



Audi

Workshop Manual

Audi A4 2008 ➤

Audi A5 Cabriolet 2009 ➤

Audi A5 Coupé 2008 ➤

Audi A5 Sportback 2010 ➤

Direct injection and ignition system (4-cyl. 1.8 ltr., 2.0 ltr. 4-valve turbo - generation III)

Engine ID	CJEB								
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Edition 06.2012

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



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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.

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 for vehicles with start/stop system	2
1.4 Rules for cleanliness and instructions for working on fuel system	3
1.5 Safety precautions when working on the ignition system	3
1.6 Reducing fuel pressure in high-pressure section	4
1.7 Checking vacuum system	5
2 Injection system	6
2.1 Technical data	6
2.2 Overview of fitting locations - injection system	6
3 Air cleaner	17
3.1 Exploded view - air cleaner	17
3.2 Removing and installing engine cover panel	18
3.3 Removing and installing air filter element	19
3.4 Removing air cleaner housing	20
4 Intake manifold	21
4.1 Exploded view - intake manifold	21
4.2 Exploded view - fuel rail (FSI)	23
4.3 Exploded view - fuel rail (MPI)	25
4.4 Removing and installing intake manifold	26
4.5 Removing and installing fuel rail for FSI injectors	30
4.6 Removing and installing throttle valve module J338	30
4.7 Cleaning throttle valve module J338	31
4.8 Checking intake manifold change-over function	31
5 High-pressure pump	34
5.1 Exploded view - high-pressure pump	34
5.2 Removing and installing high-pressure pump	35
6 Injectors	39
6.1 Removing and installing FSI injectors	39
6.2 Removing and installing MPI injectors	43
6.3 Cleaning FSI injectors	44
7 Senders and sensors	46
7.1 Removing and installing fuel pressure sender G247	46
7.2 Checking fuel pressure sender G247	47
7.3 Removing and installing fuel pressure sender for low pressure G410	49
7.4 Checking residual pressure in fuel system (up to high-pressure pump)	51
8 Lambda probes	54
8.1 Overview - Lambda probes	54
8.2 Removing and installing Lambda probe G39 and Lambda probe heater Z19 before catalytic converter	54
8.3 Removing and installing Lambda probe after catalytic converter G130 and Lambda probe 1 heater after catalytic converter Z29	55
9 Engine control unit	57
9.1 Wiring and component check with isolator boxes VAS 6606	57
9.2 Renewing engine control unit J623	58
28 - Ignition system	62
1 General notes and safety precautions	62
1.1 General notes on ignition system	62
1.2 Safety precautions	62



2	Servicing ignition system	63
2.1	Test data	63
2.2	Exploded view - ignition system	64
2.3	Removing and installing ignition coils with output stages	64
2.4	Removing knock sensor 1 G61	65
2.5	Removing and installing engine speed sender G28	66



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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 for vehicles with start/stop system“, page 2

⇒ „1.4 Rules for cleanliness and instructions for working on fuel system“, page 3

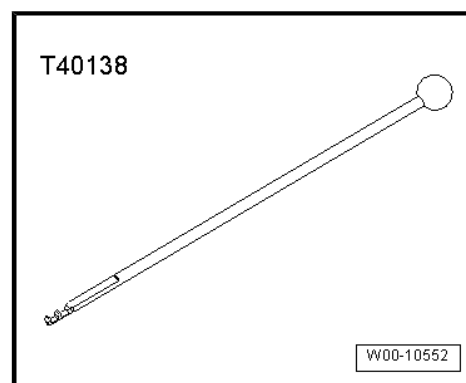
⇒ „1.5 Safety precautions when working on the ignition system“, page 3

⇒ „1.6 Reducing fuel pressure in high-pressure section“, page 4

⇒ „1.7 Checking vacuum system“, page 5

1.1 General notes on self-diagnosis

- ◆ The engine control unit has a self-diagnosis capability. Interrogate the event memory before carrying out repairs. The vacuum hoses and connections must be checked (to prevent 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 reduces the risk of a vehicle fire after a crash. The fuel pump relay deactivates the fuel pump.
- ◆ At the same time, this system also improves the engine's starting performance. Each time the driver's door is opened, the fuel pump is activated for 2 seconds. Initial fuel pressure will then build up. Observe safety precautions ⇒ [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.*

For information on the use of test equipment, please refer to the relevant technical literature. Audi AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

1.3 Safety precautions for 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 Rules for cleanliness and instructions for working on fuel system



WARNING

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

- ◆ *If the battery is not disconnected, the fuse 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.*
- ◆ *The fuel system is pressurised. The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening; for 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.*

– Disconnect battery ➔ Rep. gr. 27 .

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

- ◆ 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.
- ◆ 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.

1.5 Safety precautions when working on the ignition system

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

- ◆ Persons wearing a cardiac pacemaker must at all times maintain a safe distance from high-voltage components such as the ignition system and gas-discharge headlights.
- ◆ Do not open any fuel line connections while the engine is running.
- ◆ Always switch off the ignition before connecting or disconnecting injection or ignition system wiring or tester cables.
- ◆ If engine is to be operated at cranking speed without it starting (e.g. compression test), unplug connectors from ignition coils and remove fuse for electric fuel pump.

- ◆ Certain tests may lead to a fault being detected by the control unit and stored. The event memory should therefore be interrogated and (if necessary) erased after completing the tests and any repair work that may be required.
- ◆ If the event memory has been erased, you must generate the readiness code again.
- ◆ 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.
- ◆ If the engine has to be operated at starting speed without actually starting (e.g. to test compression pressure), detach the four connectors from the ignition coils using puller -T40039-. Also remove fuse for fuel pump control unit -J538-.



Note

Removing the fuse will interrupt the voltage supply »terminal 30« for the fuel pump control unit -J538-, see ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

1.6 Reducing fuel pressure in high-pressure section



WARNING

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

- ◆ ***The injection system consists of a high-pressure section (maximum approx. 200 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.***

Special tools and workshop equipment required

- ◆ Vehicle diagnostic tester

Reducing fuel pressure in high-pressure section:

- Connect vehicle diagnostic tester and perform function „Reduce fuel pressure“ in „Guided Functions“.
- 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.*

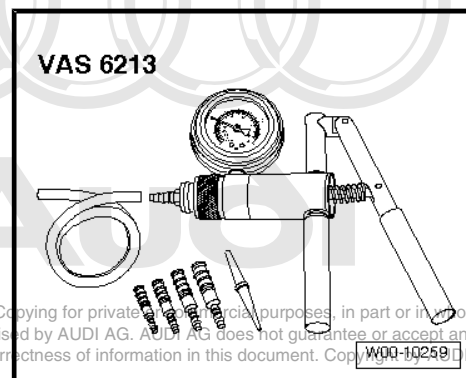
Additional steps required

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

1.7 Checking vacuum system

Special tools and workshop equipment required

- ◆ Hand vacuum pump -VAS 6213-



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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 all vacuum lines leading to the corresponding component, and also check the remaining vacuum lines leading to other components.
- If it is not possible to build up pressure with the hand vacuum pump -VAS 6213- or if the pressure drops again immediately, check the hand vacuum pump and connecting hoses for leaks.



2 Injection system

⇒ „2.1 Technical data“, page 6

⇒ „2.2 Overview of fitting locations - injection system“, page 6

2.1 Technical data

Engine data		Turbo FSI engine
Idling speed (cannot be adjusted; is regulated by idling speed stabilisation)		640 ... 800 rpm
Maximum rpm governed by deactivation of fuel injectors		6500 rpm
Fuel pressure	Initial fuel pressure up to high-pressure pump (generated according to requirements by electric fuel pump in fuel tank)	3.0 ... 7 bar
	Fuel high-pressure (generated by mechanical single-plunger pump)	25 ... 200 bar

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2.2 Overview of fitting locations - injection system

Components A to J are not shown in the exploded view.

1 - Lambda probe -G39- and Lambda probe heater -Z19-

- ☐ Fitting location
⇒ [page 15](#)
- ☐ Removing and installing
⇒ [page 54](#)

2 - Connector

- ☐ For Lambda probe - G39- and Lambda probe heater -Z19-
- ☐ Fitting location
⇒ [page 15](#)

3 - Hall sender 3 -G300-

- ☐ Fitting location
⇒ [page 11](#)
- ☐ 9 Nm

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

- ☐ Fitting location
⇒ [page 15](#)
- ☐ Electrical connector for Lambda probe after catalytic converter -G130- and Lambda probe 1 heater after catalytic converter -Z29-
- ☐ Removing and installing
⇒ [page 55](#)

5 - Fuel pressure regulating valve -N276-

- ☐ Fitting location
⇒ [page 13](#)

6 - High-pressure pump

- ☐ Removing and installing ⇒ [page 13](#)

7 - Coolant temperature sender -G62-

- ☐ Fitting location ⇒ [page 14](#)

8 - Electrical connector for MPI injectors

9 - Hall sender -G40-

- ☐ Fitting location ⇒ [page 12](#)
- ☐ 9 Nm

10 - Vacuum unit for air flow control flaps (intake manifold flaps)

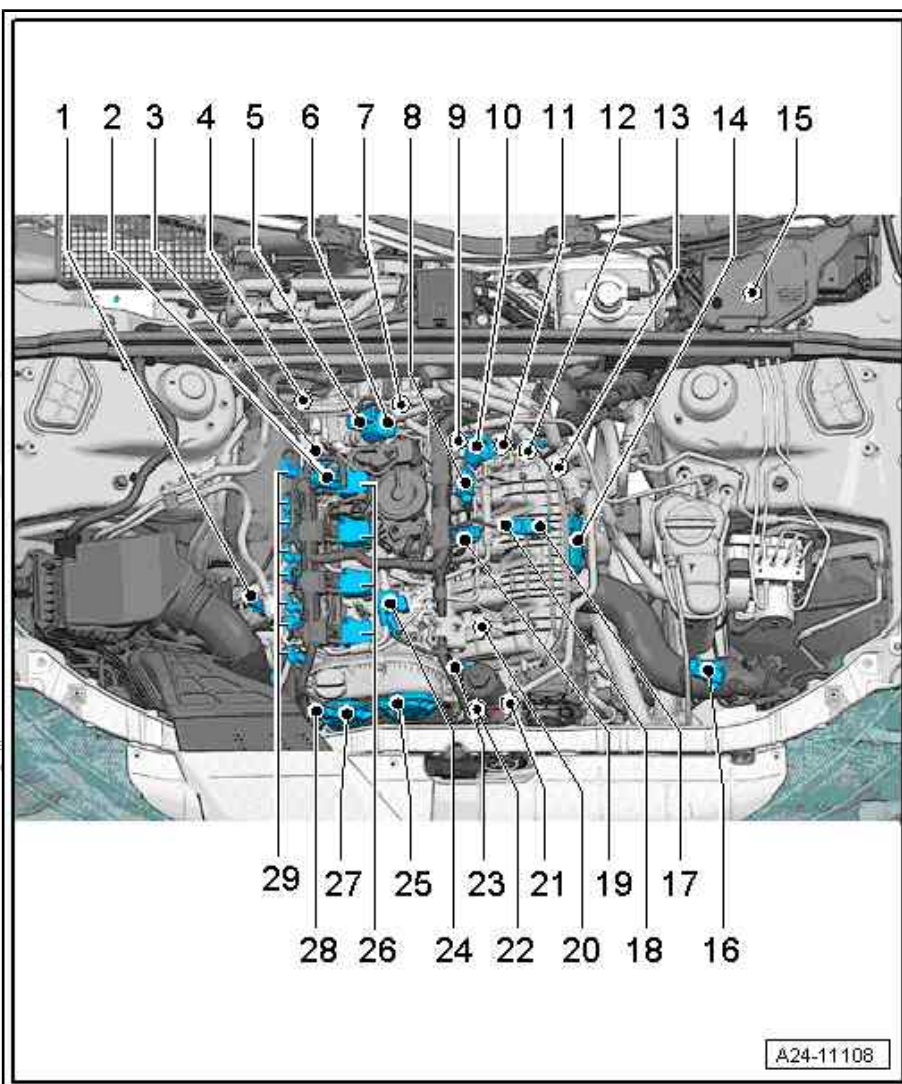
- ☐ Fitting location ⇒ [page 13](#)

11 - Intake manifold flap valve -N316-

- ☐ Fitting location ⇒ [page 13](#)

12 - Engine speed sender -G28-

- ☐ Fitting location ⇒ [page 14](#)
- ☐ Lubricate seal with oil
- ☐ Renew bolt
- ☐ 4 Nm + turn 45° further
- ☐ Removing and installing ⇒ [page 66](#)





13 - Electrical connectors for

- ☐ Knock sensor 1 -G61-
- ☐ Intake manifold flap valve -N316-
- ☐ Fuel pressure sender -G247-
- ☐ Intake manifold flap potentiometer -G336-
- ☐ Hall sender -G40-
- ☐ FSI injectors N30 ... N33
- ☐ Fitting location ⇒ [page 13](#)

14 - Throttle valve module -J338- , throttle valve drive (electric throttle operation) -G186-

- ☐ Throttle valve drive angle sender 1 -G187- and throttle valve drive angle sender 2 -G188-
- ☐ Throttle valve module -J338- must always be re-adapted to engine control unit -J623- after removal and installation or if it has been renewed
- ☐ Fitting location ⇒ [page 14](#)

15 - Engine control unit -J623-

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

16 - Charge pressure sender -G31-

- ☐ Fitting location ⇒ [page 14](#)
- ☐ Removing and installing ⇒ Rep. gr. 21

17 - Intake air temperature sender -G42- with intake manifold pressure sender -G71-

- ☐ Fitting location ⇒ [page 12](#)

18 - Knock sensor 1 -G61-

- ☐ To remove, first remove coolant pump with thermostat
- ☐ 20 Nm
- ☐ Removing and installing ⇒ [page 65](#)

19 - Fuel pressure sender for low pressure -G410-

- ☐ Fuel pressure sender for low pressure -G410- must be installed with an adapter
- ☐ 15 Nm
- ☐ Fitting location ⇒ [page 12](#)
- ☐ Removing and installing ⇒ [page 49](#)

20 - Fuel pressure sender -G247-

- ☐ Fitting location ⇒ [page 12](#)
- ☐ 27 Nm
- ☐ Removing and installing ⇒ [page 46](#)

21 - Valve for oil pressure control -N428-

- ☐ Fitting location ⇒ [page 15](#)
- ☐ Removing and installing ⇒ Rep. gr. 17

22 - Oil pressure switch -F22- , oil pressure switch for reduced oil pressure -F378- and piston cooling jet control valve -N522-

- ☐ Fitting location ⇒ [page 15](#)
 - ☐ Removing, installing and testing ⇒ Rep. gr. 17
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23 - Intake manifold flap potentiometer -G336-

- ☐ Fitting location ⇒ [page 13](#)

24 - Activated charcoal filter solenoid valve 1 -N80-

- ☐ Fitting location ⇒ [page 11](#)

25 - Camshaft control valve 1 -N205-

- ☐ Fitting location ⇒ [page 14](#)
- ☐ Removing and installing ⇒ Rep. gr. 15

26 - Ignition coils with output stages

- ☐ Fitting location ⇒ [page 11](#)
- ☐ Removing and installing ⇒ [page 64](#)

27 - Exhaust camshaft control valve 1 -N318-

- ☐ Fitting location ⇒ [page 14](#)
- ☐ Removing and installing ⇒ Rep. gr. 15

28 - Turbocharger air recirculation valve -N249- and charge pressure positioner -V465-

- ☐ Located directly on turbocharger ⇒ [page 15](#)
- ☐ Removing and installing ⇒ Rep. gr. 21

29 - 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-
- ☐ Actuator 7 for camshaft adjustment -F372-
- ☐ Actuator 8 for camshaft adjustment -F373-
- ☐ Fitting location ⇒ [page 11](#)
- ☐ Removing and installing ⇒ Rep. gr. 15

A - FSI injectors

- ☐ In fuel rail
- ☐ Fitting location ⇒ [page 12](#)
- ☐ Injector, cylinder 1 -N30-
- ☐ Injector, cylinder 2 -N31-
- ☐ Injector, cylinder 3 -N32-
- ☐ Injector, cylinder 4 -N33-
- ☐ Removing and installing ⇒ [page 39](#)

B - MPI injectors

- ☐ In fuel rail
- ☐ Fitting location ⇒ [page 12](#)
- ☐ Injector 2, cylinder 1 -N532-
- ☐ Injector 2, cylinder 2 -N533-
- ☐ Injector 2, cylinder 3 -N534-
- ☐ Injector 2, cylinder 4 -N535-
- ☐ Removing and installing ⇒ [page 43](#)

C - Fuel pump control unit -J538-

- ☐ Fitting location ⇒ [page 10](#)
- ☐ Removing and installing ⇒ Rep. gr. 20

D - Diagnostic connector

- ☐ In driver's knee restraint

E - Brake light switch - F- and brake pedal switch -F47-

- ☐ Fitting location ⇒ [page 11](#)
- ☐ In footwell on brake pedal
- ☐ Removing and installing ⇒ Rep. gr. 45

F - Clutch position sender -G476-

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

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

- ☐ Fitting location ⇒ [page 11](#)
- ☐ On accelerator pedal (both senders are accommodated in one housing)
- ☐ Removing and installing ⇒ Rep. gr. 20

H - Radiator fan control unit -J293-

- ☐ Incorporated in radiator fan

I - Stage 3 oil pressure switch -F447-

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

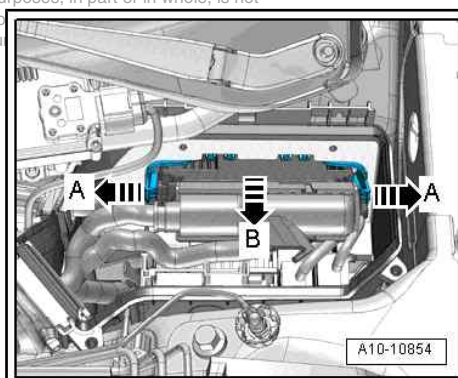
J - Left electrohydraulic engine mounting solenoid valve -N144-

- ☐ Not installed in all vehicles (depends on gearbox type)

Engine control unit -J623-

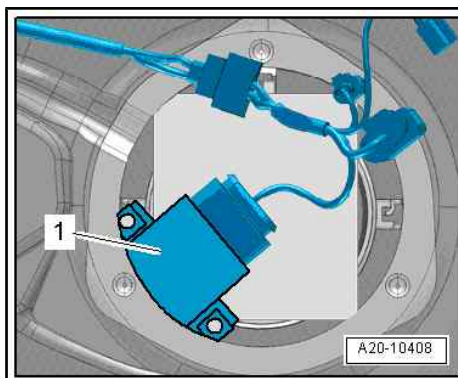
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- ◆ In left electronics box in engine compartment



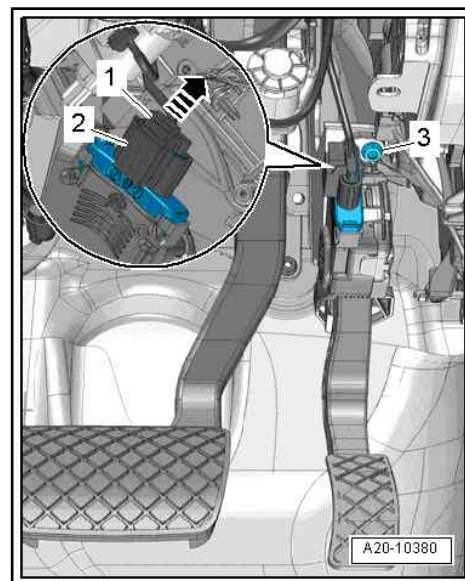
Fuel pump control unit -J538- -1-

Removing and installing ⇒ Rep. gr. 20



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

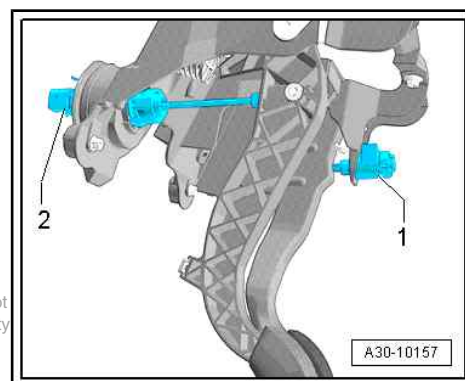
2 - Electrical connector



Clutch position sender -G476- -2-

Integrated functions: clutch pedal switch for engine start -F194- and clutch pedal switch -F36- (manual gearbox only)

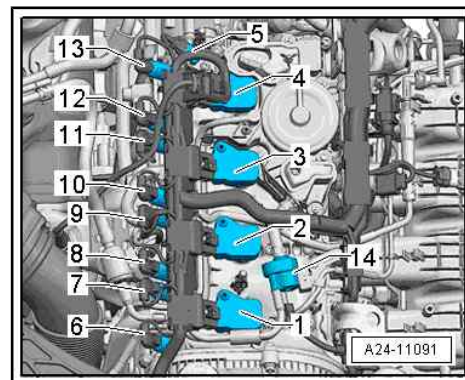
1 - Brake light switch -F- and brake pedal switch -F47-



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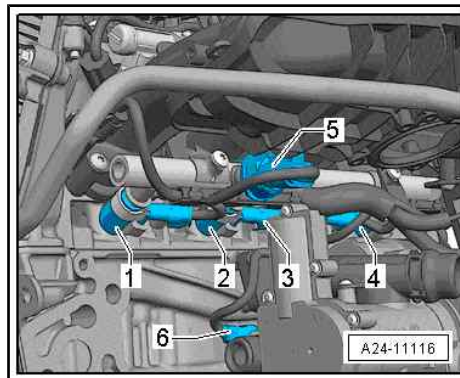
Ignition coils and actuators

- 1 - Ignition coil 1 with output stage -N70-
- 2 - Ignition coil 2 with output stage -N127-
- 3 - Ignition coil 3 with output stage -N291-
- 4 - Ignition coil 4 with output stage -N292-
- 5 - Hall sender 3 -G300-
- 6 - Actuator 2 for camshaft adjustment -F367- (for cylinder No. 1)
- 7 - Actuator 1 for camshaft adjustment -F366- (for cylinder No. 1)
- 8 - Actuator 3 for camshaft adjustment -F368- (for cylinder No. 2)
- 9 - Actuator 4 for camshaft adjustment -F369- (for cylinder No. 2)
- 10 - Actuator 6 for camshaft adjustment -F371- (for cylinder No. 3)
- 11 - Actuator 5 for camshaft adjustment -F370- (for cylinder No. 3)
- 12 - Actuator 7 for camshaft adjustment -F372- (for cylinder No. 4)
- 13 - Actuator 8 for camshaft adjustment -F373- (for cylinder No. 4)
- 14 - Activated charcoal filter solenoid valve 1 -N80-



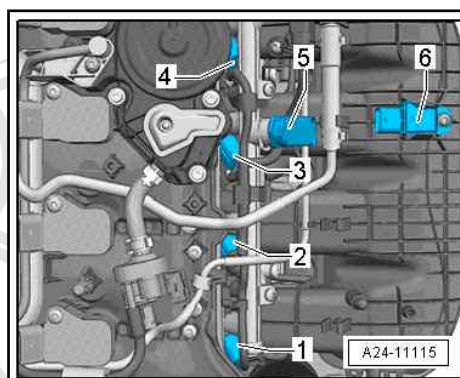
FSI injectors

- 1 - Injector, cylinder 1 -N30-
- 2 - Injector, cylinder 2 -N31-
- 3 - Injector, cylinder 3 -N32-
- 4 - Injector, cylinder 4 -N33-
- 5 - Fuel pressure sender -G247-



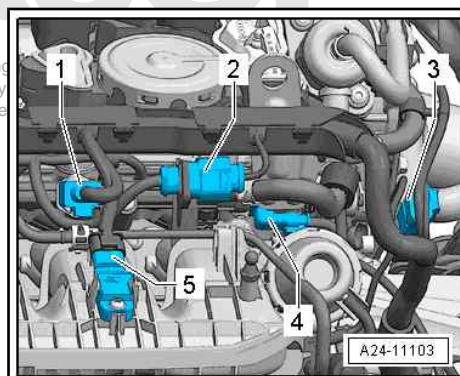
MPI injectors

- 1 - Injector 2, cylinder 1 -N532-
- 2 - Injector 2, cylinder 2 -N533-
- 3 - Injector 2, cylinder 3 -N534-
- 4 - Injector 2, cylinder 4 -N535-
- 5 - Fuel pressure sender for low pressure -G410-
- 6 - Intake air temperature sender -G42- with intake manifold pressure sender -G71-



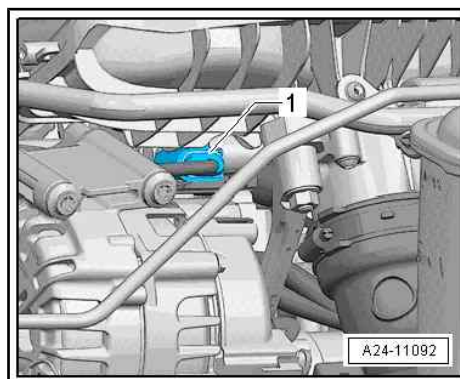
View from above

- 1 - Fuel pressure sender for low pressure -G410-
- 2 - Electrical connector for MPI injectors
- 3 - Electrical connector for Lambda probe after catalytic converter -G130-
- 4 - Hall sender -G40-
- 5 - Intake air temperature sender -G42- with intake manifold pressure sender -G71-



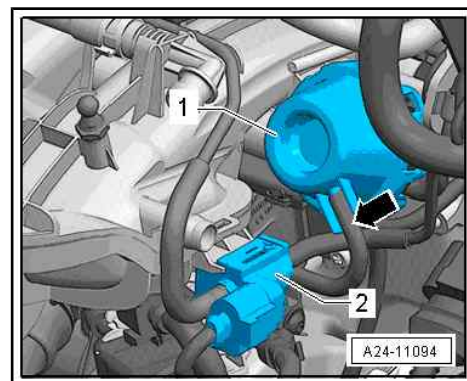
Fuel pressure sender in high-pressure system

- 1 - Fuel pressure sender -G247-

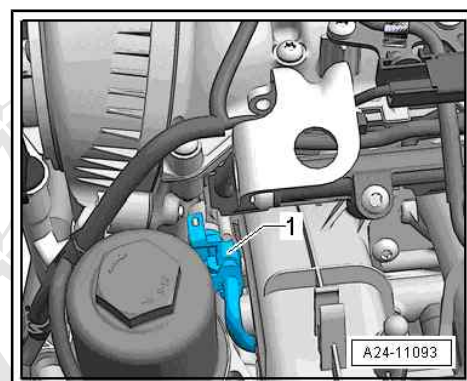


Intake manifold change-over

- 1 - Vacuum unit for air flow control flaps (intake manifold flaps)
- 2 - Intake manifold flap valve -N316-



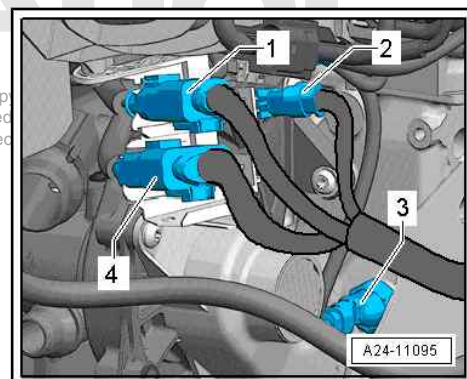
Intake manifold flap potentiometer -G336- -1-



Electrical connectors

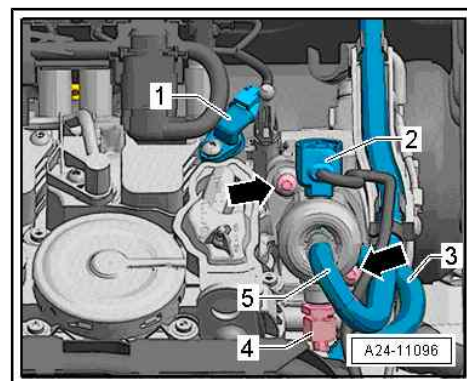
- 1 - For FSI injectors
- 2 - For knock sensor 1 -G61-
- 3 - Stage 3 oil pressure switch -F447-
- 4 - For intake manifold flap valve -N316- , fuel pressure sender -G247- , intake manifold flap potentiometer -G336- , coolant temperature sender -G62- and Hall sender -G40-

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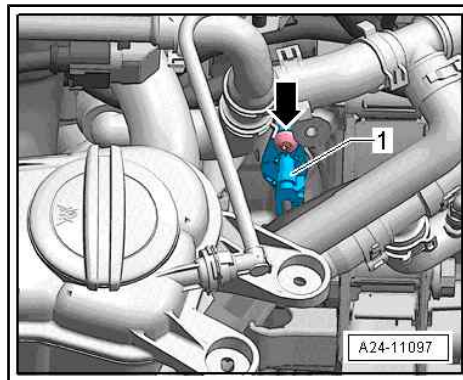


High-pressure pump and Hall sender

- 1 - Hall sender 3 -G300-
- 2 - Fuel pressure regulating valve -N276-
- 3 - Fuel supply line to fuel rail for MPI injectors
- 4 - Fuel supply line to fuel rail for FSI injectors
- 5 - Fuel supply line from fuel tank
- -Arrows- denote securing bolts

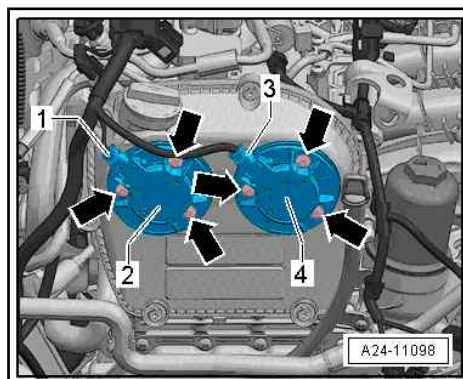


Engine speed sender -G28- -1-



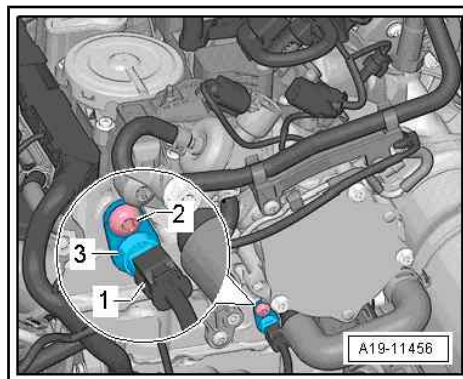
Camshaft control valves

- 1 - Electrical connector for exhaust camshaft control valve 1 - N318-
- 2 - Exhaust camshaft control valve 1 -N318-
- 3 - Electrical connector for camshaft control valve 1 -N205-
- 4 - Camshaft control valve 1 -N205-



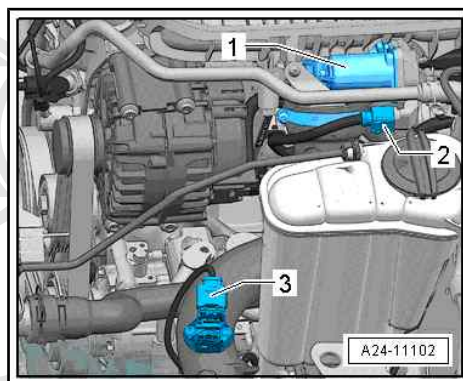
Coolant temperature sender -G62-

- 1 - Electrical connector for coolant temperature sender -G62-
- 2 - Bolt
- 3 - Coolant temperature sender -G62-



Charge pressure sender -G31-

- 1 - Throttle valve module -J338-
- 2 - Electrical connector for throttle valve module -J338-
- 3 - Charge pressure sender -G31-

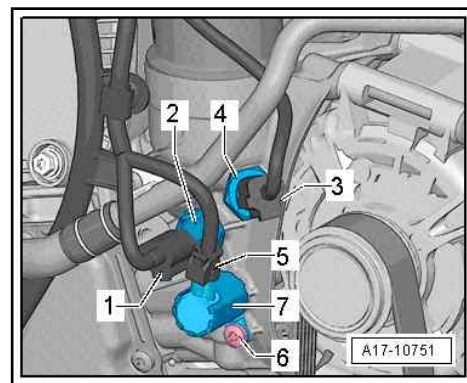


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Oil pressure switch

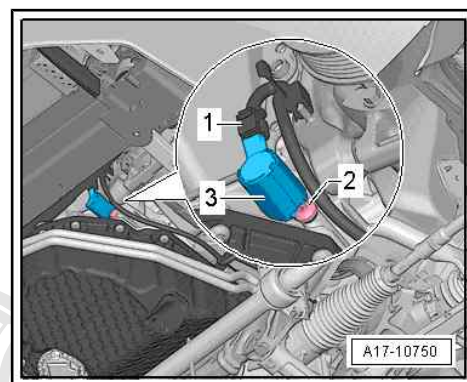
- 1 - Electrical connector for oil pressure switch -F22-
- 2 - Oil pressure switch -F22-
- 3 - Electrical connector for oil pressure switch for reduced oil pressure -F378-
- 4 - Oil pressure switch for reduced oil pressure -F378-
- 5 - Electrical connector for piston cooling jet control valve -N522-
- 6 - Bolt
- 7 - Piston cooling jet control valve -N522-

Removing and installing ⇒ Rep. gr. 17



Valve for oil pressure control -N428- -3-

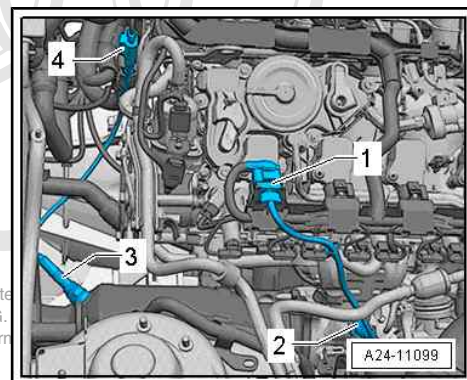
Removing and installing ⇒ Rep. gr. 17



Lambda probes

- 1 - Electrical connector for Lambda probe -G39-
- 2 - Lambda probe -G39- and Lambda probe heater -Z19-
- 3 - Lambda probe after catalytic converter -G130- and Lambda probe heater 1 after catalytic converter -Z29-
- 4 - Electrical connector for Lambda probe after catalytic converter -G130-

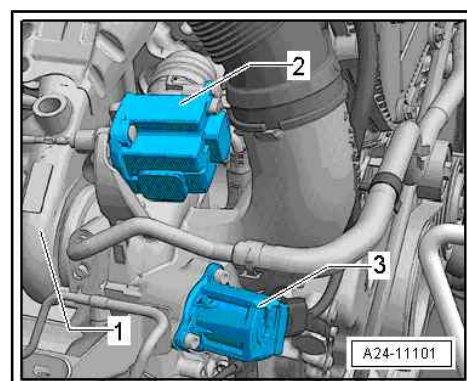
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Components on turbocharger

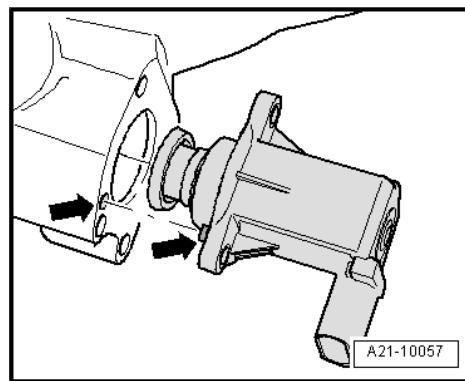
- 1 - Turbocharger
- 2 - Charge pressure positioner -V465-
- 3 - Turbocharger air recirculation valve -N249- (note installation position, refer to next illustration)

For removing and installing components on turbocharger, refer to ⇒ Rep. gr. 21 .





Pay attention to installation position of turbocharger air recirculation valve -N249-



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3 Air cleaner

⇒ „3.1 Exploded view - air cleaner“, page 17

⇒ „3.2 Removing and installing engine cover panel“, page 18

⇒ „3.3 Removing and installing air filter element“, page 19

⇒ „3.4 Removing air cleaner housing“, page 20

3.1 Exploded view - air cleaner

1 - Air hose

2 - Hose clip

3 - Air duct

- ☐ Clipped into air cleaner housing
- ☐ Clean dirt and leaves out of air duct

4 - Air duct

- ☐ Clean dirt and leaves out of air duct

5 - Air duct

- ☐ Secure to lock carrier (2 Nm)
- ☐ Clean dirt and leaves out of air duct

6 - Rubber grommet

7 - Water drain hose

- ☐ Clean connection

8 - Guide for water drain hose

9 - Air cleaner (bottom section)

- ☐ Clean any salt residue, leaves and dirt out of air cleaner (bottom section)
- ☐ Important: Check for dirt in water drain and clean as required

10 - Retainer for air cleaner (bottom section)

- ☐ Must engage positively
- ☐ Do not use any lubricants

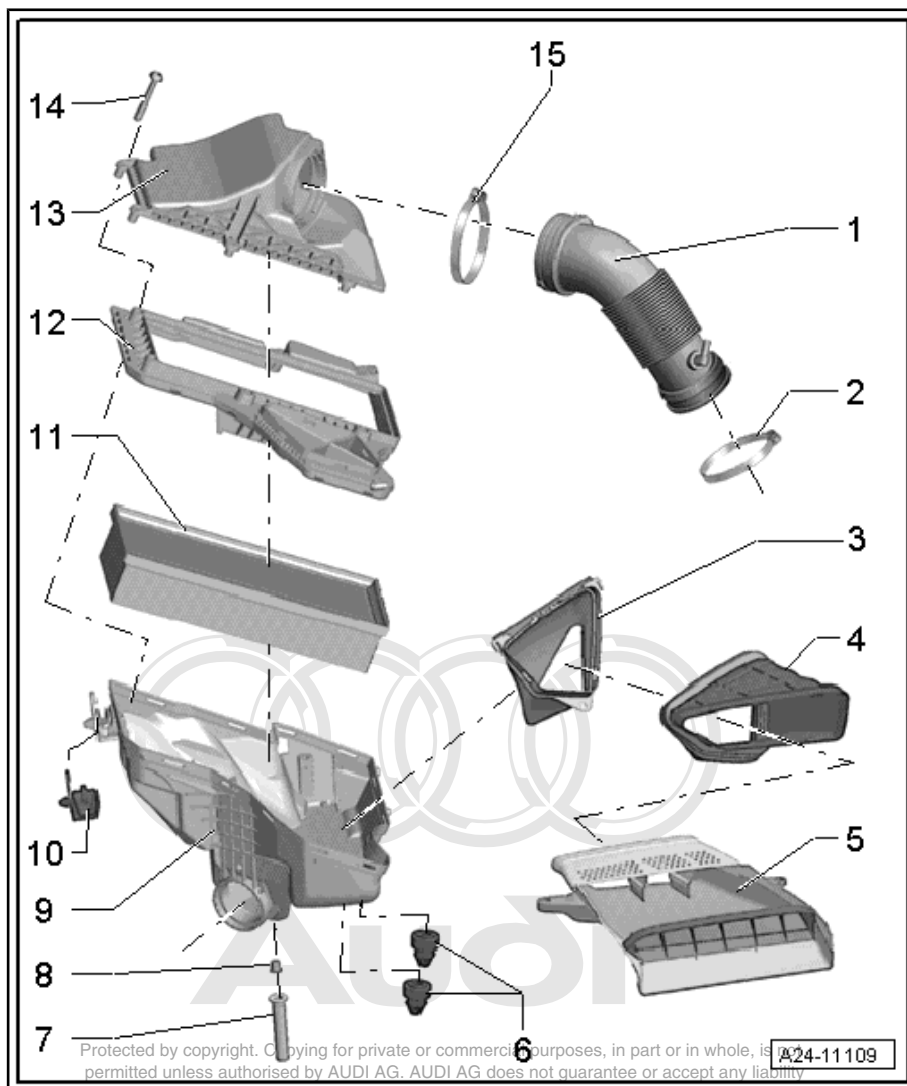
11 - Air filter element

- ☐ Always use genuine part for air filter element
- ☐ Maintenance intervals for A4 ⇒ Maintenance ; Booklet 812 , A5 ⇒ Maintenance ; Booklet 811 or A5 Cabriolet ⇒ Maintenance ; Booklet 818
- ☐ Removing and installing ⇒ [page 19](#)
- ☐ Also clean snow screen (if fitted)

12 - Frame insert for air cleaner (bottom section)

13 - Air cleaner (top section)

- ☐ Clean any salt residue, leaves and dirt out of air cleaner (top section)





14 - Bolt

15 - Hose clip

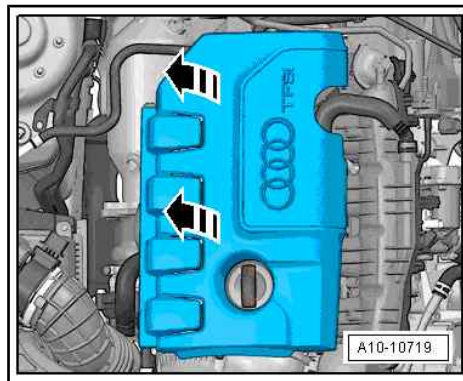
3.2 Removing and installing engine cover panel

Removing

- Pull engine cover panel carefully off retaining pins. Do not jerk the cover panel away, and do not try to pull on one side only.

Installing

- To avoid damage, do not strike the engine cover panel with your fist or with any kind of tool.
- Position engine cover panel on engine (note locations of oil filler neck and oil dipstick).
- Press engine cover panel with both hands into the rubber grommets.



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3.3 Removing and installing air filter element

Removing air filter element

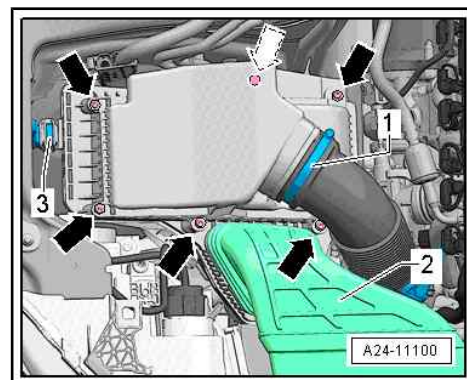
- Release hose clip -1- securing air hose (going to turbocharger) and disconnect hose from air cleaner housing.
- Remove all bolts -arrows- from air cleaner (top section) and lift out air cleaner (top section).
- Take out old filter element.

Installing air filter element



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.*
 - ◆ *Both sections of 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.*
- Blow out water drain in bottom section of air cleaner with compressed air.
 - Clean salt residue, dirt and leaves out of air cleaner housing (top and bottom sections); use a vacuum cleaner if necessary.
 - Check for dirt and leaves in air duct going from lock carrier to air cleaner housing.
 - When installing the air filter element, check that it is properly centred in the retainer in the air cleaner (bottom section).
 - Fit the top section of the air cleaner carefully on the bottom section, without using force. Make sure the top section of the air cleaner is fitted straight on the air filter element (note position of sealing lip on air filter element).
 - Make sure that air hose is securely fitted.

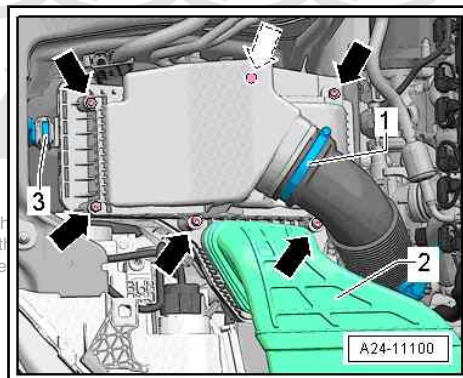


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3.4 Removing air cleaner housing

Removing

- Release hose clip -1- securing air hose (going to turbocharger) and disconnect hose from air cleaner housing.
- Remove air duct -2-.



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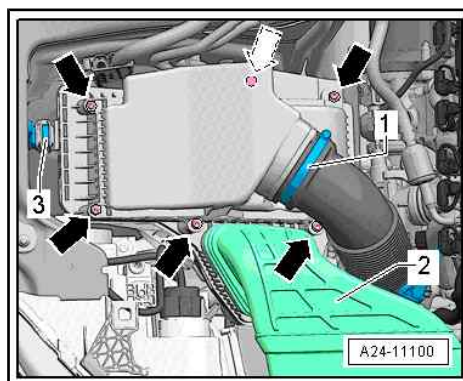
- Release retainer -3- for bottom section of air cleaner (press in rubber on left and right side and pull upwards).



Note

Do not use lubricant when installing retainer.

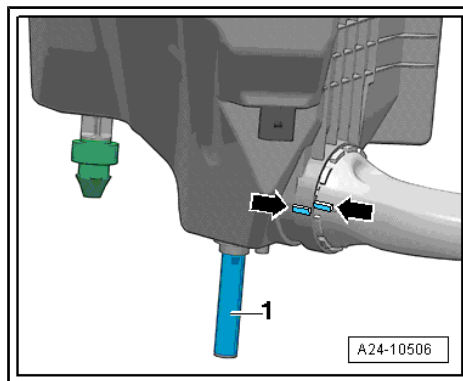
- Carefully take out complete air cleaner housing.



Note

- ♦ *Always use genuine part for air filter element.*
- ♦ *Use a silicone-free lubricant when installing the air hose.*
- ♦ *Secure all hose connections with the correct type of hose clips (same as original equipment) ➔ Parts catalogue*

- If hot air intake is fitted (for countries with cold climates only), make sure that air intake connection has engaged properly -arrows- (pay attention to markings).
- Check water drain hose -1- in air cleaner (bottom section) for dirt and other obstructions (clean if necessary).
- Check for salt residue, dirt and leaves in air intake hose (engine intake side).
- Check for dirt in air duct leading to air filter element.
- Re-install air cleaner housing.



Note

The water drain hose must be routed straight downwards without kinks.

4 Intake manifold

⇒ „4.1 Exploded view - intake manifold“, page 21

⇒ „4.2 Exploded view - fuel rail (FSI)“, page 23

⇒ „4.3 Exploded view - fuel rail (MPI)“, page 25

⇒ „4.4 Removing and installing intake manifold“, page 26

⇒ „4.5 Removing and installing fuel rail for FSI injectors“,
 page 30

⇒ „4.6 Removing and installing throttle valve module J338“, page
 30

⇒ „4.7 Cleaning throttle valve module J338“, page 31

⇒ „4.8 Checking intake manifold change-over function“,
 page 31

4.1 Exploded view - intake manifold

1 - Intake manifold

- ☐ Removing and installing
 ⇒ page 26

2 - Bolt for intake manifold

- ☐ 9 Nm

3 - Intake manifold flap valve - N316-

4 - Vacuum unit for air flow control flaps (intake manifold flaps)

5 - Bolts for high-pressure pump

- ☐ Renew
- ☐ Hand-tighten in diagonal
 sequence, then
 tighten to 8 Nm +
 90° further

6 - Electrical connector

- ☐ For fuel pressure regu-
 lating valve -N276-

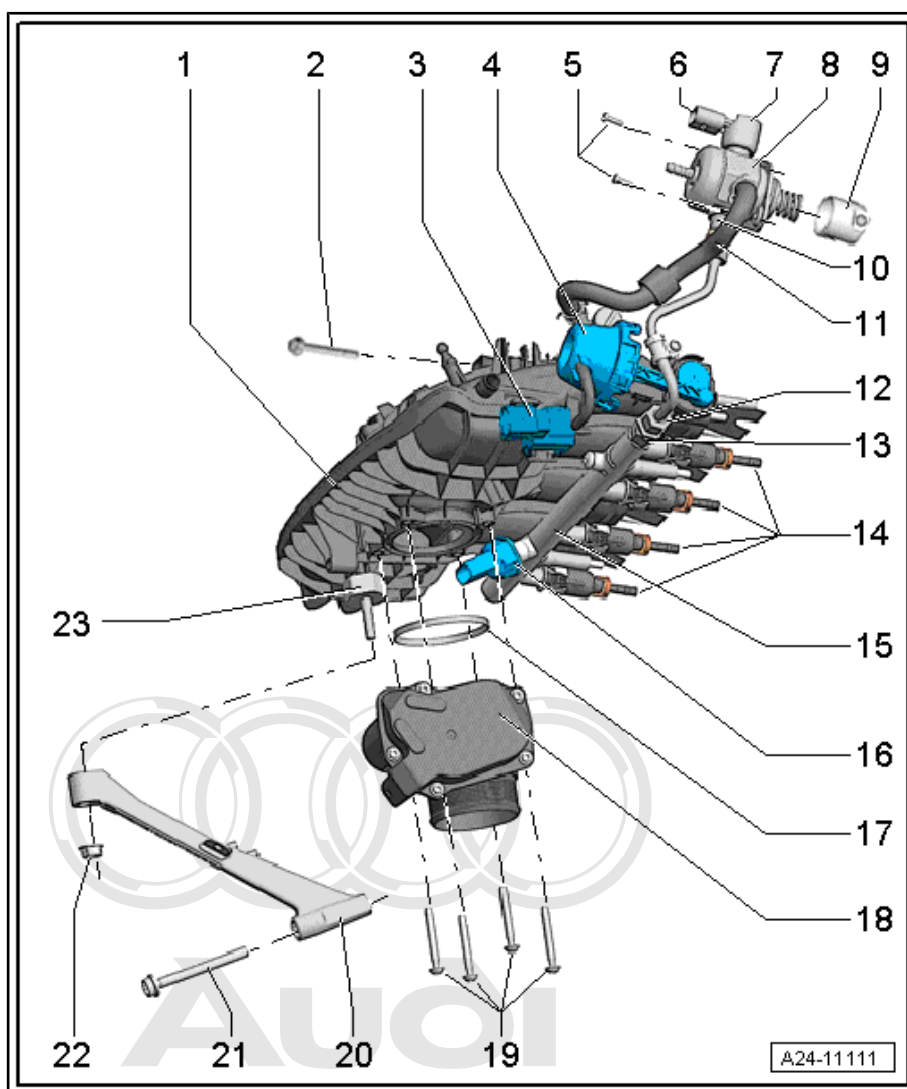
7 - Fuel pressure regulating valve -N276-

8 - High-pressure pump

- ☐ With fuel pressure regu-
 lating valve -N276-
- ☐ An electric fuel pump
 (fitted in fuel tank) sup-
 plies fuel to the mechan-
 ical high-pressure pump
- ☐ When installing the
 high-pressure fuel
 pump, it is essential to
 ensure that no dirt en-
 ters the fuel system.

- ☐ Take care to protect the high-pressure pump from knocks

- ☐ The fuel system must not be under pressure when installing the high-pressure pump; procedure for
 reducing fuel pressure ⇒ page 4



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- ☐ Fuel lines must be free of tension when installed.

- ☐ Removing and installing ⇒ [page 35](#)

9 - Roller tappet

- ☐ May remain lodged inside vacuum pump after removal of high-pressure pump, but can be removed

10 - Fuel supply line

- ☐ To fuel rail for FSI injectors
- ☐ Lightly lubricate ball of fuel supply line with engine oil
- ☐ Fuel supply line must be free of tension when installed (make sure all parts are clean)

11 - Fuel supply line

- ☐ To fuel rail for MPI injectors
- ☐ Fuel supply line must be free of tension when installed (make sure all parts are clean)

12 - Union nut for fuel supply line

- ☐ 20 Nm

13 - Connecting piece for fuel supply line

- ☐ Renew
- ☐ 40 Nm

14 - Injectors

- ☐ Renew O-ring and teflon ring
- ☐ Ensure correct installation position.
- ☐ Removing and installing ⇒ [page 39](#)

15 - Fuel rail for FSI injectors

16 - Fuel pressure sender -G247-

- ☐ 27 Nm
- ☐ Lubricate threads lightly with clean engine oil
- ☐ Removing and installing ⇒ [page 46](#)

17 - Seal

- ☐ Renew

18 - Throttle valve module -J338- , 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-
- ☐ Throttle valve module -J338- must be re-adapted to engine control unit -J623- after it has been removed, installed or renewed; see „Guided Functions“; use ⇒ Vehicle diagnostic tester

19 - Bolts for throttle valve module -J338-

- ☐ 7 Nm

20 - Intake manifold support

21 - Bolt

- ☐ For intake manifold support
- ☐ 20 Nm

22 - Securing nut for intake manifold support

- ☐ 10 Nm

23 - Rubber bush

- ☐ 5 Nm



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4.2 Exploded view - fuel rail (FSI)

1 - Injector

- ☐ With combustion chamber ring seal (teflon ring seal): always renew
- ☐ Renew O-rings
- ☐ Ensure correct installation position.
- ☐ Removing and installing ⇒ [page 39](#)

2 - Support ring

- ☐ Renew

3 - Fuel rail for FSI injectors

- ☐ Tighten to 9 Nm
- ☐ Removing and installing ⇒ [page 30](#)

4 - Roller tappet

5 - Fuel pressure regulating valve -N276-

6 - 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 lines must be free of tension when installed.
- ☐ Removing and installing ⇒ [page 35](#)

7 - Bolts for high-pressure pump

- ☐ Renew
- ☐ Hand-tighten in diagonal sequence, then tighten to 8 Nm + 90° further

8 - Connection piece for fuel supply line at high-pressure pump

- ☐ Renew
- ☐ 40 Nm

9 - Union nut for fuel supply line

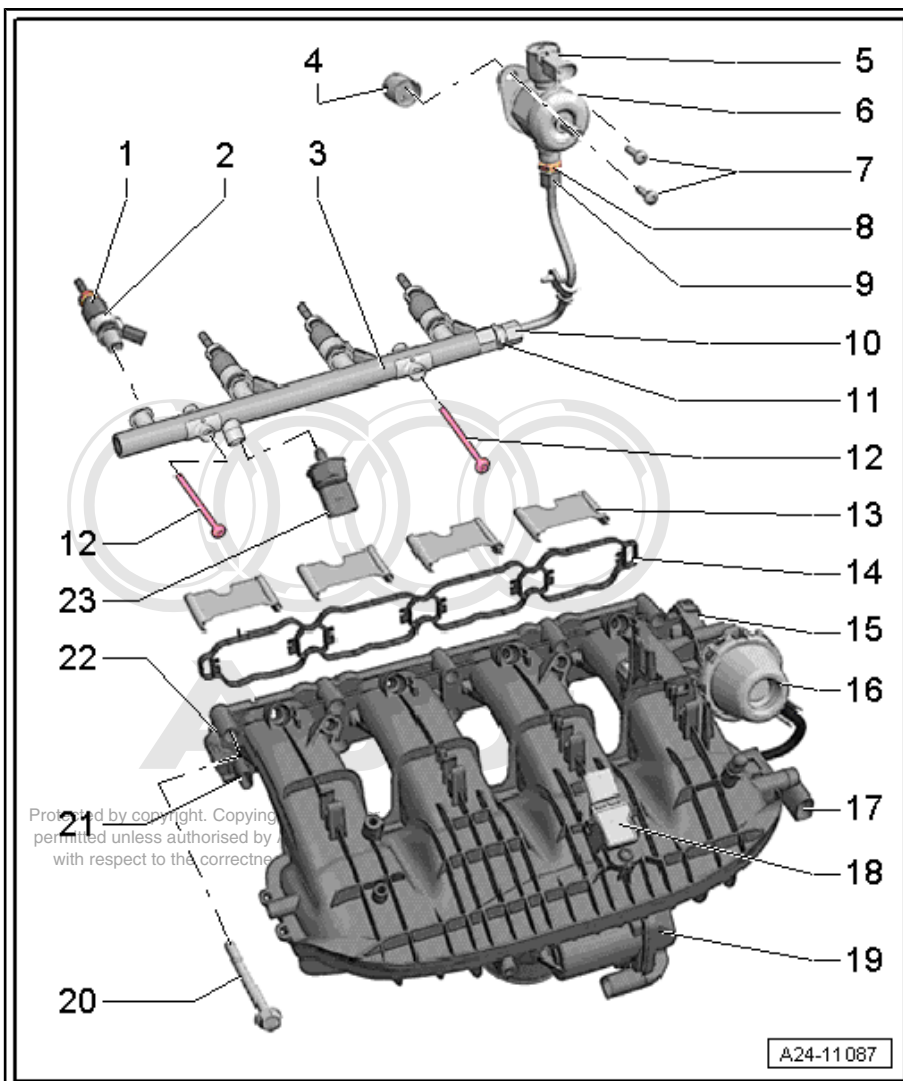
- ☐ 20 Nm

10 - Union nut for fuel supply line

- ☐ 20 Nm

11 - Connecting piece for fuel supply line at fuel rail

- ☐ Renew
- ☐ 40 Nm





12 - Bolts

- ☐ 9 Nm

13 - Port separator plates

14 - Gasket

- ☐ Check for damage and renew if necessary

15 - Adjuster for air flow control flaps (intake manifold flaps)

16 - Vacuum unit for air flow control flaps (intake manifold flaps)

17 - Intake manifold flap valve -N316-

18 - Intake air temperature sender -G42- with intake manifold pressure sender -G71-

- ☐ 5 Nm

19 - Throttle valve module -J338- , 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-
- ☐ Throttle valve module -J338- must be re-adapted to engine control unit -J623- after it has been removed, installed or renewed; see „Guided Functions“; use ⇒ Vehicle diagnostic tester
- ☐ 7 Nm

20 - Bolt for intake manifold

- ☐ 9 Nm

21 - Intake manifold flap potentiometer -G336-

- ☐ After intake manifold flap potentiometer -G336- has been removed, installed, or renewed, it must always be re-adapted to engine control unit -J623-; see „Guided Functions“; use ⇒ Vehicle diagnostic tester

22 - Intake manifold

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

23 - Fuel pressure sender -G247-

- ☐ 27 Nm
- ☐ Lubricate threads lightly with clean engine oil
- ☐ Removing and installing ⇒ [page 46](#)

4.3 Exploded view - fuel rail (MPI)

1 - Bolt

- ☐ For fuel rail for MPI injectors
- ☐ 9 Nm

2 - Fuel rail for MPI injectors

3 - O-ring

- ☐ Renew

4 - Injector

- ☐ Renew O-rings
- ☐ Ensure correct installation position.
- ☐ Removing and installing
⇒ [page 43](#)

5 - O-ring

- ☐ Renew

6 - Retaining clip

7 - Spring-type clip

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 lines must be free of tension when installed.
- ☐ Removing and installing ⇒ [page 35](#)

9 - Connecting piece for fuel supply line

- ☐ Renew
- ☐ 40 Nm

10 - Union nut for fuel supply line

- ☐ Fuel supply line to fuel rail for FSI injectors
- ☐ Lightly lubricate ball of fuel supply line with engine oil
- ☐ Fuel supply line must be free of tension when installed (make sure all parts are clean)
- ☐ 27 Nm

11 - Fuel supply line connection

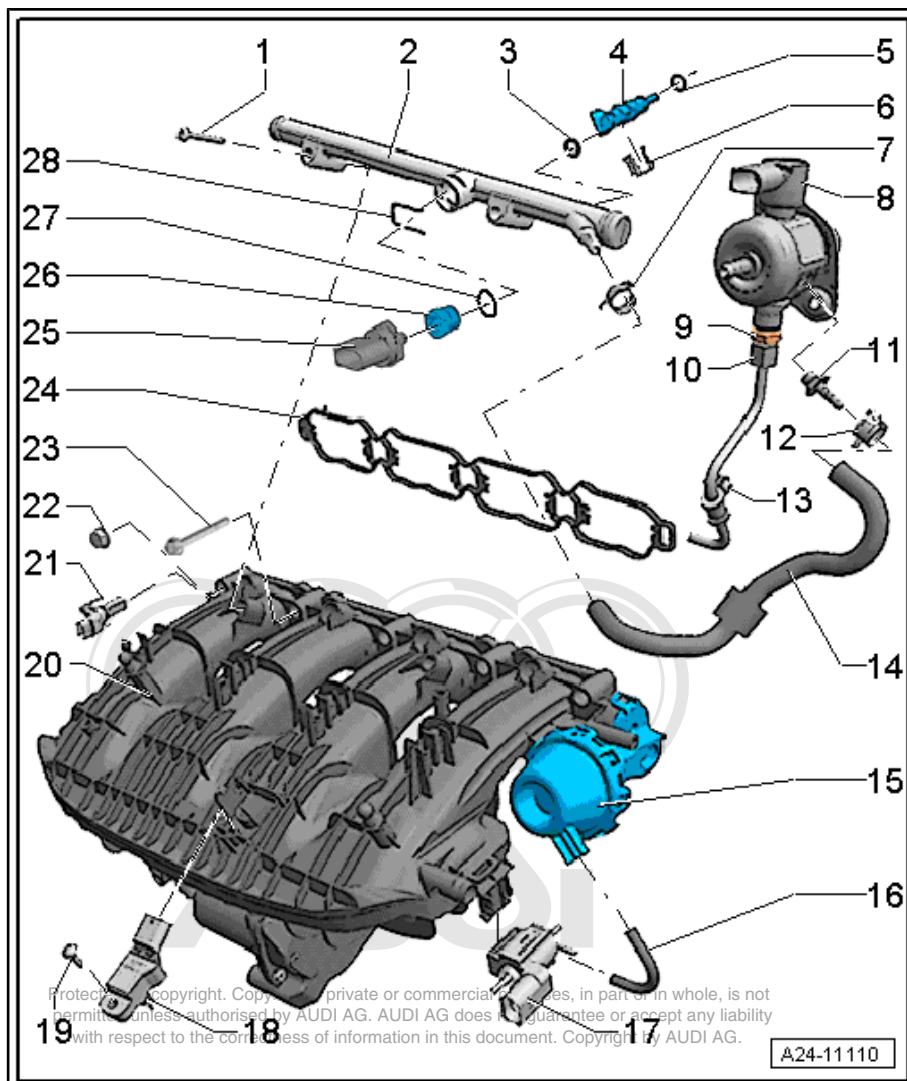
- ☐ 15 Nm

12 - Clip

- ☐ Renew

13 - Bolt

- ☐ 5 Nm



14 - Fuel supply line

- ☐ Fuel supply line to fuel rail for MPI injectors
- ☐ Fuel supply line must be free of tension when installed (make sure all parts are clean)

15 - Vacuum unit for air flow control flaps**16 - Vacuum hose****17 - Intake manifold flap valve -N316-****18 - Intake air temperature sender -G42- with intake manifold pressure sender -G71-****19 - Bolt**

- ☐ 5 Nm

20 - Intake manifold

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

21 - Intake manifold flap potentiometer -G336-

- ☐ After intake manifold flap potentiometer -G336- has been removed, installed, or renewed, it must always be re-adapted to engine control unit -J623-; see „Guided Functions“; use ⇒ Vehicle diagnostic tester

22 - Nut for intake manifold

- ☐ 9 Nm

23 - Bolts for intake manifold

- ☐ 9 Nm

24 - Gasket

- ☐ Check for damage and renew if necessary

25 - Fuel pressure sender for low pressure -G410-

- ☐ Must be screwed onto adapter -item 26-
- ☐ 15 Nm
- ☐ Removing and installing ⇒ [page 49](#)

26 - Adapter

- ☐ Must be screwed onto fuel pressure sender for low pressure -G410-
- ☐ Renew O-ring
- ☐ 15 Nm

27 - O-ring

- ☐ Renew

28 - Clip

- ☐ For securing fuel pressure sender for low pressure -G410- in fuel rail

4.4 Removing and installing intake manifold

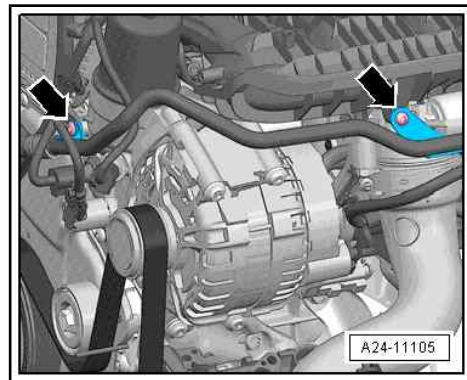
After the intake manifold has been removed or renewed, the intake manifold flap potentiometer -G336- must be adapted to the engine control unit -J623- .

Removing**WARNING**

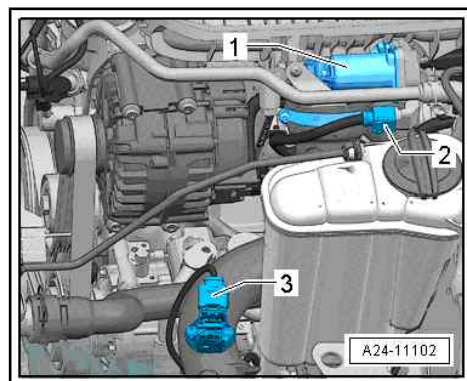
Fuel system operates under high pressure. Always dissipate pressure in high-pressure section prior to opening fuel system. For procedure, refer to ⇒ [page 4](#)

- Disconnect negative terminal from battery.
- Remove engine cover panel ⇒ [page 18](#) .

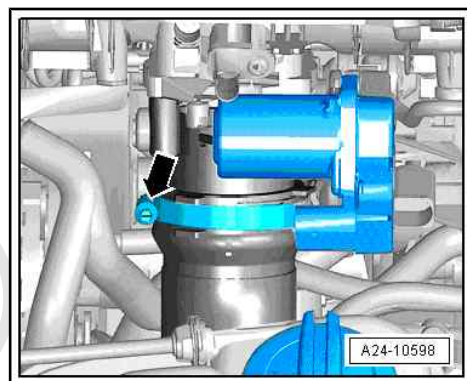
- Remove bolts -arrows- for coolant line from intake manifold.



- Unplug electrical connector -2- from throttle valve module -J338-.



- Open hose clip -arrow- securing air intake hose and disconnect hose downwards from throttle valve module -J338-.



- Unplug following electrical connectors:

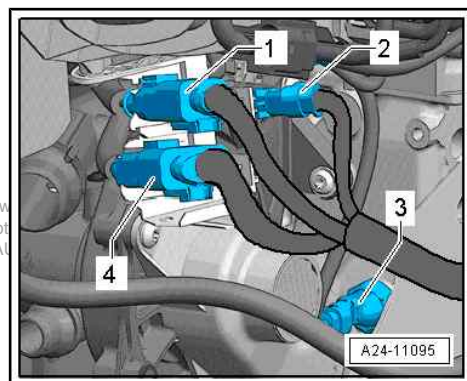
1 - From FSI injectors

2 - From knock sensor 1 -G61-

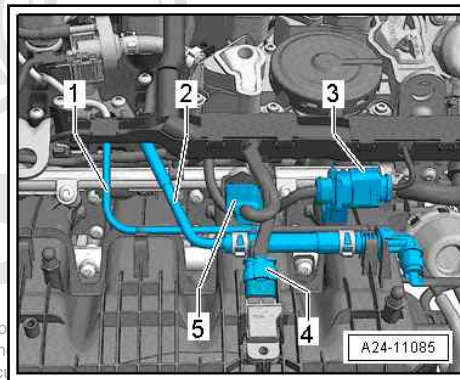
4 - For intake manifold flap valve -N316-, fuel pressure sender -G247-, intake manifold flap potentiometer -G336-, coolant temperature sender -G62- and Hall sender -G40-

- Detach vacuum line -1- and coolant line -2- from intake manifold.

- Detach electrical connector -3- from retainer.

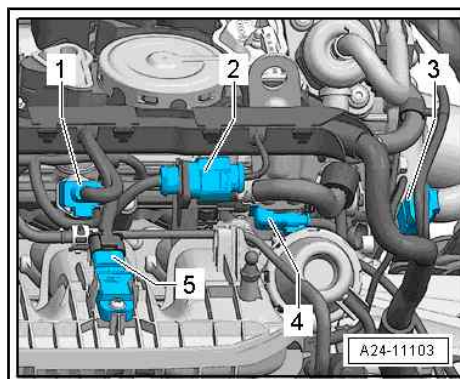


- Unplug electrical connectors -4 and 5-.
- Move clear wiring harness -1- from fuel rail.
- Detach fuel supply line -2- from fuel rail.

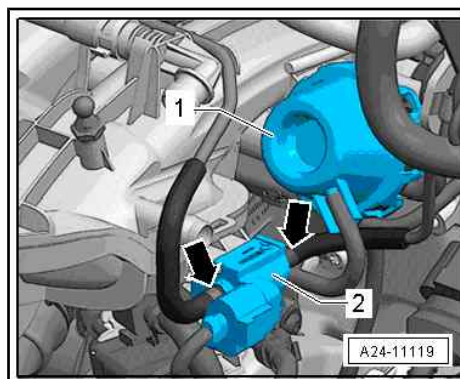


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- Unplug electrical connector -4-.
- Unplug electrical connector for intake manifold flap valve - N316- -2-.



- Disconnect vacuum lines -arrows- from intake manifold flap valve -N316- -2-.

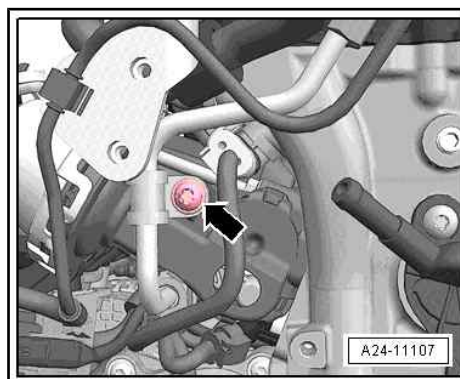


- Unscrew retaining clip -arrow- for high-pressure pipe.
- Open union nuts securing high-pressure pipe to high-pressure pump and fuel rail.
- Take out high-pressure pipe.

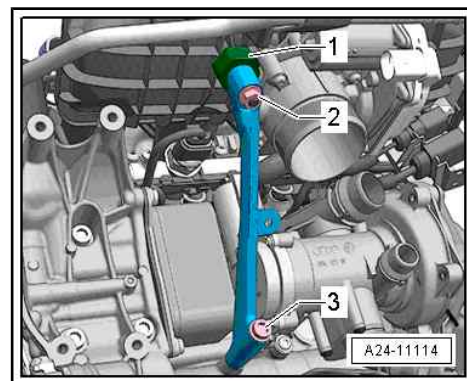


Note

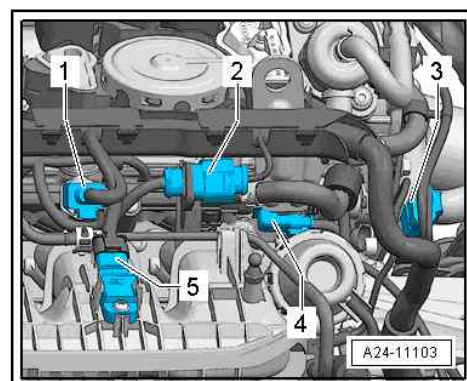
- ◆ *The fuel system must not be under pressure.*
- ◆ *Use a clean cloth to catch escaping fuel.*
- ◆ *Seal off open connections with clean caps. Make sure no dirt gets into the fuel system.*



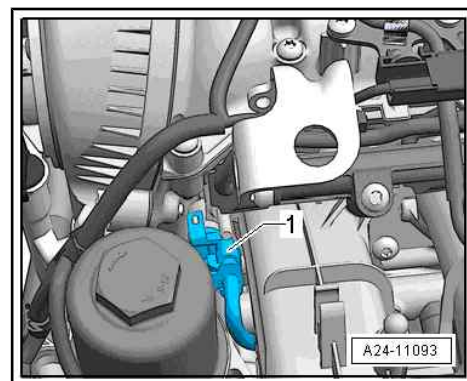
- Slightly loosen securing nut -2- and remove bolt -3-.



- Unplug electrical connector -4- from Hall sender -G40- .
- Open oil filter by a few turns.



- Unplug electrical connector -1- from intake manifold flap potentiometer -G336- .
- Unscrew bolts from intake manifold.



- Pull intake manifold slightly off cylinder head and detach bracket for electrical connectors.

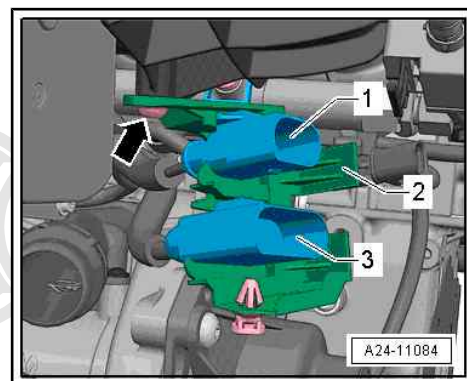


Note

Block off intake ports with a clean cloth.

Installing

- Renew both connecting pieces for high-pressure pipe.
- Re-connect bracket for electrical connectors.
- Fit intake manifold onto studs (left and right) on cylinder head.
- The remaining installation steps are carried out in the reverse sequence.
- Tightening torque
 ➤ „4.2 Exploded view - fuel rail (FSI)“, page 23



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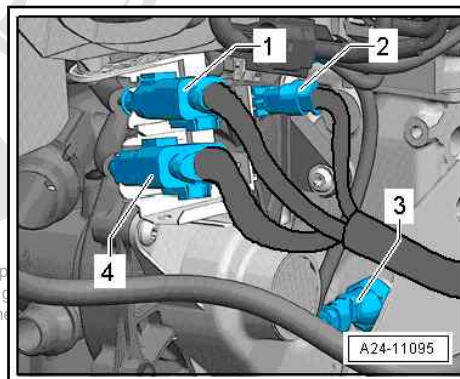
4.5 Removing and installing fuel rail for FSI injectors



Note

Intake manifold must be removed; removing intake manifold ➤ [page 26](#) .

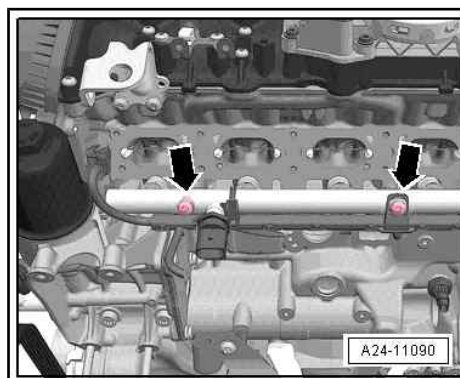
- Unplug electrical connector -3- from stage 3 oil pressure switch -F447- .
- Unplug all electrical connectors at injectors.



- Unscrew bolts -arrows- from fuel rail.
- Detach fuel rail from cylinder head.

Installing

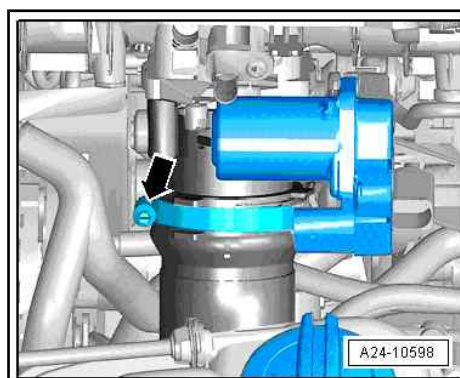
- Install in reverse order.
- Install intake manifold ➤ [page 26](#) .
- Tightening torque: Fuel rail (FSI) - exploded view ➤ [page 23](#)



4.6 Removing and installing throttle valve module -J338-

Removing

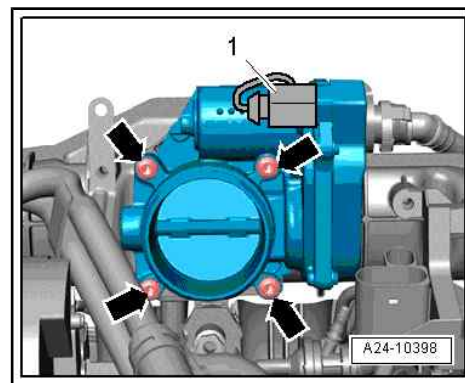
- Remove engine cover panel.
- Open hose clip -arrow- securing air intake hose and disconnect hose downwards from throttle valve module -J338- .
- Unplug electrical connector -1- from throttle valve module -J338- .



- Remove the four bolts -arrows- from throttle valve module -J338- and detach throttle valve module -J338- .

Installing

- Install in reverse order.
- Clean sealing surface for seal.
- Renew seal.
- Tightening torques: intake manifold - exploded view
 ⇒ [page 21](#) .
- After throttle valve module -J338- has been renewed, it must be re-adapted to engine control unit -J623- . Use ⇒ Vehicle diagnostic tester.



4.7 Cleaning throttle valve module -J338-



Note

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

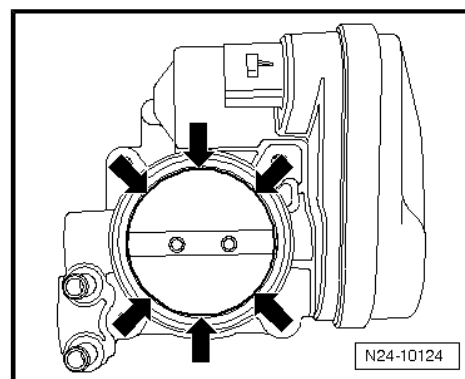
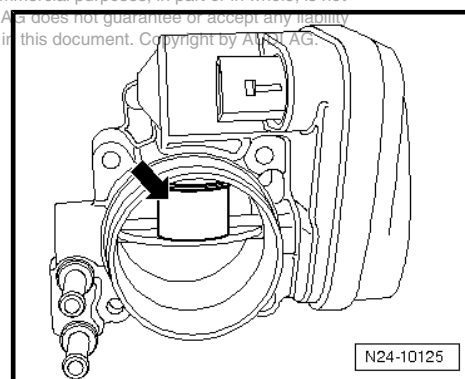
- Remove throttle valve module -J338- ⇒ [page 30](#).
- Open throttle valve by hand and block it in the open position with a suitable object (e.g. plastic or wooden wedge) -arrow-.



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.

- 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.
- Erase learnt values and adapt engine control unit -J623- to throttle valve module -J338- . Use ⇒ Vehicle diagnostic tester.

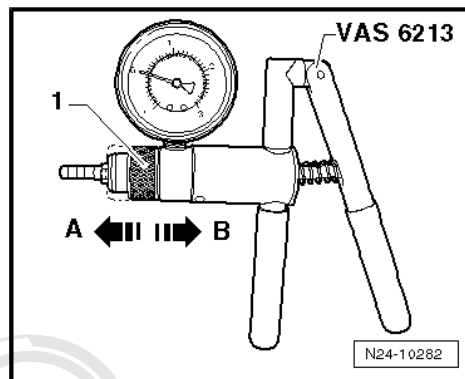


4.8 Checking intake manifold change-over function

Only perform this test if there is a loss of engine torque (poor flexibility or lack of pulling power).

Special tools and workshop equipment required

◆ Hand vacuum pump -VAS 6213-



Test condition

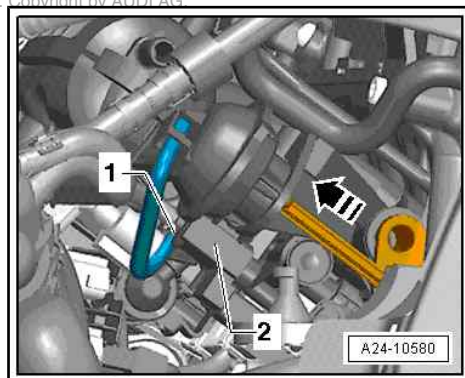
- ◆ Intake manifold flap valve -N316- has been checked with a vehicle diagnostic tester.

Perform the following steps if the intake manifold flap valve - N316- is OK.

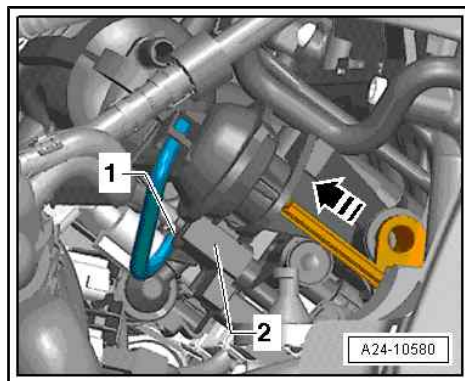
- Carefully pull off engine cover panel.
- Start engine and run at idling speed.
- Have a second mechanic rev up engine quickly (short burst of throttle) and observe vacuum unit for intake manifold change-over.
- The vacuum unit should pick up -arrow-.

If the change-over does not operate as described:

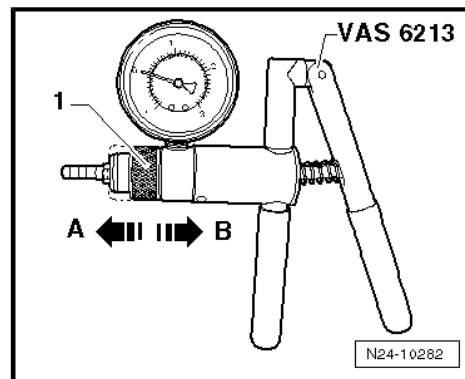
- Check vacuum system for leaks.
- Check that change-over mechanism moves freely by moving linkage manually.
- Check proper connection of vacuum lines.
- Check vacuum hoses for porosity.



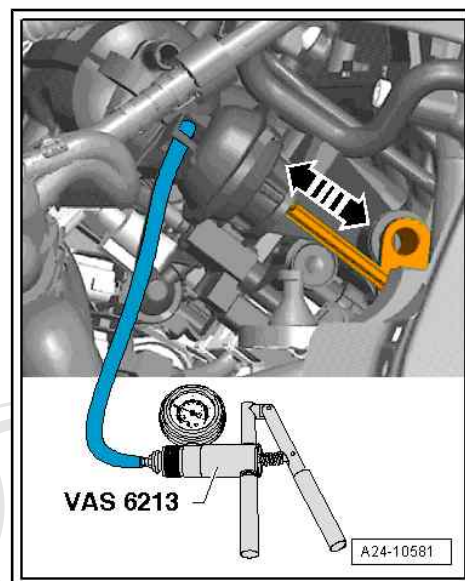
- Detach vacuum hose -1- from intake manifold flap valve - N316- -2-.



- Move adjuster ring -1- on hand vacuum pump -VAS 6213- to position -A- to select "vacuum".



- Connect hand vacuum pump -VAS 6213- to vacuum unit for intake manifold flap valve -N316- .
 - Operate the hand vacuum pump -VAS 6213- several times. The linkage should now pick up.
 - Vent vacuum; linkage should return to initial position.
- Linkage should move in both directions (arrows).
- Renew vacuum unit if linkage does not move.



5 High-pressure pump

⇒ „5.1 Exploded view - high-pressure pump“, page 34

⇒ „5.2 Removing and installing high-pressure pump“, page 35

5.1 Exploded view - high-pressure pump



WARNING

Fuel system operates under high pressure. Always dissipate pressure in high-pressure section prior to opening fuel system. For procedure, refer to ⇒ page 4

1 - Electrical connector

- ☐ For fuel pressure regulating valve -N276-

2 - Bolt for high-pressure pump

- ☐ Renew
- ☐ Hand-tighten in diagonal sequence, then tighten to 8 Nm + 90° further

3 - Fuel pressure regulating valve -N276-

4 - High-pressure pump

- ☐ 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; procedure for reducing fuel pressure ⇒ page 4
- ☐ Fuel lines must be free of tension when installed.
- ☐ Check O-ring and renew if damaged
- ☐ Removing and installing ⇒ page 35

5 - O-ring

- ☐ Renew if damaged

6 - Roller tappet

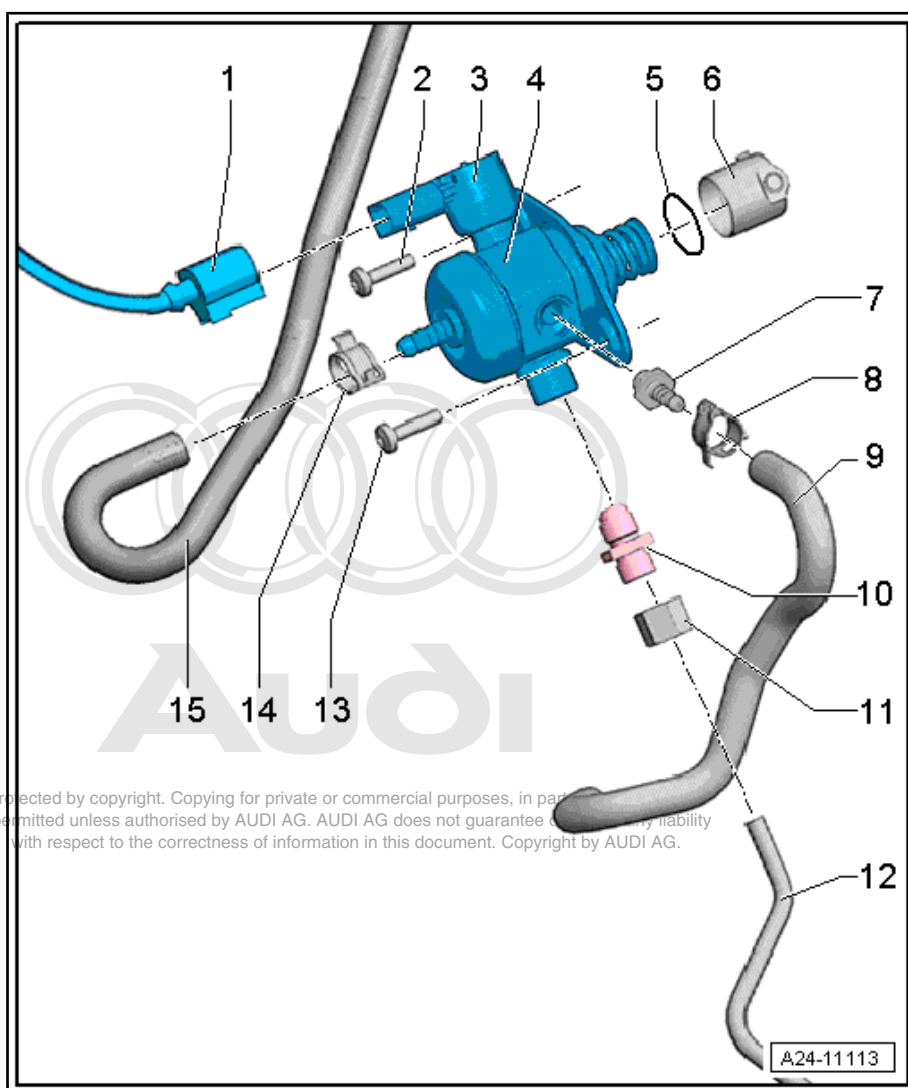
- ☐ May remain lodged in vacuum pump when high-pressure pump is removed

7 - Fuel supply line connection

- ☐ 15 Nm

8 - Clamp

- ☐ Renew



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9 - Fuel supply line

- ☐ To fuel rail for MPI injectors
- ☐ Fuel supply line must be free of tension when installed (make sure all parts are clean)

10 - Connecting piece for fuel supply line

- ☐ Renew
- ☐ 40 Nm

11 - Union nut for fuel supply line

- ☒ 20 Nm
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12 - Fuel supply line

- ☐ To fuel rail for FSI injectors
- ☐ Lightly lubricate ball of fuel supply line with engine oil
- ☐ Fuel supply line must be free of tension when installed (make sure all parts are clean)

13 - Bolt for high-pressure pump

- ☐ Renew
- ☐ Hand-tighten in diagonal sequence, then tighten to 8 Nm + 90° further

14 - Spring-type clip

- ☐ Renew if damaged

15 - Fuel supply line

- ☐ From fuel tank

5.2 Removing and installing high-pressure pump



Note

- ◆ *The high-pressure pump must only be removed 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.*
- ◆ *Check O-ring on high-pressure fuel pump and renew if damaged.*
- ◆ *Lubricate high-pressure fuel pipes lightly with engine oil and always ensure that pipes are free of tension when tightening the connections.*

Removing

- Remove engine cover panel.

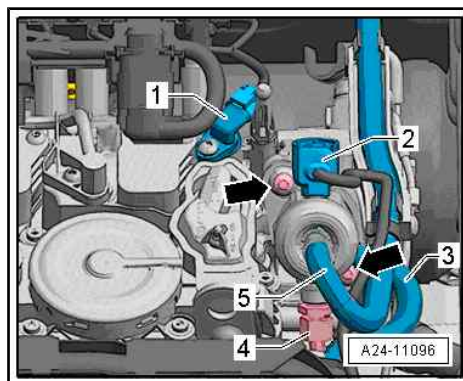


WARNING

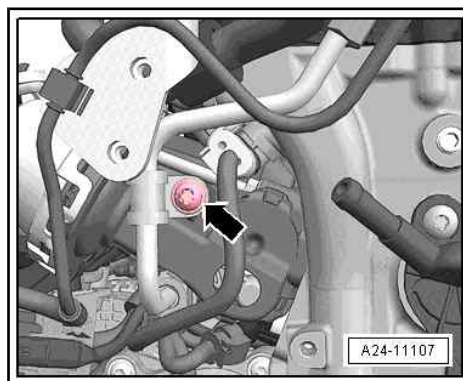
Fuel system operates under high pressure. Always dissipate pressure in high-pressure section prior to opening fuel system. For procedure, refer to ➔ [page 4](#)



- Detach electrical connector -2- from fuel pressure regulating valve -N276- .
- Detach fuel lines -3, 4 and 5-.



- Unscrew retaining clip -arrow-.



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- Remove bolts -arrows-.
- Carefully pull out high-pressure pump. It is possible that the roller tappet may remain lodged in the vacuum pump.

Installing

- Renew O-ring for high-pressure pump.
- Before fitting, check roller tappet for damage and renew if necessary.
- Fit roller tappet in vacuum pump, noting position of locating element.



Note

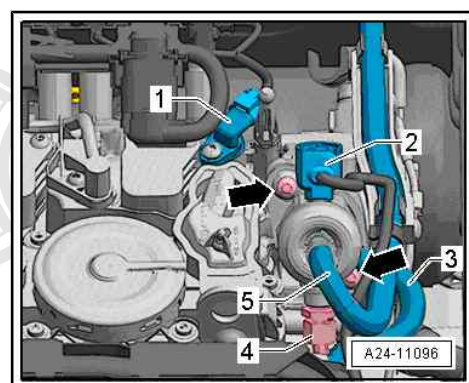
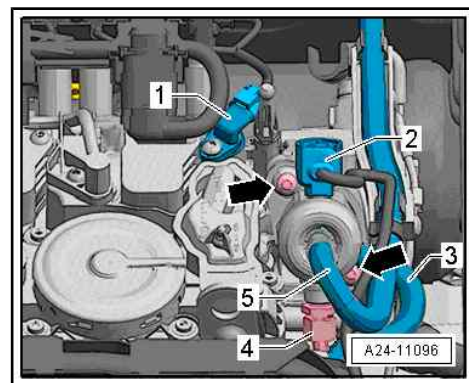
- ◆ *The roller tappet must be positioned at the lowest point when installing the high-pressure pump.*
- ◆ *If the old high-pressure pump is re-installed, or if a used pump is installed, the connecting piece for the fuel supply line (high-pressure section of the system) must be renewed. Refer to high-pressure pump - exploded view (item 9) ⇒ [page 34](#) .*

- Turn crankshaft until roller tappet is positioned at lowest point.
- Renew connecting piece at high-pressure pump.
- Fit high-pressure pump in vacuum pump and secure in position.
- Tighten bolts hand-tight.
- Tightening torque: refer to exploded view of high-pressure pump ⇒ [page 34](#) .
- Now tighten bolts in diagonal sequence to specified torque, refer to high-pressure pump - exploded view ⇒ [page 34](#) .
- Fit both fuel lines and secure with spring-type clips.
- Tighten union nut on fuel supply line hand-tight. Align so it is free of tension and tighten to specified torque ⇒ [page 34](#) .
- Re-attach electrical connector -2- for fuel pressure regulating valve -N276- .



Note

Check fuel system for leaks.



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6 Injectors

⇒ „6.1 Removing and installing FSI injectors“, page 39

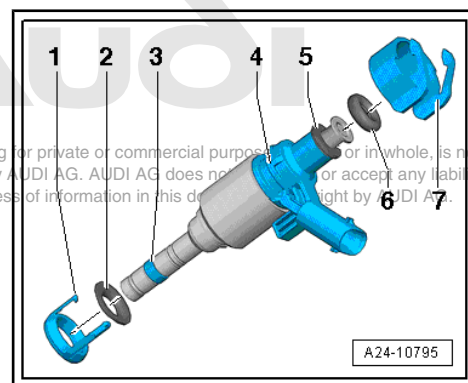
⇒ „6.2 Removing and installing MPI injectors“, page 43

⇒ „6.3 Cleaning FSI injectors“, page 44

6.1 Removing and installing FSI injectors

Special tools and workshop equipment required

- ◆ Tool set for FSI engines -T10133-



Injector - exploded view

- 1 - Renew intermediate ring
- 2 - Renew retainer
- 3 - Combustion chamber ring seal (teflon ring seal)
 - renew; when fitting, do not grease ring or use any other lubricant
- 4 - Injector
- 5 - Renew spacer ring
- 6 - Renew O-ring (apply thin coating of clean engine oil prior to installation)
- 7 - Renew support ring (via this support ring, fuel rail exerts force which secures injector in cylinder head)

Removing



Note

Injectors must only be installed when the engine is cold.

- Remove engine cover panel ⇒ [page 18](#) .
- Remove intake manifold ⇒ [page 26](#) .

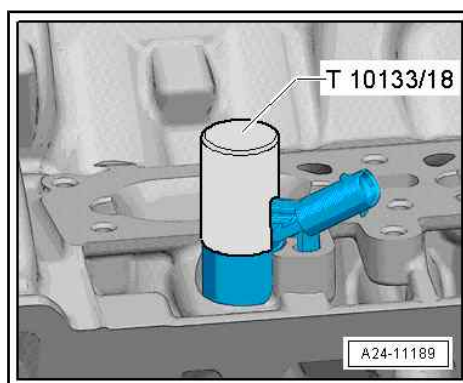
- Remove fuel rail
⇒ [page 30](#) .

Removing injectors (from fuel rail)

Carefully pull injectors
out of fuel rail.

Removing injectors (from cylinder head)

- Cover open inlet
ports with a clean
cloth.
- Unplug electrical con-
nector at injector that
is to be removed.
- Slide stop sleeve -T10133/18- over injector.

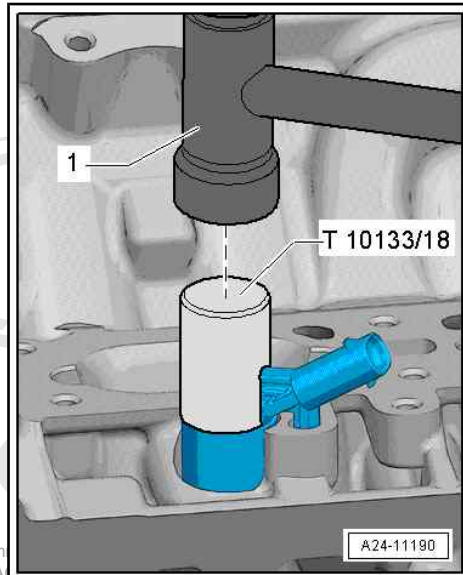


- Carefully knock against stop sleeve several times to loosen
injector.



Note

- ◆ Use a torque wrench to pull out injector.
- ◆ Adjust torque wrench to 5 Nm.



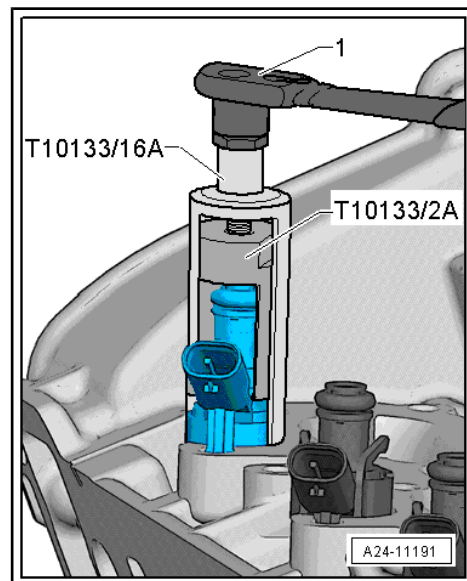
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- Guide puller -T10133/2A- into groove on injector.
- Then fit guide puller T10133/16A .
- Pull out injector by turning bolt with torque wrench -1-.
- If injector does not come loose after limit torque of 5 Nm is reached, remove puller and repeat procedure using stop sleeve to loosen injector.



Note

- ◆ *Observe correct torque to avoid irreparable damage to injector.*
- ◆ *The combustion chamber ring seal must always be renewed before the injector is re-installed ➔ [page 41](#) .*



6.1.1 Renewing combustion chamber ring seal (teflon ring seal)



Note

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

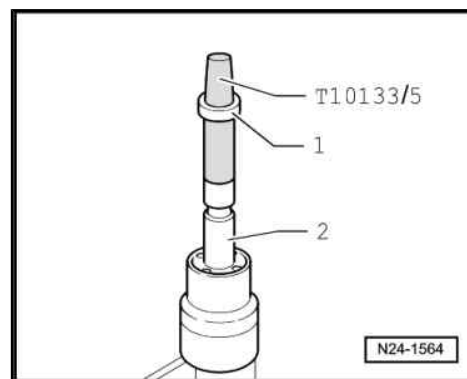
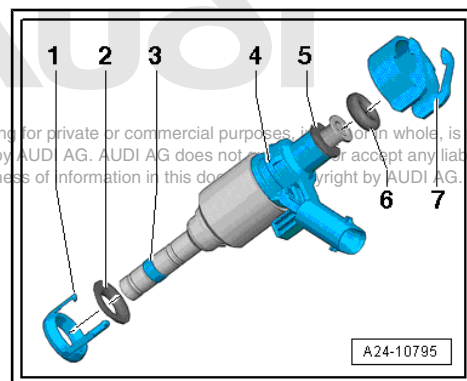
- Carefully remove old combustion chamber ring seal -3- using suitable tools (e.g. cut open seal using a razor blade, or prise open seal with small screwdriver and then pull off forwards). It is important to ensure that the groove and the continuous ridge in the bottom of the groove are not damaged.



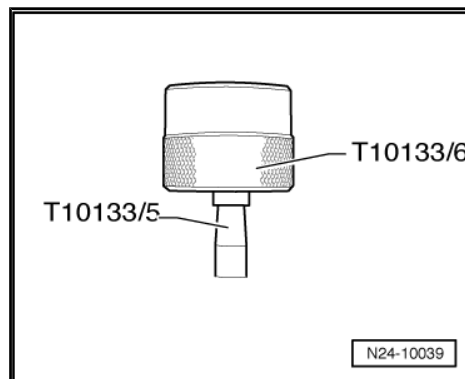
Note

The injector must be renewed if the groove is damaged.

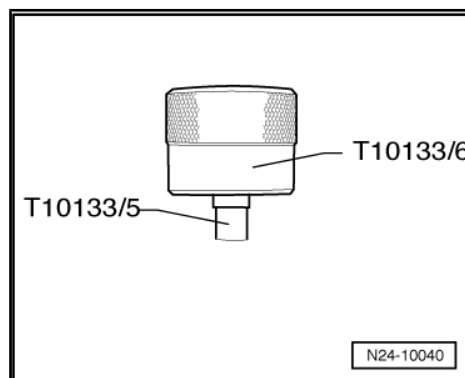
- Before new combustion chamber ring seal is fitted, any combustion residue must be removed from ring groove and injector stem using a clean cloth.
- Fit assembly cone -T10133/5- with new combustion chamber ring seal -1- onto injector -2-.



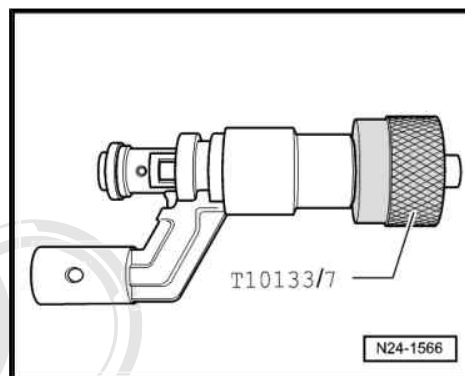
- Using assembly sleeve -T10133/6- , push combustion chamber ring seal onto assembly cone -T10133/5- as far as it will go.



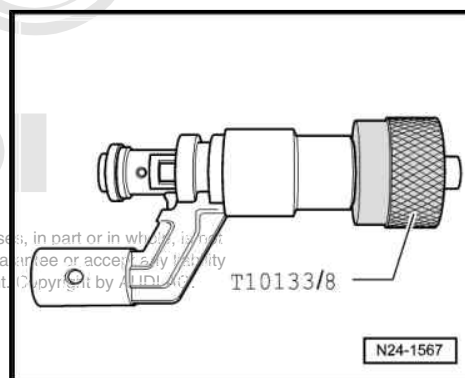
- Turn assembly sleeve -T10133/6- upside down and push combustion chamber ring seal to end of assembly cone -T10133/5- .
- Remove assembly cone -T10133/5- and push combustion chamber ring seal into sealing ring groove using assembly sleeve -T10133/6- .



- 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 new O-ring on injector. Lubricate O-ring lightly with clean engine oil before installing.



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



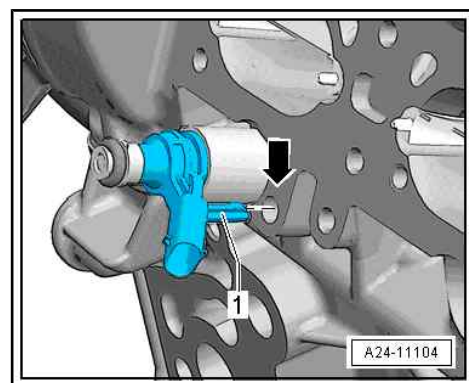
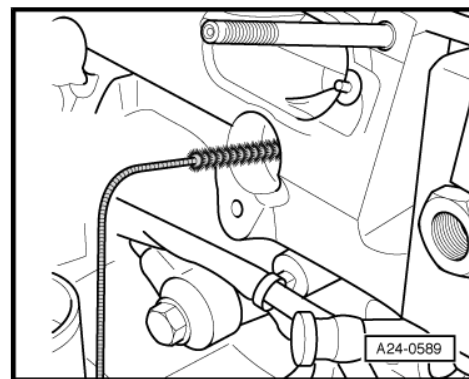
Note

- ◆ *The combustion chamber ring seal on the injector must not be oiled or greased.*
- ◆ *Make sure that there is no cleaning fluid or oil in the holes in the cylinder head when installing the injectors.*

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- 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.

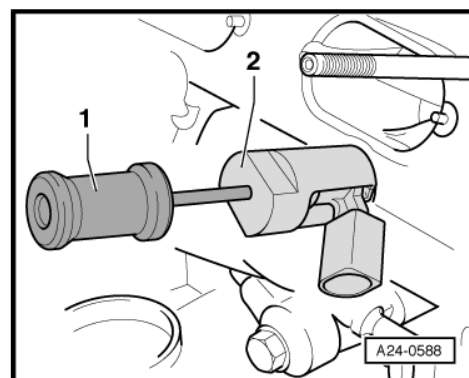
- Lug -1- and hole -arrow- in cylinder head must face each other.



Note

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

- Coat O-rings of injectors with clean engine oil to facilitate insertion into fuel rail.
- Install fuel rail ➤ [page 30](#) .
- Install intake manifold ➤ [page 26](#) .
- The remaining installation steps are carried out in the reverse sequence.

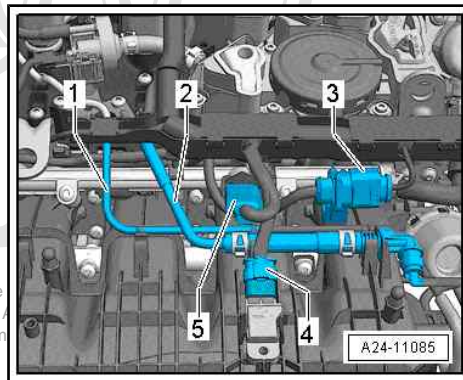


6.2 Removing and installing MPI injectors

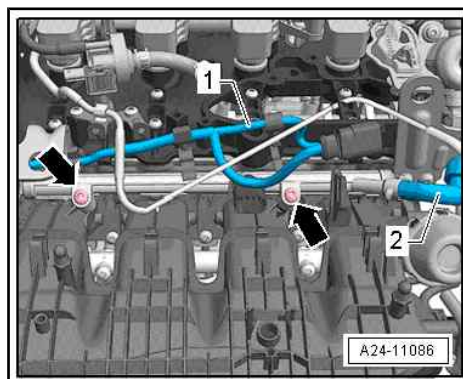
Removing

- Detach vacuum lines -1 and 2- from intake manifold.
- Detach electrical connector -3- from retainer.

- Unplug electrical connectors -4 and 5-.
- Move clear wiring harness -1- from fuel rail.
- Detach fuel supply line -2- from fuel rail.



- Unscrew bolts -arrows- from fuel rail.
- Carefully lift out fuel rail with injectors.
- Unplug electrical connectors at injectors.

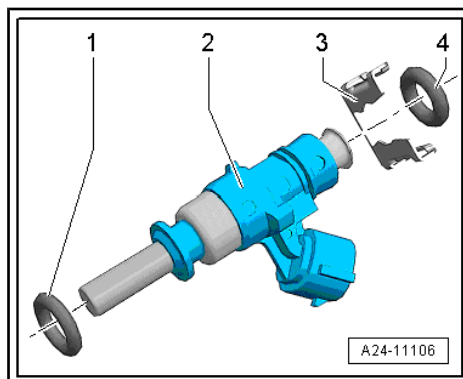


Injector - exploded view

- 1 - Renew O-ring (apply thin coating of clean engine oil prior to installation)
- 2 - Injector
- 3 - Retaining clip
- 4 - Renew O-ring (apply thin coating of clean engine oil prior to installation)

Installing

- Fit new O-rings on injector. Lubricate O-rings lightly with clean engine oil before installing.
- Fit electrical connectors at injectors.
- Push fuel rail with injectors by hand as far as it will go into aperture in intake manifold (do not use oil or grease).
- The remaining installation steps are carried out in the reverse sequence.
- Install fuel rail.
- ♦ Tightening torque
⇒ [„4.3 Exploded view - fuel rail \(MPI\)“, page 25](#)



6.3 Cleaning FSI injectors

Special tools and workshop equipment required

- ♦ Ultrasonic cleaning unit -VAS 6418-
- ♦ Mounting plate for injection modules -VAS 6418/1-
- ♦ For cleaning fluid refer to electronic parts catalogue.

Cleaning

- Remove injectors ⇒ [page 39](#) .



Note

Observe safety precautions and operating instructions for ultrasonic unit.

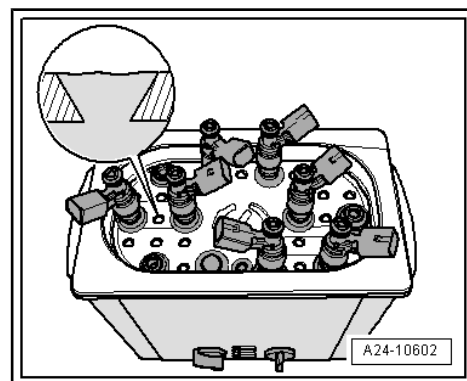
- Ultrasonic unit must be filled with cleaning fluid.



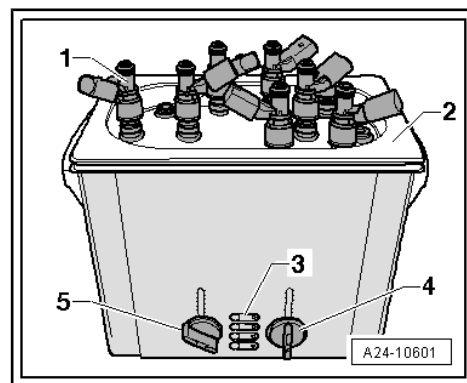
Note

Ultrasonic unit must be filled with cleaning fluid up to top edge of apertures (see detail in illustration).

- Insert FSI injectors -1- all the way into mounting plate for injection modules -VAS 6418/1- -2-.



- Immerse FSI injectors together with mounting plate for injection modules -VAS 6418/1- into cleaning fluid.
- Set rotary knob -4- to a temperature of 50°C.
- Select a cleaning time of 30 minutes with rotary knob -5-.
- Switch on ultrasonic unit with button -3-.



Note

The time set starts to elapse as soon as a cleaning temperature of 50°C has been reached.

- After cleaning, always renew combustion chamber ring seal (teflon ring seal) for each FSI injector ➔ [page 41](#) .
- Then re-install FSI injectors ➔ [page 39](#) .



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7 Senders and sensors

⇒ „7.1 Removing and installing fuel pressure sender G247“, page 46

⇒ „7.2 Checking fuel pressure sender G247“, page 47

⇒ „7.3 Removing and installing fuel pressure sender for low pressure G410“, page 49

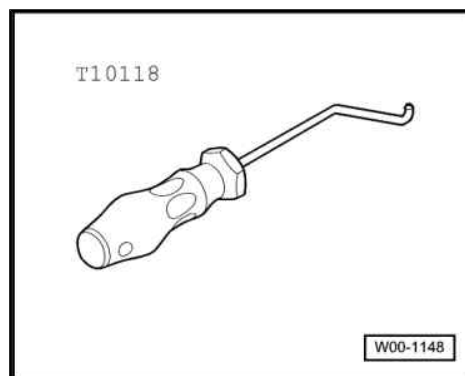
⇒ „7.4 Checking residual pressure in fuel system (up to high-pressure pump)“, page 51

7.1 Removing and installing fuel pressure sender -G247-

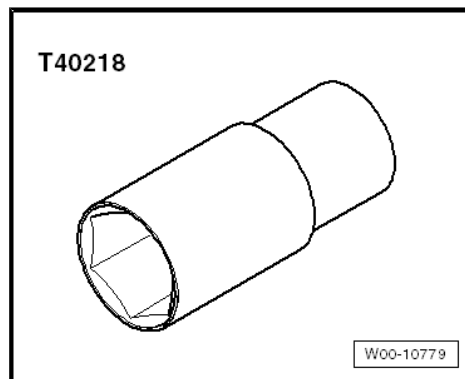
If the fuel pressure sender -G247- fails, the fuel pressure regulating valve -N276- is switched off, the electric fuel pump is fully activated and the engine is operated with the fuel pressure which remains. This will reduce engine torque considerably.

Special tools and workshop equipment required

- ◆ Assembly tool -T10118-



- ◆ Bit (27 mm) -T40218- or commercially available socket (27 mm)



Removing

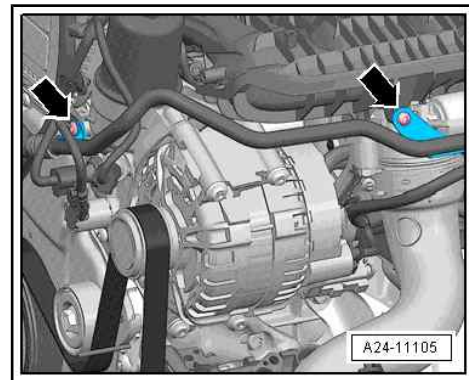
- Carefully pull off engine cover panel.



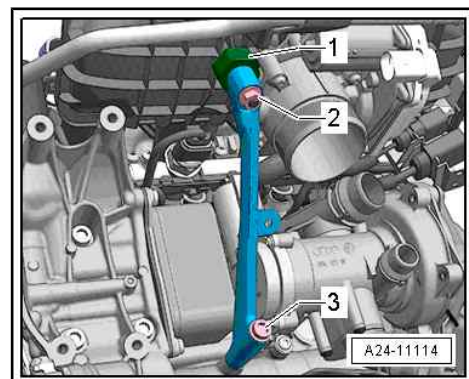
WARNING

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

- Remove bolts -arrows- for coolant line from intake manifold.



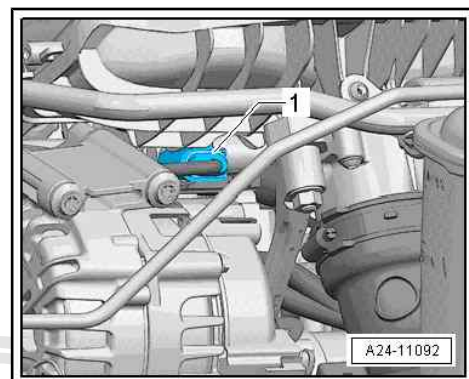
- Remove intake manifold support; to do so, unscrew nut -2- and bolt -3-.
- Remove rubber bush -1- for intake manifold support.



- Release connector on fuel pressure sender -G247- -1- using assembly tool -T10118- .
- Unscrew fuel pressure sender -G247- -1- using bit, 27mm - T40218- .

Installing

- Install in reverse order.
- Tightening torque: fuel rail - exploded view
 ⇒ „4.2 Exploded view - fuel rail (FSI)“, page 23



7.2 Checking fuel pressure sender -G247-

Special tools and workshop equipment required

- ◆ Pressure sensor tester -VAS 6394-
- ◆ Adapter -VAS 6394/2-
- ◆ Test instrument adapter -VAS 5570-
- ◆ Torque wrench -V.A.G 1331-
- ◆ ⇒ Vehicle diagnostic tester

Procedure:

- Remove engine cover panel.

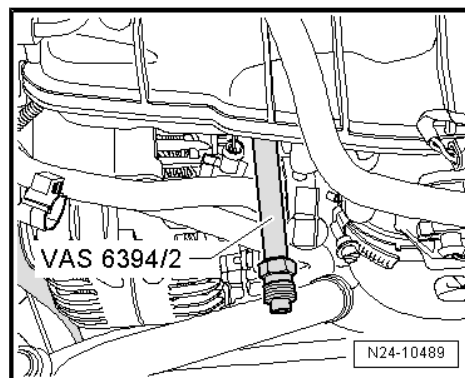
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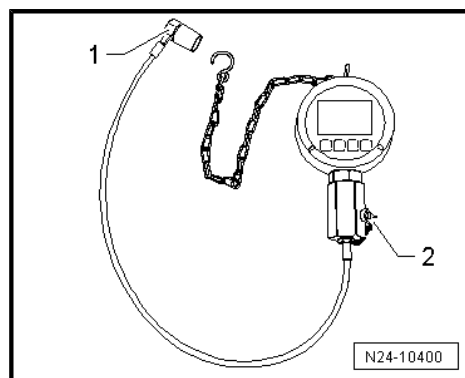
WARNING

*Fuel system operates under high pressure. Always dissipate pressure in high-pressure section prior to opening fuel system.
 For procedure, refer to ⇒ page 4*

- Remove fuel pressure sender -G247- ➔ [page 46](#) .
- Screw in adapter -VAS 6394/2- in place of fuel pressure sender -G247- and tighten adapter with the same torque as that specified for fuel pressure sender -G247- .
- ◆ Tightening torque: fuel rail - exploded view ➔ [page 23](#)

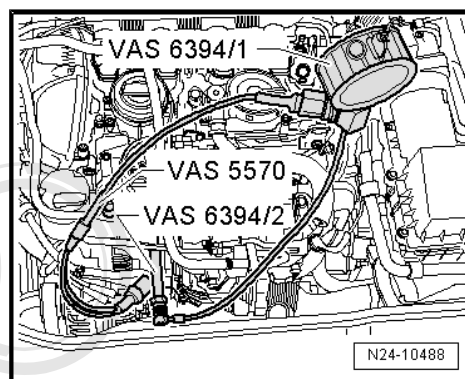


- Unscrew plug -2- on pressure gauge -VAS 6394/1- and screw removed fuel pressure sender -G247- into opening. Tighten to torque specified for fuel pressure sender.



- Use test instrument adapter -VAS 5570- to make electrical connection between vehicle and fuel pressure sender -G247- .
- Connect a ➔ Vehicle diagnostic tester.
- Switch on ignition.
- Select „Engine electronics“ in vehicle self-diagnosis.
- Then select „Measured values“.
- Select „Fuel pressure“ from the list.

The display zone shows the actual pressure value being transmitted to the engine control unit by the fuel pressure sender -G247- .



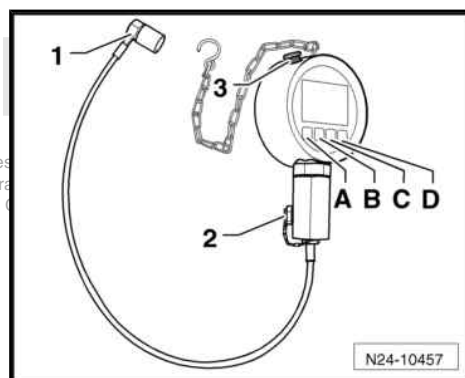
- Switch on pressure gauge -VAS 6394/1- by pressing button -A- once briefly.



Note

You can press and hold button -A- for 2 seconds to switch on the illumination for 20 seconds.

Pressure gauge -VAS 6394/1- should indicate 0 bar. If this is not the case, press button -C- once briefly to zero the tester.

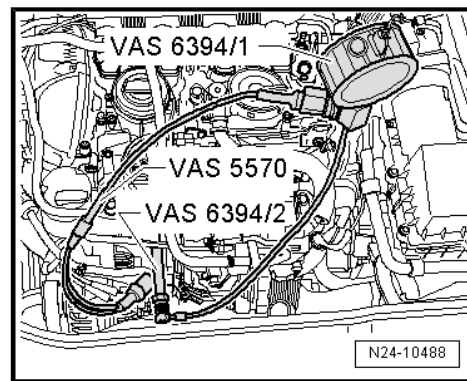


- Connect pressure line of pressure gauge -VAS 6394/1- to adapter -VAS 6394/2- .
- Start engine.
- Compare the pressure indicated by pressure gauge -VAS 6394/1- with the actual pressure value on ⇒ Vehicle diagnostic tester.
- The pressure readings must not deviate by more than 5 bar.
- If the deviation is more than 5 bar, test a new fuel pressure sender -G247- .



WARNING

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



- Screw a new fuel pressure sender -G247- into pressure gauge -VAS 6394/1- .
- Repeat the test with the new fuel pressure sender -G247- and compare the two pressure values.

If the two values still do not agree:

- Check the electrical connection between the fuel pressure sender -G247- and the engine control unit; refer to ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

If the values agree:

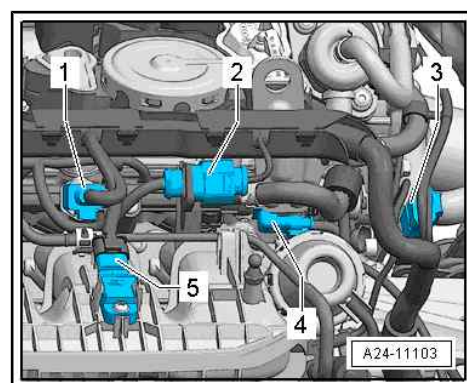
- Install the new fuel pressure sender -G247- ⇒ [page 46](#) .

7.3 Removing and installing fuel pressure sender for low pressure -G410-

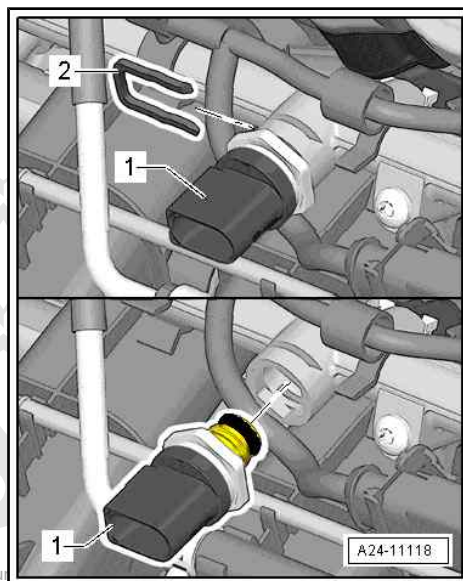
Removing

- Carefully pull off engine cover panel.
- Unplug electrical connector -1- at fuel pressure sender for low pressure -G410- .

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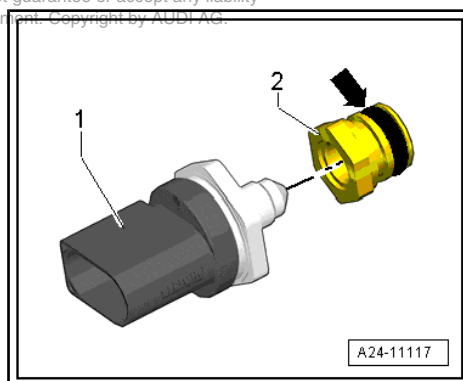


- Pull out clip -2-.
- Pull fuel pressure sender for low pressure -G410- -1- out of fuel rail.

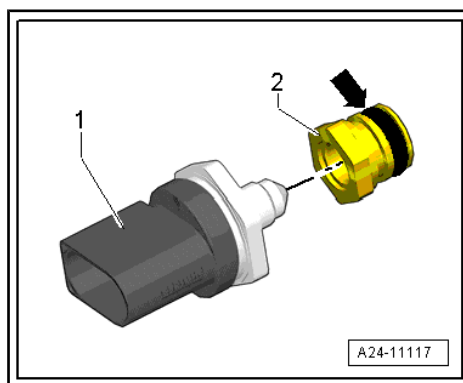


- Unscrew fuel pressure sender for low pressure -G410- -1- from adapter -2-.

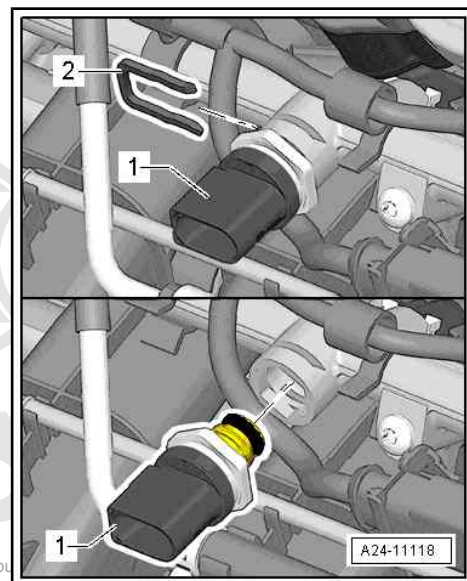
Installing



- Fit new O-ring -arrow-.
- Screw adapter -2- onto fuel pressure sender for low pressure -G410- -1-.
- Tightening torque
⇒ [„4.3 Exploded view - fuel rail \(MPI\)“, page 25](#)



- Carefully slide fuel pressure sender for low pressure -G410-1- into fuel rail as far as it will go.
- To lock fuel pressure sender for low pressure -G410- , push clip -2- into groove.
- Plug in electrical connector.

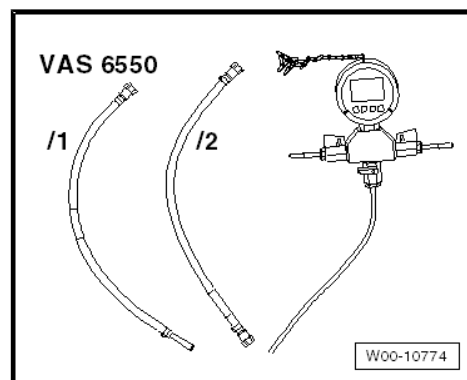


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7.4 Checking residual pressure in fuel system (up to high-pressure pump)

Special tools and workshop equipment required

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



- ◆ Vehicle diagnostic tester
- ◆ 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.
- Ignition off.

Checking fuel pressure

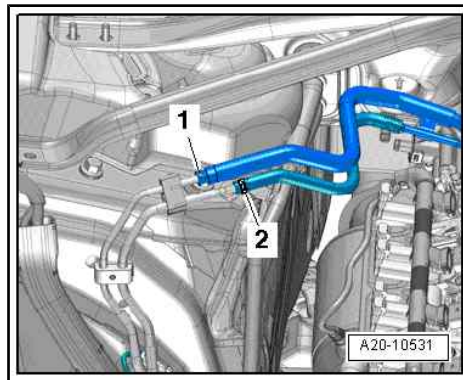


WARNING

Risk of injury - fuel system operates under high pressure.

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

- Disconnect fuel line -1- by pulling release ring -1-.
- Connect pressure tester -VAS 6550- to fuel supply line with hose -VAS 6550/2- .



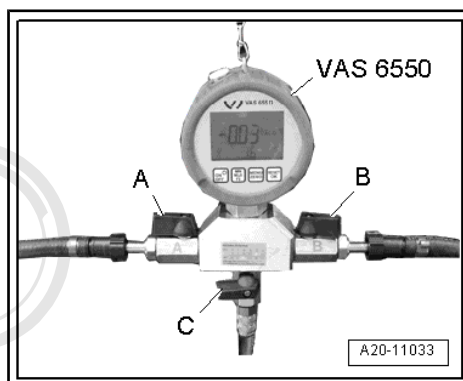
- Attach hose -VAS 6550/1- and hold end of hose into fuel-resistant measuring container.



Caution

Risk of fuel escaping.

- ◆ *Make sure that drain tap -C- is closed.*
- ◆ *The lever should point perpendicular to direction of flow.*



- Open cut-off valves -A- and -B-.
- Levers must point in direction of flow.
- Connect a vehicle diagnostic tester .
- Select „Engine electronics“ in vehicle self-diagnosis.
- Then select „Final control diagnosis“.
- Select „Fuel pump electronics“ from list and press „start“.

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Note

This function activates the fuel pump.

- When fuel emerging is free of bubbles, close cut-off valve -B- to allow fuel pressure to build up.
- Lever is at right angle to direction of flow -arrow-.
- Read fuel pressure off pressure tester -VAS 6550- :
- Specification: 4.0 ... 7.0 bar
- Terminate final control diagnosis.

If specification is not obtained:

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

Checking residual pressure

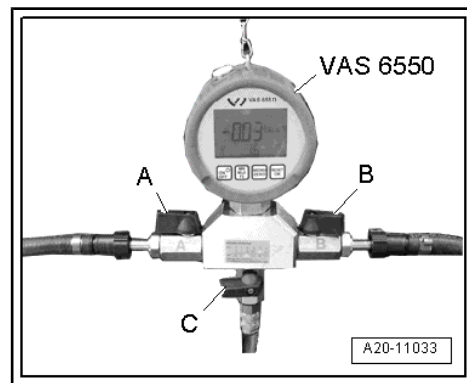
- Check system for leaks and check residual pressure by watching the drop in pressure on the pressure tester -VAS 6550- .
- After 10 minutes pressure should still be at least 3 bar.

If the residual pressure drops below 3 bar:

- ◆ Check connections 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 ⇒ Rep. gr. 20 .
- ◆ Non-return valve of fuel pump is defective ⇒ Rep. gr. 20 .

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

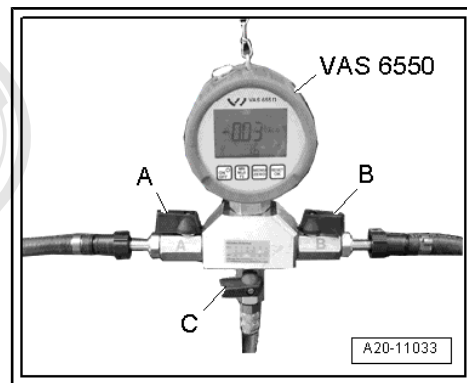
- Switch off ignition.



Note

Before removing the pressure tester, release the fuel pressure by opening the cut-off valve -B- and allowing fuel to drain off into a measuring container.

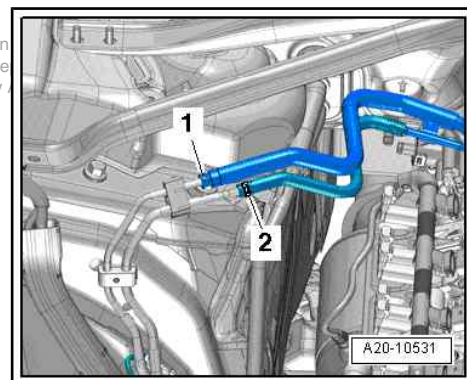
- Remove pressure tester -VAS 6550- with hoses -VAS 6550/1- and -VAS 6550/2- .



- Reconnect fuel supply line -1- (make sure that all parts are clean).
- Press fuel line in again and then pull to check that plug-in connector is correctly engaged.

Note

Check fuel system for leaks.



8 Lambda probes

⇒ „8.1 Overview - Lambda probes“, page 54

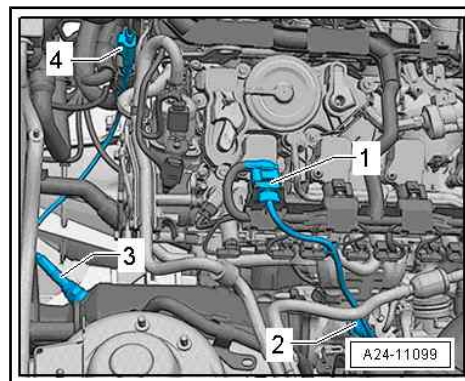
⇒ „8.2 Removing and installing Lambda probe G39 and Lambda probe heater Z19 before catalytic converter“, page 54

⇒ „8.3 Removing and installing Lambda probe after catalytic converter G130 and Lambda probe 1 heater after catalytic converter Z29“, page 55

8.1 Overview - Lambda probes

Lambda probes

- 1 - Electrical connector for Lambda probe -G39-
 - 2 - Lambda probe -G39- and Lambda probe heater -Z19-
 - 3 - Lambda probe after catalytic converter -G130- and Lambda probe heater 1 after catalytic converter -Z29-
 - 4 - Electrical connector for Lambda probe after catalytic converter -G130-
- Tightening torque: 55 Nm



Note

- ◆ *New Lambda probes are coated with an assembly paste. The paste must not get into the slots on the Lambda 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, it is important to re-attach the Lambda probe wiring at the same locations to prevent it from coming into contact with the exhaust pipe.*

Removing and installing Lambda probe -G39- and Lambda probe heater -Z19- ⇒ „8.1 Overview - Lambda probes“, page 54

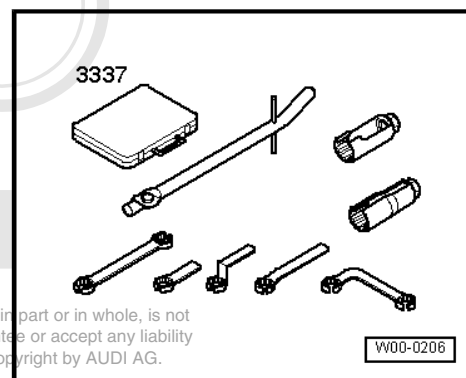
Removing and installing Lambda probe after catalytic converter -G130- and Lambda probe 1 heater after catalytic converter -Z29- ⇒ „8.3 Removing and installing Lambda probe after catalytic converter G130 and Lambda probe 1 heater after catalytic converter Z29“, page 55

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

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Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set -3337-



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Removing

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

Installing

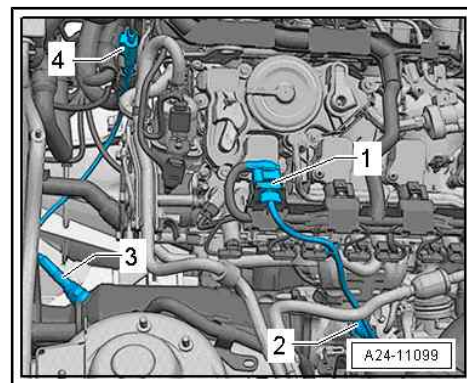
When installing, note the following:



Note

- ◆ *New Lambda probes are coated with an assembly paste. The paste must not get into the slots on the Lambda 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, it is important to re-attach the Lambda probe wiring at the same locations to prevent it from coming into contact with the exhaust pipe.*

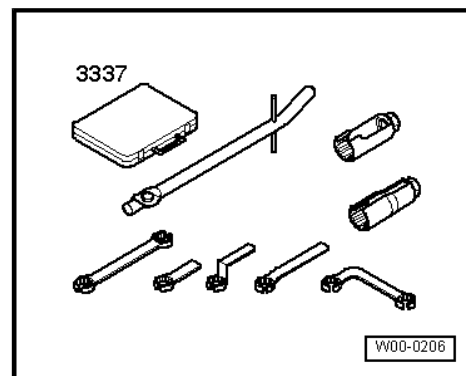
- Tightening torque
 ⇒ „8.1 Overview - Lambda probes“, page 54



8.3 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-



Removing

- Unplug electrical connector -4- for Lambda probe after catalytic converter -G130- and Lambda probe 1 heater after catalytic converter -Z29- .
- Unscrew Lambda probe after catalytic converter -G130- -3- using tool from Lambda probe open ring spanner set -3337- .

Installing

When installing, note the following:

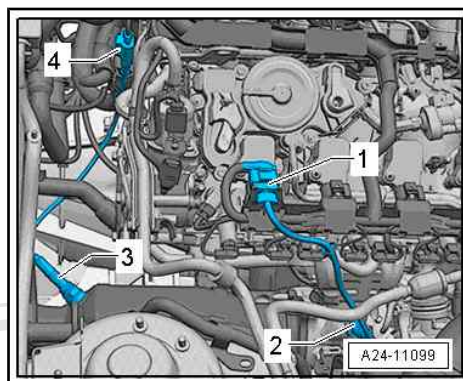


Note

- ◆ *New Lambda probes are coated with an assembly paste. The paste must not get into the slots on the Lambda 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, it is important to re-attach the Lambda probe wiring at the same locations to prevent it from coming into contact with the exhaust pipe.*

- Tightening torque

⇒ „8.1 Overview - Lambda probes“, page 54



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9 Engine control unit

⇒ „9.1 Wiring and component check with isolator boxes VAS 6606“
“, page 57

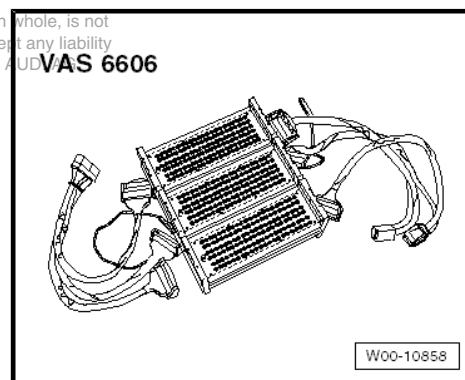
⇒ „9.2 Renewing engine control unit J623“, page 58

9.1 Wiring and component check with isolator boxes -VAS 6606-

Special tools and workshop equipment required

- ◆ Isolator box, 198-pin -VAS 6606/1-1-
- ◆ Isolator box, 198-pin -VAS 6606/1-2-
- ◆ Isolator box, 198-pin -VAS 6606/1-3-
- ◆ Sheets -VAS 6606/1-1-
- ◆ Sheets -VAS 6606/2-1-
- ◆ Sheets -VAS 6606/3-1-
- ◆ Set of cables -VAS 6606/7-1- and -VAS 6606/7-2-

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Note

- ◆ *Always make sure that the cables are properly connected.*
- ◆ *Do not use damaged or worn tools and accessories.*
- ◆ *Observe operating instructions.*
- Connect both cable sets -VAS 6606/7-1- and -VAS 6606/7-2- to the three isolator boxes -VAS 6606-.
- Use the following sheets:
 - ◆ -VAS 6606/1-1- for isolator box, 198-pin -VAS 6606/1-1-
 - ◆ -VAS 6606/2-1- for isolator box, 198-pin -VAS 6606/1-2-
 - ◆ -VAS 6606/3-1- for isolator box, 198-pin -VAS 6606/1-3-



Note

Make sure that all plug-in bridges are inserted completely in all isolator boxes.

- Connect earth strap to an isolator box and to an earth point on the vehicle.
- Remove engine control unit
⇒ „9.2 Renewing engine control unit J623“, page 58.

- Connect engine control unit to cable set -VAS 6606/7-1- .
- Connect vehicle wiring harness to cable set -VAS 6606/7-2- .

The connection on the engine control unit consists of a large and a small connector.

The large connector has 105 pins and is assigned to the sheets for the isolator box marked „A 1 to A 105“.

The small connector has 91 pins and is assigned to the sheets for the isolator box marked „B 1 to B 91“.

When a push-in bridge is pulled out, the corresponding wiring connection is disconnected.



Note

- ♦ The „In“ contact -1- (red socket) leads to the engine control unit.
- ♦ The „Out“ contact -2- (blue socket) leads to the wiring harness.

- Carry out test as described in appropriate repair procedures.

Installing engine control unit

Installation is performed in the reverse sequence.

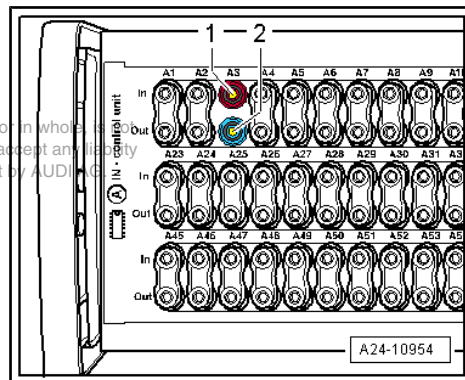
- Make sure you fit protective housing (if fitted) back on engine control unit.
- Clean threaded holes for shear bolts to remove any residue from locking fluid. This can be done using a thread tap.
- Always use new shear bolts.

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



Note

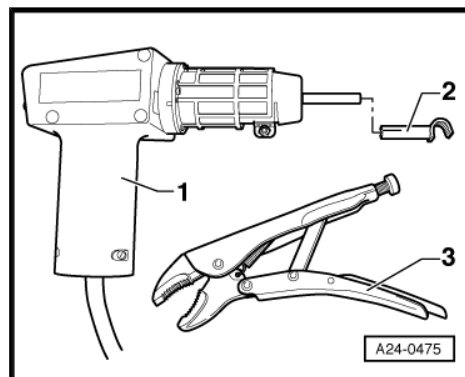
After completion of the Guided Fault Finding routine, the tester will attempt to erase the event memories of all control units. If this is not successful, the remaining faults registered in the memories must be rectified until all faults can be erased.



9.2 Renewing engine control unit -J623-

Special tools and workshop equipment required

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

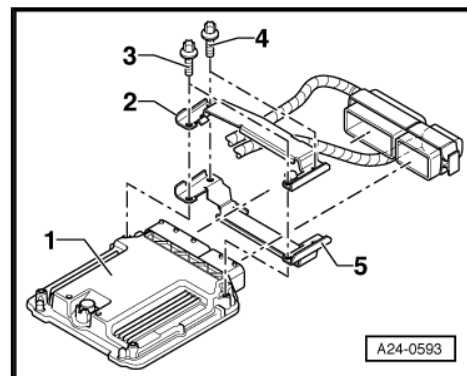


- ♦ Small, commercially available mole grips -3-



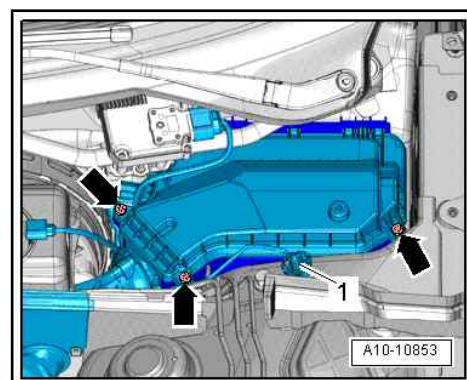
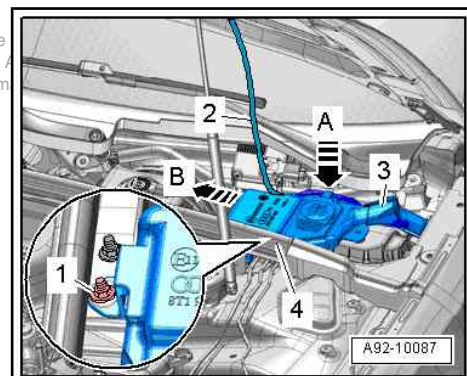
Note

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



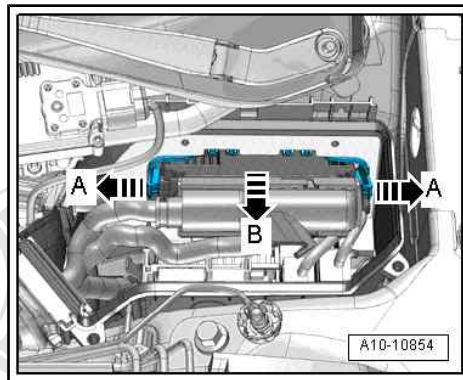
Removing

- Before removing the engine control unit, the adaption values for the chain length must be read out of the engine control unit.
- Connect vehicle diagnostic tester , select diagnosis object „Chain elongation adaption diagnosis“ in „Guided Functions“ mode and read out adaption values.
- Switch off ignition and remove ignition key.
- Remove plenum chamber cover.
- Slightly pull off rubber seal in front of nut -1- on plenum chamber cover.
- Unhook wiring harness -2- from retainers -A-.
- Remove nut -1-.
- Pull filler neck -3- with filler pipe out of washer fluid reservoir and through opening in body.
- Unscrew bolts -arrows- and take off lid for electronics box.



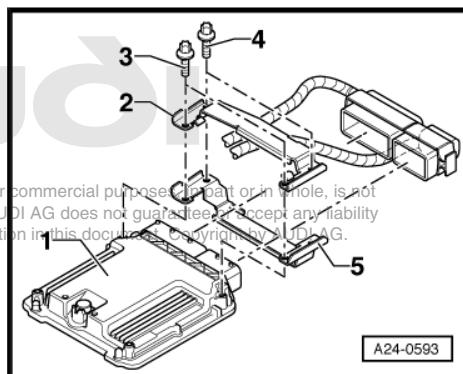
- Release retainers -arrows A- and pull out engine control unit -J623- -arrow B-.

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

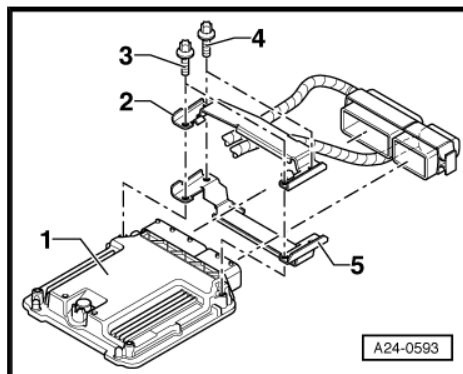


To help prevent unauthorised access to the connectors on the engine control unit, the engine control unit -1- is bolted to a protective housing -5- by means of shear bolts -3 and 4- and a locking plate -2-.

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



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

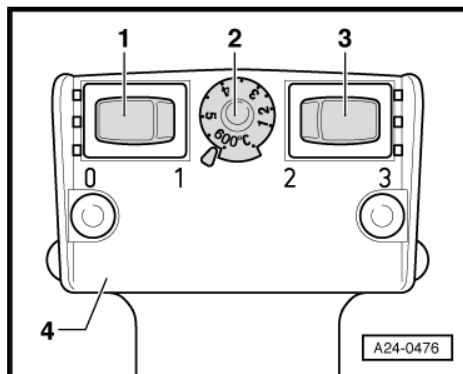


- Select settings on hot air blower as shown in illustration, i.e. set temperature potentiometer -2- to maximum heat output and two-stage air flow switch -3- to position 3.

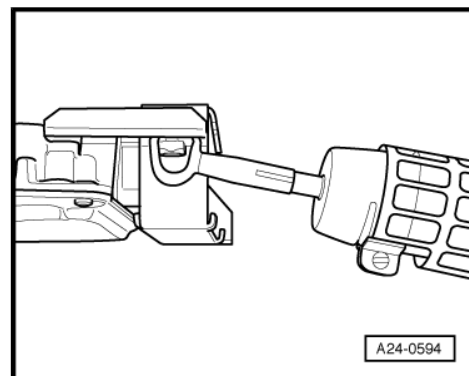


WARNING

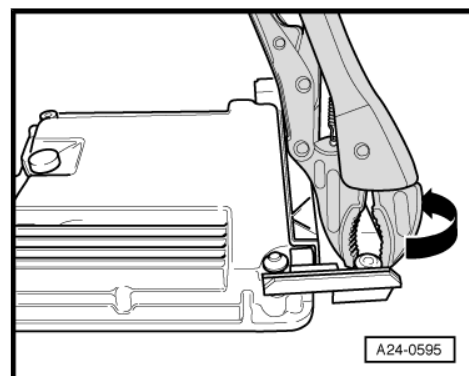
The shear bolts and protective housing also become very hot when heating the threads of the locking mechanism. Take care to avoid burns. It is also important to ensure that only the thread is heated and none of the surrounding components if at all possible. These should be covered if necessary.



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



- Unscrew shear bolts using suitable vice-grip pliers (see arrow in illustration).
- The two shear bolts screwed into the engine control unit do not need to be heated. They should be removed without being heated.
- Detach protective housing from control unit connectors.
- Release connectors on engine control unit and unplug connectors.
- Take out old engine control unit -J623- and install new engine control unit -J623- .



Installing

Installation is performed in the reverse sequence.

- Make sure you fit protective housing (if fitted) 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.
- Tightening torque for bolts securing lid of electronics box: 3.5 Nm.

The procedure required after connecting the new engine control unit is described in „Guided Functions“ mode in diagnosis object „Chain elongation adaption diagnosis“.

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28 – Ignition system

1 General notes and safety precautions

Overview

♦ ➔ „1.1 General notes on ignition system“, page 62

♦ ➔ „1.2 Safety precautions“, page 62

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 must then be interrogated and, if necessary, the control unit must be adapted.

1.2 Safety precautions

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



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.*

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

- ♦ Do not touch or disconnect ignition wiring when the engine is running or being turned at starter speed.
- ♦ The ignition must be switched off before disconnecting or connecting ignition system wiring, high-voltage wires and test leads.
- ♦ If you want to crank the engine at starting speed without actually starting it (e.g. compression test), first unplug the connectors from the ignition coils and the injectors.
- ♦ Always switch off the ignition before cleaning the engine.

2 Servicing ignition system

Overview

- ◆ ⇒ „2.1 Test data“, page 63
- ◆ ⇒ „2.2 Exploded view - ignition system“, page 64
- ◆ ⇒ „2.3 Removing and installing ignition coils with output stages“, page 64
- ◆ ⇒ „2.4 Removing knock sensor 1 G61“, page 65
- ◆ ⇒ „2.5 Removing and installing engine speed sender G28“, page 66

2.1 Test data

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Engine data	Turbo FSI engine
Idling speed (cannot be adjusted; is regulated by idling speed stabilisation)	640...800 rpm
Engine speed limiter (deactivates injectors/closes throttle valve)	approx. 6,500 rpm
Ignition timing is determined by the control unit. Ignition timing cannot be adjusted.	
Ignition system	Multi-coil system with 4 ignition coils (output stages integrated) connected directly to spark plugs via spark plug connectors
Firing order	1-3-4-2

2.2 Exploded view - ignition system

1 - Bolt

- ☐ 10 Nm

2 - 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-
- ☐ Removing and installing
⇒ [page 64](#)

3 - Spark plug

- ☐ 30 Nm
- ☐ Removing and installing; A4 ⇒ Maintenance ; Booklet 812 , A5 ⇒ Maintenance ; Booklet 811 , A5 Cabriolet ⇒ Maintenance ; Booklet 818

4 - Bolt

- ☐ Renew
- ☐ 20 Nm
- ☐ Tightening torque influences functions of knock sensor

5 - Knock sensor 1 -G61-

- ☐ Contacts gold-plated
- ☐ Removing and installing
⇒ [page 65](#)

6 - Engine speed sender -G28-

- ☐ Check O-ring for damage
- ☐ Removing and installing ⇒ [page 66](#)

7 - Bolt

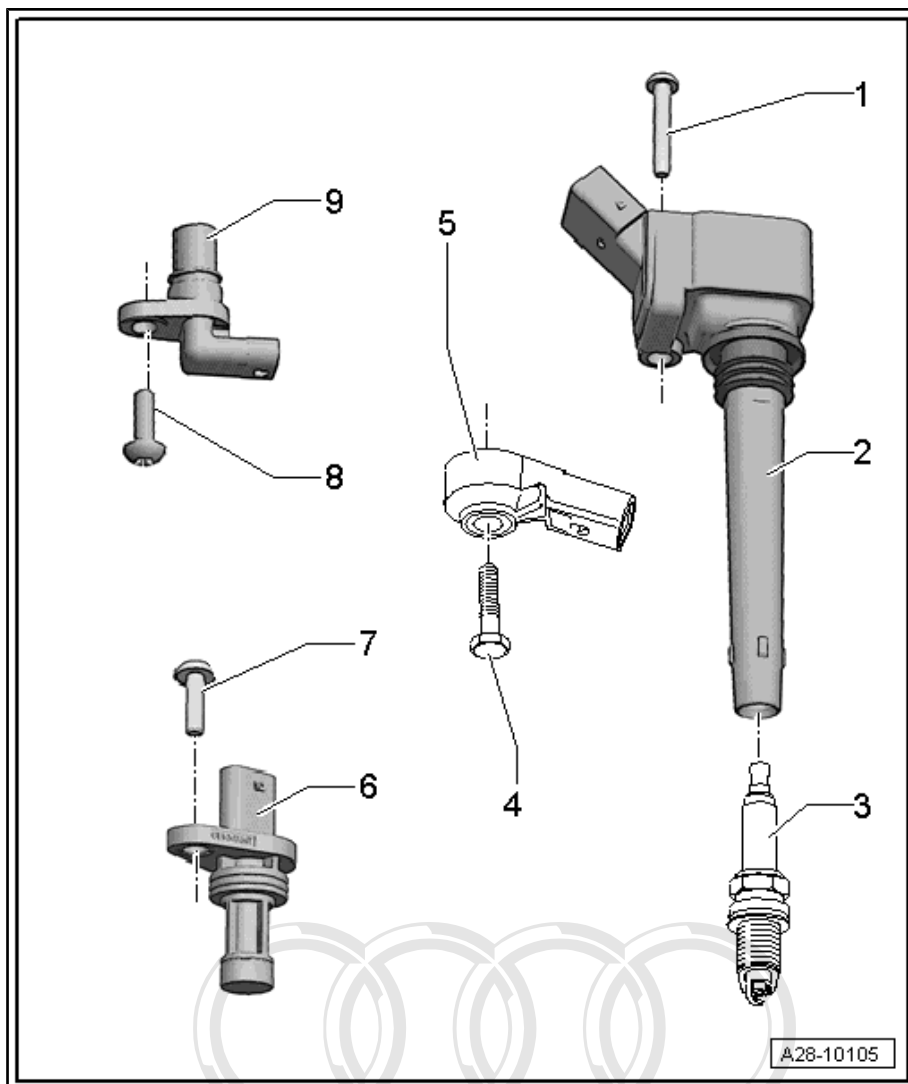
- ☐ 10 Nm

8 - Bolt

- ☐ 9 Nm

9 - Hall sender -G40- and Hall sender 3 -G300-

- ☐ Check O-ring for damage



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2.3 Removing and installing ignition coils with output stages

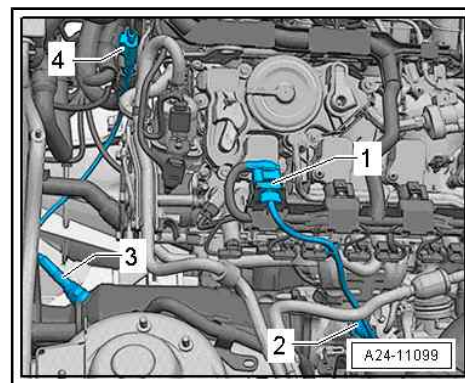
Removing

- Remove engine cover.

- Detach electrical connector -1- for Lambda probe -G39- from retainer.
- Release connectors and unplug all connectors from the ignition coils at the same time.
- Unscrew bolt of ignition coil to be removed.
- Carefully lift out ignition coil.

Installing

- Press ignition coils onto spark plugs by hand with uniform pressure (do not use any tools).
- Secure ignition coils.
- Tightening torque
 ⇒ „2.2 Exploded view - ignition system“, page 64



2.4 Removing knock sensor 1 -G61-

Removing

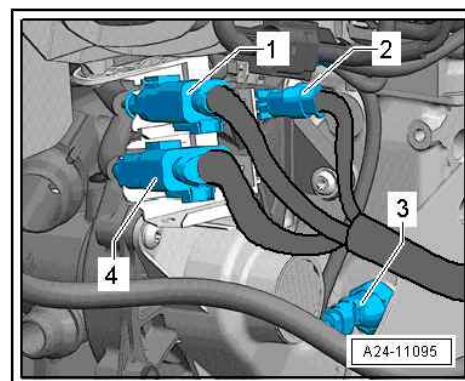
- Unplug electrical connector -2- at knock sensor 1 -G61- .
- Remove actuator for engine temperature regulation -N493- ⇒ Rep. gr. 19 ; Coolant pump/coolant regulator unit; Exploded view - coolant pump/thermostat .



Note

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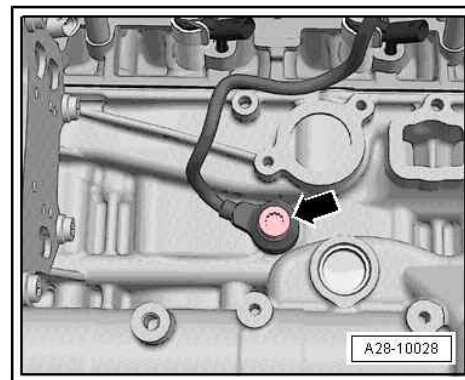
Knock sensor 1 -G61- is located below the intake manifold and behind the coolant pump.



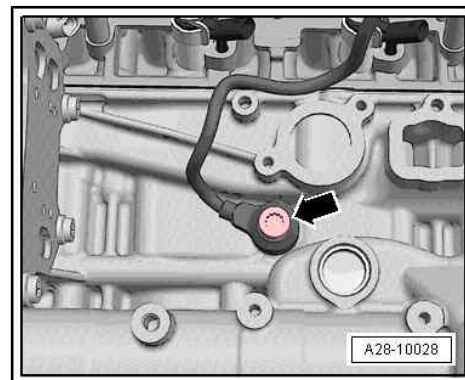
- Remove knock sensor 1 -G61- -arrow-.

Installing

- Install in reverse order.



- Note installation position of knock sensor 1 -G61- .
- Tightening torque for new bolt
 ⇒ „2.2 Exploded view - ignition system“, page 64
- Install actuator for engine temperature regulation -N493- ⇒ Rep. gr. 19 ; Coolant pump/coolant regulator unit; Exploded view - coolant pump/thermostat .



2.5 Removing and installing engine speed sender -G28-

- Unplug electrical connector -1- at engine speed sender -G28- -2-.
- Unscrew securing bolt -arrow-.

Installing

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

- Tightening torque
⇒ „2.2 Exploded view - ignition system“, page 64

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