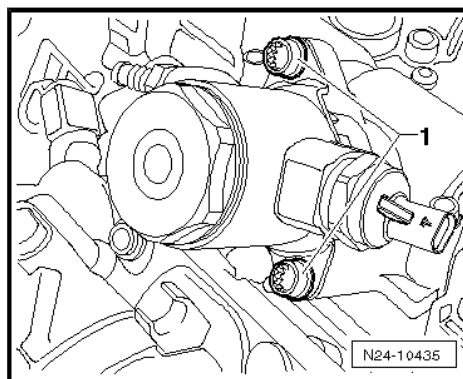
- Check roller tappet for damage and renew if necessary.
- Lubricate roller tappet -1- with clean engine oil.
- Insert lubricated roller tappet -1- into camshaft housing.
- Turn crankshaft in direction of engine rotation until roller tappet is positioned at lowest point.
- Renew connecting piece for high-pressure pipe at high-pressure pump.
- Insert a new, oiled O-ring -2- into groove -3- on high-pressure pump.
- Carefully insert high-pressure pump -3-.
- Press high-pressure pump down by hand as far as possible onto stop.



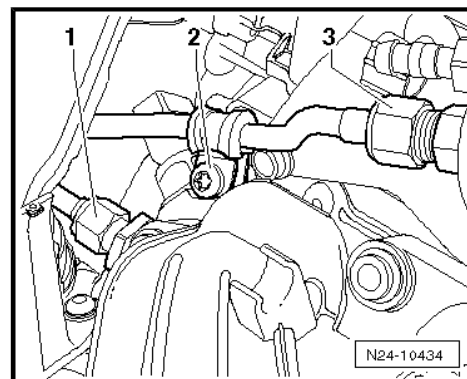
- At the same time, tighten securing bolts -1- by hand.
- Then tighten securing bolts -1- alternately to 5 Nm (do not tilt high-pressure pump).
- Now tighten securing bolts -1- alternately to final torque.
- Tightening torque: refer to exploded view of high-pressure pump ⇒ [page 22](#) .

Fitting instructions for high-pressure pipe: (install free of stress)

- Screw in union nuts -1- and -3- on high-pressure pipe (two threads by hand).
- Screw in bolt -2- by hand.
- Tighten both union nuts -1- and -3- as far as stop.
- Tighten bolt -2- to 8 Nm.



- Tighten both union nuts -1- and -3- to specified torque.
- Re-connect fuel supply line -2- to high-pressure pump (make sure it is securely fitted).

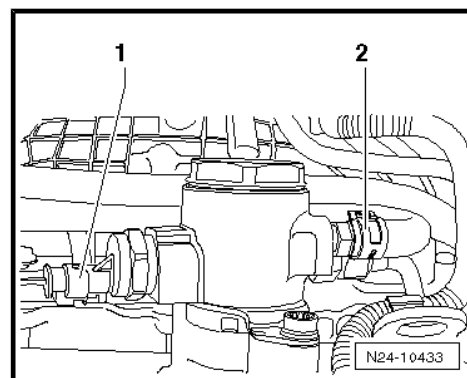


- Re-attach electrical connector -1- for fuel pressure regulating valve -N276- .



Note

Check fuel system for leaks.



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

7 Injectors

Overview

⇒ „7.1 Removing and installing injectors“, page 28

⇒ „7.1.1 Renewing combustion chamber ring seal (teflon ring seal)“, page 29

7.1 Removing and installing injectors

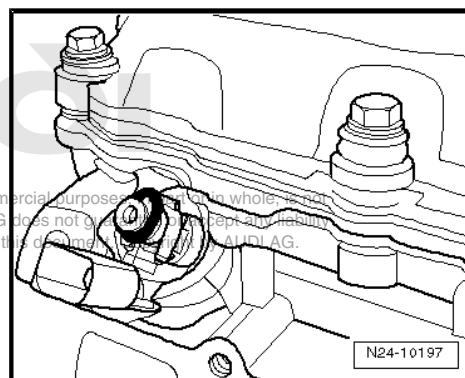
Special tools and workshop equipment required

- ◆ Tool set for FSI engines -T10133-

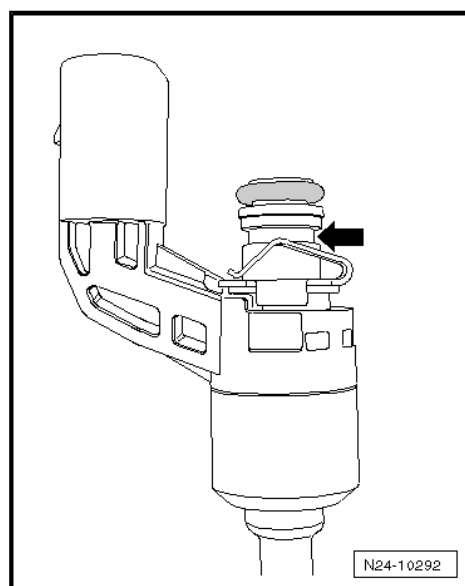


Removing

- Remove intake manifold ⇒ [page 17](#) .
- Remove intake manifold (bottom section) ⇒ [page 20](#) .
- Press O-ring by hand upwards (as illustrated) and remove from injector.
- Screw striker -T10133/3- onto puller -T10133/15-



- Then guide puller -T10133/15- into groove -arrow- on injector.

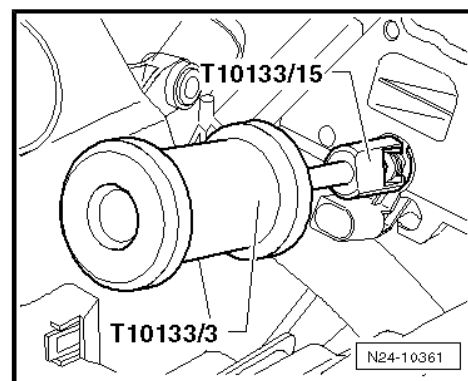


- Pull out injector by knocking carefully.



Note

The combustion chamber ring seal must always be renewed before the injector is re-installed ⇒ [page 29](#).



7.1.1 Renewing combustion chamber ring seal (teflon ring seal)



Note

The combustion chamber ring seal must always be renewed before the injector is re-installed.

Renewing combustion chamber ring seal

- Remove injector ⇒ [page 28](#).
- Carefully remove old combustion chamber ring seal using suitable tools (e.g. cut open ring using razor blade, or prise open ring with small screwdriver and then pull off forwards). It is important to ensure that the groove and the continuous ridge in the bottom of the groove are not damaged.

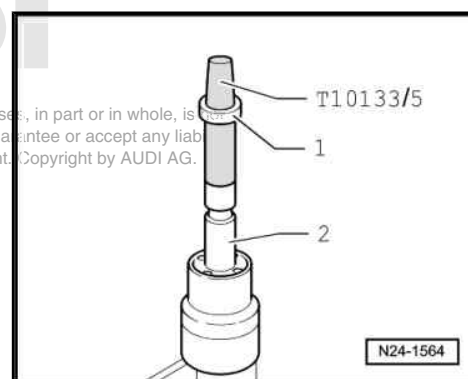


Note

The injector must be renewed if the groove is damaged.

- Before new combustion chamber ring seal is fitted, any combustion residue must be removed from ring groove and injector stem using a clean cloth.
- Fit assembly cone -T10133/5- with new teflon ring -1- onto injector -2-.

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



- Use assembly sleeve -T10133/6- to press combustion chamber ring seal further onto assembly cone -T10133/5- until it seats in groove. Do not use any lubricants during this procedure.



Note

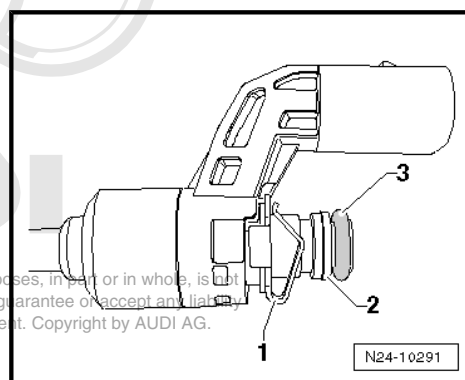
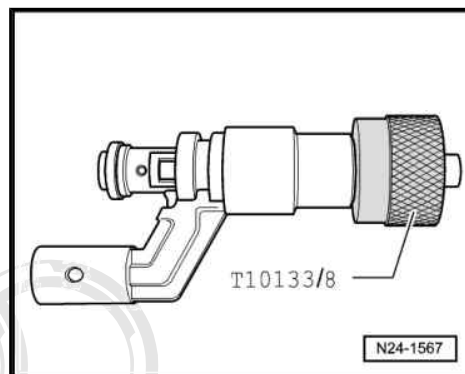
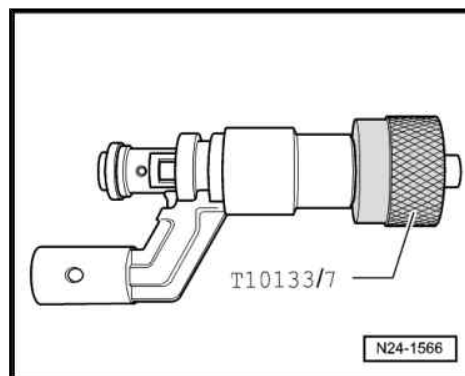
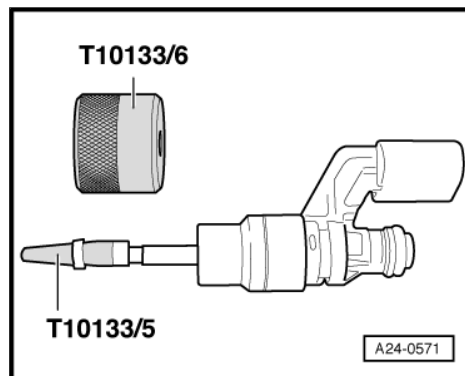
The combustion chamber ring seal is widened when it is pushed onto the injector. After pushing it on, it therefore has to be compressed again. This is done in two stages, as described below.

- 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.

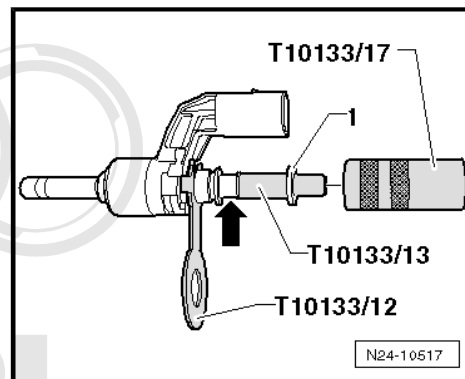
Renewing support ring and O-ring

- Remove O-ring -3-.
- Cut open support ring -2- with small side-cutting pliers and remove support ring.
- Detach spring element -1- from injector and fit locking plate -T10133/12- in place of spring element.
- Fit a new support ring -1- onto assembly cone -T10133/13- and fit onto injector (as illustrated).



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

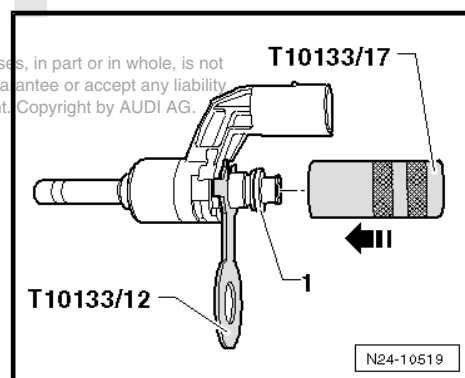
- Using calibration sleeve -T10133/17- (knurled side faces towards injector), push support ring -1- into first groove -arrow- on injector.
- Then turn round calibration sleeve -T10133/17- (knurled side now faces away from injector). Push calibration sleeve over support ring -1- in direction of -arrow- until it makes contact with locking plate -T10133/12- .



- Pull calibration sleeve -T10133/17- off again.

Support ring now has its correct installation depth.

- Now install a new spring element -1- in place of locking plate -T10133/12- .



- Renew O-ring -3-.

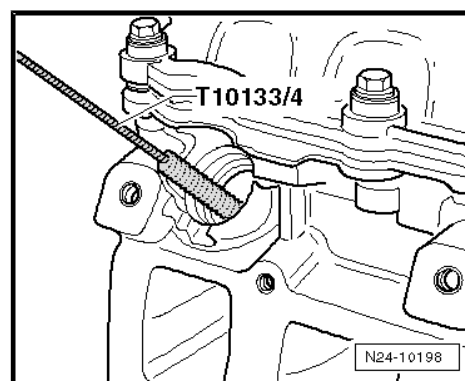
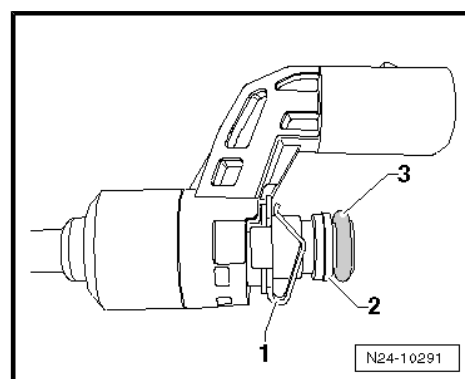


Note

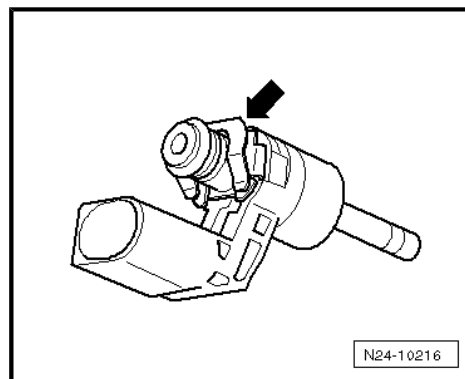
Lubricate O-ring lightly with assembly oil or engine oil before installing.

Installing

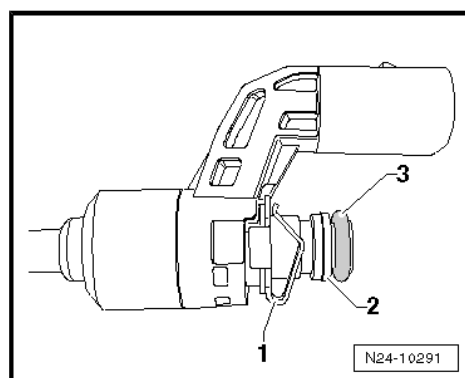
- Before installing injectors, thoroughly clean apertures for injectors in cylinder head using supplied nylon brush - T10133/4- .



- Always renew spring element -arrow- if injectors have been removed.

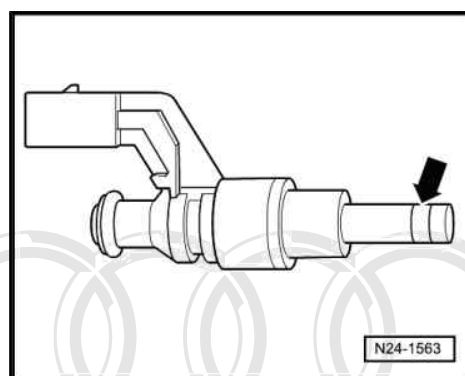


- Fit a new O-ring on each injector. Lubricate O-ring -3- lightly with clean engine oil before installing.
- Push injector by hand as far as it will go into aperture in cylinder head (do not use oil or grease). Ensure that the injector is properly seated in the cylinder head.



Note

- ◆ The teflon seal -arrow- must not be lubricated when fitting the injector.
- ◆ Make sure there is no cleaning fluid or oil in the cylinder head bores when installing the injectors.
- ◆ It should be possible to insert the injector easily. If necessary, wait until the teflon seal has contracted sufficiently.
- ◆ Note correct installation position and ensure that injectors are properly seated in cylinder head.



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

- Install bottom section of intake manifold ⇒ [page 20](#) .
- Install intake manifold ⇒ [page 17](#) .

Audi

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

8 Components of injection system

Overview

⇒ „8.1 Removing and installing fuel pressure sender G247 “, page 33

⇒ „8.2 Checking fuel pressure and residual pressure (up to high-pressure pump)“, page 34

⇒ „8.3 Removing and installing high-pressure pipe“, page 37

⇒ „8.4 Removing and installing intake air temperature sender G42 / intake manifold pressure sender G71 “, page 38

⇒ „8.5 Removing and installing throttle valve module J338 “, page 38

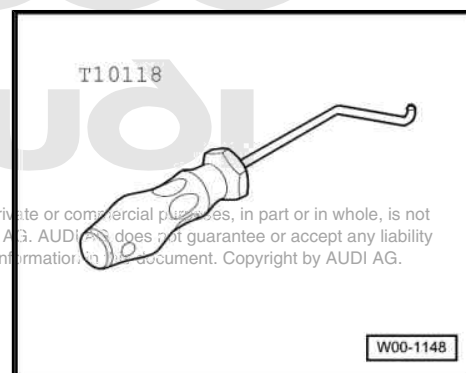
⇒ „8.6 Cleaning throttle valve module J338 “, page 41

8.1 Removing and installing fuel pressure sender -G247-

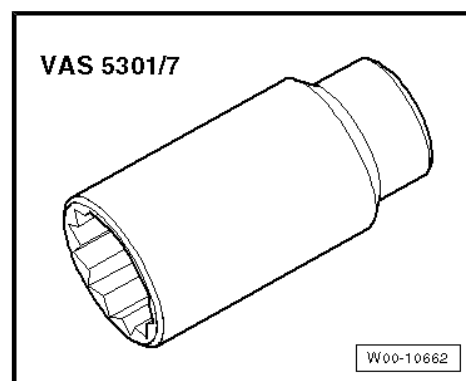
If the fuel pressure sender -G247- fails, the fuel pressure regulating valve -N276- is switched off, the electric fuel pump is fully activated and the engine is operated with the fuel pressure which remains. This will reduce engine torque considerably.

Special tools and workshop equipment required

- ◆ Assembly tool -T10118-



- ◆ Double hexagon socket 1/2", 27 mm -VAS 5301/7- or commercially available socket (27 mm)



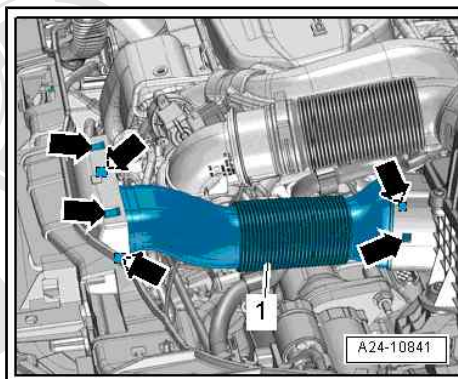
Removing



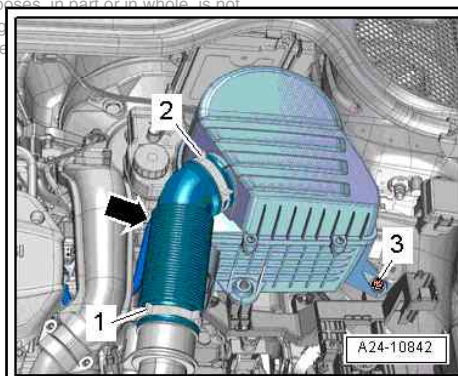
WARNING

The fuel system is pressurised. The fuel pressure in the high-pressure part of the injection system must be reduced to a residual pressure prior to opening; for procedure see ⇒ [page 4](#).

- Release fasteners -arrows- and detach air duct -1-.



- Disconnect vacuum hose -arrow-.
- Release hose clips -1 and 2- and remove air hose.



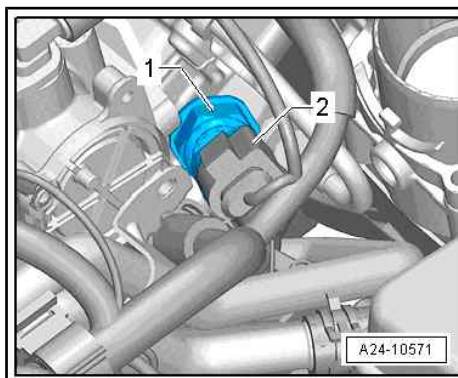
Note

Disregard -item 3-.

- Unplug electrical connector -2- at fuel pressure sender -G247- -1- using assembly tool -T10118- .
- Unscrew fuel pressure sender -G247- -1- using double hexagon socket, 1/2", 27 mm -VAS 53017/- .

Installing

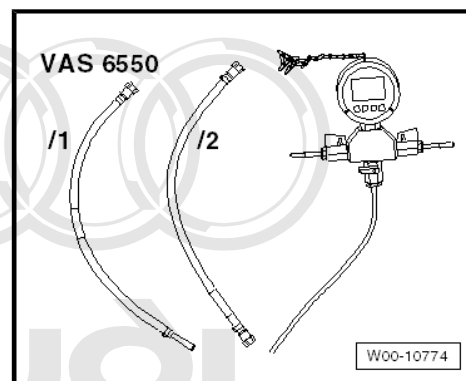
- Install in reverse order.
- Tightening torque
⇒ „5.3 Intake manifold (bottom section), fuel rail, injector - exploded view“, page 19



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

Special tools and workshop equipment required

- ◆ Pressure tester -VAS 6550- with adapters -VAS 6550/1- and -VAS 6550/2-



- ◆ Fuel-resistant measuring container

Test conditions

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

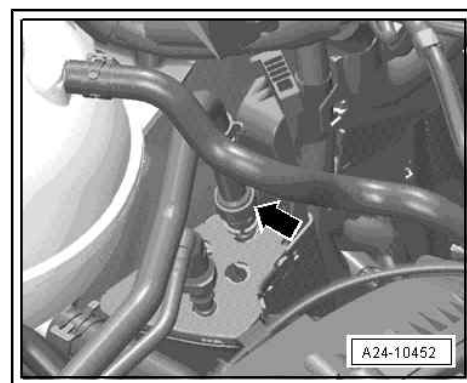
Test sequence



WARNING

Fuel system is pressurised (initial fuel pressure). Wear safety goggles and protective clothing to avoid possible injury and skin contact. Wrap a cloth around the connection before opening the fuel system. Then dissipate residual pressure by carefully detaching the connection.

- Lift release tab and disconnect fuel supply line -arrow-.



- Connect pressure tester -VAS 6550- with adapters -VAS 6550/1- and -VAS 6550/2- to fuel supply line.
- Make sure that drain tap (centre hose) is closed and cut-off valves (left and right) are open.
- Switch on ignition.
- Fuel pump will run for approx. 5 seconds and build up fuel pressure.
- Read fuel pressure off pressure tester -VAS 6550- .
- Specification: 4.0 ... 7.0 bar

If specification is not obtained:

- Check delivery rate of fuel pump ⇒ Fuel supply system, petrol engines; Rep. gr. 20 .

Checking residual pressure

- Check system for leaks and check residual pressure by watching the drop in pressure on the pressure tester -VAS 6550- .
- After 10 minutes pressure should still be at least 3 bar.

If the residual pressure drops below 3 bar:

- ◆ Check union between pressure tester -VAS 6550- and fuel supply line for leaks.
- ◆ Check pressure tester -VAS 6550- for leaks.
- ◆ Check fuel lines and their connections for leaks.
- ◆ Renew fuel filter with integrated fuel pressure regulator ⇒ Fuel supply system, petrol engines; Rep. gr. 20 . Then repeat the test.
- ◆ If fuel filter is OK, renew fuel pump ⇒ Fuel supply system, petrol engines; Rep. gr. 20 .

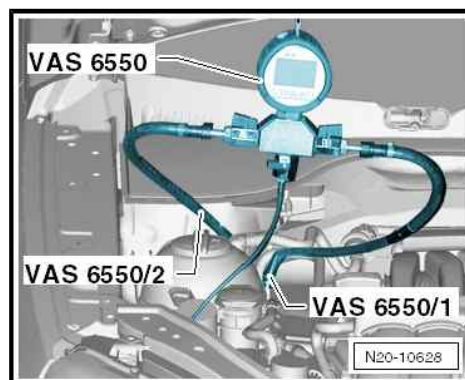
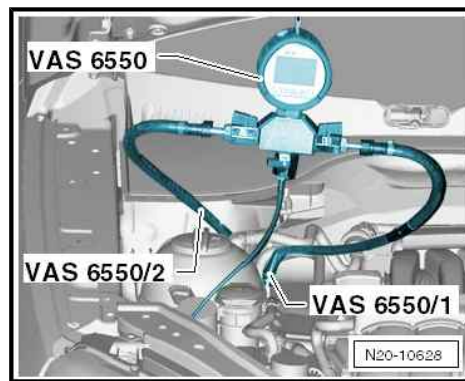
Assembly is carried out in the reverse order; note the following:

- The ignition must be switched off.

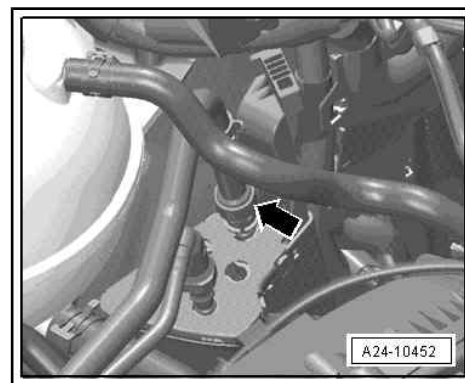


Note

Before removing the pressure tester, release the fuel pressure by opening the drain tap (centre hose). Hold end of hose into a measuring container.



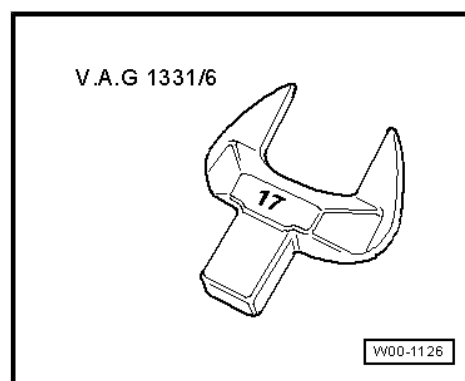
- Re-attach fuel supply line -arrow- (make sure that all parts are clean and that there are no leaks).



8.3 Removing and installing high-pressure pipe

Special tools and workshop equipment required

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



Removing



WARNING

The fuel system is pressurised. The fuel pressure in the high-pressure part of the injection system must be reduced to a residual pressure prior to opening; for procedure see [⇒ page 4](#).

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- Remove union nuts -arrows- and bolt -1- and detach high-pressure pipe.



Note

Disregard -item 2-.

Installing

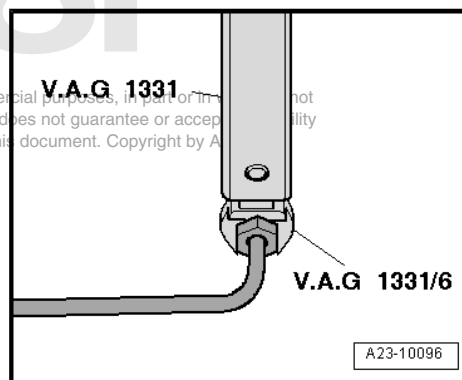
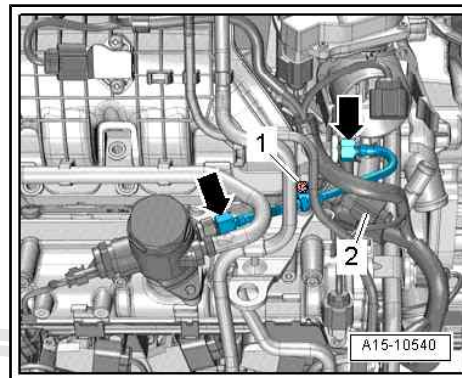
- Tightening torques
⇒ „6.1 High-pressure pump - exploded view“, page 22



Note

- ◆ Renew connecting piece.
- ◆ The connections of the high-pressure pipe must not be damaged.
- ◆ Do not attempt to bend high-pressure pipe to a different shape.

- First tighten union nut by hand until it makes contact, making sure that high-pressure pipe is not under tension.
- Tighten union nut with torque wrench V.A.G 1331 and open end spanner insert (AF 17) -V.A.G 1331/6- to do so, counterhold at hexagon flats of threaded connection with an open end spanner.
- Do not tighten bolt for retainer until high-pressure pipe has been tightened.



8.4 Removing and installing intake air temperature sender -G42- / intake manifold pressure sender -G71-

Removing

- Unplug electrical connector -1-.
- Unscrew bolts -arrows- and detach intake air temperature sender -G42- / intake manifold pressure sender -G71-.

Installing

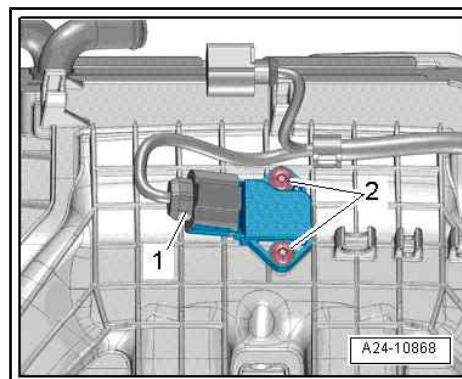
Installation is carried out in the reverse order; note the following:

- Tightening torque ⇒ page 16



Note

Fit new O-ring.

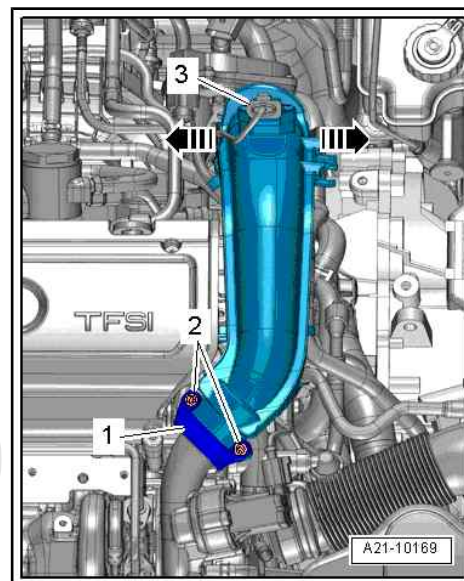


8.5 Removing and installing throttle valve module -J338-

Removing

- Unscrew bolts -2- and detach retaining bracket -1-.

- Unplug electrical connector -3- at charge pressure sender - G31- / intake air temperature sender 2 -G299- .
- Release retainers -arrows- and detach air pipe first from throttle valve module -J338- and then from turbocharger.
- Move clear hoses at air pipe.



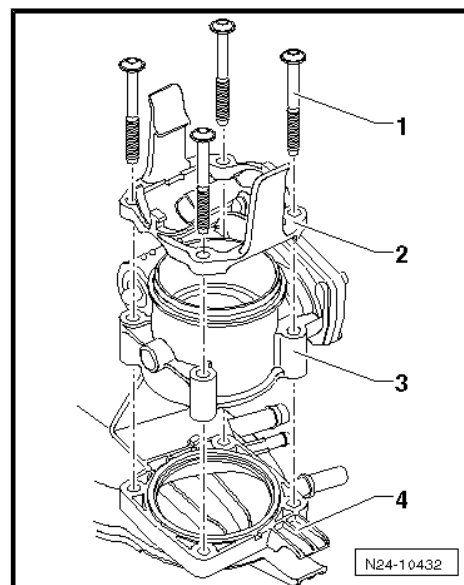
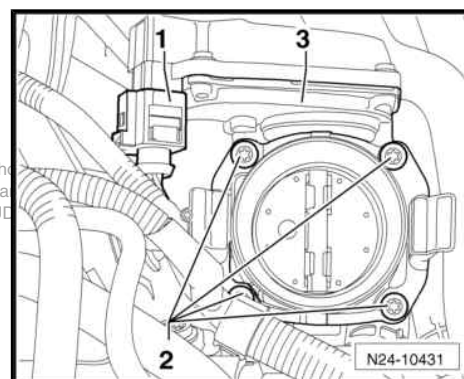
- Unplug electrical connector -1- at throttle valve module - J338- .
- Remove securing bolts -2- and detach throttle valve module - J338- -3- from intake manifold.

Installing

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is prohibited without the written permission of Audi AG. Audi AG does not guarantee or accept any liability for the use of this information.

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

- Tightening torques
⇒ [„5.1 Intake manifold \(top section\) - exploded view“, page 16](#)
- Insert new seal in groove on intake manifold.
- Fit throttle valve module -J338- -3- together with adapter -2- and securing bolts -1- onto intake manifold -4-.



- Tighten securing bolts -2-.
- For tightening torque refer to exploded view of intake manifold (top section) ⇒ [page 16](#) .
- Plug in electrical connector -1- at throttle valve module -J338- -3-.



Note

Before installing, lubricate O-rings at turbocharger and in pressure pipe lightly with engine oil.

- Fit air pipe -2- on turbocharger.
- Push air pipe -2- onto throttle valve module -J338- .

Retaining clips -1- should engage audibly.



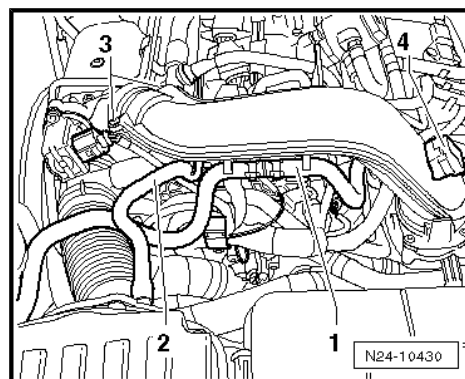
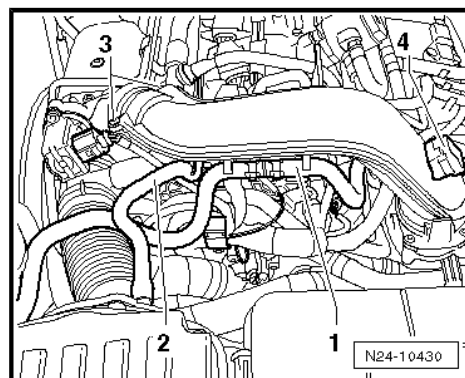
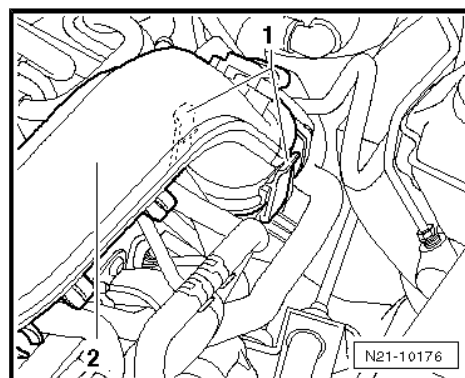
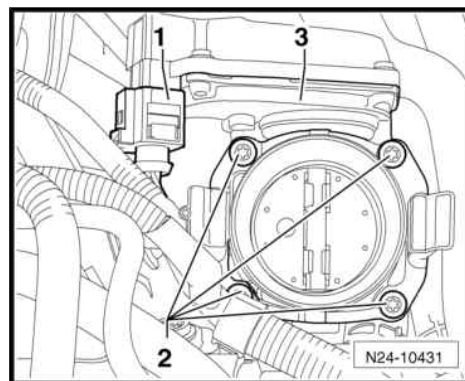
- Tighten securing bolts -3- for retaining clips.
- Tightening torques
⇒ „5.1 Intake manifold (top section) - exploded view“, [page 16](#)
- Plug in electrical connector at charge pressure sender -G31- / intake air temperature sender 2 -G299-

For purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- Press hoses -1- and -2- into retainers on pressure pipe.

If a new throttle valve module -J338- has been installed:

- Erase learnt values and adapt engine control unit -J623- to throttle valve module -J338- . Use vehicle diagnostic tester to do so.



8.6 Cleaning throttle valve module -J338-

Note

- ◆ If a new engine control unit -J623- is installed, it must be adapted to the throttle valve module.
- ◆ Take care not to scratch the throttle valve housing when cleaning it.

Special tools and workshop equipment required

- ◆ Acetone (commercially available)
- ◆ Brush

Procedure

- Remove throttle valve module -J338- ⇒ [page 38](#) .
- Open throttle valve by hand and block it in the open position with a suitable object (e.g. plastic or wooden wedge) -arrow-.

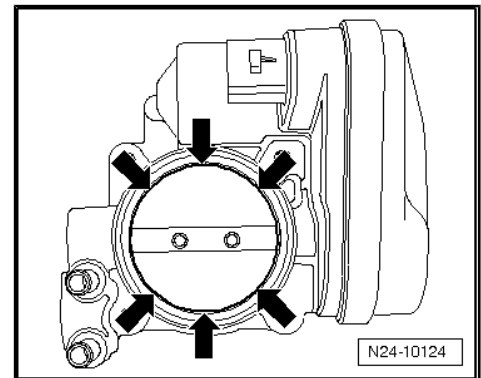
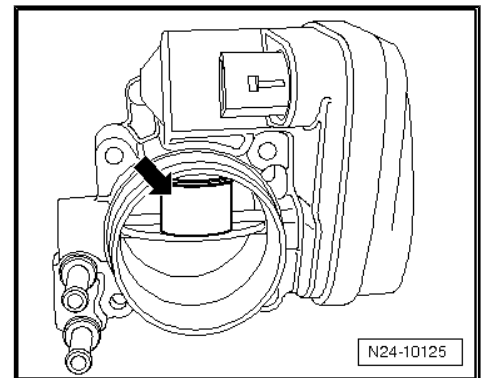


WARNING

Acetone is highly flammable. Please observe all accident prevention regulations and safety precautions when handling flammable liquids. Do not use compressed air when cleaning the throttle valve. Wear safety goggles and protective clothing to avoid possible injury and skin contact.

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- Clean throttle valve housing thoroughly, especially around the points -arrows- where the throttle valve closes, using commercially available acetone and a small brush.
- Wipe out throttle valve housing with a lint-free cloth.
- Allow acetone to evaporate completely and re-install throttle valve module after cleaning.
- Install throttle valve module -J338- ⇒ [page 38](#) .
- Erase learnt values and adapt engine control unit -J623- to throttle valve module. Use vehicle diagnostic tester to do so.



9 Lambda probes

Overview

⇒ „9.1 Lambda probe - overview“, page 42

⇒ „9.2 Removing and installing Lambda probe G39 and Lambda probe heater Z19 before catalytic converter“, page 43

⇒ „9.3 Removing and installing Lambda probe after catalytic converter G130 and Lambda probe 1 heater after catalytic converter Z29“, page 44

9.1 Lambda probe - overview

1 - Lambda probe after catalytic converter -G130-

- ☐ With Lambda probe 1 heater after catalytic converter -Z29-
- ☐ Removing and installing ⇒ page 43
- ☐ 55 Nm

2 - Lambda probe -G39-

- ☐ With Lambda probe heater -Z19-
- ☐ Removing and installing ⇒ page 43
- ☐ 55 Nm

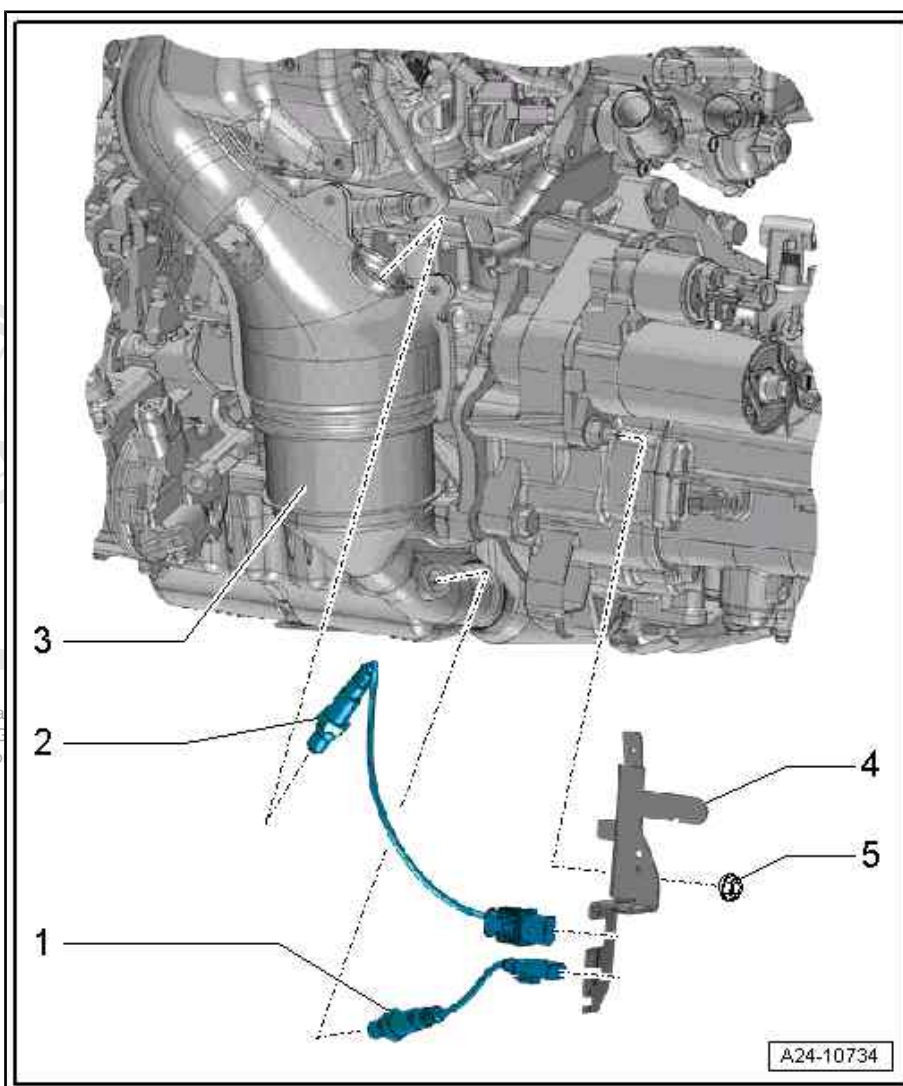
3 - Catalytic converter

4 - Bracket

- ☐ For electrical connectors

5 - Nut

- ☐ M6: 9 Nm
- ☐ M8: 23 Nm





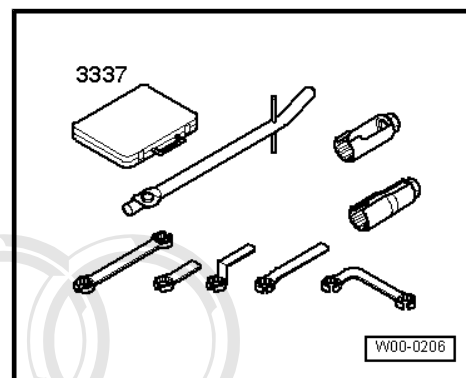
Note

- ◆ *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 ⇒ 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.*

9.2 Removing and installing Lambda probe -G39- and Lambda probe heater -Z19- before catalytic converter

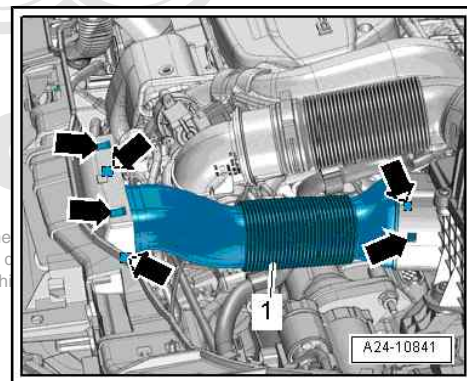
Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set -3337-



Removing

- Release fasteners -arrows- and detach air duct -1-.



Protected by copyright. Copying for private or commercial use is not permitted unless authorised by AUDI AG. AUDI AG does not accept any liability with respect to the correctness of information in this document.

- Unplug electrical connector -2- for Lambda probe -G39- and Lambda probe heater -Z19- .
- Unscrew Lambda probe -G39- -1- using tool from Lambda probe open ring spanner set -3337- .

Installing

When installing, note the following:



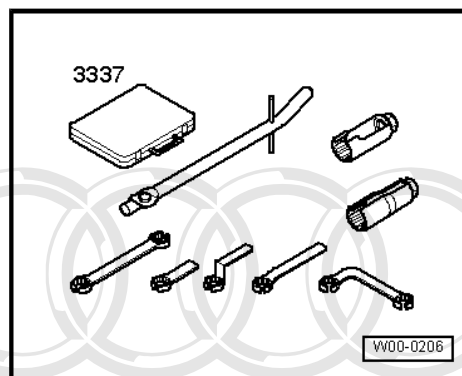
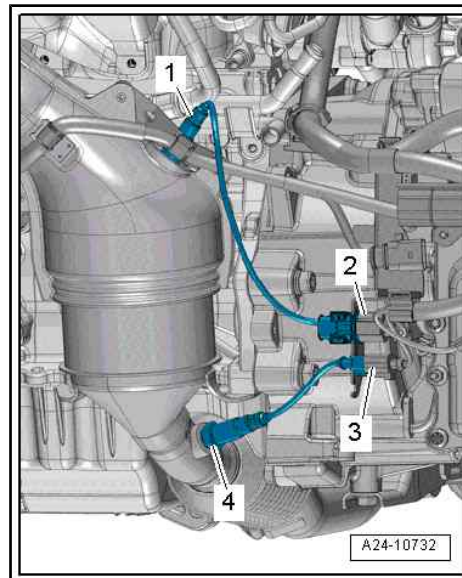
Note

- ◆ *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 ⇒ Parts catalogue*
 - ◆ *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*
- Tightening torque ⇒ „9.1 Lambda probe - overview“, page 42

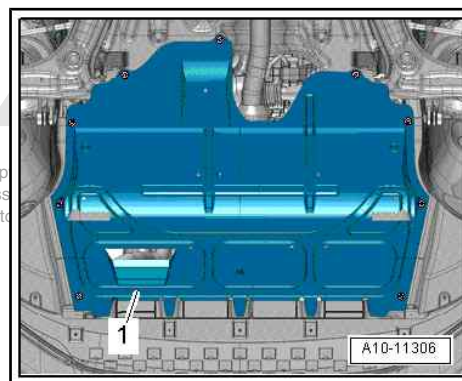
9.3 Removing and installing Lambda probe after catalytic converter -G130- and Lambda probe 1 heater after catalytic converter -Z29-

Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set -3337-



- Remove noise insulation -1- ⇒ Rep. gr. 50 .



- Unplug electrical connector -3- for Lambda probe after catalytic converter -G130- and Lambda probe heater -Z19- .
- Unscrew Lambda probe after catalytic converter -G130- -4- using tool from Lambda probe open ring spanner set -3337- .

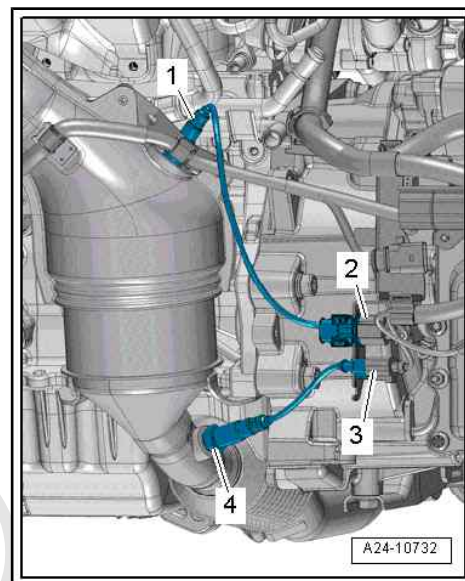
Installing

When installing, 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 ⇒ Parts catalogue*
 - ◆ *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*
- Tightening torque ⇒ [„9.1 Lambda probe - overview“, page 42](#)



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

10 Engine control unit

Overview

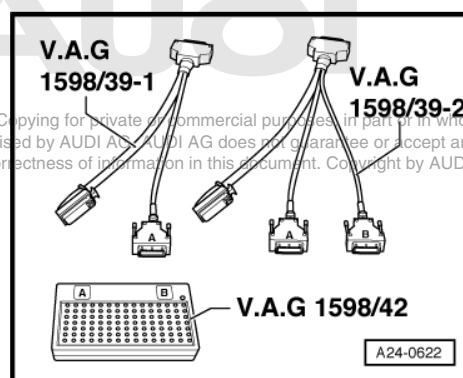
⇒ „10.1 Wiring and component check with test box V.A.G 1598/42“
 „page 46“

⇒ „10.2 Removing and installing engine control unit J623“ „page 47“

10.1 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-



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

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

The engine control unit has to be removed before connectors can be unplugged from engine control unit ⇒ [page 47](#) .

**Caution**

Electronic components are susceptible to damage.

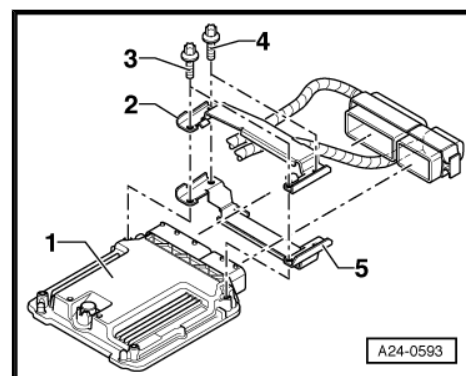
- ◆ **Select the appropriate measuring range before connecting the test leads and observe test requirements.**

- Connect test box -V.A.G 1598/42- to wiring harness with adapter cable -V.A.G 1598/39-1- or adapter cable -V.A.G 1598/39-2-. Connect earth clip of test box to negative terminal of battery. The instructions for performing the individual tests indicate whether or not the engine control unit itself also needs to be connected to the test box.
- Carry out test as described in repair procedure.
- Make sure you fit protective housing back on engine control unit.
- Clean threaded holes for shear bolts to remove any residue from locking fluid. This can be done using a thread tap.
- Always use new shear bolts.
- Interrogate event memory and erase if necessary.

10.2 Removing and installing engine control unit -J623-

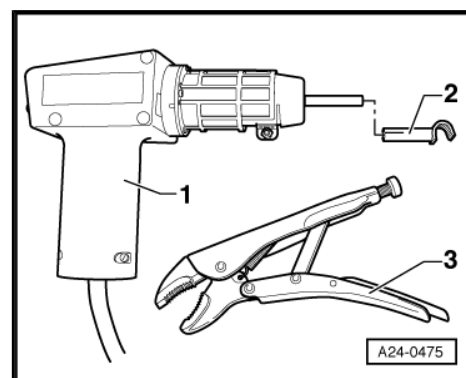
**Note**

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



Special tools and workshop equipment required

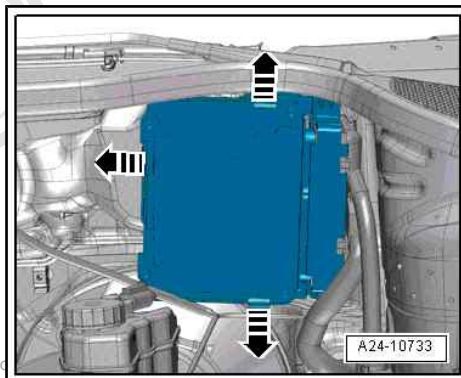
- ◆ Hot air blower -VAS 1978/14A- -item 1- with nozzle attachment -2- from wiring harness repair set -VAS 1978 B-



- ◆ Small mole grips -3- (commercially available)

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 take out ignition key.
- Remove air cleaner housing ⇒ [page 15](#) .
- Release fasteners -arrows- and detach engine control unit - J623- from bracket.

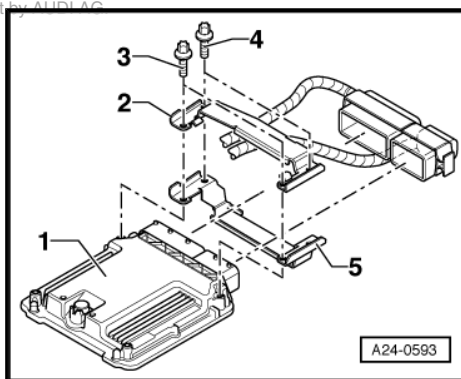


Protected by copyright. Copying for private or commercial purposes, in part or in full, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



Note

- ◆ *The threads of the two shear bolts -4- which are not screwed into the engine control unit -1- 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.*



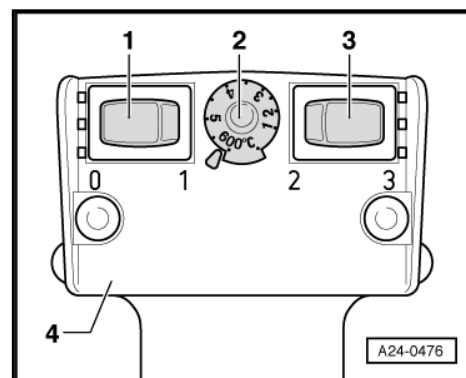


Caution

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

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

- Select settings on hot air blower -4- as shown in illustration:
- 2 - Temperature potentiometer to maximum heat output
- 3 - Two-stage air flow switch to position „3“



Note

- ◆ **Then use hot air blower to heat threaded holes in protective housing into which shear bolts have been screwed. This reduces the inhibiting action of the locking fluid on the shear bolt threads and makes it easier to unscrew these bolts.**
- ◆ **Cover up all painted parts to avoid any damage caused by hot air blower or vice-grip pliers.**



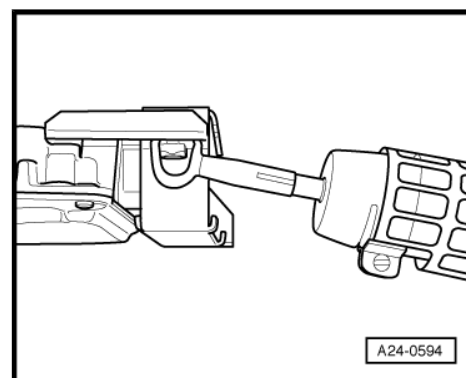
WARNING

Risk of burns.

- ◆ **Parts of the metal locking plate will become very hot as a result of heating the shear bolts. Try to ensure that only the thread is heated and none of the nearby components. These should be covered if necessary.**

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

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



- Then grasp bolt head with vice-grip pliers and unscrew shear bolt.
- Repeat procedure for second shear bolt.
- Detach protective housing from multi-pin connectors.
- Unscrew the two shear bolts screwed into the engine control unit (they do not need to be heated).

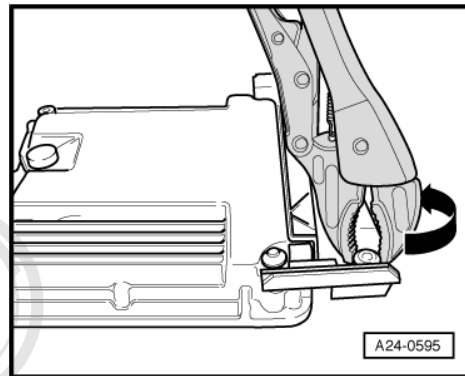
Installing

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

- 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.

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

- Activate engine control unit using a Vehicle diagnostic tester in „Guided Functions“ mode; „Replace engine control unit“



This document, including all drawings and illustrations, in part or in whole, is not to be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or by any information storage and retrieval system. Audi AG does not warrant or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

28 – Ignition system

1 General notes and safety precautions

Overview

⇒ „1.1 General notes on ignition system“, page 51

⇒ „1.2 Safety precautions when using testers and measuring instruments during a road test“, page 51

⇒ „1.3 Safety precautions when working on the injection and ignition system“, page 52

⇒ „1.4 Safety precautions when working on vehicles with start/stop system“, page 52

1.1 General notes on ignition system

- ◆ The engine control unit has a self-diagnosis capability.
- ◆ A voltage of at least 11.5 V is required for proper operation of the electrical components.
- ◆ Certain tests may lead to a fault being detected by the control unit and stored. The event memory should therefore be interrogated and (if necessary) erased after completing the tests and any repair work that may be required.
- ◆ If the engine starts, runs for a short period and then cuts out after completing fault finding, repairs or component tests, this may be due to the 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 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 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 54](#).
- ◆ Also remove fuse for fuel pump control unit -J538- ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- ◆ Entries are stored in the event memory of the engine control unit if electrical connectors were unplugged and the engine was started: „Generate readiness code“ in „Guided Functions“ ⇒ Vehicle diagnostic tester.



Caution

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

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

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability for errors or omissions. © 2011 AUDI AG.

– Disconnect battery ⇒ Electrical system; Rep. gr. 27

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).*



2 Servicing ignition system

Overview

⇒ „2.1 Test data“, page 53

⇒ „2.2 Ignition system - exploded view“, page 54

⇒ „2.3 Removing and installing ignition coils with output stages“, page 54

⇒ „2.4 Removing and installing knock sensor 1 G61“, page 56

⇒ „2.5 Removing and installing Hall sender G40“, page 56

⇒ „2.6 Removing and installing engine speed sender G28“, page 56

2.1 Test data

1.4 ltr. TFSI engine		
Idling speed		Cannot be adjusted; regulated by idling speed stabilisation
Ignition timing		Cannot be adjusted; determined by control unit
Ignition system		Multi-coil system with 4 ignition coils (output stages integrated) connected directly to spark plugs via spark plug connectors
Spark plugs	Designations	⇒ Data sheets for exhaust emissions test
	Tightening torque	
Firing order		⇒ Maintenance : Booklet 819 1-3-4-2

Protected by Copyright. Copying for private or commercial purposes, in particular, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee the accuracy of any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

2.2 Ignition system - exploded view

1 - Spark plug

- ☐ Remove and install with spark plug socket and extension -3122 B-
- ☐ Removing and installing
⇒ Maintenance ; Book-let 819
- ☐ Tightening torque
⇒ Maintenance ; Book-let 819

2 - Cable guide

3 - Ignition coil with output stage

- ☐ 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-

4 - Bolt

- ☐ 9 Nm

5 - Hall sender -G40-

- ☐ Removing and installing
⇒ [page 56](#)

6 - O-ring

- ☐ Renew if damaged

7 - Knock sensor 1 -G61-

- ☐ Removing and installing
⇒ [page 56](#)

8 - Bolt

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

9 - Engine speed sender -G28-

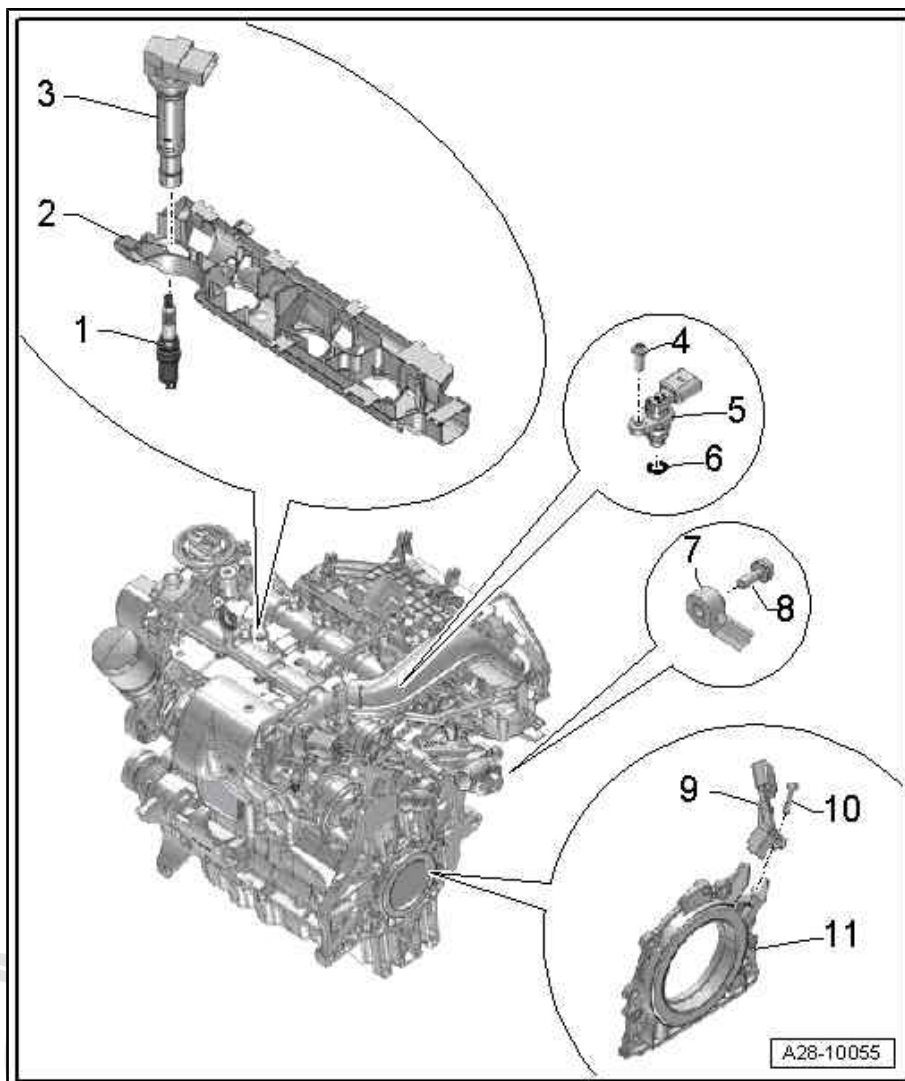
- ☐ Removing and installing ⇒ [page 56](#)

10 - Bolt

- ☐ 4.5 Nm

11 - Sender wheel

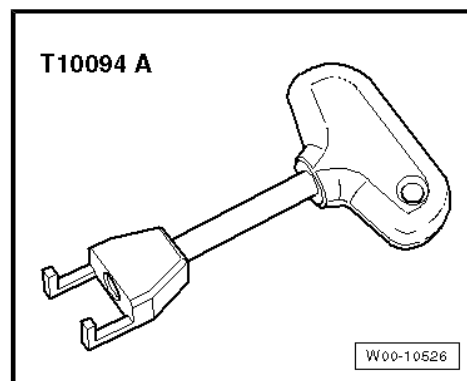
- ☐ For engine speed sender -G28-
- ☐ Removing and installing ⇒ Rep. gr. 13



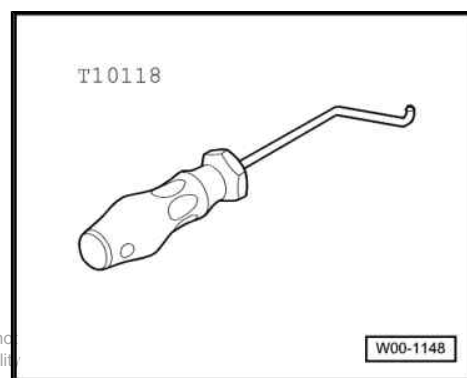
2.3 Removing and installing ignition coils with output stages

Special tools and workshop equipment required

◆ Puller -T10094 A-



◆ Assembly tool -T10118-



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

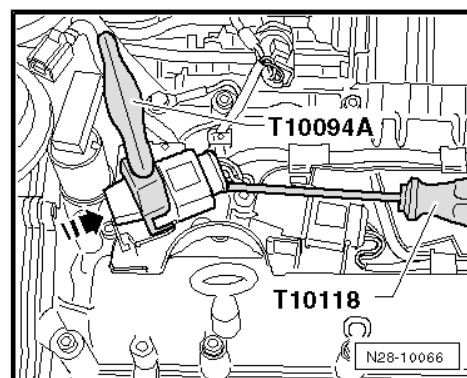
Removing

- Remove engine cover panel ⇒ [page 13](#) .
- Apply puller -T10094 A- to all ignition coils and pull out ignition coils.
- At the same time detach electrical connectors at all ignition coils; to do so apply assembly tool -T10118- as shown and release electrical connectors.

Installing

- Fit all ignition coils loosely into spark plug holes.
- Align the ignition coils with the connectors and attach all connectors onto ignition coils simultaneously.
- Press ignition coils onto spark plugs by hand with uniform pressure (do not use tool).

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



2.4 Removing and installing knock sensor 1 -G61-

Removing

- Unplug electrical connector -1- at knock sensor 1 -G61- .



Note

Knock sensor 1 -G61- is located below intake manifold and knock sensor 1 -G61- must therefore be removed from below.

- Remove knock sensor 1 -G61- -2-.

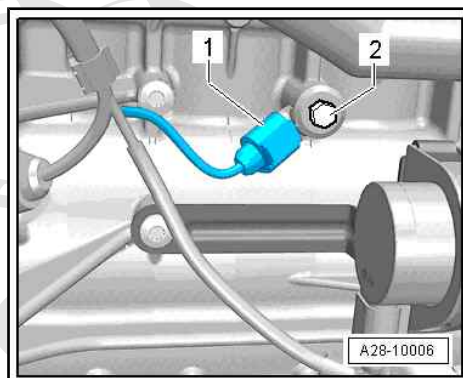
Installing

- Install in reverse order.

- Tightening torque

⇒ „2.2 Ignition system - exploded view“, page 54

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



2.5 Removing and installing Hall sender - G40-

Removing

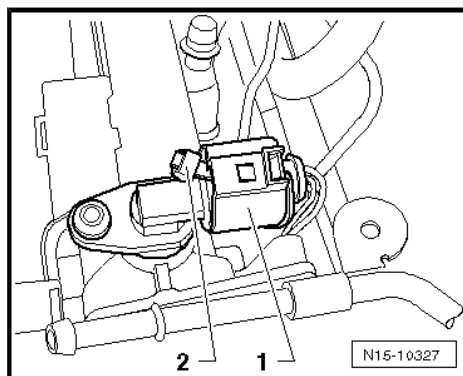
- Remove engine cover panel ⇒ [page 13](#) .
- Unplug electrical connector -1-.
- Unscrew bolt and remove Hall sender -G40- .

Installing

- Install in reverse order.

- Tightening torque

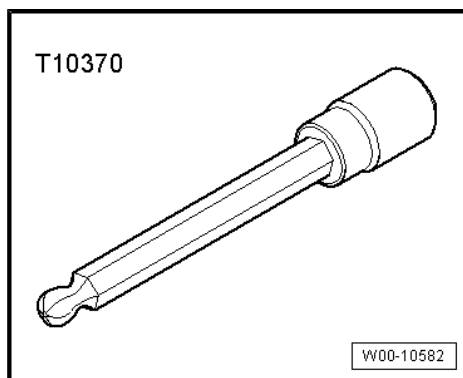
⇒ „2.2 Ignition system - exploded view“, page 54



2.6 Removing and installing engine speed sender -G28-

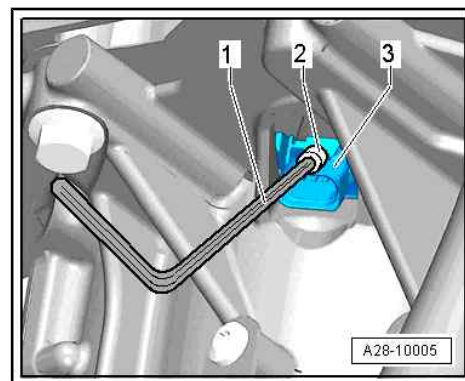
Special tools and workshop equipment required

- ◆ Socket, 4 mm -T10370-



Removing

- Remove intake manifold ⇒ [page 17](#) .
- Unplug electrical connector for engine speed sender -G28- -item 3-.
- Unscrew bolt -2- and detach engine speed sender.



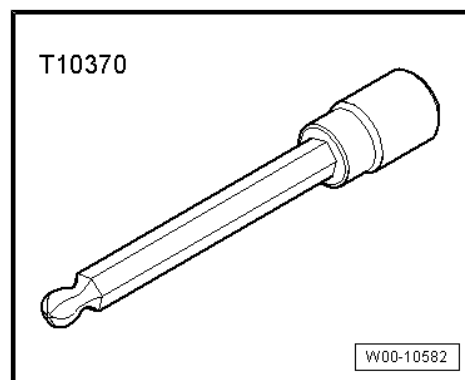
Note

If access is difficult, use socket (4 mm) -T10370- .

Installing

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

- Lubricate O-ring with clean engine oil.
- Carefully insert engine speed sender -G28- into guide (do not knock in).
- Install intake manifold ⇒ [page 17](#) .



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.