

Workshop Manual Audi A6 2005 ➤

**Direct petrol injection and ignition system (4-cyl. 2.0 ltr.
4-valve turbo)**

Engine ID	BPJ	BYK							
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Edition 05.2013

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List of Workshop Manual Repair Groups

Repair Group

24 - Mixture preparation - injection

28 - Ignition system



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

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Audi A6 2005 ►

Direct petrol injection and ignition system (4-cyl. 2.0 ltr. 4-valve turbo) - Edition 05.2013



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24 – Mixture preparation - injection

1 Safety precautions and rules for cleanliness

(ARL003390; Edition 05.2013)

1.1 General notes on self-diagnosis

- ◆ The engine control unit has a self-diagnosis capability. Before carrying out repairs and fault finding, the event memory must be interrogated. The vacuum hoses and connections must all be checked (unmetered air).
- ◆ Fuel hoses in engine compartment must only be secured with spring-type clips. O-type clips or screw-type clips must not be used.
- ◆ A voltage of at least 11.5 V is required for proper operation of the electrical components.
- ◆ Do not use sealants containing silicone. Particles of silicone drawn into the engine will not be burnt in the engine and will damage the Lambda probe.
- ◆ The vehicles are fitted with a crash/fuel shut-off system. This system is designed to reduce the risk of a vehicle fire after a crash by deactivating the fuel pump via the fuel pump relay.
- ◆ At the same time, this system also improves the engine's starting performance. When the driver's door is opened, the fuel pump is activated for 2 seconds in order to build up pressure in the fuel system ⇒ [page 1](#).

1.2 Safety precautions



WARNING

The fuel system is pressurised. The fuel pressure in the high-pressure part of the injection system must be reduced to a residual pressure prior to opening; for procedure see ⇒ [page 3](#).

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.

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



WARNING

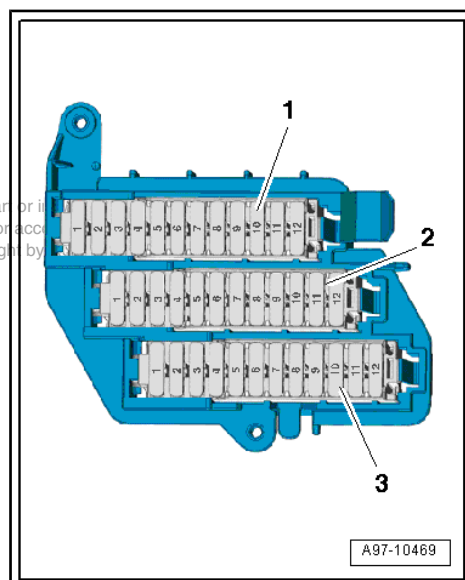
Accidents can be caused if the driver is distracted by test equipment while road-testing, or if test equipment is not properly secured.

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:

- ◆ 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 fault memory should therefore be interrogated and (if necessary) erased after completing the tests and any repair work that may be required. Then generate readiness code.
- ◆ 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 cranking 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

- ◆ *The fuse is located in the fuse holder in the dash panel.*
- ◆ *Removing the fuse (located in fuse carrier in dash panel on driver's side) will interrupt the power supply from »terminal 30« for the fuel pump control unit - J538- . ⇒ Current flow diagrams, Electrical fault finding and Fitting locations*

1.3 Rules for cleanliness and instructions for working on fuel system

When working on the fuel supply/injection system, pay careful attention to the following "6 rules":

- ◆ Thoroughly clean all unions and surrounding areas before disconnecting.
- ◆ Place parts that have been removed on a clean surface and cover them over. Do not use fluffy cloths.

- ◆ Carefully cover or seal open components if repairs cannot be carried out immediately.
- ◆ Only install clean components; replacement parts should only be unpacked immediately prior to installation. Do not use parts that have been previously unpacked and stored away loose (e.g. in toolboxes, etc.).
- ◆ When the system is open: Do not work with compressed air. Do not move vehicle.
- ◆ Unplugged electrical connectors must be kept clean and dry. Make sure connections are dry when attaching.

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

Special tools and workshop equipment required

- ◆ Vehicle diagnostic tester



WARNING

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

- ◆ *The injection system consists of a high-pressure section (maximum approx. 110 bar) and a low-pressure section (approx. 6 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.*

Reducing fuel pressure in high-pressure section

- Connect vehicle diagnostic tester and perform function “Reduce fuel pressure” in “Guided Functions”.
- Start engine and run at idling speed.
- Select “Engine electronics” in vehicle self-diagnosis.
- Then select function read “Measured values”.
- Select measured value block 140.
- With engine idling the fuel pressure is displayed in zone 3.
- ◆ Specification: between 35 and 45 bar
- Remove dash panel end trim (right-side) ⇒ Rep. gr. 70.

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- With engine idling, pull out fuse for fuel pump control unit - J538- in fuse carrier, see ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Observe fuel pressure displayed on tester.
- The fuel pressure will decrease very quickly because the mechanical high-pressure pump is no longer being supplied with fuel by the fuel system pressurisation pump - G6- .
- Switch off ignition as soon as fuel pressure has dropped to approx. 8 bar.


Note

Fuel pressure must not fall below 6 bar, otherwise the engine will stall (this could damage the catalytic converter).


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.

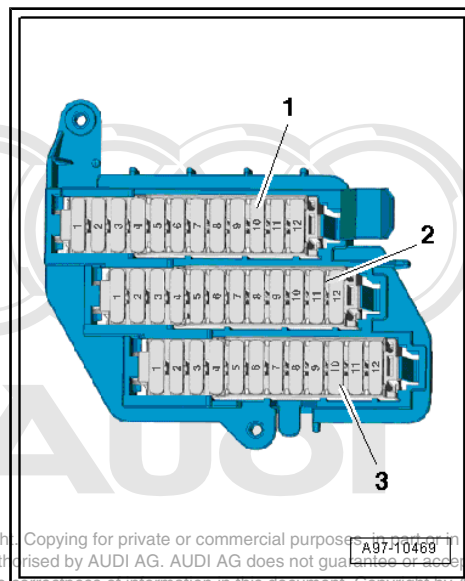
Additional steps required

- Re-install fuse.
- Install dash panel end trim (right-side) ⇒ Rep. gr. 70 .
- Erase event memory and generate readiness code in engine control unit in "Guided Functions" mode.

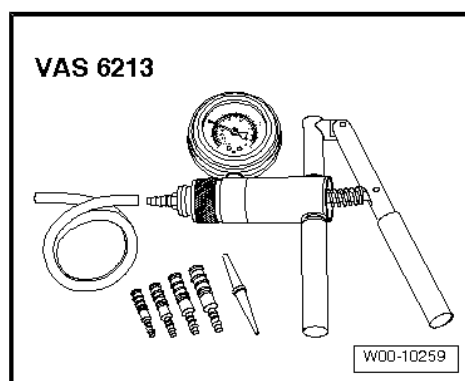
1.5 Checking vacuum system

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

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2 Injection system

2.1 Technical data

Engine data		2.0 ltr. turbo FSI engine
Idling speed is not adjustable; controlled by the 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 by electric fuel pump in fuel tank)	approx. 6.0 bar when ignition is on
	Pressure in high-pressure fuel circuit (generated by mechanical single-plunger pump) at a coolant temperature of approx. 85°C.	approx. 50 bar at idling speed approx. 110 bar in certain parts of operating range.

2.2 Overview of fitting locations

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

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1 - Air mass meter - G70-

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

2 - Lambda probe - G39- and Lambda probe heater - Z19-

- ☐ Fitting location
⇒ [page 11](#)
- ☐ Removing and installing
⇒ [page 35](#)

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

- ☐ Fitting location
⇒ [page 11](#)
- ☐ Removing and installing
⇒ [page 36](#)

4 - Coolant temperature sender - G62-

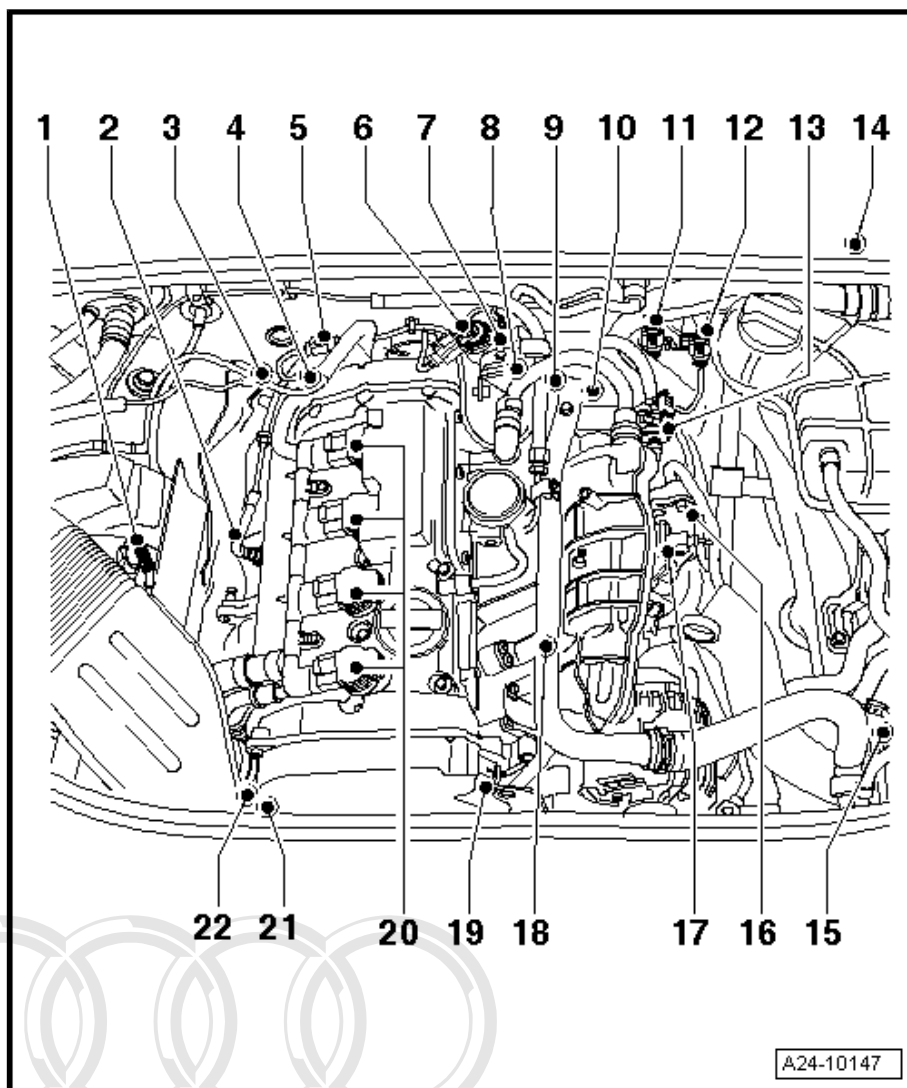
- ☐ Fitting location
⇒ [page 11](#)

5 - Camshaft control valve 1 - N205-

- ☐ Fitting location
⇒ [page 10](#)
- ☐ Removing and installing
⇒ Rep. gr. 15

6 - Fuel pressure regulating valve - N276-

- ☐ Fitting location





⇒ [page 10](#)

7 - High-pressure pump

- ❑ Removing and installing ⇒ [page 28](#)

8 - Fuel pressure sender for low pressure - G410-

- ❑ 15 Nm

9 - Intake manifold flap motor - V157- with intake manifold flap potentiometer - G336-

- ❑ After the fuel rail has been renewed, intake manifold flap potentiometer - G336- must be re-adapted to engine control unit - J623- ⇒ Vehicle diagnostic tester, "Guided Functions"

10 - Engine speed sender - G28-

- ❑ Fitting location ⇒ [page 12](#)

11 - 6-pin connector

- ❑ For Lambda probe - G39- and Lambda probe heater - Z19- (black) ⇒ [page 11](#)

12 - 6-pin connector

- ❑ For Lambda probe after catalytic converter - G130- and Lambda probe 1 heater, after catalytic converter - Z29- (brown connector) ⇒ [page 11](#)

13 - Activated charcoal filter solenoid valve 1 - N80-

14 - Engine control unit - J623-

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

15 - Charge pressure sender - G31-

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

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

- ❑ Throttle valve drive angle sender - G187- and throttle valve drive angle sender 2 - G188-
- ❑ After throttle valve module - J338- has been renewed, it must be re-adapted to engine control unit - J623- , see ⇒ Vehicle diagnostic tester, "Guided Functions"
- ❑ Fitting locations ⇒ [page 11](#)

17 - Intake air temperature sender - G42-

- ❑ Fitting location ⇒ [page 11](#)

18 - Fuel pressure sender - G247-

- ❑ 22 Nm
- ❑ Fitting location ⇒ [page 10](#)

19 - Hall sender - G40- (camshaft position sensor)

- ❑ Fitting location ⇒ [page 10](#)

20 - Ignition coils with output stages

- ❑ 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-
- ❑ Puller - T40039- is required for removing ignition coils from cylinder head.
- ❑ Removing and installing ⇒ [page 45](#)

21 - Turbocharger air recirculation valve - N249-

- ❑ Located directly on turbocharger ⇒ [page 13](#)
 - ❑ Removing and installing ⇒ Rep. gr. 21
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22 - Charge pressure control solenoid valve - N75-

- ❑ Located directly on turbocharger ⇒ [page 13](#)
- ❑ Removing and installing ⇒ Rep. gr. 21

A - Diagnostic connector

- ☐ In driver's knee restraint

B - Fuel pump control unit - J538-

- ☐ Adaption must be performed after renewing fuel pump control unit - J538- "Start basic setting" (display group 103) ⇒ Rep. gr. 20 .

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

- ☐ Fitting location ⇒ [page 12](#)

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

- ☐ On accelerator pedal (both senders are accommodated in one housing)

E - Clutch position sender - G476- and clutch pedal switch for engine start - F194-

- ☐ Fitting location ⇒ [page 12](#)

F - 8-pin connector for injectors

- ☐ Fitting location ⇒ [page 12](#)

G - Connector

- ☐ For Hall sender - G40- and fuel pressure sender - G247-
- ☐ Fitting location ⇒ [page 12](#)

H - Radiator fan control unit - J293-

- ☐ Installed in left-side radiator fan (in direction of travel)

I - Injectors

- ☐ In fuel rail
- ☐ Injector, cylinder 1 - N30-
- ☐ Injector, cylinder 2 - N31-
- ☐ Injector, cylinder 3 - N32-
- ☐ Injector, cylinder 4 - N33-
- ☐ Removing and installing ⇒ [page 29](#)

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J - Knock sensor 1 - G61-

- ☐ For cylinders 1 and 2
- ☐ 20 Nm
- ☐ Fitting location ⇒ [page 12](#)
- ☐ Removing and installing ⇒ [page 46](#)

K - Knock sensor 2 - G66-

- ☐ For cylinders 3 and 4
- ☐ 20 Nm
- ☐ Fitting location ⇒ [page 12](#)
- ☐ Removing and installing ⇒ [page 46](#)

L - Oil pressure sender - G10-

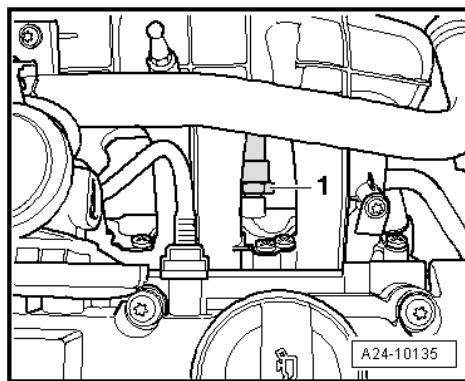
- ☐ Fitting location ⇒ [page 12](#)
- ☐ Removing, installing and testing ⇒ Rep. gr. 17

M - Oil level and oil temperature sender - G266-

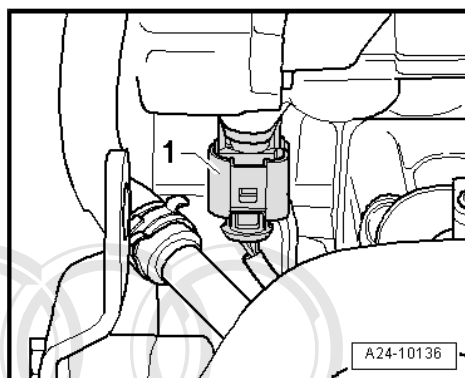
- ☐ Fitting location ⇒ [page 13](#)

Fuel pressure sender - G247- -1-

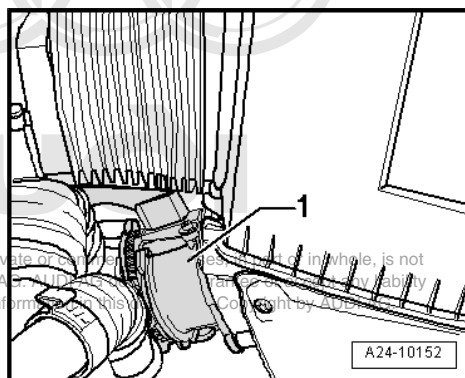
- Make sure that connecting piece is tightened to specified torque "30 Nm" before installing fuel pressure sender - G247-



Hall sender - G40- -1-

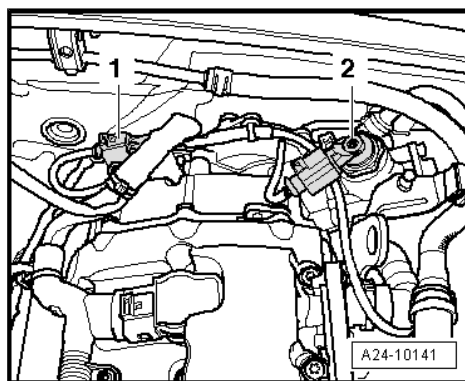


Air mass meter - G70- -1-



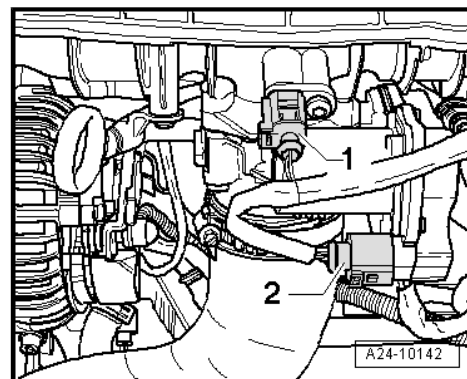
Fitting locations

- Camshaft control valve 1 - N205-
- Fuel pressure regulating valve - N276-



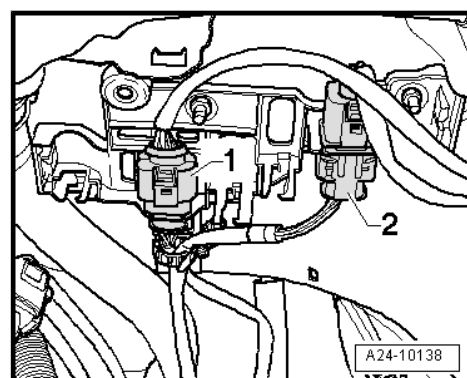
Fitting locations

- 1 - Intake air temperature sender - G42-
- 2 - Throttle valve module - J338-



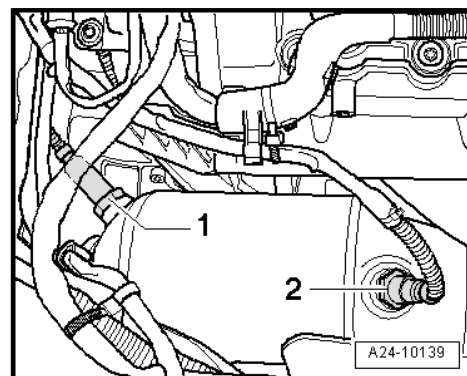
Electrical connectors (Lambda probes)

- 1 - Lambda probe - G39- and Lambda probe heater - Z19- (black connector)
- 2 - Lambda probe after catalytic converter - G130- and Lambda probe heater after catalytic converter - Z29- (brown connector)

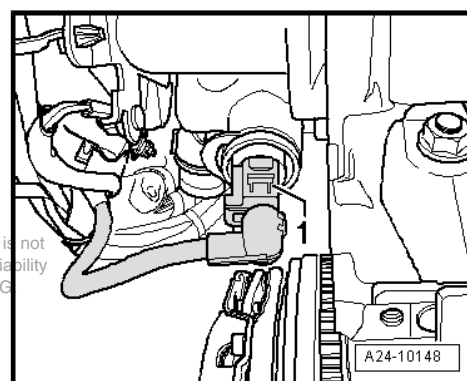


Lambda probes

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



Coolant temperature sender - G62- -1-



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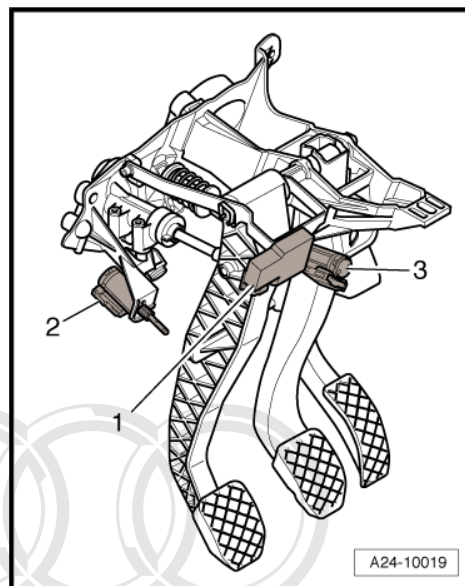
Pedal bracket

- 1 - Clutch position sender - G476-
- 2 - Clutch pedal switch for engine start - F194-
- 3 - Brake light switch - F- / brake pedal switch - F47-



Note

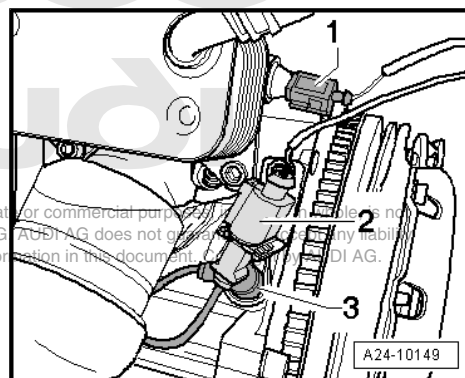
Switches must not be installed more than once, otherwise they may not fit securely.



Electrical connectors

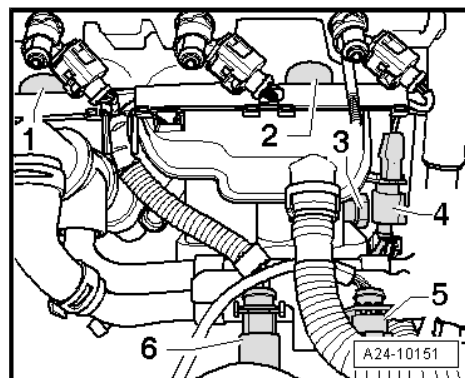
- 1 - Oil pressure sender - G10-
- 2 - 3-pin electrical connector (grey) for engine speed sender - G28-
- 3 - Engine speed sender - G28-

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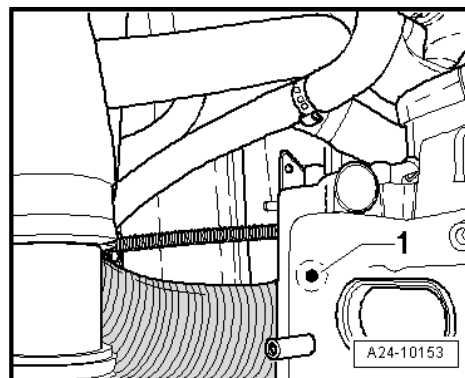
Fitting locations of components below intake manifold

- 1 - Knock sensor 1 - G61-
- 2 - Knock sensor 2 - G66-
- 3 - Oil pressure sender - G10- in oil filter bracket
- 4 - 3-pin electrical connector (grey) for engine speed sender - G28-
- 5 - Electrical connector for Hall sender - G40- and fuel pressure sender - G247-
- 6 - 8-pin connector for injectors

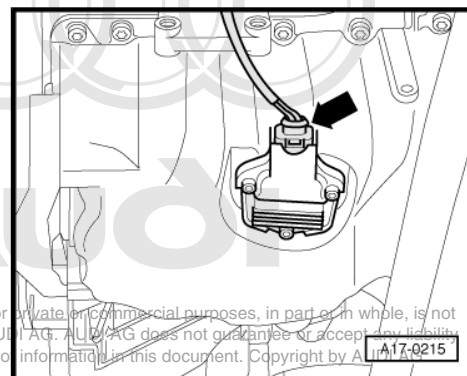


Charge pressure sender - G31- -1- (fitting location: below left headlight)

- Renew O-ring
- Tighten to 5 Nm
- Removing and installing ⇒ Rep. gr. 21

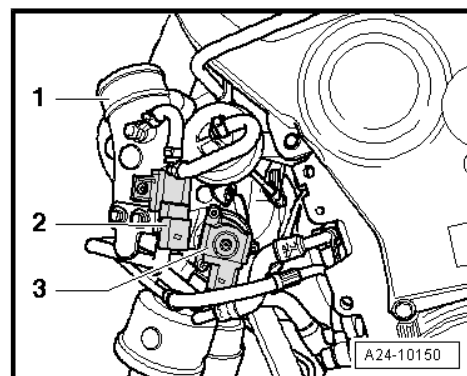


Oil level and oil temperature sender - G266-

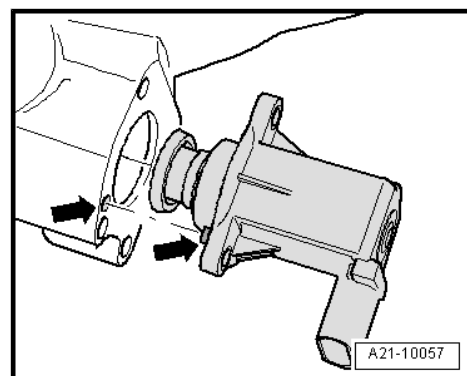


Components on turbocharger

- 1 - Turbocharger
- 2 - Tighten charge pressure control solenoid valve - N75- to 3 Nm
- 3 - Tighten turbocharger air recirculation valve - N249- to 7 Nm (note installation position, refer to next illustration)



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



2.3 Air cleaner - exploded view

1 - Air hose

- ☐ To turbocharger
- ☐ Clean any leaves and dirt out of air intake hose

2 - Crankcase breather hose

3 - Vacuum hose

- ☐ Not installed in all vehicles
- ☐ From air filter bypass flap valve - N275- to vacuum unit for air cleaner bypass flap

4 - Air duct

- ☐ Not installed in all vehicles
- ☐ To wheel housing
- ☐ Clean dirt and leaves out of air duct, if fitted

5 - Air duct

- ☐ To lock carrier
- ☐ Clean any leaves and dirt out of air duct

6 - Bolt

- ☐ 1.5 Nm

7 - Air duct

- ☐ To air cleaner housing
- ☐ Clean any leaves and dirt out of air duct

8 - Air cleaner (top section)

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

9 - Air filter element

- ☐ Observe change intervals ⇒ Maintenance ; Booklet 405
- ☐ Always use genuine part for air filter element
- ☐ Removing and installing ⇒ [page 15](#)

10 - Air cleaner bypass flap

- ☐ Not installed in all vehicles
- ☐ Clean dirt and leaves out of bypass flap, if fitted

11 - Grommet

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12 - Air cleaner (bottom section)

- ☐ Clean any salt residue, leaves and dirt out of air cleaner (bottom section)
- ☐ Clean water drain in bottom section of air cleaner (this is important)

13 - Grommet

14 - Water drain hose

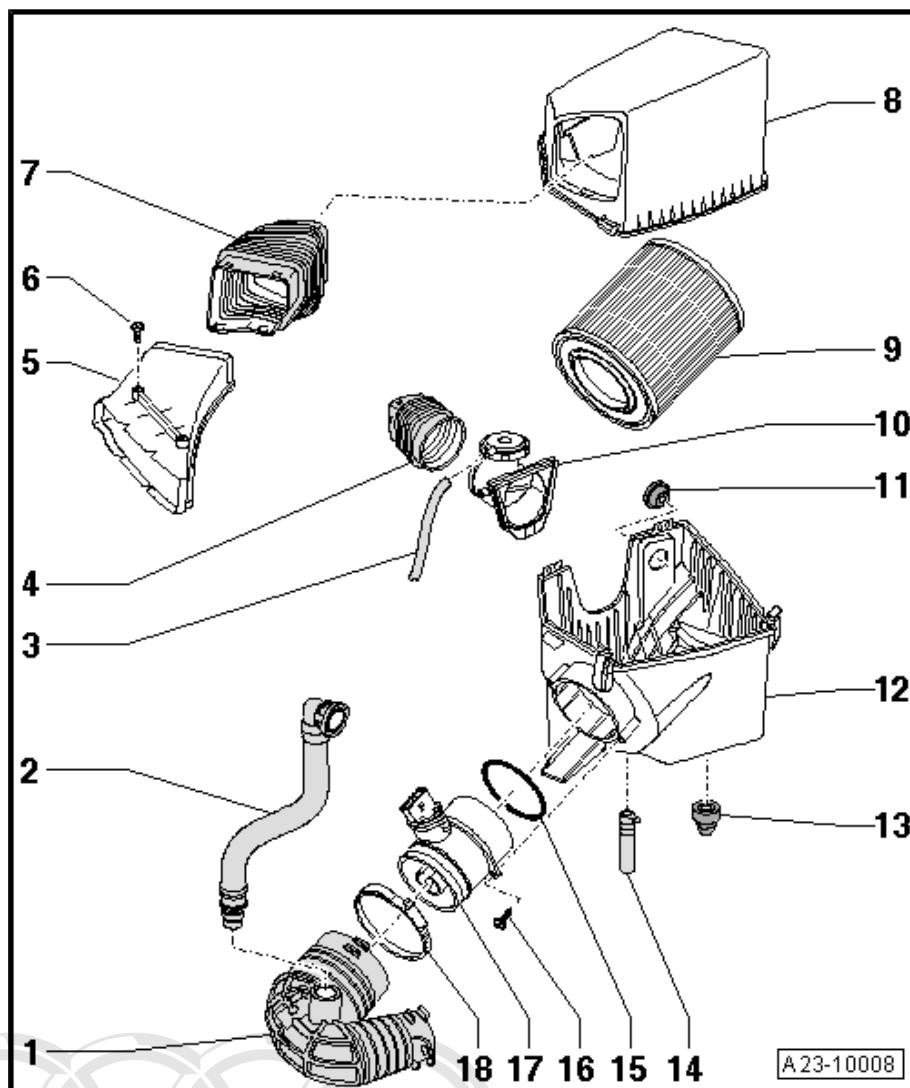
- ☐ Clean water drain hose (this is important)

15 - O-ring

- ☐ Renew if damaged

16 - Bolt

- ☐ 1.5 Nm



17 - Air mass meter - G70-

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

18 - Hose clip

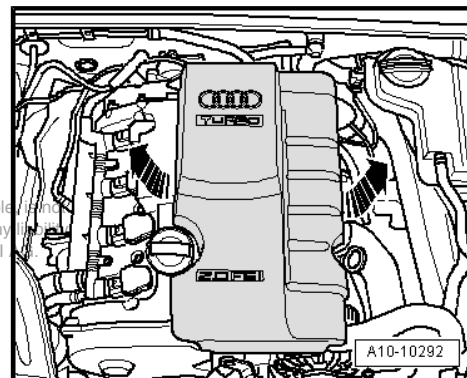
2.4 Removing and installing engine cover panel

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

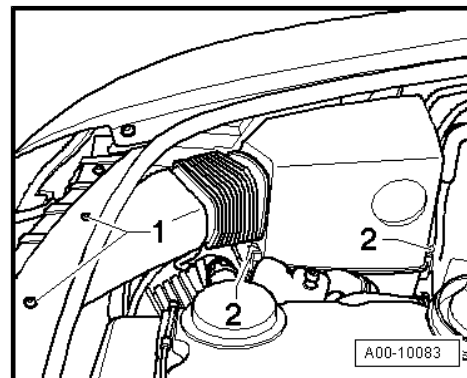
- To avoid damage, do not strike the engine cover panel with your fist or with any kind of tool.
- Position engine cover panel on engine (note locations of oil filler neck and oil dipstick).
- Press engine cover panel with both hands into the rubber grommets.



2.5 Removing and installing air filter element

Removing air filter element

- Unscrew bolts -1- and lift out air duct.
- Release clips -2-, then move top section of air cleaner housing to side and take out.



- Lift out air filter element -1-.

Installing air filter element

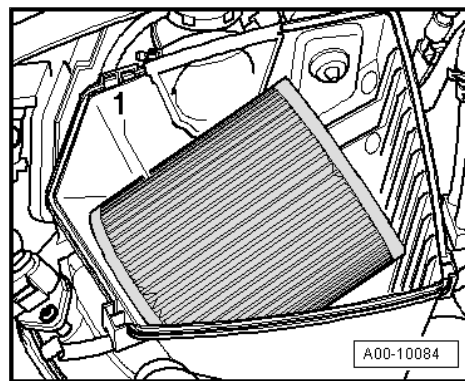
To ensure the proper function of the air mass meter - G70- it is important to observe the following notes and instructions.



Note

- ◆ *If the air filter element is very dirty or wet, dirt or water could reach the air mass meter - G70- and affect the air mass value. This would lead to loss of power, since a smaller injection quantity is calculated.*
- ◆ *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 (air mass meter, intake pipes, etc.) with a clean cloth when blowing out the air cleaner housing with compressed air.*
- ◆ *Please observe requirements for disposal.*
- Clean water drain in bottom section of air cleaner (this is important).
- Clean salt residue, dirt and leaves out of air cleaner housing (top and bottom sections); use a vacuum cleaner if necessary.
- Clean wheel housing intake (if fitted) in bottom section of air cleaner.
- Check for salt residue, dirt and leaves in air mass meter and air intake hose (engine intake side).
- Check for dirt and leaves in air duct going from lock carrier to air cleaner housing.
- When installing the air filter element, check that it is properly centred in the retainer in the 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).
- Ensure secure fit of intake hose at air mass meter - G70- .

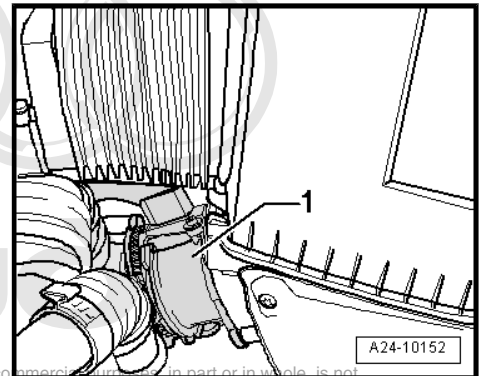
The remaining installation steps are carried out in the reverse sequence.



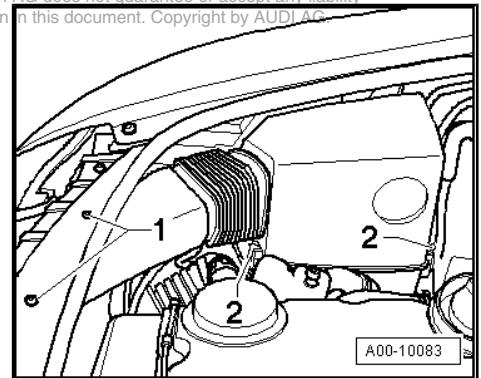
2.6 Removing and installing air mass meter - G70-

Removing

- Unplug electrical connector -1- at air mass meter - G70- .



- Unscrew bolts -1- and lift out air duct.
- Release hose clip securing air hose (coming from turbocharger) and disconnect hose from air mass meter - G70- .
- Unscrew both bolts from air mass meter - G70- .
- Then carefully pull air mass meter - G70- out of guide on air cleaner housing.



Installing

To ensure the proper function of the air mass meter - G70- it is important to observe the following notes and instructions.



Note

- ◆ *If the air filter element is very dirty or wet, dirt or water could reach the air mass meter - G70- and affect the air mass value. This would lead to loss of power, since a smaller injection quantity is calculated.*
- ◆ *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*
- Check for salt residue, dirt and leaves in air mass meter and air intake hose (engine intake side).
- Clean water drain in bottom section of air cleaner.
- Check for dirt in air duct leading to air filter element. If necessary, clean salt residue, dirt and leaves out of air cleaner housing (top and bottom sections); wash out or use a vacuum cleaner as required.
- Clean water drain hose in bottom section of air cleaner as well (this is important).
- Removing and installing air cleaner ⇒ [page 15](#)

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

2.7 Intake manifold - exploded view

1 - Screw for intake air temperature sender 2 - G299-

- 5 Nm

2 - Intake air temperature sender 2 - G299-

3 - Intake manifold

- Removing and installing
⇒ [page 21](#)

4 - Activated charcoal filter solenoid valve 1 - N80-

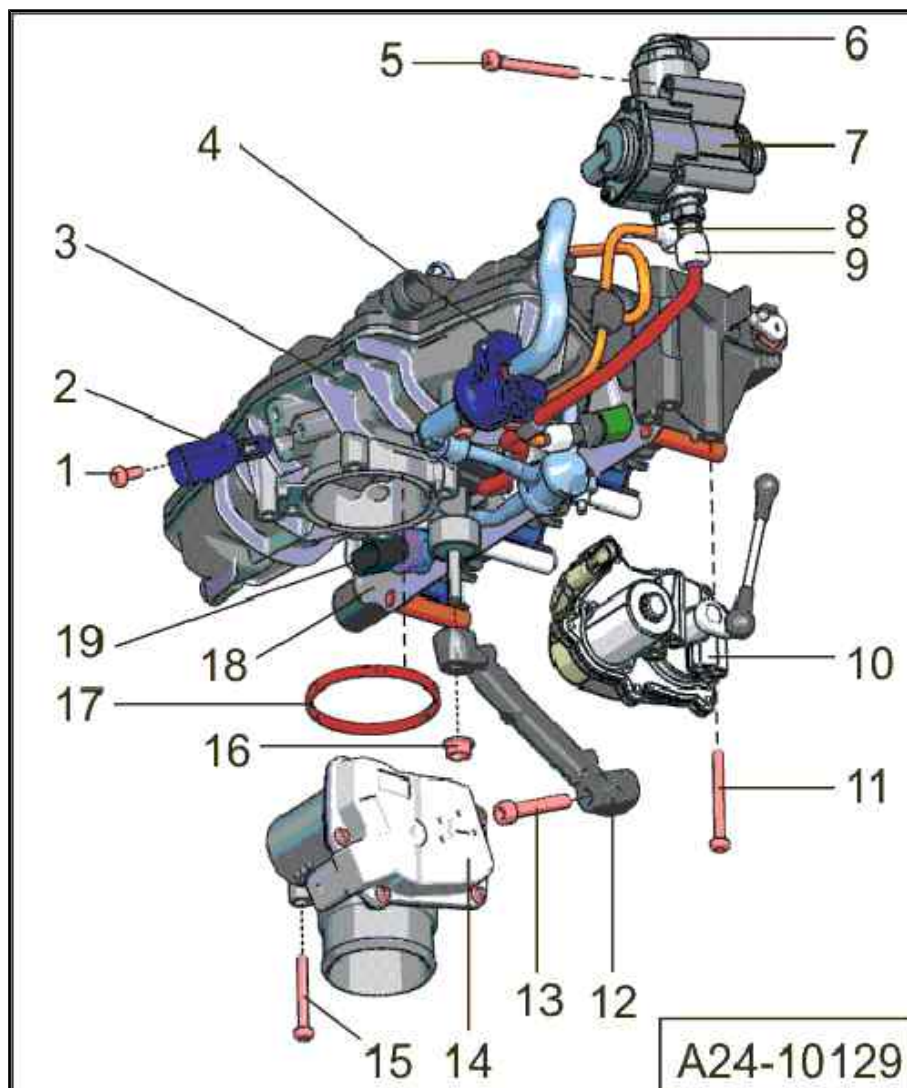
5 - Bolt for high-pressure pump

- 3x
- 10 Nm

6 - Fuel pressure regulating valve - N276-

7 - High-pressure pump

- With fuel pressure regulating valve - N276- and fuel pressure sender, low pressure - G410-
- An electric fuel pump (fitted in fuel tank) supplies fuel to the mechanical high-pressure pump at a pressure of approx. 6 bar.
- 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;



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procedure for reducing
fuel pressure ⇒ [page 3](#)

- ☐ Fuel lines must be free of tension when installed.
- ☐ Removing and installing ⇒ [page 28](#)

8 - Connection for fuel return line to fuel tank

- ☐ Renew bolt
- ☐ Tighten connecting piece to 40 Nm (always make sure that connecting piece is tightened to specified torque before installing fuel line)
- ☐ Fuel line must be free of tension when installed (make sure all parts are clean); tightening torque: 25 Nm

9 - Fuel supply line to fuel rail

- ☐ Tighten connecting piece to 30 Nm (always make sure that connecting piece is tightened to specified torque before installing fuel line)
- ☐ Fuel line must be free of tension when installed (make sure all parts are clean); tightening torque: 30 Nm

10 - Intake manifold flap motor - V157- with intake manifold flap potentiometer - G336-

- ☐ After the fuel rail has been renewed, intake manifold flap potentiometer - G336- must be re-adapted to engine control unit - J623- ⇒ Vehicle diagnostic tester, "Guided Functions"

11 - Bolt for intake manifold flap motor - V157- with intake manifold flap potentiometer - G336-

- ☐ 3x
- ☐ 7 Nm

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12 - Intake manifold support

13 - Bolt for intake manifold support

- ☐ 23 Nm

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

- ☐ With throttle valve drive angle sender 1 - G187- and throttle valve drive angle sender 2 - G188-
- ☐ After throttle valve module - J338- has been renewed, it must be re-adapted to engine control unit - J623- , see ⇒ Vehicle diagnostic tester, "Guided Functions"

15 - Bolt for throttle valve module - J338-

- ☐ 4x
- ☐ 7 Nm

16 - Securing nut for intake manifold support

- ☐ 10 Nm

17 - Seal

- ☐ Renew

18 - Fuel rail

- ☐ Removing and installing ⇒ [page 25](#)

19 - Fuel pressure sender - G247-

- ☐ 20 Nm

2.8 Fuel rail - exploded view

1 - Radial compensation element

- ☐ Renew if damaged

2 - Injector

- ☐ With combustion chamber ring seal (teflon ring seal): always renew
- ☐ Renew O-rings
- ☐ Ensure correct installation position. Protected by copyright. Reproduction is permitted unless otherwise stated.
- ☐ Removing and installing: [⇒ page 29](#)

3 - Support ring

4 - Fuel rail

- ☐ Removing and installing: [⇒ page 25](#)

5 - Fuel pressure sender - G247-

- ☐ 22 Nm
- ☐ Tighten connecting piece to 30 Nm

6 - Fuel pressure sender for low pressure - G410-

- ☐ 15 Nm

7 - Fuel pressure regulating valve - N276-

8 - High-pressure pump

- ☐ With fuel pressure regulating valve - N276- and fuel pressure sender, low pressure - G410-
- ☐ An electric fuel pump (fitted in fuel tank) supplies fuel to the mechanical high-pressure pump at a pressure of approx. 6 bar.
- ☐ 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 3](#)
- ☐ Fuel lines must be free of tension when installed.
- ☐ Removing and installing [⇒ page 28](#)

9 - Activated charcoal filter solenoid valve 1 - N80-

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

- ☐ With throttle valve drive angle sender 1 - G187- and throttle valve drive angle sender 2 - G188-
- ☐ After throttle valve module - J338- has been renewed, it must be re-adapted to engine control unit - J623- , see ⇒ Vehicle diagnostic tester, "Guided Functions"

11 - Intake air temperature sender 2 - G299-

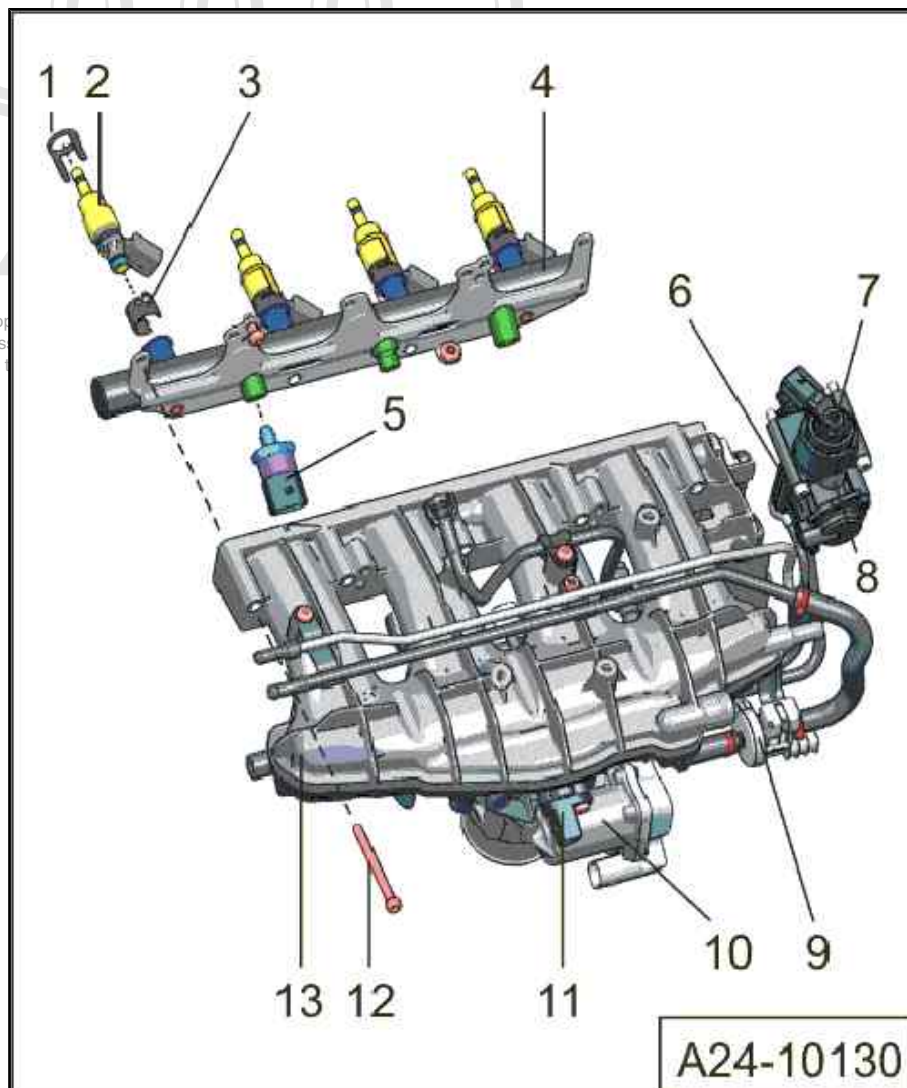
- ☐ Tighten to 5 Nm

12 - Bolts for intake manifold

- ☐ 9 Nm

13 - Intake manifold

- ☐ Removing and installing [⇒ page 21](#)

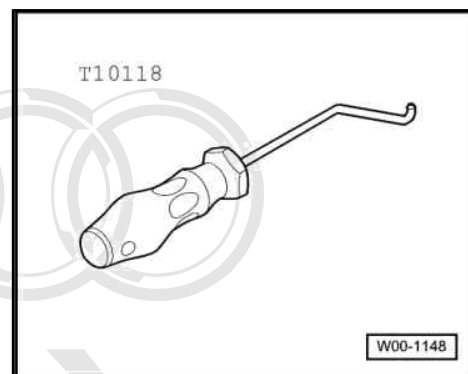


2.9 Removing and installing intake manifold with fuel rail

After the fuel rail has been removed or renewed, intake manifold flap potentiometer - G336- must be adapted to engine control unit - J623- . Use ⇒ Vehicle diagnostic tester, "Guided Functions".

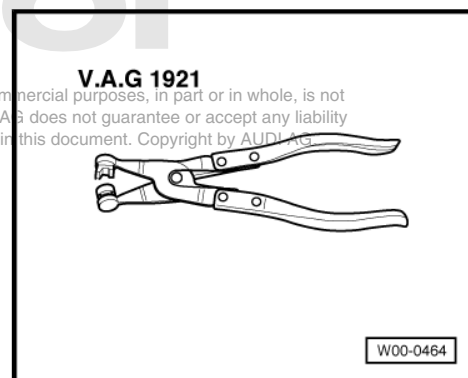
Special tools and workshop equipment required

- ◆ Assembly tool - T10118-

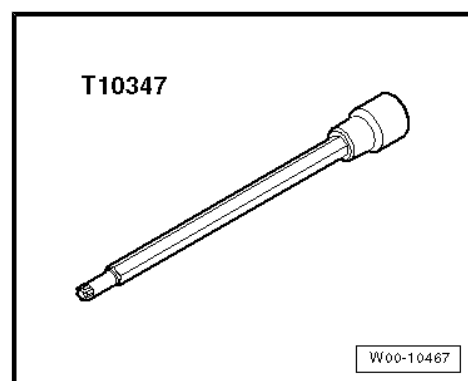


- ◆ Hose clip pliers - V.A.G 1921-

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- ◆ Special wrench - T10347-



Removing



Note

- ◆ *The injectors can only be accessed after the intake manifold and the fuel rail with the air flow control flap have been removed. (Additional or fewer steps may be required depending on the model.)*
- ◆ *The combustion chamber (teflon) ring seal and the O-ring must always be renewed.*
- ◆ *Intake manifold - exploded view ⇒ [page 17](#)*

**Caution**

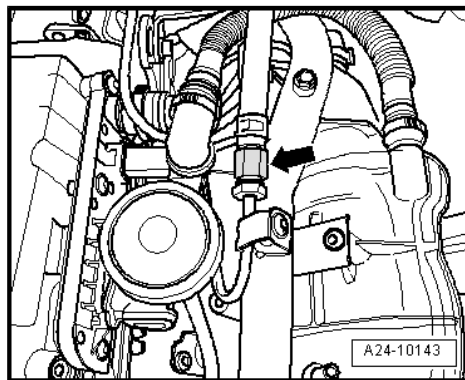
The fuel pressure must be reduced prior to opening any components in the high-pressure section of the fuel system. It is very important to observe the procedure specified in ⇒ [page 3](#).

- Disconnect negative terminal from battery.
- Remove engine cover panel ⇒ [page 15](#).
- Unplug all electrical connectors as necessary.
- Disconnect vacuum hose between intake manifold and vacuum pump at intake manifold.

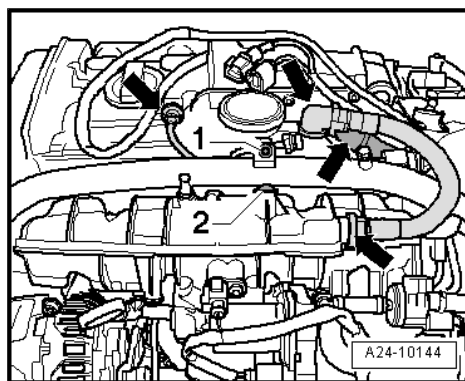
**Note**

This vacuum hose and the vacuum pump (located at rear of cylinder head) are only fitted on vehicles with automatic gearbox.

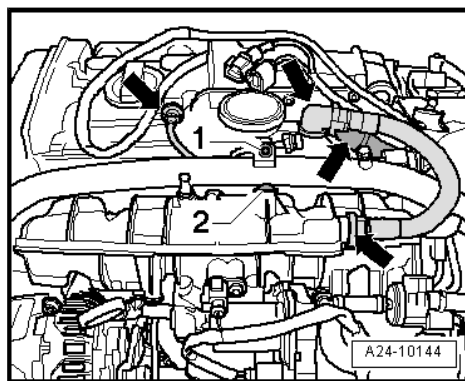
- Disconnect fuel line -arrow- (catch escaping fuel and seal off open connections immediately).



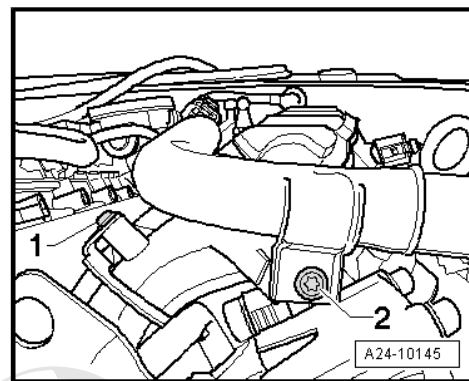
- Disconnect hose connections -arrows- at cylinder head cover.



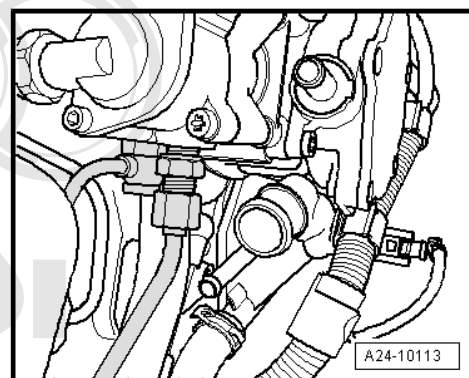
- Remove two bolts -1 and 2- from coolant pipe.



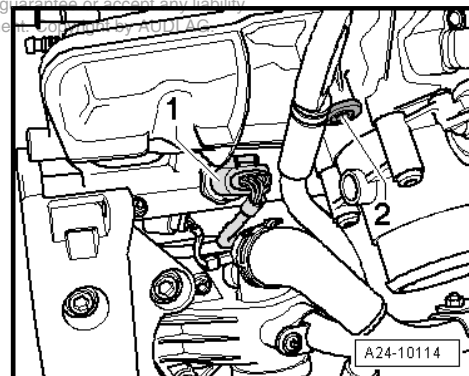
- Unscrew bolts from oil line -1- and coolant pipe -2-.



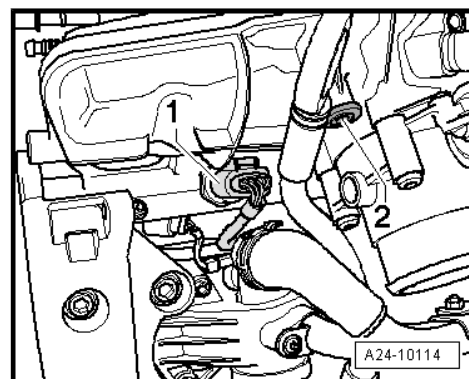
- Open both fuel line connections at high-pressure pump.
- Open hose clips and disconnect intake hose from throttle valve module - J338- and intake manifold.



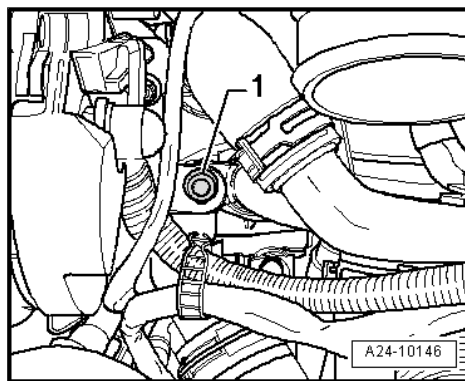
- Unplug electrical connector -1- at fuel pressure sender - G247- .



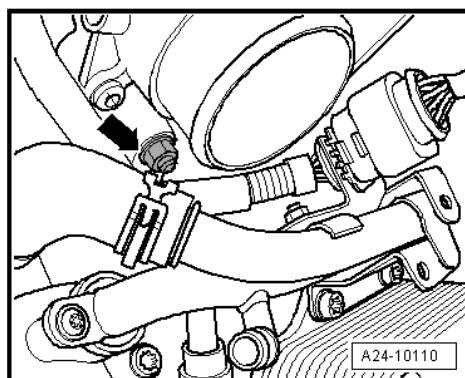
- Pull out oil dipstick and unscrew bolt -2- at dipstick guide tube.



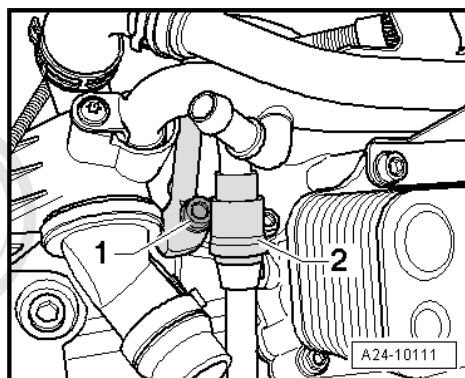
- Unscrew bolt -1- securing oil line.



- Unscrew securing nut -arrow- on intake manifold support (remove throttle valve module - J338- if necessary).



- Disconnect oil dipstick guide at joint -2- and unscrew bolt -1- on intake manifold support.
- Unscrew bolts from intake manifold using socket Torx T30 - T10347- .



Note

To remove the bolts that cannot be accessed if you do not have socket Torx T30 - T10347- , the throttle valve module - J338- must be removed.

- Carefully pull intake manifold and fuel rail off cylinder head.



Note

The injectors can remain in the fuel rail.

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- Removing and installing fuel rail ⇒ [page 25](#)

Installing



Note

Make sure that injectors are installed correctly.

- Fit intake manifold onto studs (left and right) on cylinder head.
- The remaining installation steps are carried out in the reverse sequence.
- ♦ Tightening torque: intake manifold - exploded view
⇒ [page 17](#)
- ♦ Tightening torque: Fuel rail - exploded view ⇒ [page 20](#)

2.10 Removing and installing fuel rail

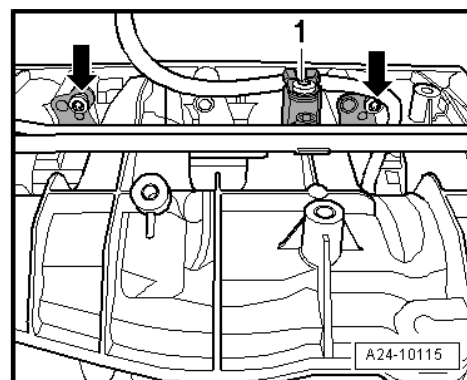
After the fuel rail has been removed or renewed, intake manifold flap potentiometer - G336- must be adapted to engine control unit - J623- . Use ⇒ Vehicle diagnostic tester, "Guided Functions".



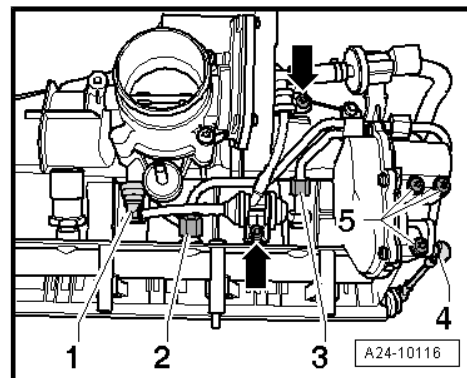
Note

Intake manifold must be removed; refer to ⇒ [page 21](#) for removal procedure

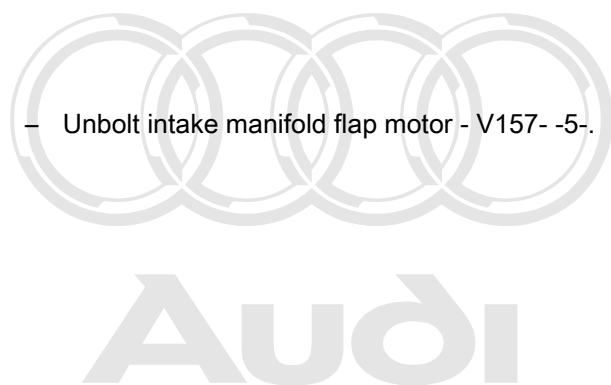
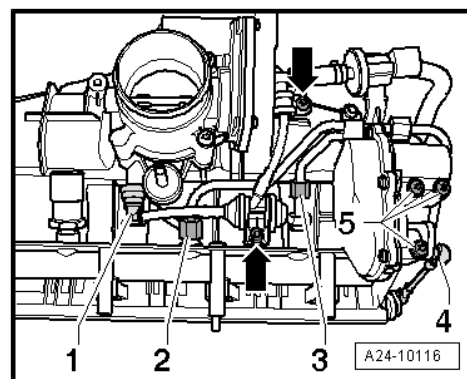
- Remove hoses from activated charcoal filter.
- To do this, unfasten hose clip -1-.
- Unscrew two bolts -arrows- from fuel rail.
- Detach hose connection -1- from intake manifold and unscrew two bolts -arrows-.



- Disconnect fuel lines -2 and 3-.
- Carefully pry off linkage from intake manifold flap motor - V157- -4-.



- Unbolt intake manifold flap motor - V157- -5-.

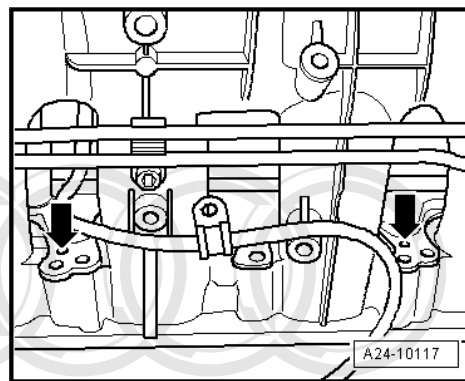


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- Pry fuel rail over retaining lugs -arrows- on intake manifold.
- Detach fuel rail from intake manifold.

Installing

- Install in reverse order.
- Install intake manifold ⇒ [page 21](#) .
- ◆ Tightening torque: intake manifold - exploded view
⇒ [page 17](#)
- ◆ Tightening torque: Fuel rail - exploded view ⇒ [page 20](#)



2.11 Checking initial fuel pressure up to mechanical high-pressure pump



Note

- ◆ *Control unit for electric fuel pump OK.*
- ◆ *Fuel pump OK.*
- ◆ *Fuel filter OK.*
- ◆ *Battery voltage at least 11 Volt.*
- Connect a ⇒ Vehicle diagnostic tester.
- Switch on ignition.
- Select “Engine electronics” in vehicle self-diagnosis.
- Then select function read “Measured values”.
- Select measured value block 140.
- With ignition on, the fuel pressure is indicated in display zone 3.

Observe the reading in display zone 3. The display shows the current (actual) pressure in the fuel rail.



Note

When the ignition is switched off and on, the control unit for the electric fuel pump - J538- will activate the fuel pump for several seconds. The initial fuel pressure can only be measured during this time.

- ◆ Specification: approx. 6 bar (5 ... 7 bar)
- If reading does not match specification, check fuel delivery rate of electric fuel pump ⇒ Rep. gr. 20 .

2.12 High-pressure pump - exploded view



WARNING

Fuel system operates under high pressure. Always dissipate fuel pressure prior to opening fuel system. For procedure, refer to ⇒ [page 3](#)

1 - Air guide plates

- ☐ Removable
- ☐ Check for damage and correct fitting

2 - Sleeve

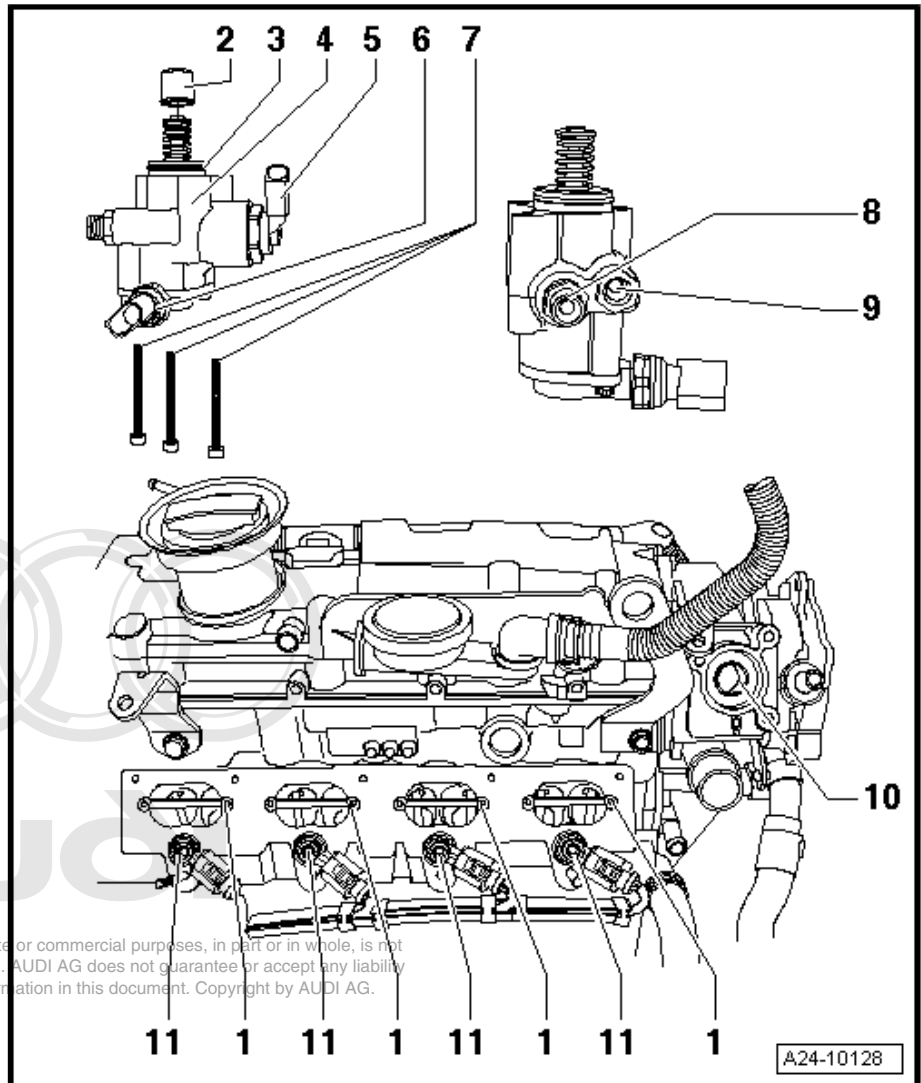
- ☐ May remain lodged in cylinder head when high-pressure pump is removed; it can be removed

3 - O-ring

- ☐ Renew

4 - Single-plunger high-pressure pump

- ☐ An electric fuel pump (fitted in fuel tank) supplies fuel to the mechanical high-pressure pump at a pressure of approx. 6 bar.
- ☐ 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 3](#)
- ☐ Fuel lines must be free of tension when installed
- ☐ Removing and installing ⇒ [page 28](#)

**5 - Fuel pressure regulating valve - N276-****6 - Fuel pressure sender for low pressure - G410-**

- ☐ 15 Nm

7 - Bolts for high-pressure pump

- ☐ 10 Nm

8 - Fuel supply line to fuel rail

- ☐ Tighten connecting piece to 30 Nm (always make sure that connecting piece is tightened to specified torque before installing fuel line)
- ☐ Fuel line must be free of tension when installed (make sure all parts are clean); tightening torque: 30 Nm

9 - Connection for fuel return line to fuel tank

- ☐ Renew bolt
- ☐ Tighten connecting piece to 40 Nm (always make sure that connecting piece is tightened to specified torque before installing fuel line)
- ☐ Fuel line must be free of tension when installed (make sure all parts are clean); tightening torque: 25 Nm

10 - Bore in cylinder head for high-pressure pump**11 - Injectors**

- ☐ Renew O-rings
- ☐ Ensure correct installation position.
- ☐ Removing and installing ⇒ [page 29](#)

2.13 Removing and installing high-pressure pump



WARNING

Fuel system operates under high pressure. Always dissipate fuel pressure prior to opening fuel system. For procedure, refer to ⇒ [page 3](#)



Note

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

Removing

- Detach electrical connectors from fuel pressure sender for low pressure - G410- and fuel pressure regulating valve - N276-1 and 2-.
- Detach both fuel lines.



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- Remove 3 bolts -arrows-.
- Carefully pull out high-pressure fuel pump. It is possible that the sleeve may remain lodged in the cylinder head.

Installing

- Renew O-ring for high-pressure pump.
- Fit roller tappet in vacuum pump (check roller tappet for damage first).



Note

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

- Turn crankshaft until roller tappet is positioned at lowest point.
- Carefully fit high-pressure pump and sleeve in cylinder head bore.
- Tighten bolts hand-tight.
- Now tighten bolts alternately to specified torque.
- ♦ Tightening torque: refer to exploded view of high-pressure pump ⇒ [page 26](#).
- Make sure that connecting pieces on high-pressure pump are tightened to specified torque before installing fuel lines.
- ♦ Tightening torque of connecting piece for fuel return line: 40 Nm
- ♦ Tightening torque for connecting piece for fuel supply line: 30 Nm



Note

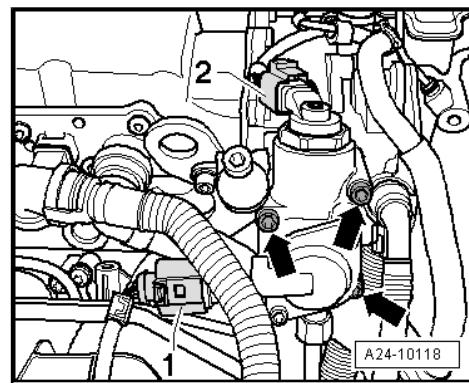
Renew bolt for fuel return line.

- Tighten bolt for fuel return line finger-tight. Align so that parts are free of tension.
- Tighten union nut on fuel supply line hand-tight. Align so that parts are free of tension.
- ♦ Tightening torque for fuel return line: 25 Nm
- ♦ Tightening torque for fuel supply line: 30 Nm
- Reattach electrical connectors for fuel pressure sender (low pressure) - G410- and fuel pressure regulating valve - N276-.



Note

Check fuel system for leaks.



2.14 Removing and installing injectors

Removing

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

Removing injectors (from fuel rail)

Carefully pull injectors out of fuel rail.

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Removing injectors (from cylinder head)

Special tools and workshop equipment required

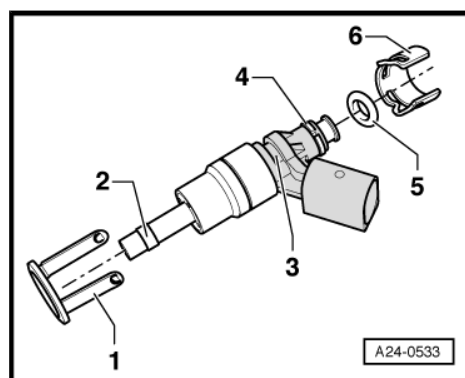
- ◆ Tool kit with puller - T10133-



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

Illustration shows injector assembly

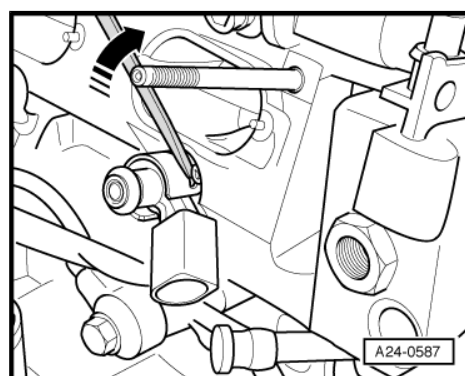
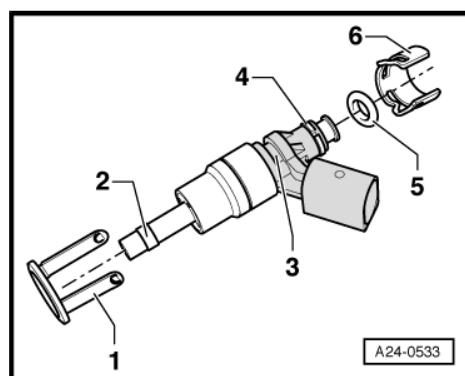
- 1 - Radial compensation element, renew if damaged
- 2 - Combustion chamber ring seal (teflon ring seal) - renew; when fitting, do not grease ring or use any other lubricant
- 3 - Groove on injector
- 4 - Spacer ring (renew if damaged)
- 5 - O-ring (renew; apply thin coating of clean engine oil prior to installation)
- 6 - Support ring (via this support ring, fuel rail exerts force which secures injector in cylinder head)



Note

The radial compensation element -1- is clipped into the support ring -6- with the injector fitted. To remove the injector, the support ring must be removed from the injector so that the puller - T10133/2- can be inserted into the groove on the injector -3-.

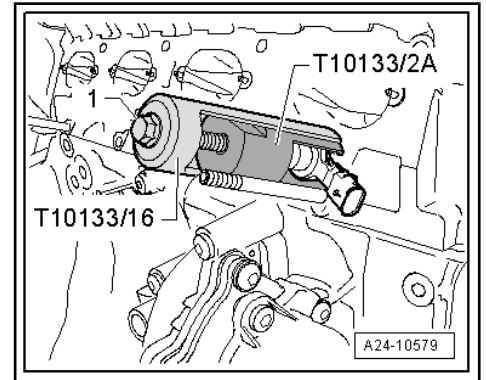
- Cover open inlet ports with a clean cloth.
- Unplug electrical connector at injector that is to be removed.
- Use a screwdriver to bend retainer tabs of radial compensation element to side, and pull support ring off injector.



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

Note

The combustion chamber ring seal must always be renewed prior to reinstalling the injector ⇒ [page 31](#) .

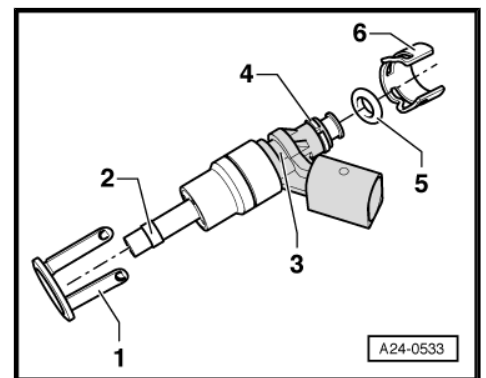


2.15 Renewing combustion chamber ring seal (teflon ring seal)

Note

The combustion chamber ring seal must always be renewed prior to reinstalling the injector.

- Illustration shows injector assembly
- 1 - Radial compensation element, renew if damaged
- 2 - Combustion chamber ring seal (teflon ring seal) - renew; when fitting, do not grease ring or use any other lubricant
- 3 - Groove on injector
- 4 - Spacer ring (renew if damaged)
- 5 - O-ring (renew; apply thin coating of clean engine oil prior to installation)
- 6 - Support ring (via this support ring, fuel rail exerts force which secures injector in cylinder head)
- Carefully remove old teflon ring using suitable tools (e.g. cut open ring using razor blade, or prise open ring with small screwdriver and then pull off forwards). It is important to ensure that the groove and the continuous ridge in the bottom of the groove are not damaged.



Note

The injector must be renewed if the groove is damaged.

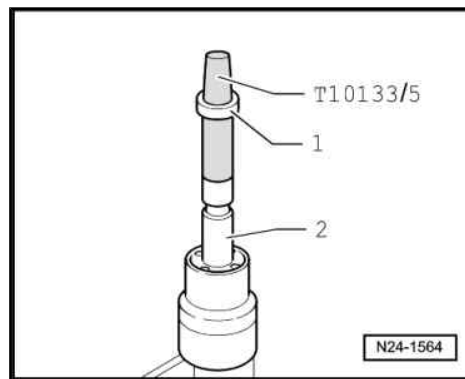
- Before new teflon ring is fitted, any combustion residue must be removed from ring groove and injector stem using a clean cloth.

Note

The illustration shows an injector with "offset connector". This can be ignored since it is not relevant when replacing the combustion chamber ring seal.

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- Fit assembly cone -T10133/5- with new teflon ring -1- onto injector -2-.



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



Note

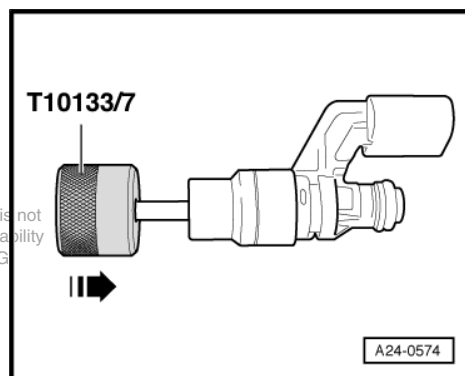
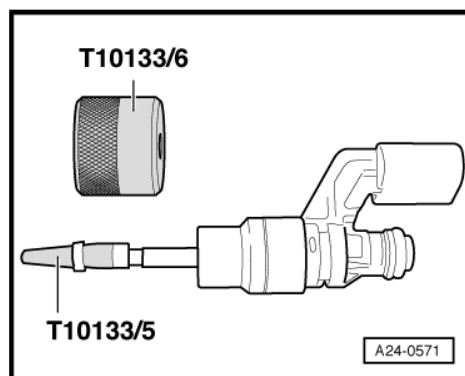
The teflon ring is widened as it is pushed onto the injector. The teflon ring must therefore be compressed again after it has been fitted. This is done in two steps. The procedure is described below.

Step 1 of teflon ring seal calibration (adaption) is done with calibration sleeve -T10133/7- .

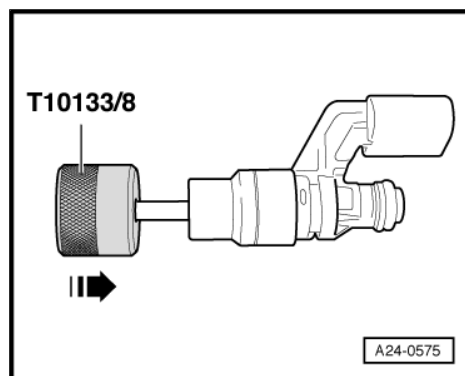
- Slide calibration sleeve -T10133/7- onto injector as far as the stop by pressing lightly and turning approx. 180°. Pull calibration sleeve -T10133/7- off again by turning it in the opposite direction.

Step 2 of teflon ring seal calibration (adaption) is done with calibration sleeve -T10133/8- .

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- Slide calibration sleeve -T10133/8- onto injector as far as the stop by pressing lightly and turning 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.
- The teflon ring must not be lubricated.

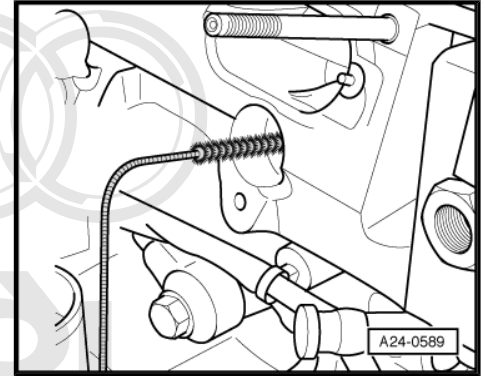


- Use supplied nylon brush -T10133/4- to thoroughly clean holes for high-pressure injectors in cylinder head prior to installing injector.

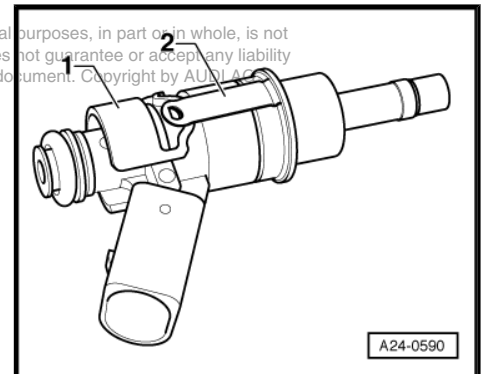


Note

An open inlet valve may prevent cleaning. If so, the engine must be cranked by hand by rotating the crankshaft with a spanner.

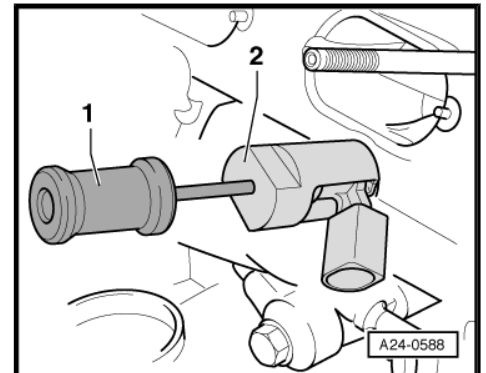


- Refit support ring -1- on injector and clip radial compensation element -2- onto support ring.
- Push injector by hand as far as it will go into aperture in cylinder head (do not use oil or grease). Ensure that the injector is properly seated in the cylinder head.



Note

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



Important: the following points must always be observed:

- Coat O-rings of high-pressure injectors with clean engine oil to facilitate insertion into fuel rail.
- Renew all seals.
- Fuel rail must be positioned on injectors and pressed in evenly.
- Install intake manifold with fuel rail ⇒ [page 25](#) .

2.16 Cleaning injectors

Special tools and workshop equipment required

- ◆ Ultrasonic cleaning unit - VAS 6418-
- ◆ Mounting plate for injection modules - VAS 6418/1-
- ◆ Cleaning fluid - VAS 6418/2-

Cleaning

- Remove injectors ⇒ [page 29](#) .



Note

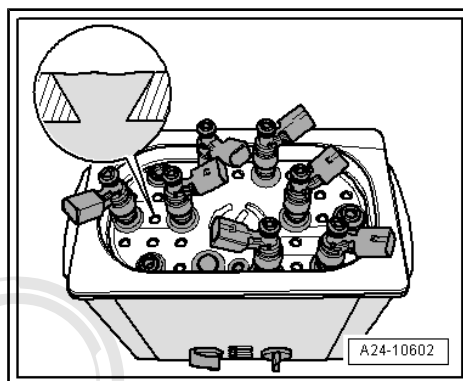
Observe safety precautions and operating instructions for ultrasonic unit.

- Ultrasonic unit must be filled with cleaning fluid - VAS 6418/2- .

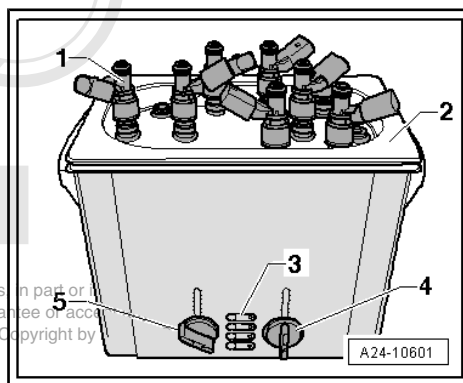


Note

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



- Insert injectors -1- all the way into mounting plate for injection modules - VAS 6418/1- -2-; injectors will then be immersed in 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

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

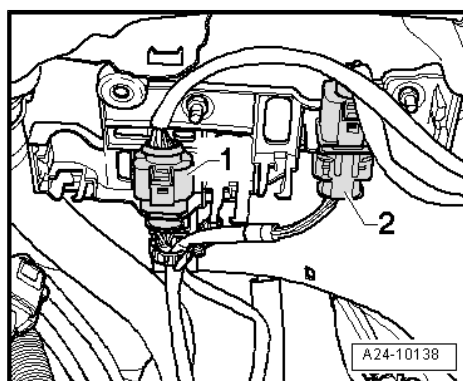
- After cleaning, always renew combustion chamber ring seal (teflon ring seal) for each injector ⇒ [page 31](#) .
- Then re-install injectors ⇒ [page 29](#) .

2.17 Lambda probes - overview

Electrical connectors for Lambda probes

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

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



Lambda probes

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

2 - Lambda probe - G39- and Lambda probe heater - Z19-

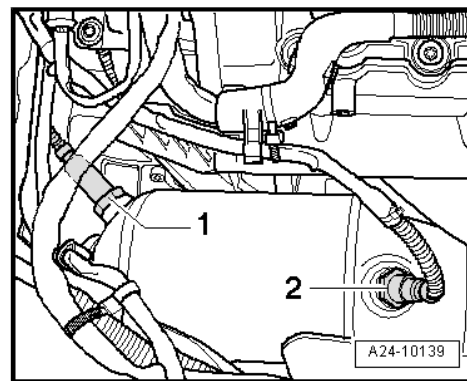
Tightening torque for Lambda probes

- ◆ 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*
- ◆ *The electrical wiring of the lambda probe must be secured at the original locations when installing. The wiring must NOT come into contact with the exhaust pipe.*



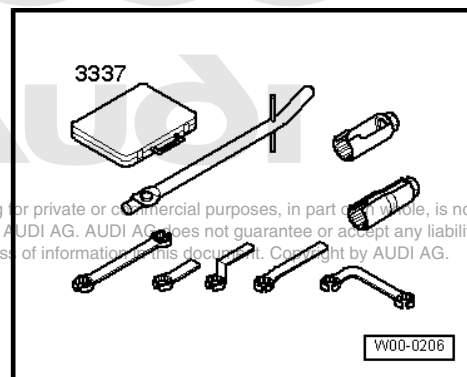
Removing and installing Lambda probe - G39- and Lambda probe heater - Z19- ⇒ [page 35](#) .

Removing and installing Lambda probe after catalytic converter - G130- and Lambda probe 1 heater after catalytic converter - Z29- ⇒ [page 36](#)

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

Special tools and workshop equipment required

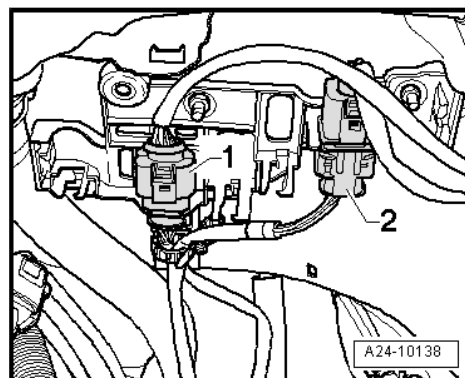
- ◆ Lambda probe open ring spanner set - 3337-



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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- .

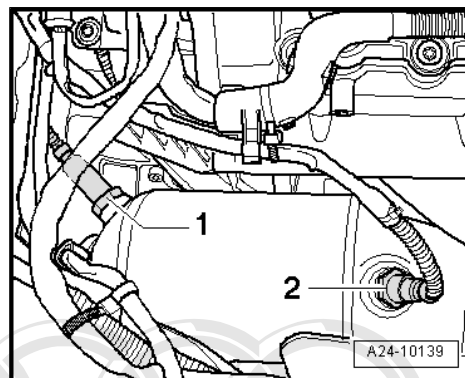
Installing

When installing, note the following:



Note

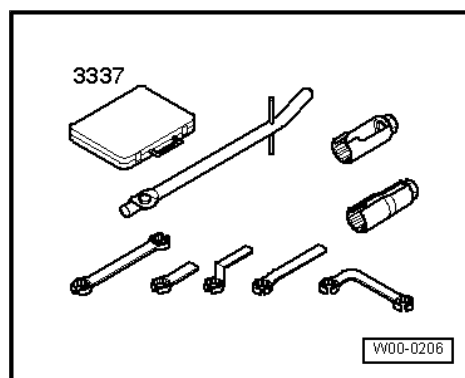
- ◆ New Lambda probes are coated with an assembly paste. The paste must not get into the slots on the Lambda probe body.
- ◆ In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the Lambda probe body. High-temperature paste → Parts catalogue
- ◆ The electrical wiring of the lambda probe must be secured at the original locations when installing. The wiring must NOT come into contact with the exhaust pipe.
- ◆ Tightening torque: refer to overview of Lambda probes
⇒ [page 34](#) .



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

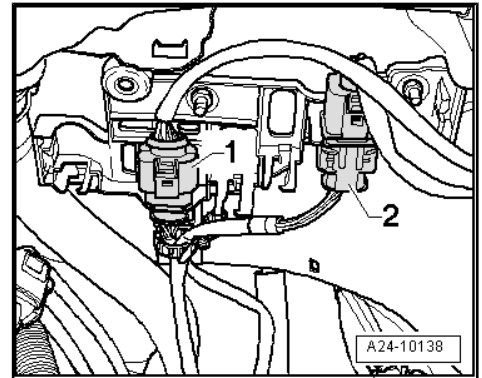
Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set - 3337-



Removing

- Unplug connector -2- (brown) for Lambda probe after catalytic converter - G130- .



- Unscrew Lambda probe after catalytic converter - G130- -1- using tool from Lambda probe open ring spanner set - 3337- .

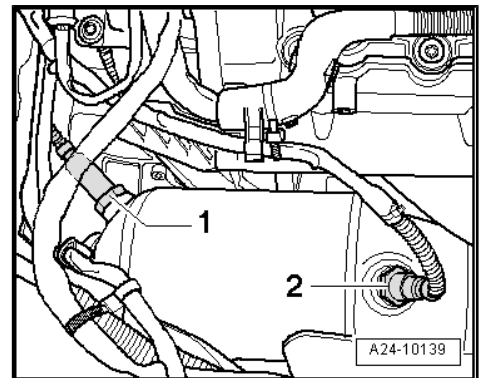
Installing

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*
- ◆ *The electrical wiring of the lambda probe must be secured at the original locations when installing. The wiring must NOT come into contact with the exhaust pipe.*
- ◆ Tightening torque: refer to overview of Lambda probes
⇒ [page 34](#) .



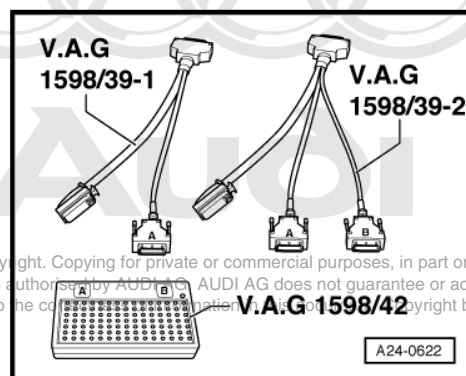
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3 Engine control unit

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

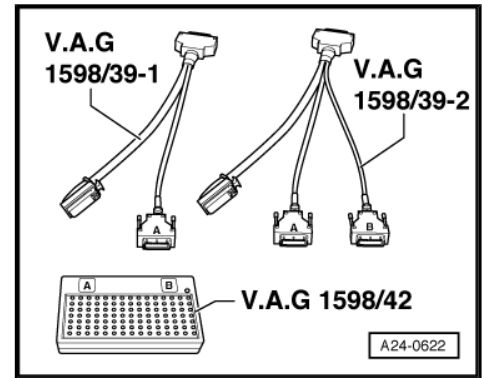
Special tools and workshop equipment required

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



**Note**

- ◆ *The test box has 105 sockets. The connecting cable can be disconnected from the test box. This means that only the cable (and not the test box) has to be purchased for future engine control units with different types of connectors.*
- ◆ *The smaller of the two connectors on the engine control unit has the contacts 1 to 60. The larger of the two connectors has the contacts 1 to 94.*
- ◆ *To carry out tests on the 60-pin wiring harness connector, the adapter cable - V.A.G 1598/39-1- is connected to connector "A" on the test box. For components connected to 60-pin wiring harness connector ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.*
- ◆ *To carry out tests on the 94-pin wiring harness connector, the adapter cable - V.A.G 1598/39-2- must be connected to connectors "A" and "B" on the test box. For components connected to 94-pin wiring harness connector ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.*
- ◆ *The test box - V.A.G 1598/42- is designed so it can be connected both to the wiring harness for the engine control unit and to the engine control unit itself at the same time.*
- ◆ *The advantage of this is that the electronic engine control system remains fully functional when the test box is connected (for example, for measuring signals when the engine is running).*
- ◆ *The relevant test procedure will state whether it is necessary to also connect the engine control unit to the test box.*
- ◆ *Always use auxiliary measuring set - V.A.G 1527B- to connect test equipment (e.g. voltage tester - V.A.G 1526C- , hand-held multimeter - V.A.G 1594C- etc.).*

**WARNING**

To prevent irreparable damage to the electronic components, select appropriate measuring range before connecting the measuring cables and observe the test requirements.

- Remove engine control unit ⇒ [page 40](#) .
- Connect test box - V.A.G 1598/42- to wiring harness with adapter cable - V.A.G 1598/39-1- or adapter cable - V.A.G 1598/39-2- . Connect earth clip of test box to negative terminal of battery. The instructions for performing the individual tests indicate whether or not the engine control unit itself also needs to be connected to the test box.
- Carry out test as described in appropriate repair procedures.

Installing engine control unit

Installation is performed in the reverse sequence.

- After installation, the locking plate must be re-fitted on the 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.

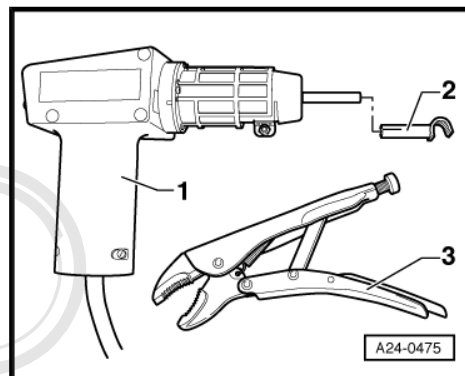
Perform the following after reconnecting engine control unit:

- Interrogate event memory.

3.2 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-

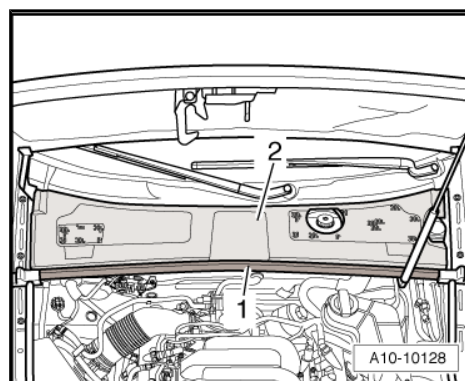


Note

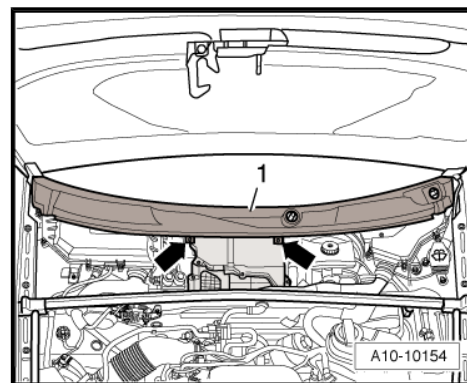
- ◆ *Not every engine control unit is bolted to a protective housing. Whether a protective housing is fitted depends on the engine/gearbox combination.*
- ◆ *When the engine control unit is disconnected, the learnt values are erased but the contents of the fault memory remain intact.*

Removing

- When renewing engine control unit, select diagnosis object "Replace engine control unit" in "Guided Functions" ⇒ Vehicle diagnostic tester.
- Switch off ignition and remove ignition key.
- Pull off rubber seal -1- on plenum chamber cover.
- Detach plenum chamber cover -2-.
- Use screwdriver to pry off cover caps on windscreen wiper arms and unscrew hexagon nuts.
- Pull windscreen wiper arms off wiper shafts.



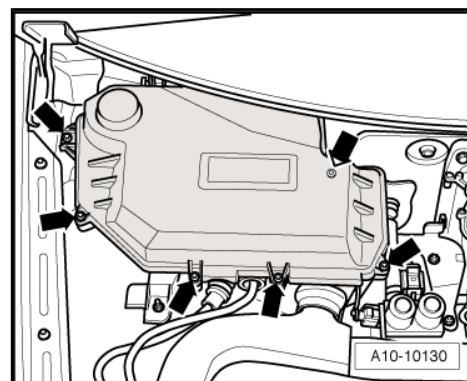
- Unscrew bolts (left and right) -arrows- from cowl panel -1-.



- Unscrew bolts -arrows- and take off lid for electronics box.

**WARNING**

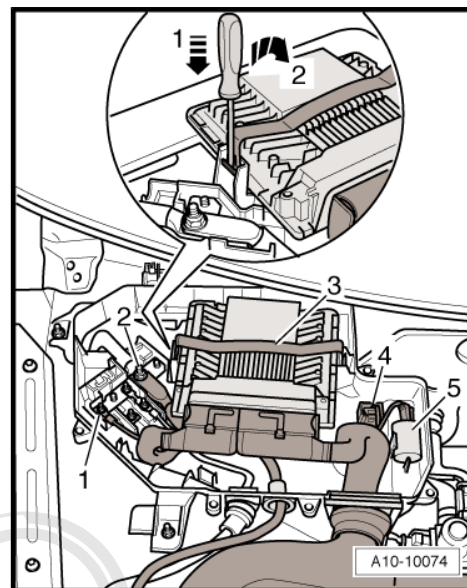
The pump valve unit for heating system (left in front of electronics box) gets very hot - risk of burns!



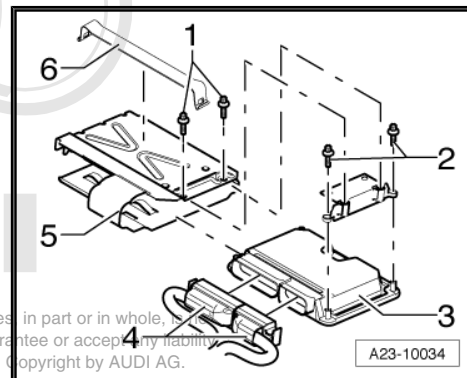
- Carefully lever out the retaining strap -3- using a screwdriver -arrows 1 and 2- and remove the engine control unit from the electronics box.

To help prevent unauthorised access to the connectors on the engine control unit, the control unit is secured by means of shear bolts to a locking plate and a metal casing.

The threads of the two shear bolts -1- 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.



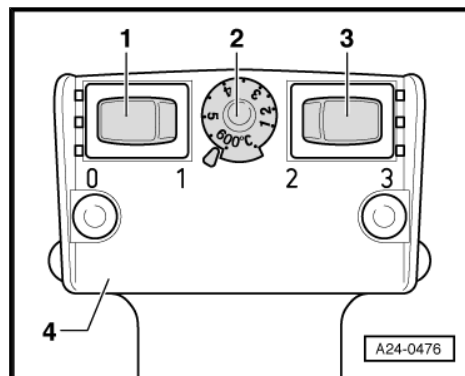
The threads of the two shear bolts -2- which are screwed into the engine control unit are not secured with locking fluid. Do not apply heat to the threads in the control unit housing; this is not necessary and would cause overheating of the control unit.



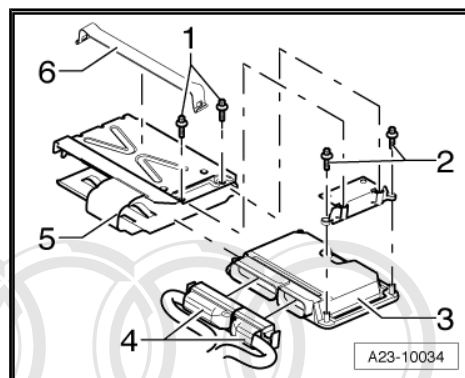
- Select settings on hot air blower as shown in illustration, i.e. set temperature potentiometer -2- to maximum heat output and two-stage air flow switch -3- to position 3.


WARNING

Heating the thread of the locking plate also heats up the shear bolts and parts of the metal housing. Take care to avoid burns. It is also important to ensure that only the thread is heated and none of the surrounding components if at all possible. These should be covered if necessary.



- Apply heat to the threads of the shear bolts -1- for approx. 25 to 30 seconds.
- Unscrew shear bolts using vice-grip pliers.
- The two shear bolts screwed into the control unit do not need to be heated. They should be removed without being heated.
- Detach metal locking plate from control unit connectors.



- Release connectors -4- on engine control unit and unplug connectors.
- Take out old engine control unit - J623- and install new engine control unit - J623- .

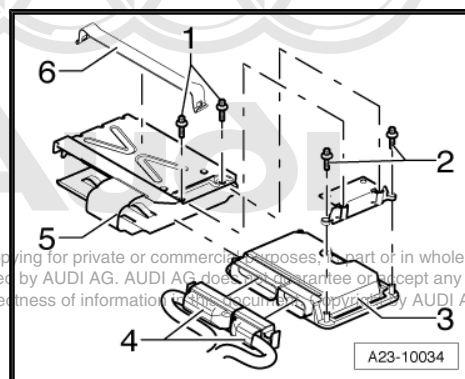
Installing

Installation is performed in the reverse sequence.

- After installation, the locking plate must be re-fitted on the engine control unit - J623- .
- Clean threaded holes for shear bolts to remove any residue from locking fluid. This can be done using a thread tap.
- Always use new shear bolts.
- ◆ Tightening torque for bolts securing lid of electronics box: 3.5 Nm.

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

- Activate engine control unit in “Guided Functions” mode, “Re-new engine control unit” ⇒ Vehicle diagnostic tester.



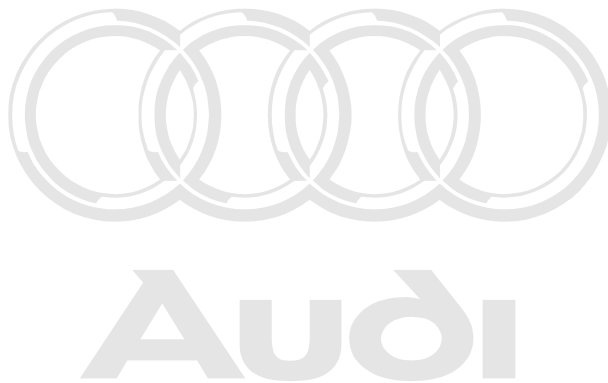
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28 – Ignition system

1 General notes and safety precautions

1.1 General notes on ignition system

- ◆ The engine control unit has a self-diagnosis capability.
- ◆ A voltage of at least 11.5 V is required for proper operation of the electrical components.
- ◆ Certain tests may lead to 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.



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2 Servicing ignition system

2.1 Test data

Engine data	2.0 ltr. turbo FSI engine
Idling speed is not adjustable; controlled by the 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 ignition system with 4 ignition coils (integrated output stages) connected directly to spark plugs via spark plug connectors; ignition coils can be pulled out of cylinder head using puller - T40039 -
Firing order	1-3-4-2

2.2 Ignition system - exploded view

1 - Knock sensor 1 - G61- and knock sensor 2 - G66-

- Contacts gold-plated

2 - Ignition coil with output stage - (N70, N127, N291, N292)-

- Removing and installing
⇒ [page 45](#)
- Use puller - T40039- for
removal

3 - Spark plug

- 30 Nm
- Removing and installing
⇒ Maintenance ; Book-
let 405

4 - Bolt

- Renew
- 20 Nm
- Tightening torque influ-
ences the function of the
knock sensors

5 - Bolt

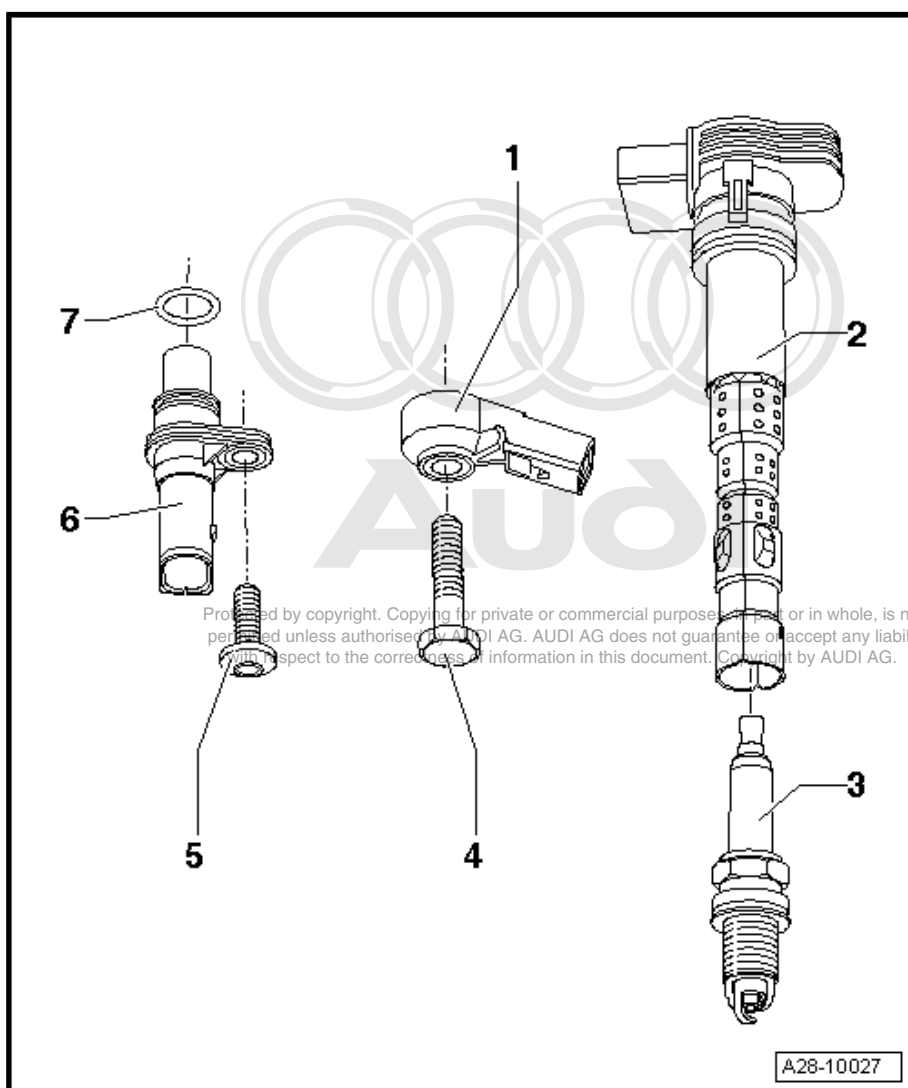
- 10 Nm

6 - Hall sender - G40-

- Contacts gold-plated

7 - O-ring

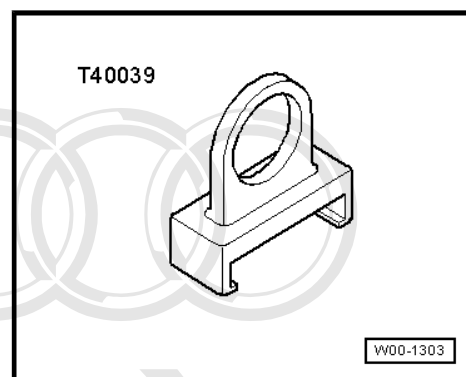
- Renew O-Ring if dam-
aged



2.3 Removing and installing ignition coils with output stages

Special tools and workshop equipment required

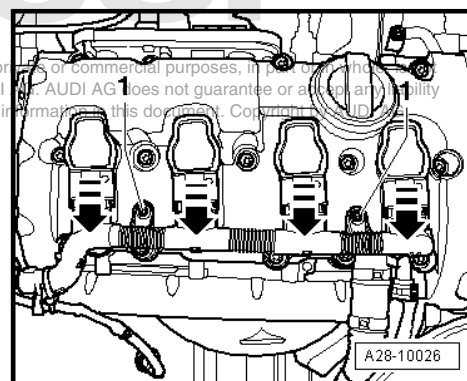
- ◆ Puller - T40039-



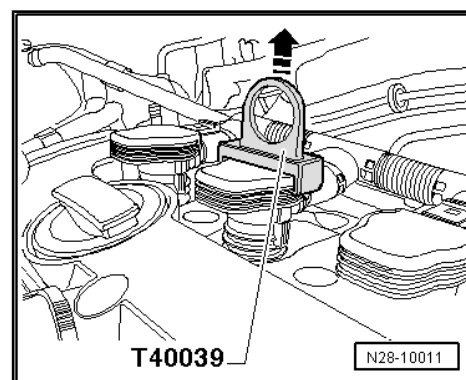
Removing:

- Unscrew two bolts -1- on connector rail.

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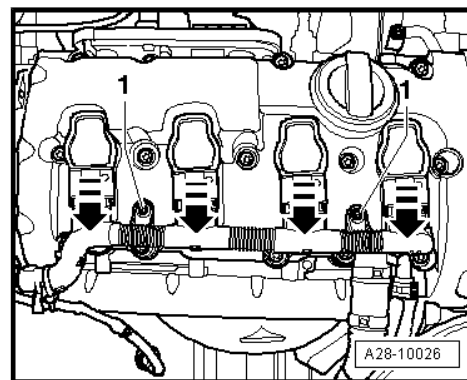
- Pull all ignition coils approx. 30 mm out of spark plug holes using puller - T40039-.



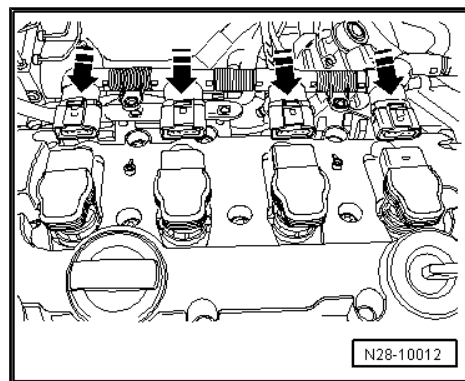
- Release connectors and unplug all connectors from the ignition coils at the same time.

Installing:

- Fit all ignition coils loosely into spark plug holes.



- Align the ignition coils with the connectors and attach all connectors onto ignition coils simultaneously.
- Press ignition coils onto spark plugs by hand with uniform pressure (do not use any tools).



2.4 Removing and installing knock sensor 1 - G61- and knock sensor 2 - G66-

Removing

- Remove intake manifold
⇒ [“2.9 Removing and installing intake manifold with fuel rail”, page 21](#).
- Unplug electrical connector at relevant knock sensor.



Note

The knock sensors are located beneath the intake manifold.

Knock sensors

- 1 - Knock sensor 1 - G61-
- 2 - Knock sensor 2 - G66-
- Unscrew relevant knock sensor.

Installing

- Install in reverse order.
- Install intake manifold
⇒ [“2.9 Removing and installing intake manifold with fuel rail”, page 21](#).

Tightening torque

- Ignition system - exploded view
⇒ [“2.2 Ignition system - exploded view”, page 44](#)

