

Workshop Manual Audi A1 2011 ➤

**Direct petrol injection and ignition system (4-cyl. 1.2 ltr.
2-valve turbo with timing chain)**

Engine ID	CBZ A								
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Edition 01.2013



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List of Workshop Manual Repair GroupsList of Workshop Manual Repair Groups

Repair Group

24 - Mixture preparation - injection

28 - Ignition system



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

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24 – Mixture preparation - injection

1 Safety precautions and rules for cleanliness

(ARL003223; Edition 01.2013)

⇒ [“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 Safety precautions when working on the fuel system”, page 3](#)

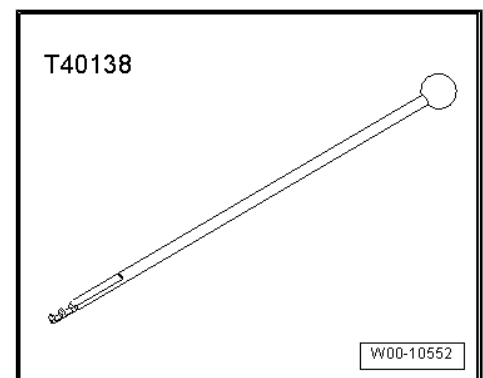
⇒ [“1.5 Safety precautions when working on the ignition system”, page 4](#)

⇒ [“1.6 Reducing pressure in high-pressure section of injection system”, 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. Before carrying out repairs and fault finding, the event memory must be interrogated. The vacuum hoses and connections must also be checked (unmetered air).
- ◆ Fuel hoses in engine compartment must only be secured with spring-type clips. O-type clips or screw-type clips must not be used.
- ◆ A voltage of at least 11.5 V is required for proper operation of the electrical components.
- ◆ Do not use sealants containing silicone. Particles of silicone drawn into the engine will not be burnt in the engine and will damage the Lambda probe.
- ◆ The vehicles are fitted with a crash/fuel shut-off system. This system is designed to reduce the risk of a vehicle fire after a crash by deactivating the fuel pump via the fuel pump relay.
- ◆ At the same time, this system also improves the engine's starting performance. When the driver's door is opened, the fuel pump is activated for 2 seconds in order to build up pressure in the fuel system ⇒ [page 2](#).
- ◆ Use release tool -T40138- to unplug connectors that cannot be accessed easily.



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

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



WARNING

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

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

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

1.3 Safety precautions 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 Safety precautions when working on the 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.***



Note

- ◆ *The fuse is located in the fuse holder behind the dash panel cover.*
- ◆ *Removing the fuse will interrupt the voltage supply »terminal 30« for the fuel pump control unit -J538-.*
- ◆ *For fuse for fuel pump control unit -J538- refer to applicable current flow diagram ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.*

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

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 xenon headlights.
- ◆ Do not open any fuel line connections while the engine is running.
- ◆ Always switch off the ignition before connecting or disconnecting injection or ignition system wiring or tester cables.
- ◆ If the engine is to be operated at cranking speed without it starting (e.g. compression test), unplug the connectors from the ignition coils and remove the fuse for the electric fuel pump.
- ◆ Certain tests may lead to a fault being detected by the control unit and stored. The event memory should therefore be interrogated and (if necessary) erased after completing the tests and any repair work that may be required.
- ◆ If the event memory has been erased, you must generate the readiness code again.
- ◆ Always switch off the ignition before cleaning the engine.
- ◆ If you want to crank the engine at starting speed without actually starting it (e.g. compression test), first unplug the four connectors from the ignition transformer. Also remove fuse for fuel pump control unit -J538-.

1.6 Reducing pressure in high-pressure section of injection system

Special tools and workshop equipment required

- ◆ Vehicle diagnostic tester



WARNING

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

- ◆ ***The injection system consists of a high-pressure section (maximum approx. 120 bar) and a low-pressure section (approx. 7 bar).***
- ◆ ***Prior to opening the high-pressure section (e.g. when removing the high-pressure pump, fuel rail, injectors, fuel pipes or fuel pressure sender -G247-), the fuel pressure in the high-pressure section must be reduced to a specified level. The procedure is described below.***

Reducing fuel pressure in high-pressure section

- Connect a ⇒ Vehicle diagnostic tester.
- Start engine and run at idling speed.
- Select “Engine electronics” in vehicle self-diagnosis.
- Then select “Basic setting”.
- Select “Reducing fuel pressure in fuel rail” from the list.
- Then select “Measured values”.
- Call up fuel pressure.

- Press the “Start” key.
- Observe fuel pressure displayed on tester.
- Fuel pressure will drop to a specified value.
- Switch off engine.

**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**

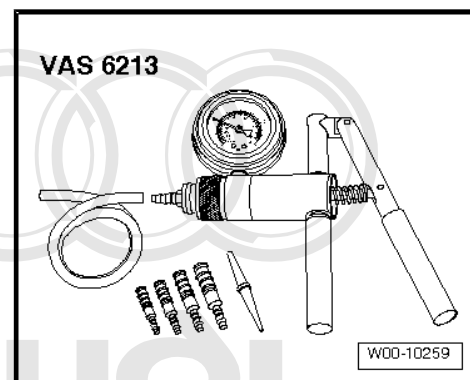
The pressure will increase again due to the effect of residual heat if the high-pressure system is not opened immediately.

- Using a ⇒ Vehicle diagnostic tester, 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-



Procedure

- Check all vacuum lines in the complete vacuum system for:
 - ◆ Cracks
 - ◆ Traces of animal bites
 - ◆ Kinked or crushed lines
 - ◆ Lines porous or leaking
- Check vacuum line to solenoid valve and from solenoid valve to corresponding component.
- If a fault is stored in the event memory, check the vacuum lines leading to the corresponding component and also check the remaining vacuum lines leading to other components.

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- 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		1.2 ltr. / 63 kW 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)	3 to 7 bar
	Pressure in high-pressure fuel circuit (generated by mechanical single-plunger high-pressure pump) at a coolant temperature of approx. 85°C	approx. 35 bar at idling speed approx. 140 bar in certain parts of operating range

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2.2 Overview of fitting locations - injection system

Components A to F are not shown in the exploded view of components.

1 - Oil pressure switch -F1-

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

2 - Solenoid for coolant circuit -N492-

- ☐ Fitting location
⇒ [page 12](#)

3 - Intake air temperature sender -G42- and intake manifold pressure sender -G71-

- ☐ Fitting location
⇒ [page 12](#)
- ☐ In standard production, intake air temperature sender -G42- is clipped on via retainer tabs (moulded onto intake manifold), but not bolted on. If a retainer tab should break off, intake air temperature sender -G42- can be secured with securing bolts

4 - Charge air cooler

6 - Coolant circulation pump - V50-

- ☐ Fitting location
⇒ [page 13](#)

7 - Knock sensor 1 -G61-

- ☐ Fitting location
⇒ [page 13](#)
- ☐ Removing and installing ⇒ ["2.3 Removing and installing knock sensor 1 G61", page 55](#)
- ☐ 20 Nm

8 - Ignition transformer -N152-

- ☐ Fitting location ⇒ [page 12](#)

9 - 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-
- ☐ After throttle valve module -J338- or engine control unit has been renewed, throttle valve module must be re-adapted to engine control unit -J623- using a vehicle diagnostic tester

10 - Vacuum sender -G608-

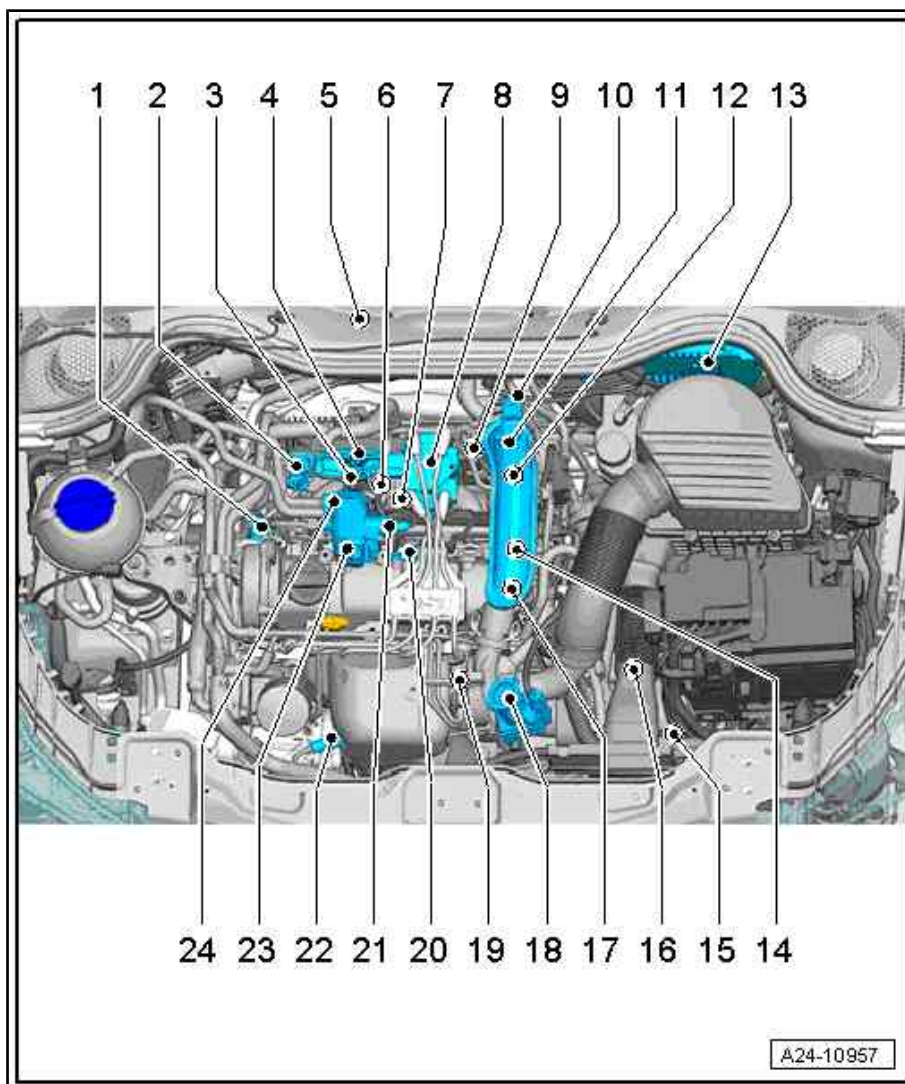
- ☐ Only installed on vehicles with dual clutch gearbox
- ☐ For removing and installing refer to Brake system ⇒ Rep. gr. 45

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

- ☐ Fitting location ⇒ [page 13](#)
- ☐ Removing and installing, refer to engine - mechanics ⇒ Rep. gr. 21

12 - Engine speed sender -G28-

- ☐ Fitting location ⇒ [page 13](#)
- ☐ Removing and installing ⇒ [page 55](#)
- ☐ 5 Nm



13 - Engine control unit -J623-

- ☐ Fitting location ⇒ [Fig. "Engine control unit -J623-", page 10](#)
- ☐ Removing and installing ⇒ ["9.2 Removing and installing engine control unit J623", page 48](#)

14 - Fuel pressure sender -G247-

- ☐ Fitting location ⇒ [page 11](#)
- ☐ Removing and installing ⇒ [page 39](#)

15 - Radiator outlet coolant temperature sender -G83-

- ☐ Fitting location ⇒ [page 13](#)
- ☐ Removing and installing, refer to engine - mechanics ⇒ Rep. gr. 19

16 - Electrical connectors for Lambda probes

- ☐ Fitting location ⇒ [page 15](#)

17 - Coolant temperature sender -G62-

- ☐ Fitting location ⇒ [page 12](#)

18 - Charge pressure positioner -V465-

- ☐ Located directly on turbocharger ⇒ [page 15](#)
- ☐ Charge pressure positioner -V465- can only be renewed together with turbocharger
- ☐ Removing and installing turbocharger ⇒ Rep. gr. 21
- ☐ Adaption of charge pressure positioner -V465- must be performed after renewal; use a vehicle diagnostic tester

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

- ☐ Fitting location ⇒ [page 15](#)
- ☐ Fitting location of electrical connector ⇒ [page 15](#)
- ☐ Removing and installing ⇒ [page 45](#)

20 - Hall sender -G40-

- ☐ Fitting location ⇒ [page 12](#)
- ☐ Removing and installing ⇒ [page 55](#)

21 - Fuel pressure regulating valve -N276-

- ☐ Fitting location ⇒ [page 12](#)

22 - Lambda probe -G39- and Lambda probe heater -Z19-

- ☐ Fitting location ⇒ [page 14](#)
- ☐ Fitting location of electrical connector ⇒ [page 15](#)
- ☐ Removing and installing ⇒ [page 44](#)

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

- ☐ Fitting location ⇒ [page 12](#)
- ☐ Removing and installing ⇒ [page 28](#)

24 - Activated charcoal filter solenoid valve 1 -N80-

- ☐ Fitting location ⇒ [page 12](#)

A - Injectors

- ☐ Removing and installing ⇒ [page 31](#)
- ☐ Injector, cylinder 1 -N30-
- ☐ Injector, cylinder 2 -N31-
- ☐ Injector, cylinder 3 -N32-
- ☐ Injector, cylinder 4 -N33-

B - Clutch position sender -G476-

- ☐ Only fitted on vehicles with manual gearbox
- ☐ Fitting location ⇒ [page 11](#)
- ☐ Removing and installing, see Power transmission, clutch ⇒ Rep. gr. 30

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

- ☐ Fitting location ⇒ [page 11](#)
- ☐ For removing and installing refer to Brake system ⇒ Rep. gr. 45

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

- ☐ Fitting location ⇒ [page 10](#)
- ☐ On accelerator pedal (both senders are accommodated in one housing)
- ☐ If accelerator pedal module or engine control unit is renewed, kick-down function must be adapted on vehicles with automatic gearbox
- ☐ Removing and installing; Fuel supply system, petrol engines ⇒ Rep. gr. 20

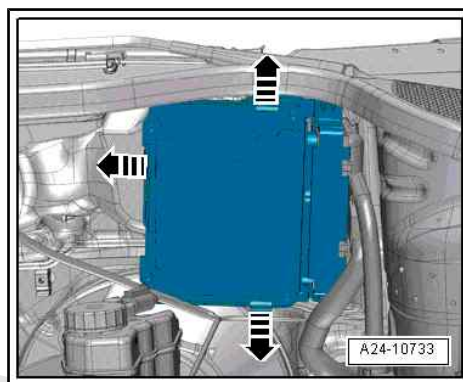
E - Fuel pump control unit -J538-

- ☐ Fitting location ⇒ [page 11](#)
- ☐ Removing and installing; Fuel supply system, petrol engines ⇒ Rep. gr. 20

F - Radiator fan control unit -J293- with radiator fan -V7-

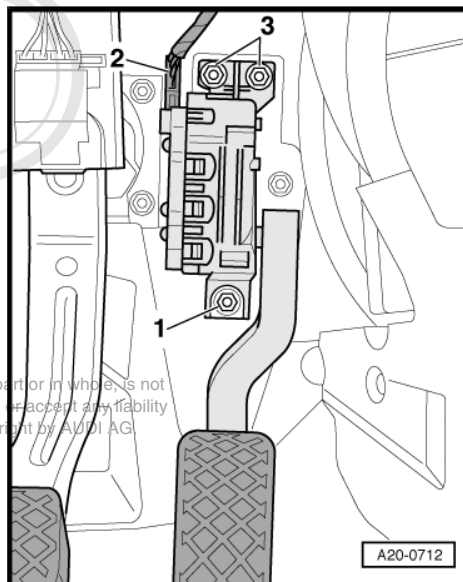
- ☐ Removing and installing, refer to engine - mechanics ⇒ Rep. gr. 19

Engine control unit -J623-



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

2 - Electrical connector for accelerator pedal module

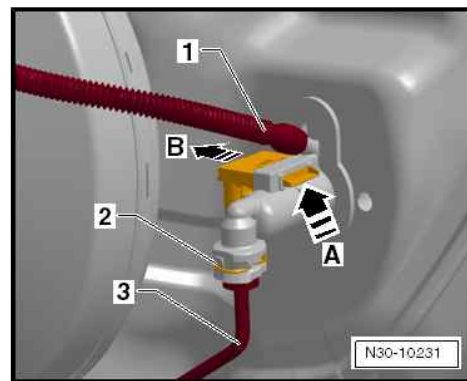


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Clutch position sender -G476-

- ◆ On clutch master cylinder, next to brake servo

Removing and installing, see Power transmission, clutch ⇒ Rep. gr. 30



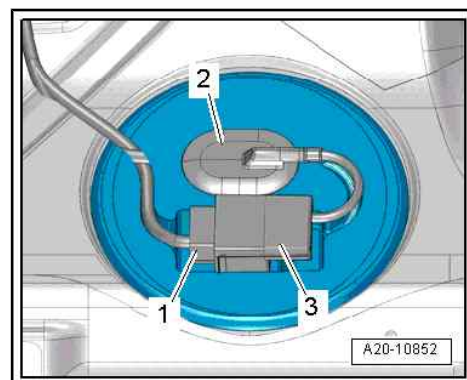
Fuel pump control unit -J538-

- 1 - Connector for fuel pump control unit -J538-

- 2 - Fuel system pressurisation pump -G6-

- 3 - Fuel pump control unit -J538-

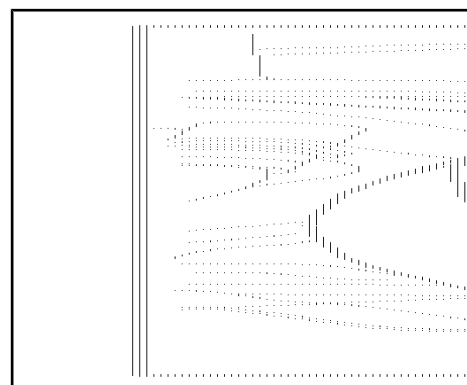
Removing and installing ⇒ Rep. gr. 20



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

- ◆ On brake master cylinder

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

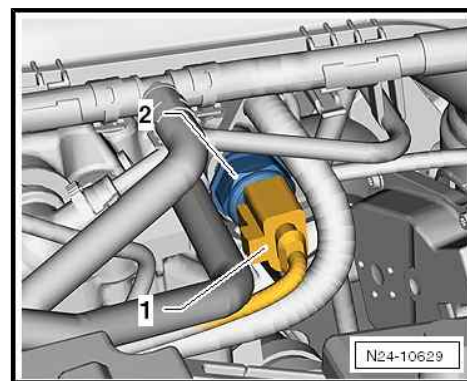


Fuel pressure sender -G247-

- 1 - Electrical connector for fuel pressure sender -G247-

- 2 - Fuel pressure sender -G247-

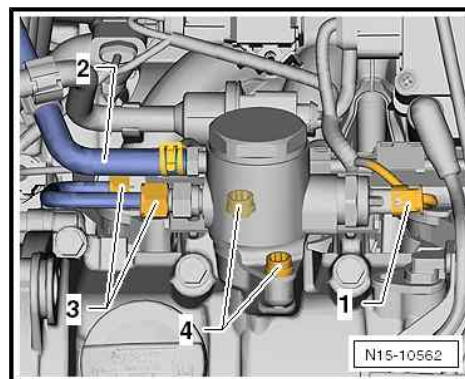
Removing and installing ⇒ [page 39](#)



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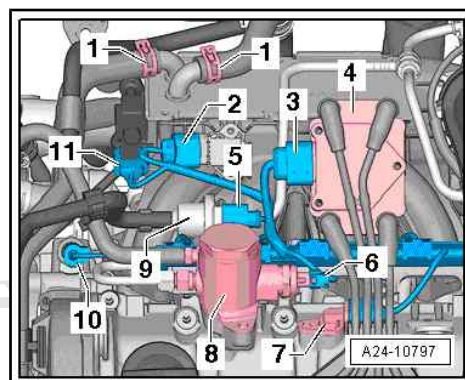
High-pressure fuel pump

- 1 - Fuel pressure regulating valve -N276-
- 2 - Fuel supply line
- 3 - High-pressure fuel pipe
- 4 - Bolts for high-pressure pump



Components

- 1 - Coolant hoses for charge air cooler
- 2 - Intake air temperature sender -G42- and intake manifold pressure sender -G71-
- 3 - Electrical connector for ignition transformer -N152-
- 4 - Ignition transformer -N152-
- 5 - Electrical connector for activated charcoal filter solenoid valve 1 -N80-
- 6 - Fuel pressure regulating valve -N276-
- 7 - Hall sender -G40-
- 8 - High-pressure fuel pump
- 9 - Activated charcoal filter solenoid valve 1 -N80-
- 10 - Oil pressure switch -F1-
- 11 - Solenoid for coolant circuit -N492-

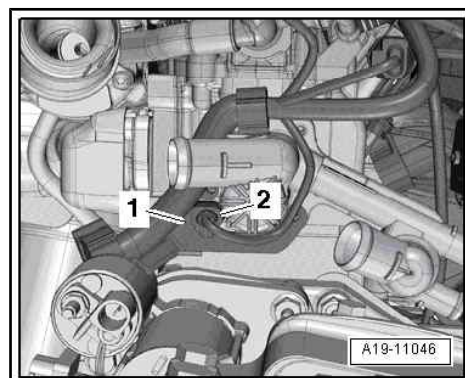


Note

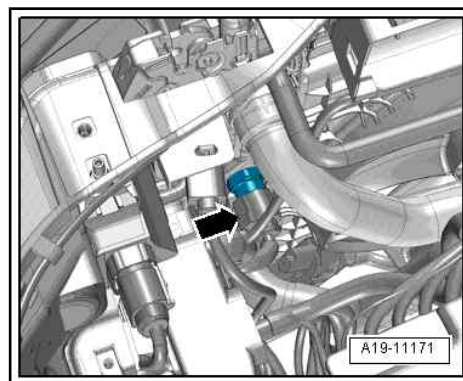
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In standard production, intake air temperature sender -G42- is clipped on via retainer tabs (moulded onto intake manifold), but not bolted on. If a retainer tab should break off, intake air temperature sender -G42- can be secured with securing bolts.

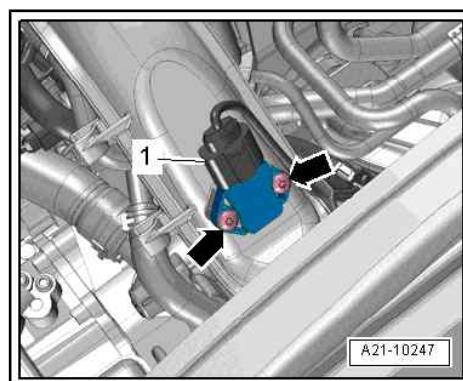
Coolant temperature sender -G62- -1-



Radiator outlet coolant temperature sender -G83- -arrow-

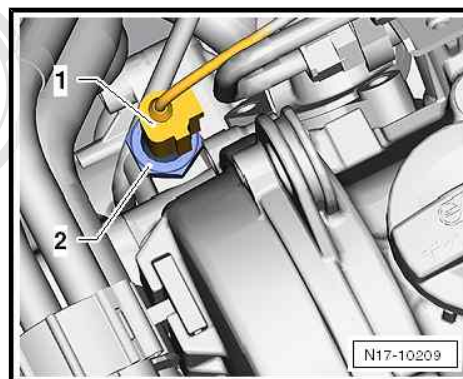


Charge pressure sender -G31- / intake air temperature sender 2 -G299- -1-



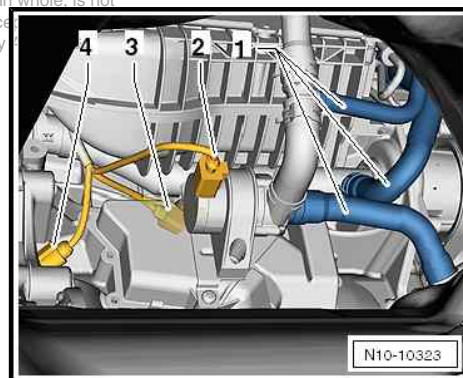
Oil pressure switch -F1-

- 1 - Electrical connector for oil pressure switch -F1-
- 2 - Oil pressure switch -F1-

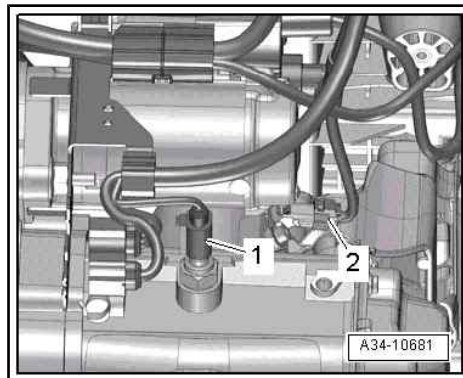


Components below intake manifold

- 1 - Coolant hoses
- 2 - Electrical connector for coolant circulation pump -V50-
- 3 - Electrical connector for knock sensor 1 -G61-
- 4 - Electrical connector for engine speed sender -G28-



Fitting location of gearbox neutral position sender -G701-

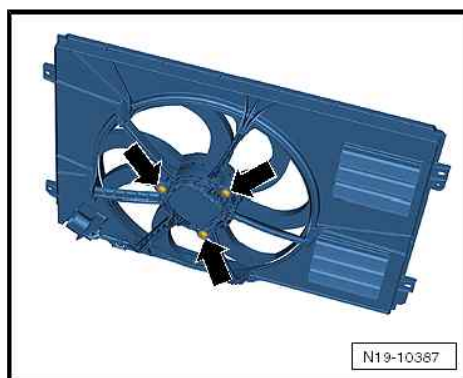


Radiator fan control unit -J293-

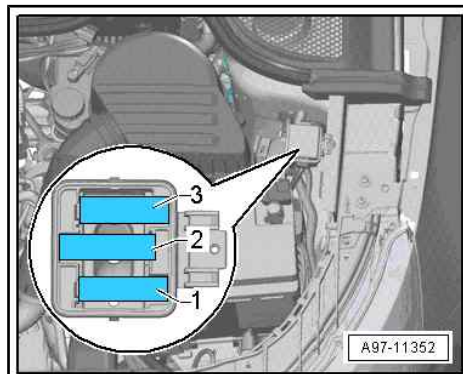


Note

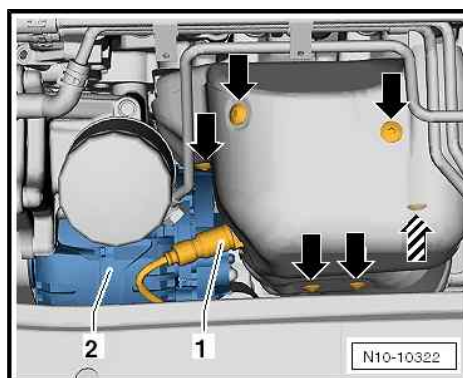
Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted. The radiator fan control unit -J293- is integrated into the radiator fan -V7-.



Additional coolant pump relay -J496- -1-

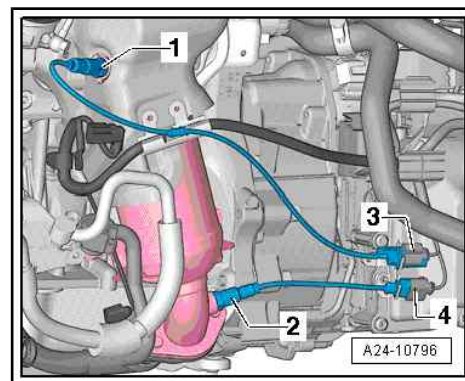


Lambda probe -G39- and Lambda probe heater -Z19- -1-



Fitting locations of 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-
- 3 - Electrical connector for Lambda probe -G39-
- 4 - Electrical connector for Lambda probe after catalytic converter -G130-

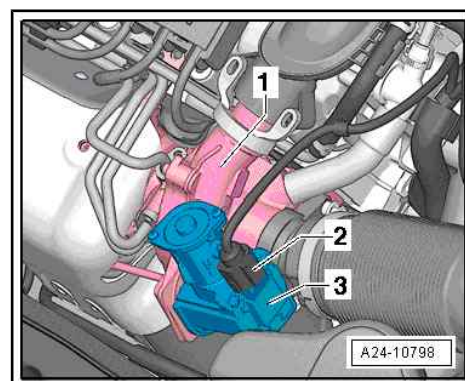


Components on turbocharger

- 1 - Removing and installing turbocharger ⇒ Rep. gr. 21
- 2 - Electrical connector for charge pressure positioner -V465-
- 3 - Charge pressure positioner -V465-

Charge pressure positioner -V465- can only be renewed together with turbocharger.

After charge pressure positioner -V465- has been renewed adaption must be performed using a ⇒ Vehicle diagnostic tester.



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3 Air cleaner

⇒ "3.1 Exploded view - air cleaner", page 16

⇒ "3.2 Removing and installing air filter element", page 17

3.1 Exploded view - air cleaner

1 - O-ring

- ☐ Renew if damaged

2 - Intake connecting pipe

3 - Spring-type clip

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

4 - Intake air duct

- ☐ Clean any leaves and dirt out of intake air duct

5 - Vacuum hose

- ☐ Renew if damaged
- ☐ To cylinder head cover

6 - Intake connecting pipe

7 - Air cleaner (top section)

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

8 - Bolt

- ☐ Tighten to 1.5 Nm using torque screwdriver - VAS 6494-

9 - Filter element

- ☐ Always use genuine part for air filter element
- ☐ Removing and installing ⇒ [page 17](#)
- ☐ Observe change intervals ⇒ Maintenance ; Booklet 819

10 - Rubber bush

11 - Air cleaner (bottom section)

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

12 - Bolt

- ☐ 8 Nm

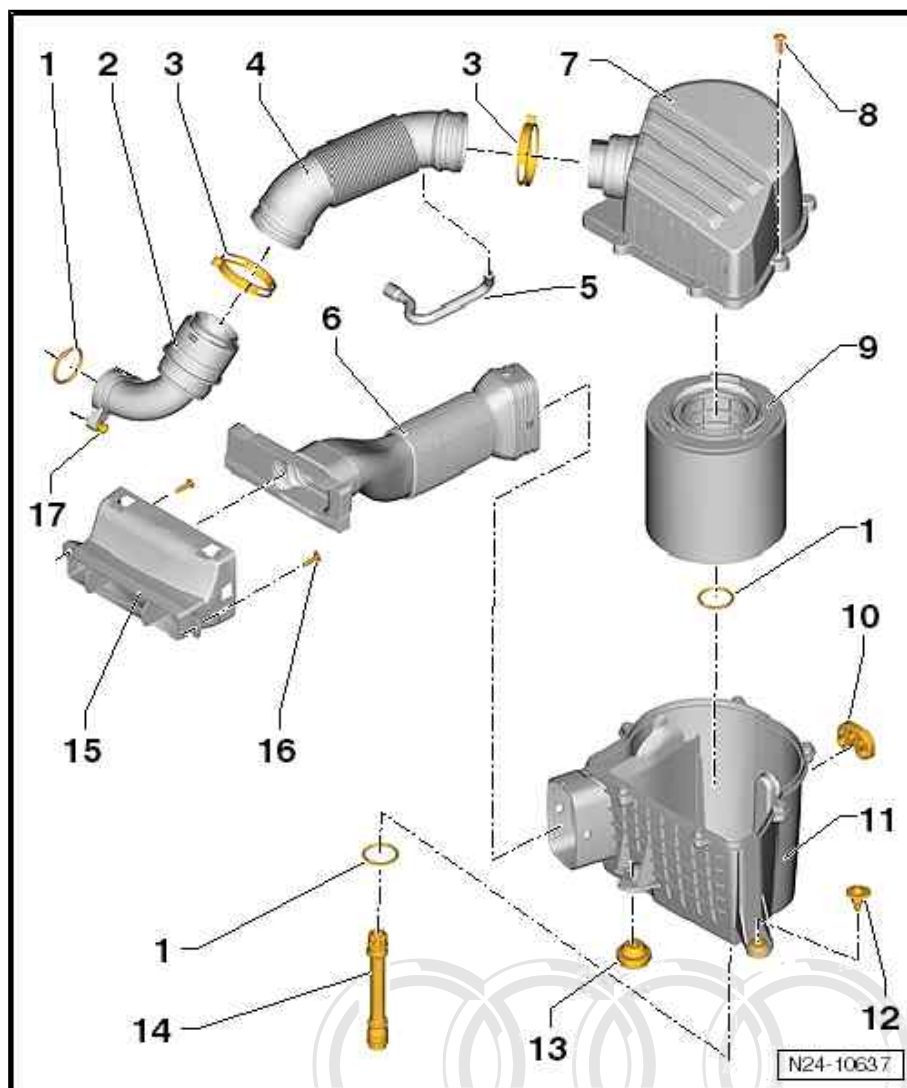
13 - Rubber bush

14 - Water drain connection

15 - Intake air duct

16 - Bolt

- ☐ 3 Nm



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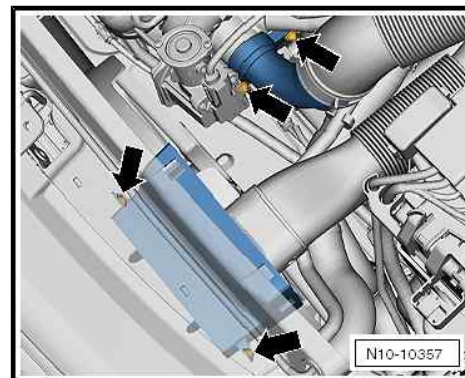
17 - Bolt

- 10 Nm

3.2 Removing and installing air filter element

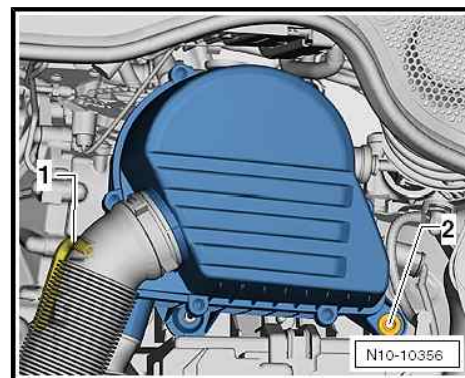
Removing

- Unscrew securing bolts -arrows-.

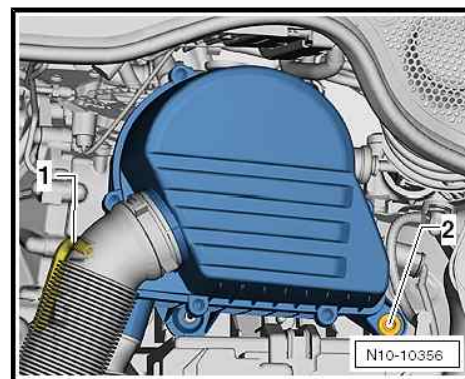


- Detach vacuum hose -1- beneath intake hose.
- Remove securing bolt -2-.
- Lift air cleaner housing.

Installing



- Press air cleaner housing onto mounting pins from above.
- Tighten securing bolt -2- to 8 Nm.
- Fit vacuum hose -1-.



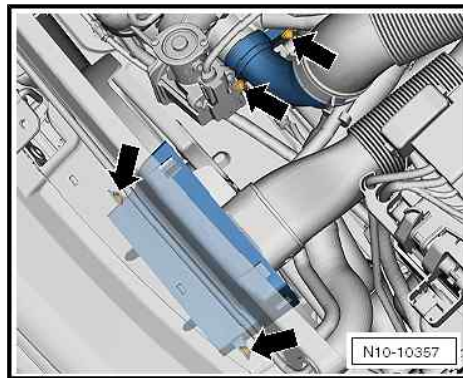
- Tighten securing bolts -arrows-.



Note

- ◆ Always use genuine part for air filter element.
 - ◆ Hose connections and hoses for charge air system must be free of oil and grease before assembly. Do not use any lubricants containing silicone when assembling.
 - ◆ The air cleaner housing must be clean.
 - ◆ Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue
 - ◆ To prevent malfunctions, cover all critical parts of the engine air intake tract with a clean cloth when blowing out the air cleaner housing with compressed air.
 - ◆ Please observe requirements for disposal.
- Check for salt residue, dirt and leaves in air intake hose (engine intake side).
 - Check for dirt in air intake hose from air duct.
 - Clean water drain and air cleaner (bottom section).
 - When installing the air filter element, check that it is properly centred in the retainer in the air cleaner (bottom section).
 - Fit the top section of the air cleaner carefully on the bottom section, without using force. Also ensure that both sealing strips are fitted (see item 7, Air cleaner - exploded view ⇒ [page 16](#)).

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



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4 Intake manifold

⇒ "4.1 Exploded view - intake manifold (part 1)", page 19

⇒ "4.2 Exploded view - intake manifold (part 2)", page 20

⇒ "4.3 Removing and installing intake manifold", page 21

⇒ "4.4 Removing and installing throttle valve module J338", page 23

⇒ "4.5 Cleaning throttle valve module J338", page 25

4.1 Exploded view - intake manifold (part 1)

1 - Connecting hose

- ☐ To air cleaner

2 - Electrical connector

- ☐ For intake manifold pressure sender -G71-
- ☐ Intake manifold pressure sender -G71- is only secured with retaining tabs; if the retaining tabs break off the intake manifold pressure sender -G71- must be secured with self-tapping screws

3 - Electrical connector

- ☐ Solenoid for coolant circuit -N492-

4 - Bolt

- ☐ 10 Nm

5 - Non-return valve

- ☐ For crankcase breather

6 - Connecting hose

- ☐ To turbocharger

7 - O-rings

- ☐ Renew

8 - Intake manifold

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

9 - Connecting hose

- ☐ To coolant pump



Note

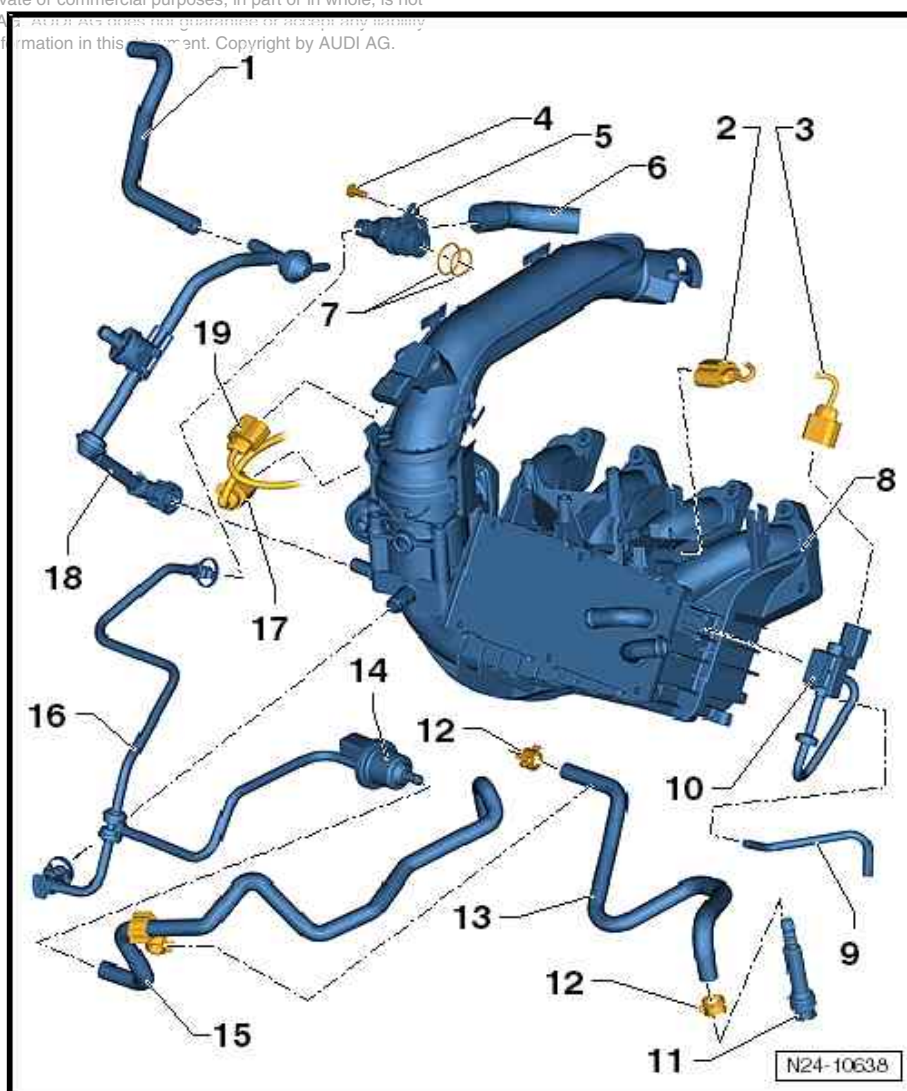
10 - Solenoid for coolant circuit -N492-



Note

11 - Connection

- ☐ For fuel supply



12 - Spring-type clip

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

13 - Fuel supply hose

- ☐ To high-pressure pump

14 - Activated charcoal filter solenoid valve 1 -N80-

15 - Connecting hose

- ☐ To activated charcoal filter

16 - Connecting hose

17 - Electrical connector

- ☐ For throttle valve module -J338-

18 - Connecting hose

19 - Connector

- ☐ For charge pressure sender -G31- with intake air temperature sender 2 -G299-

4.2 Exploded view - intake manifold (part 2)

1 - Pressure pipe

- ☐ Use lubricant when installing

2 - Bolt

- ☐ 7 Nm

3 - Retaining clip

4 - Fuel pressure sender - G247-

- ☐ 22 Nm
- ☐ Checking ⇒ [page 37](#)
- ☐ Removing and installing ⇒ [page 39](#)

5 - Fuel rail

6 - Bolt

- ☐ 20 Nm

7 - Adapter

- ☐ 30 Nm

8 - High-pressure pipe

- ☐ 25 Nm

9 - High-pressure pipe

- ☐ 18 Nm

10 - O-ring

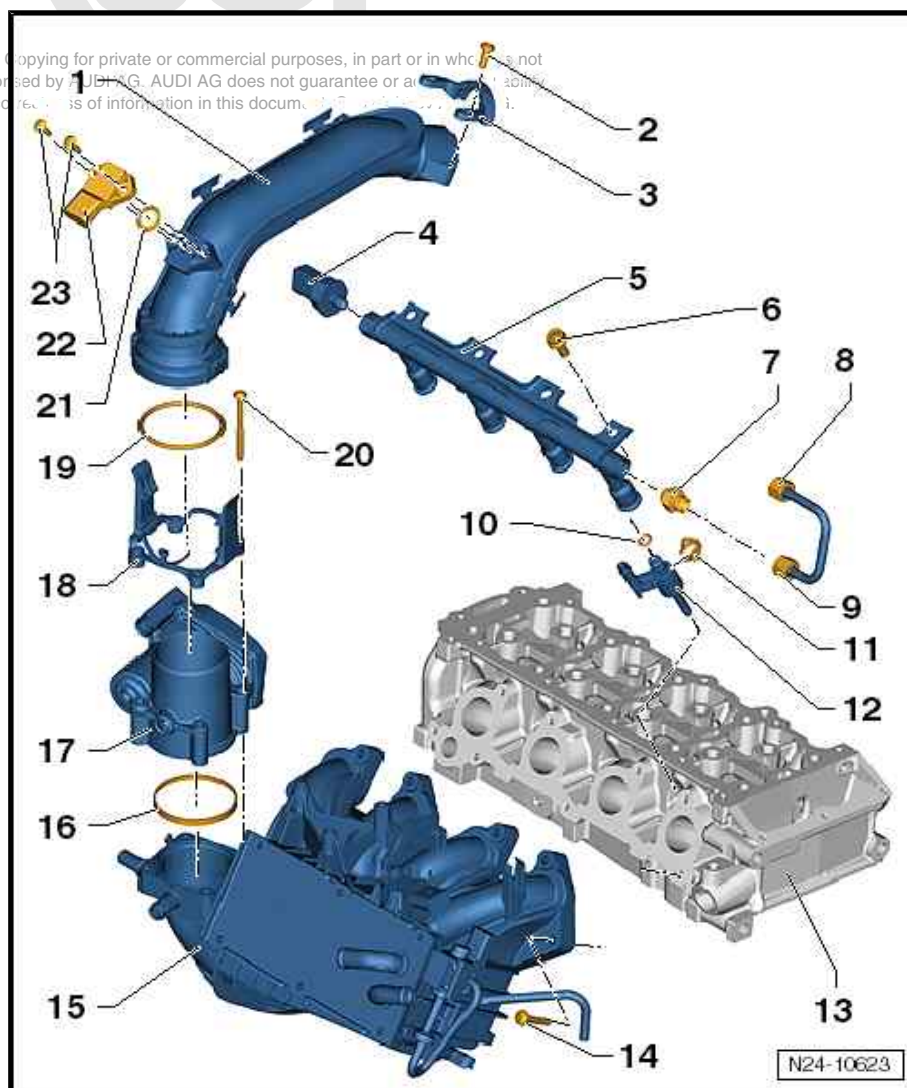
- ☐ Renew

11 - Spring element

- ☐ Check for correct fit on injector

12 - Injector, cylinder 1 -N30-

- ☐ Injector, cylinder 2 - N31-
- ☐ Injector, cylinder 3 -N32-



- ☐ Injector, cylinder 4 -N33-
- ☐ With teflon seal and support ring
- ☐ Always renew teflon seal and support ring after removing injector
- ☐ Removing and installing injectors ⇒ [page 31](#)

13 - Cylinder head

14 - Bolt

- ☐ 9 Nm

15 - Intake manifold

- ☐ With intake air temperature sender -G42- and intake manifold pressure sender -G71- (clipped onto intake manifold)
- ☐ In standard production, intake air temperature sender -G42- is clipped on via retainer tabs (moulded onto intake manifold), but not bolted on. If a retainer tab should break off, intake air temperature sender -G42- can be secured with securing bolts
- ☐ Removing and installing intake manifold ⇒ [page 21](#)

16 - Seal

- ☐ Renew

17 - Throttle valve module -J338-

- ☐ Removing and installing ⇒ [page 23](#)
- ☐ Cleaning ⇒ [page 25](#)
- ☐ Tighten to 7 Nm
- ☐ When renewing, erase learnt values and adapt engine control unit -J623- using a vehicle diagnostic tester

18 - Adapter

19 - O-ring

- ☐ Renew

20 - Bolt

- ☐ 7 Nm

21 - O-ring

- ☐ Renew

22 - Charge pressure sender -G31- with intake air temperature sender 2 -G299-

- ☐ Removing and installing ⇒ Rep. gr. 21

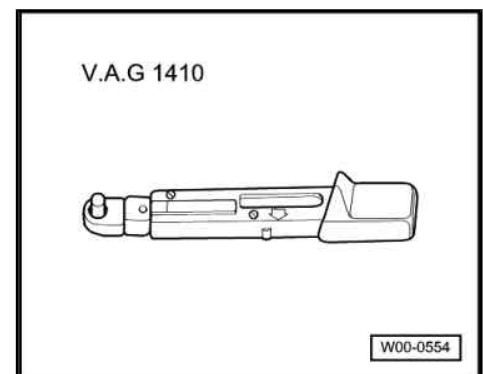
23 - Bolt

- ☐ 3 Nm

4.3 Removing and installing intake manifold

Special tools and workshop equipment required

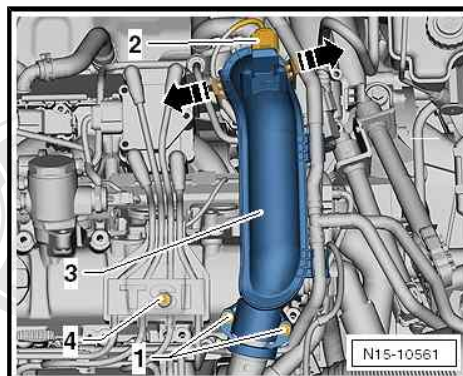
- ◆ Torque wrench (4...20 Nm) -V.A.G 1410-



- ◆ Hose clip pliers

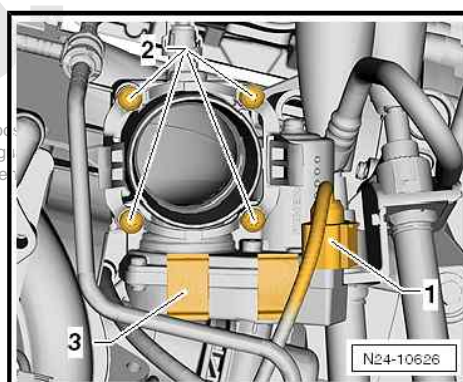
Removing

- Remove bolts -1- and remove retaining bracket.
- Move clear coolant hose on pressure pipe.
- Unplug electrical connector -2- at charge pressure sender - G31- .
- Release retainers in direction of -arrow- and detach pressure pipe -3- first from throttle valve module -J338- and then from turbocharger.

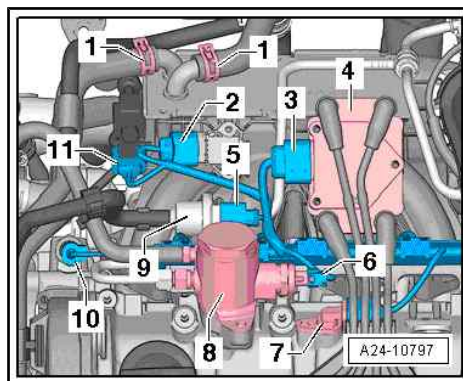


- Detach connector -1- from throttle valve module -J338- .
- Remove securing bolts -2- and detach throttle valve module -3- from intake manifold.

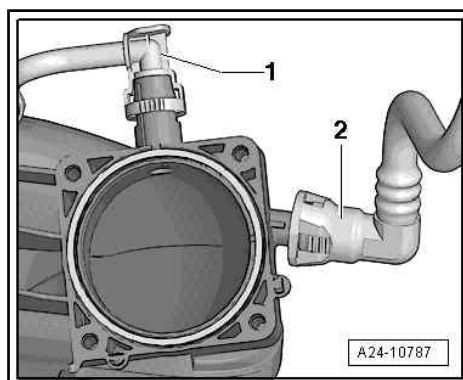
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- Use hose clamps (up to 25 mm) -3094- to clamp off coolant hoses -1- and detach coolant hoses from charge air cooler.
- Unplug electrical connectors -2, 3, 5 and 11-.
- Remove securing bolts from ignition transformer -N152- -4- and move ignition transformer to one side.
- Pull activated charcoal filter solenoid valve 1 -N80- -9- out of bracket.



- Detach vacuum connections -1 and 2- from intake manifold.

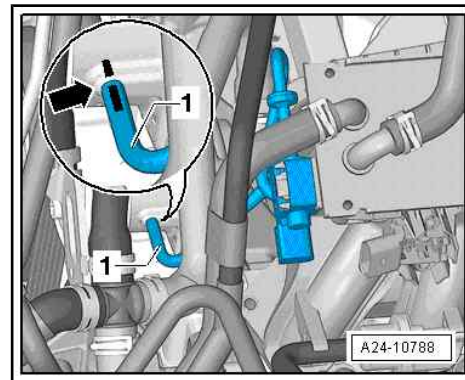


- Detach vacuum line -1- from coolant pump.



Note

Only installed on engines with a coolant pump that can be switched off.



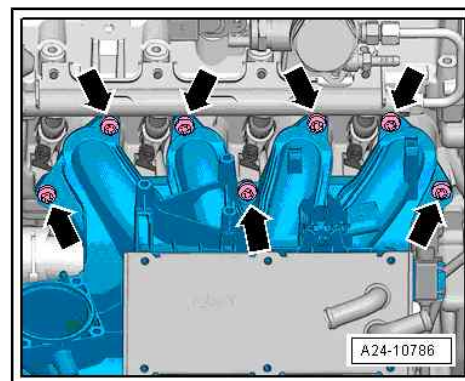
- Unscrew intake manifold securing bolts -arrows- below fuel rail.
- Carefully remove intake manifold upwards.

Installing

- Install in reverse order.

Tightening torques:

- ◆ ⇒ [“4.2 Exploded view - intake manifold \(part 2\)”, page 20](#)
- Install throttle valve module -J338- ⇒ [page 23](#) .



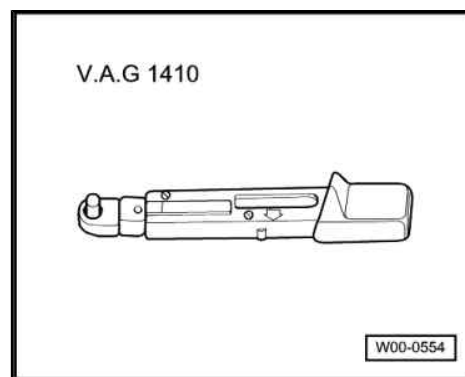
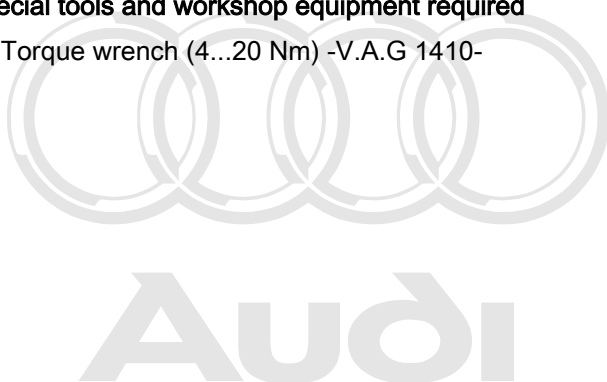
Note

After installing intake manifold check coolant level, refer to engine - mechanics ⇒ Rep. gr. 19 .

4.4 Removing and installing throttle valve module -J338-

Special tools and workshop equipment required

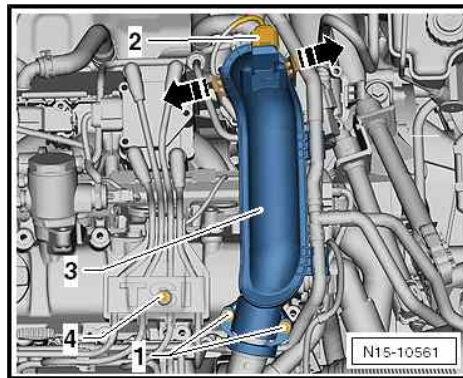
- ◆ Torque wrench (4...20 Nm) -V.A.G 1410-



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Removing

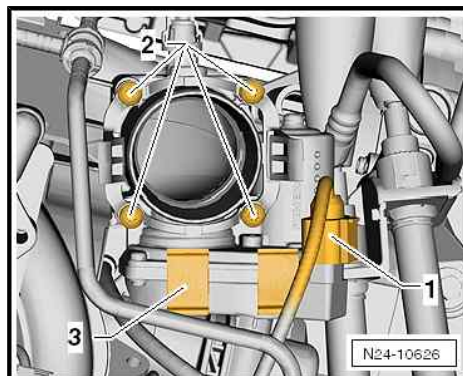
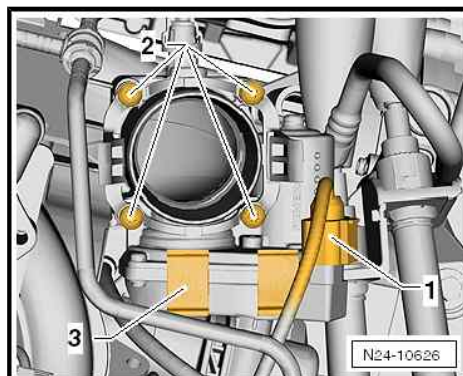
- Remove bolts -1- and remove retaining bracket.
- Unplug connector -2- at charge pressure sender -G31- with intake air temperature sender 2 -G299- .
- Move clear coolant hose on pressure pipe.
- Release retainers in direction of -arrow- and detach pressure pipe -3- first from throttle valve module -J338- and then from turbocharger.



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

Installing

- Insert new seal in groove on intake manifold.
- Position throttle valve module -J338- with adapter on intake manifold.
- Tighten securing bolts -2-.
- Tightening torque: intake manifold (part 2) - exploded view
⇒ [page 20](#)
- Plug in electrical connector -1- at throttle valve module -J338- -3-.



Note

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

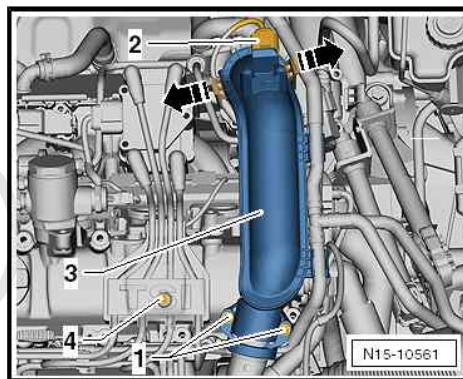
- Fit pressure pipe -3- on turbocharger.
- Push pressure pipe -3- onto throttle valve module -J338- .

The retaining clips must engage audibly.

- Tighten securing bolts -1- for retaining clips.

Tightening torques:

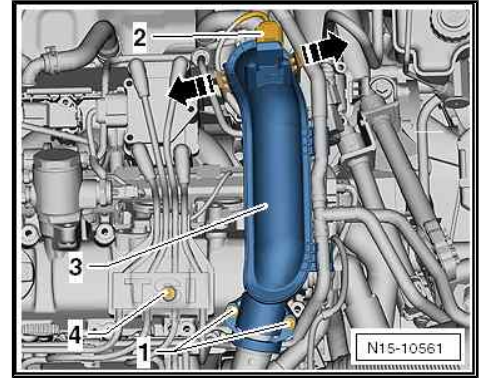
- ♦ ⇒ ["4.2 Exploded view - intake manifold \(part 2\)", page 20](#)



- Plug in electrical connector -2- at charge pressure sender - G31- / intake air temperature sender 2 -G299- .

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

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



4.5 Cleaning throttle valve module -J338-

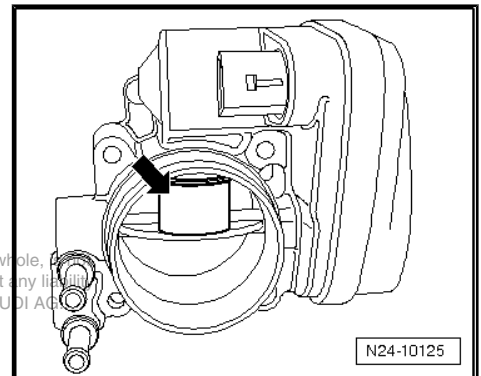
Note

- ◆ If a new engine control unit -J623- is installed, it must be adapted to the throttle valve module.
- ◆ Carbon deposits and dirt in the throttle valve limit stop can lead to incorrect adaption values.
- ◆ Take care not to scratch the throttle valve housing when cleaning it.
- Remove throttle valve module -J338- ⇒ [page 23](#) .
- Open throttle valve by hand and block it in the open position with a suitable object (e.g. plastic or wooden wedge) -arrow-.

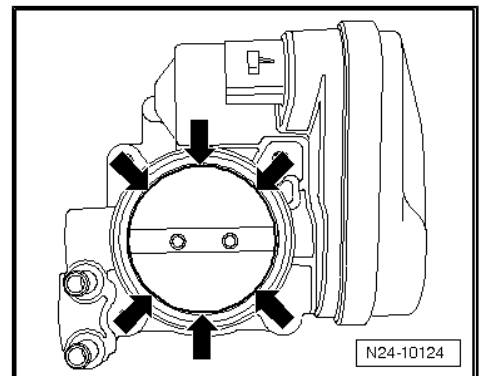


WARNING

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 .



5 High-pressure pump

⇒ "5.1 Exploded view - high-pressure pump", page 26

⇒ "5.2 Removing and installing high-pressure pump", page 28

5.1 Exploded view - high-pressure pump



WARNING

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

1 - Bolts for high-pressure pump

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

2 - Connecting piece for fuel supply pipe from fuel tank

3 - Spring-type clip

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

4 - Fuel supply pipe

- ☐ From fuel tank

5 - High-pressure pipe

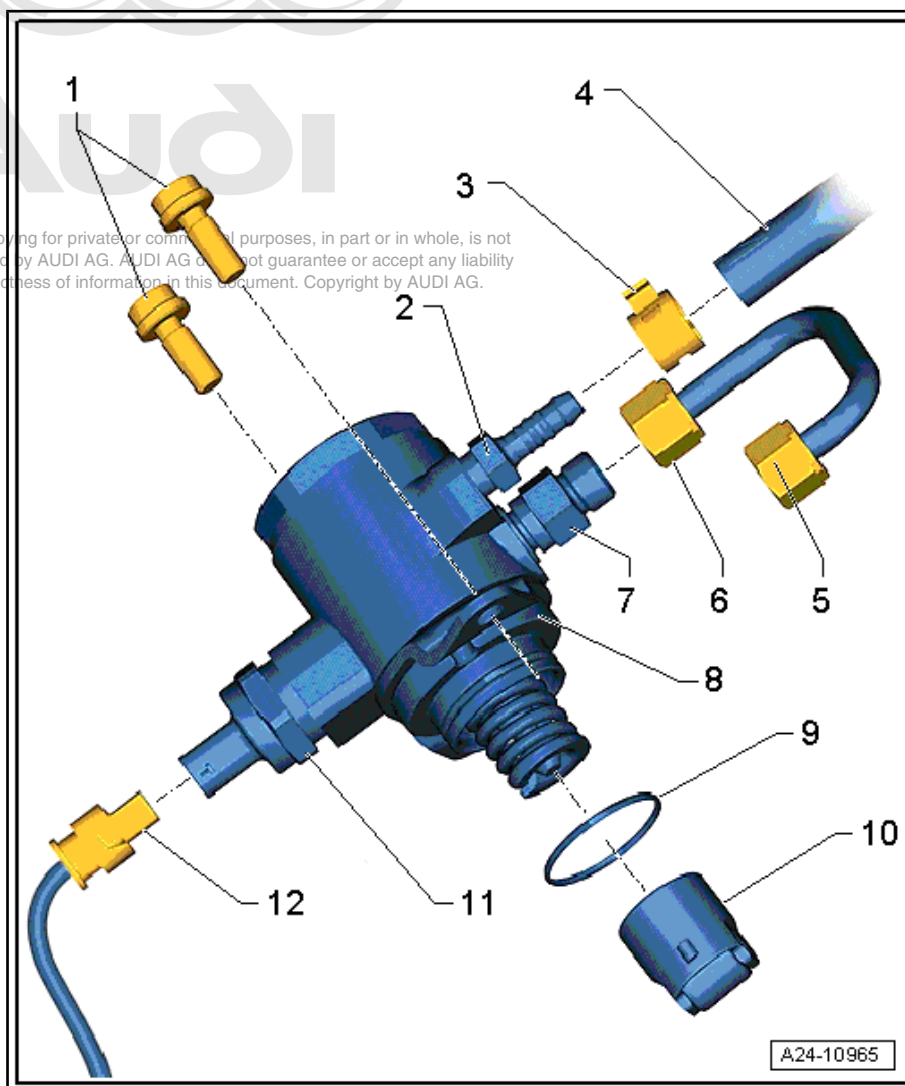


WARNING

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

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

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



6 - High-pressure pipe

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

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

7 - Connecting piece

- ☐ Check tightening torque: 30 Nm

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

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

**Caution**
*When removing or installing the high-pressure pump, take hold of it only by the housing.
If the piston spring assembly of the high-pressure pump comes loose, the high-pressure pump will leak and must be renewed.*

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

9 - O-ring

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

10 - Roller tappet

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

11 - Fuel pressure regulating valve -N276-

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

5.2 Removing and installing high-pressure pump

Removing



Note

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



WARNING

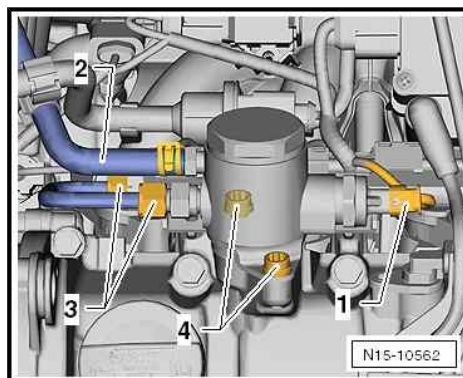
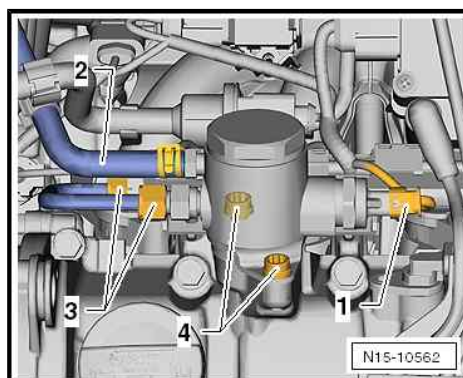
Fuel system operates under high pressure. Always dissipate fuel pressure prior to opening fuel system. For procedure, refer to [page 4](#).

- Unplug electrical connector -1- on fuel pressure regulating valve -N276-.
- Disconnect fuel supply line -2- at high-pressure pump.
- Loosen union nuts -3- and take out high-pressure pipe.



Note

- ◆ *Counterhold connections on high-pressure pump and fuel rail with a spanner when loosening union nuts.*
- ◆ *Use a cloth to catch escaping fuel.*
- Unscrew securing bolts -4- evenly.



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



Caution

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

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

Installing



Note

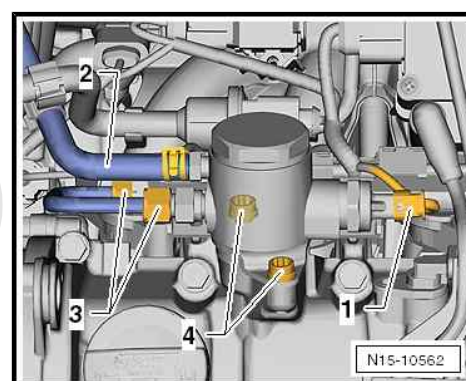
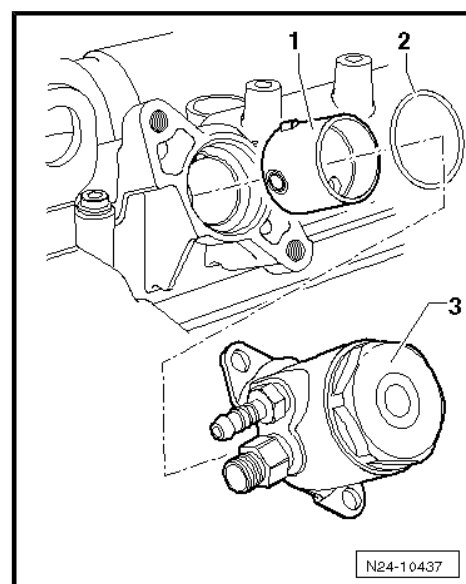
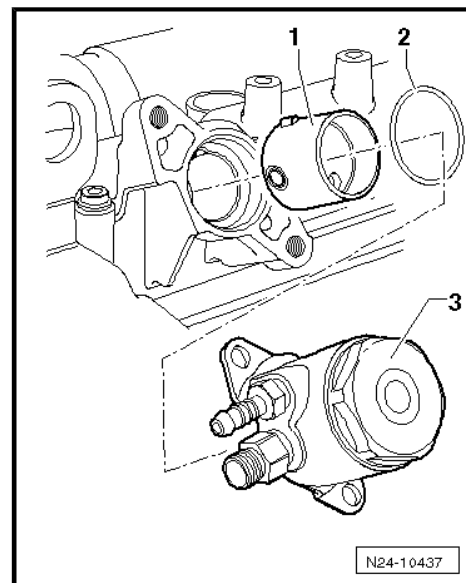
Renew O-ring for high-pressure pump.

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

- At the same time, tighten securing bolts -4- by hand.
- Then tighten securing bolts -4- alternately to 5 Nm (do not tilt high-pressure pump).
- Now tighten securing bolts -4- alternately to final torque.

Tightening torques:

- ◆ ⇒ [“5.1 Exploded view - high-pressure pump”, page 26](#)

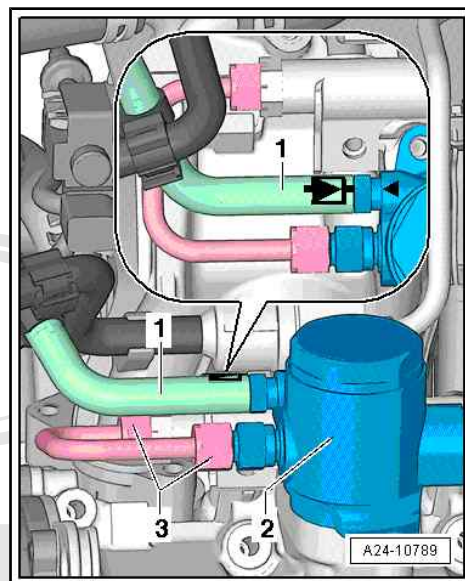


- Hand-tighten union nuts -3- on high-pressure pipe. Align so that parts are free of tension.
- Align high-pressure pipe so it is free of tension and tighten to specified torque.
- Re-connect fuel supply line -1- to high-pressure pump (make sure it is securely fitted).



Note

Note arrows between fuel supply line and high-pressure pump.



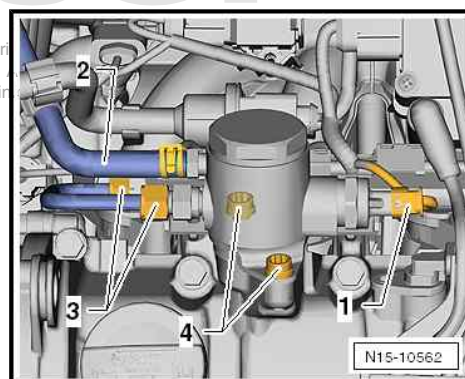
- Re-attach electrical connector -1- for fuel pressure regulating valve -N276- .

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Note

Check fuel system for leaks.



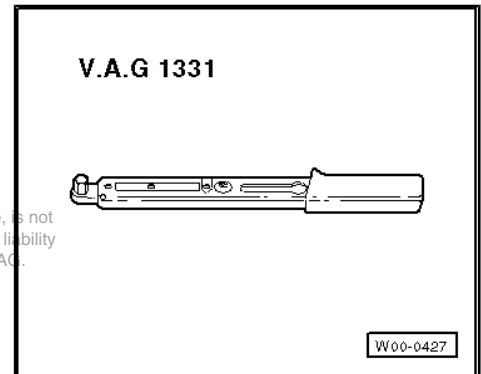
6 Injectors

⇒ **"6.1 Removing and installing injectors", page 31**

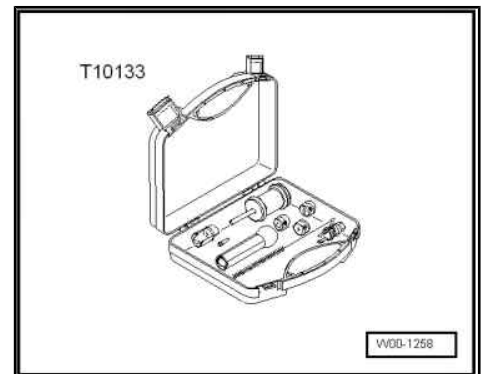
6.1 Removing and installing injectors

Special tools and workshop equipment required

- ◆ Torque wrench -V.A.G 1331-

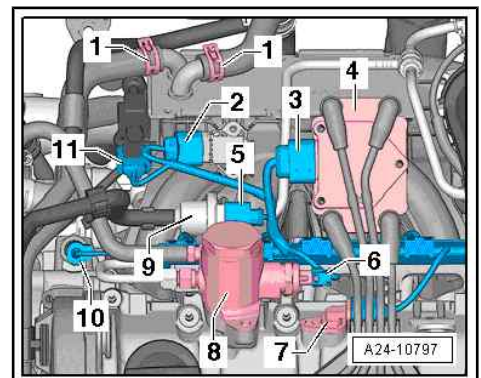
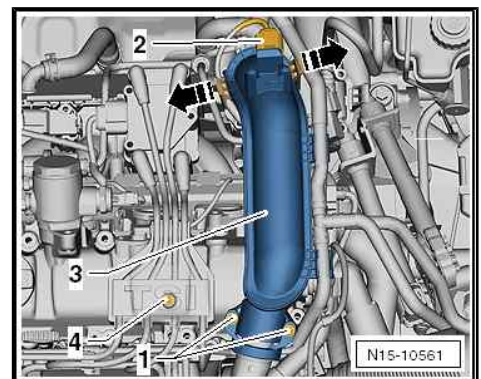


- ◆ Tool set for FSI engines -T10133-

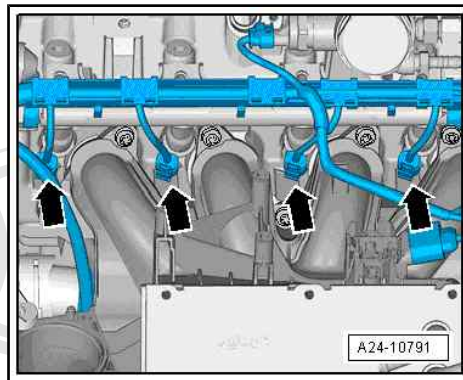


Removing

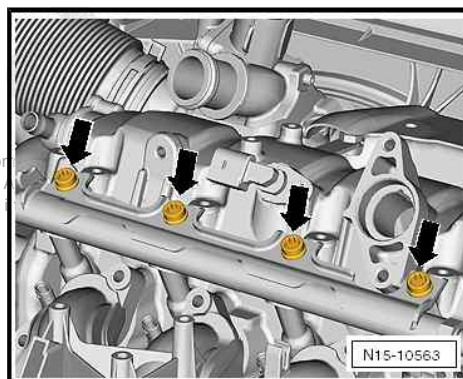
- Remove bolts -1- and remove retaining bracket.
- Move clear coolant hose on pressure pipe.
- Unplug electrical connector -2- at charge pressure sender - G31- .
- Release retainers in direction of -arrow- and detach pressure pipe -3- first from throttle valve module -J338- and then from turbocharger.
- Remove high-pressure pump -8- ⇒ [page 28](#) .
- Remove securing bolts from ignition transformer -N152- -4- and move ignition transformer to one side.
- Unplug all electrical connectors as necessary.
- Pull activated charcoal filter solenoid valve 1 -N80- -9- out of bracket.



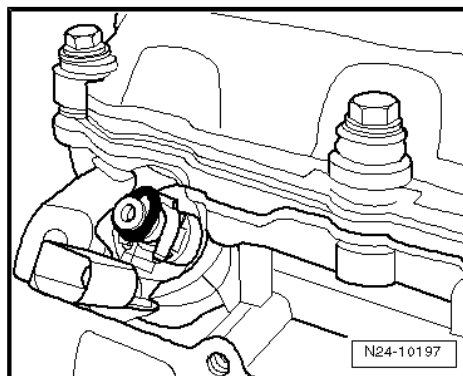
- Unplug electrical connectors -arrows- at injectors.



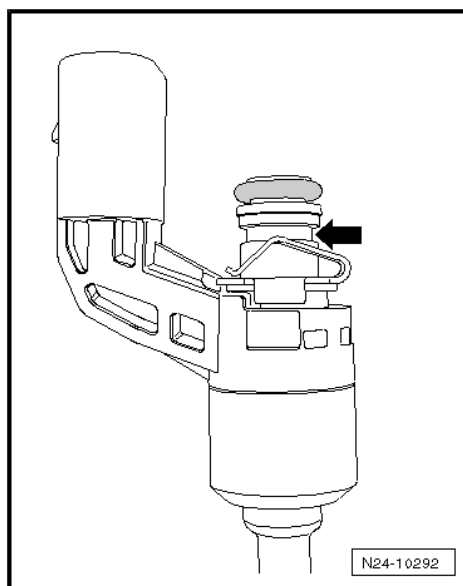
- Unscrew bolts -arrows- and pull fuel rail off injectors.



- Press O-ring by hand upwards (as illustrated) and remove from injector.
- Screw striker -T10133/3- onto puller -T10133/15- .



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



- Pull out injector by knocking carefully.

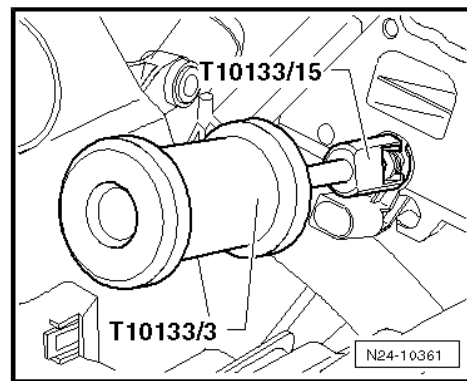


Note

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

Renewing combustion chamber ring seal

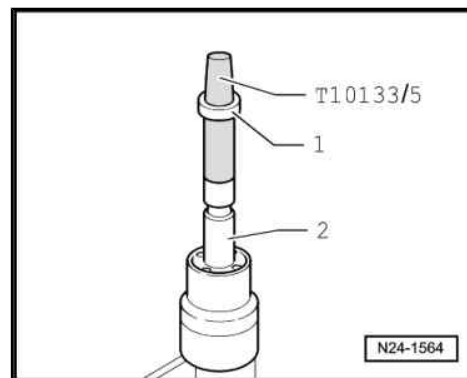
- Remove injector ⇒ [page 31](#).
- Carefully remove old combustion chamber ring seal using suitable tools (e.g. cut open ring using razor blade, or prise open ring with small screwdriver and then pull off forwards). It is important to ensure that the groove and the continuous ridge in the bottom of the groove are not damaged.



Note

The injector must be renewed if the groove is damaged.

- Before new combustion chamber ring seal -1- 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-.

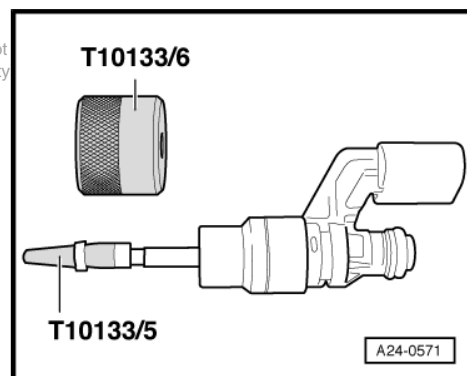


- Use assembly sleeve -T10133/6- to press combustion chamber ring seal further onto assembly cone -T10133/5- until it seats in groove. Do not use any lubricants during this procedure.

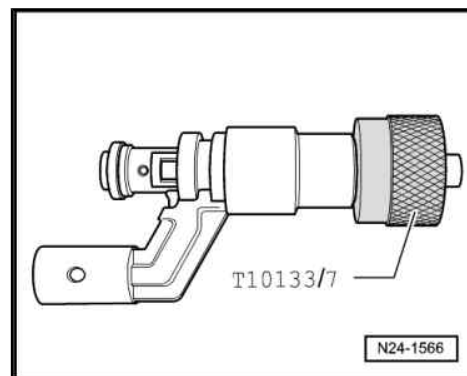


Note

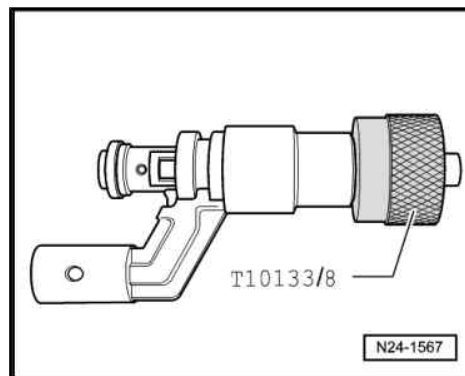
The combustion chamber ring seal is widened when it is pushed onto the injector. After pushing it on, it therefore has to be compressed again. This is done in two stages, as described below.



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

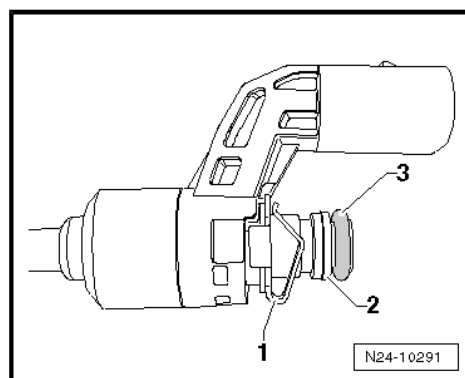


- Push calibration sleeve -T10133/8- onto injector as far as it will go and simultaneously turn it slightly (approx. 180°).
- Pull calibration sleeve -T10133/8- off again by turning it in the opposite direction.

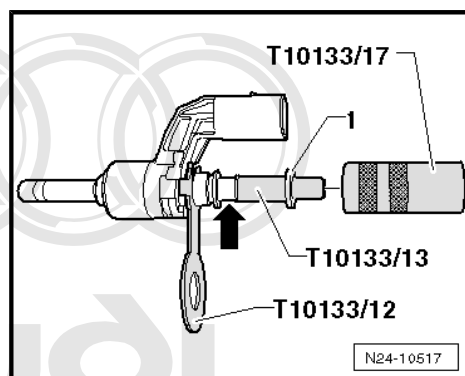


Renewing support ring and O-ring

- Remove O-ring -3-.
- Cut open support ring -2- with small side-cutting pliers and remove support ring.
- Detach spring element -1- from injector and fit locking plate -T10133/12- in place of spring element.

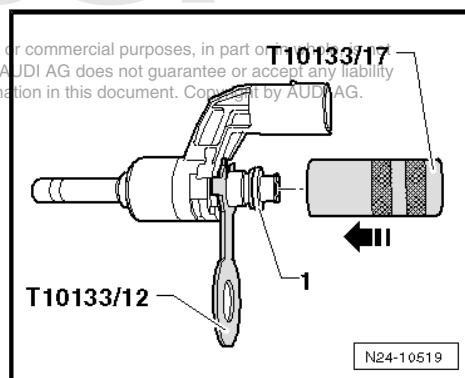


- Fit a new support ring -1- onto assembly cone -T10133/13- and fit onto injector (as illustrated).
- Using calibration sleeve -T10133/17- (knurled side faces towards injector), push support ring -1- into first groove -arrow- on injector.
- Then turn round calibration sleeve -T10133/17- (knurled side now faces away from injector).



- Push calibration sleeve over support ring -1- in direction of -arrow- until it makes contact with locking plate -T10133/12-.
- Pull calibration sleeve -T10133/17- off again.

Support ring now has its correct installation depth.



- Now install a new spring element -1- in place of locking plate -T10133/12- .
- Renew O-ring -3-.



Note

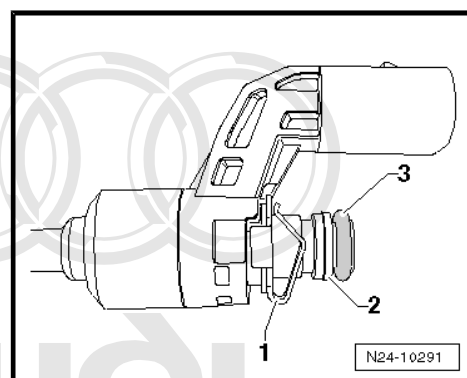
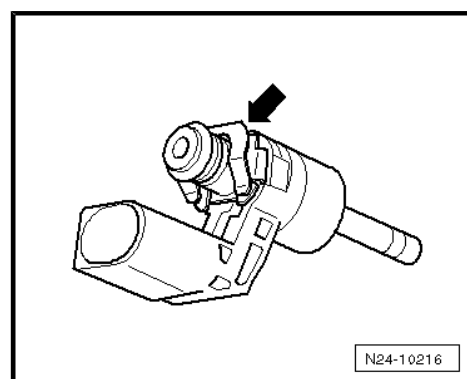
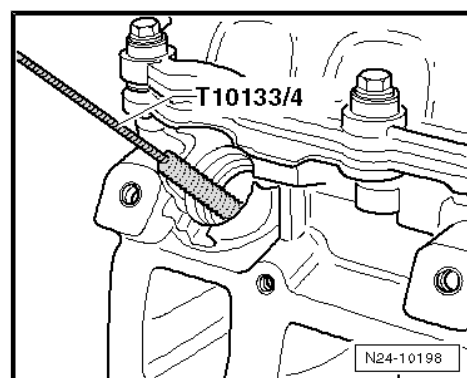
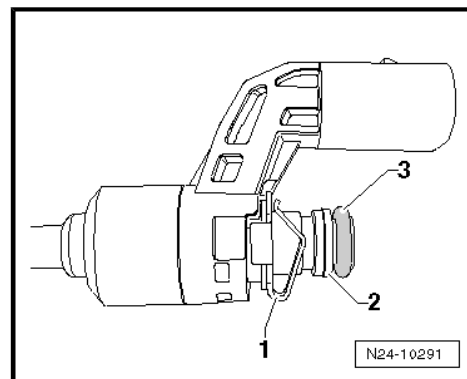
Lubricate O-ring lightly with assembly oil or engine oil before installing.

Installing

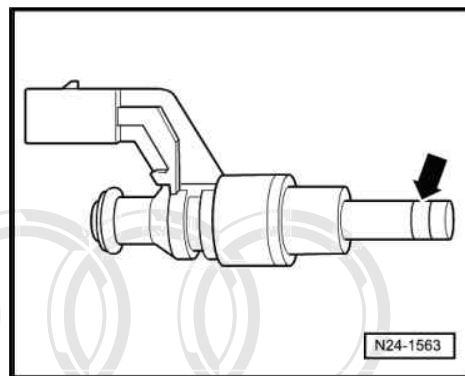
- Before installing injectors, thoroughly clean apertures for injectors in cylinder head using supplied nylon brush - T10133/4- .

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

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



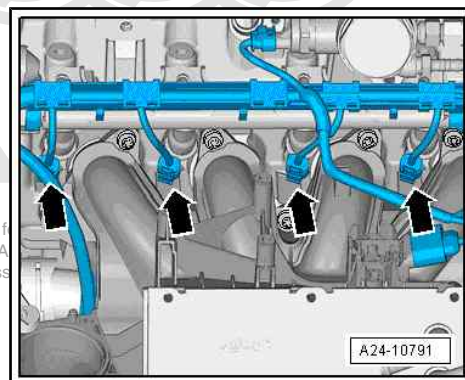
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Note

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

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

Tightening torques:

- ◆ ⇒ [“4.1 Exploded view - intake manifold \(part 1\)”, page 19](#)
- ◆ ⇒ [“4.2 Exploded view - intake manifold \(part 2\)”, page 20](#)
- Install high-pressure pump ⇒ [page 28](#) .

7 Senders and sensors

⇒ ["7.1 Checking fuel pressure sender G247", page 37](#)

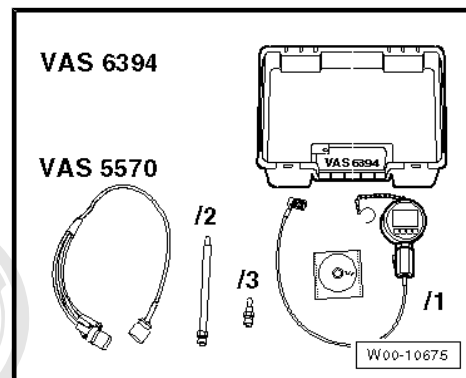
⇒ ["7.2 Removing and installing fuel pressure sender G247", page 39](#)

⇒ ["7.3 Checking residual pressure in fuel system \(up to high-pressure pump\)", page 40](#)

7.1 Checking fuel pressure sender -G247-

Special tools and workshop equipment required

- ◆ Pressure sensor tester -VAS 6394-



- ◆ Socket, 27 mm, long (commercially available)

- ◆ Test instrument adapter -VAS 5570-

- ◆ Vehicle diagnostic tester

Procedure



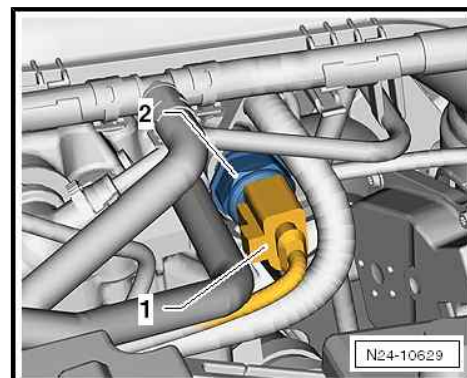
WARNING

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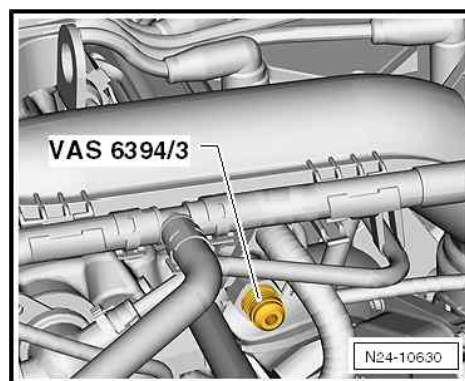
The injection system consists of a high-pressure section (maximum approx. 120 bar) and a low-pressure section (approx. 6 bar).

Prior to opening the high-pressure section, the fuel pressure in the high-pressure section must be reduced in a controlled manner to a residual pressure of approx. 6 bar. The procedure is described in ⇒ [page 4](#), Reducing fuel pressure in high-pressure section of fuel system.

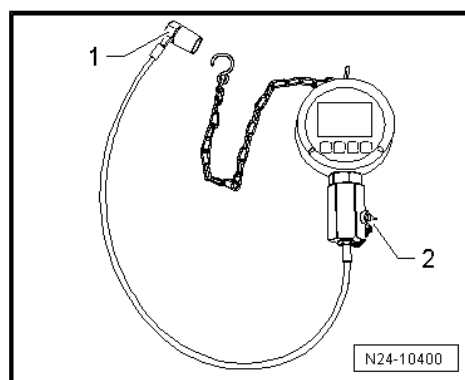
- Unplug connector -1- and remove fuel pressure sender -G247-
-2-
⇒ ["7.2 Removing and installing fuel pressure sender G247", page 39](#).



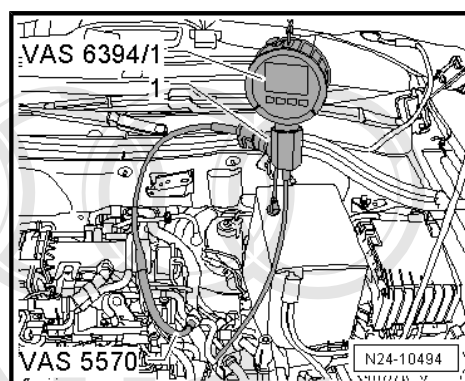
- Lubricate taper seal of adapter -VAS 6394/3- with clean engine oil and screw into fuel rail. Tightening torque: 22 Nm.



- Unscrew plug -2- and screw fuel pressure sender -G247- into tester -VAS 6394/1-. Tightening torque: 22 Nm.



- Connect pressure line of tester -VAS 6394/1- to adapter -VAS 6394/3- .
- Use test instrument adapter -VAS 5570- to make electrical connection between vehicle and fuel pressure sender -G247- .



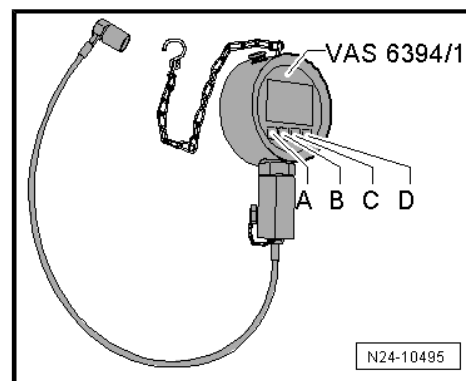
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- Switch on tester -VAS 6394/1- by pressing button -A- once briefly.



Note

- ◆ *You can press and hold button -A- for 2 seconds to switch on the illumination for 20 seconds.*
- ◆ *If tester -VAS 6394/1- does not indicate 0 bar, zero the tester ⇒ Operating instructions .*
- Connect a ⇒ Vehicle diagnostic tester.
- Start engine and run at idling speed.
- Select “Engine electronics” in vehicle self-diagnosis.
- Then select function read “Measured values”.
- Select “Fuel pressure” from the list.
- Compare fuel pressure indicated on tester -VAS 6394/1- with actual value displayed on ⇒ Vehicle diagnostic tester.
- The pressure readings must not deviate by more than 5 bar.
- If the deviation is more than 5 bar, renew fuel pressure sender -G247- .



WARNING

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

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

If the values agree:

- Install the new fuel pressure sender -G247- ⇒ [page 39](#) .

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.

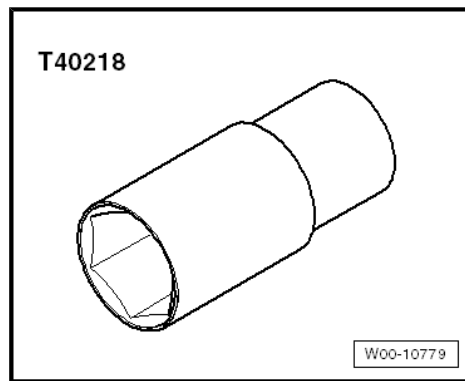
7.2 Removing and installing fuel pressure sender -G247-

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

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



Removing



WARNING

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

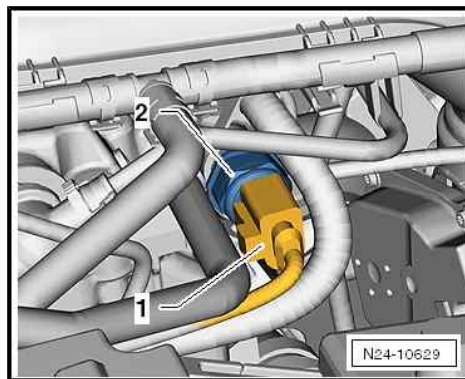
- Unplug connector -1- and remove fuel pressure sender -G247- -2-.

Installing

- Install in reverse order.

Tightening torques:

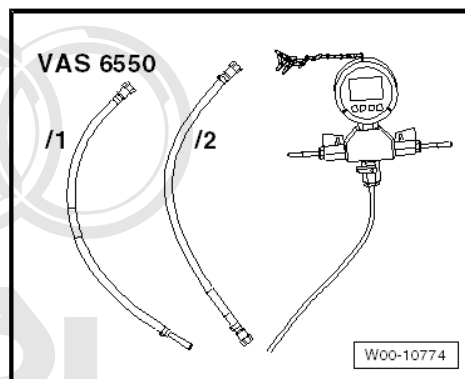
- ◆ ⇒ [“4.2 Exploded view - intake manifold \(part 2\)”](#), [page 20](#)



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

Special tools and workshop equipment required

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



- ◆ Fuel-resistant measuring container

- ◆ Protective gloves

- ◆ Vehicle diagnostic tester

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Test conditions

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

Test sequence

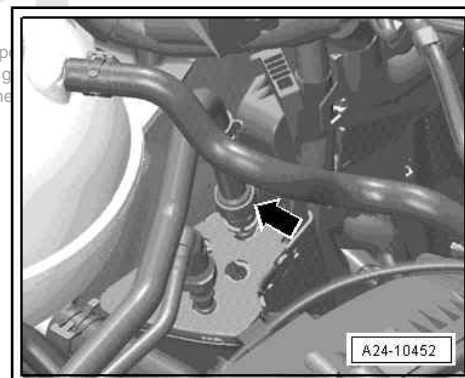


WARNING

- ◆ *The pressure in the high-pressure part of the injection system must be reduced to a residual pressure prior to opening the system*
⇒ *"1.6 Reducing pressure in high-pressure section of injection system", page 4.*
- ◆ *A clean cloth must then be wrapped around the connection and the residual pressure dissipated by carefully loosening the connection.*

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

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

If specification is not obtained:

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

Checking residual pressure

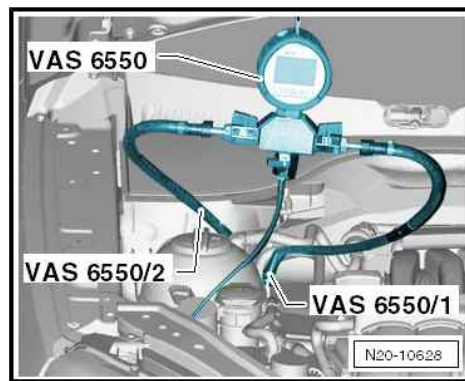
- Check system for leaks and check residual pressure by watching the drop in pressure on the pressure tester -VAS 6550- .
- After 10 minutes pressure should still be at least 3 bar.

If the residual pressure drops below 3 bar:

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

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

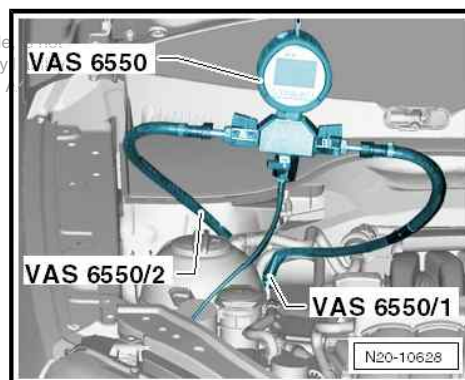
- The ignition must be switched off.



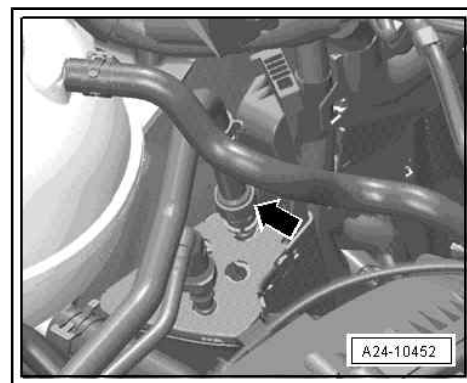
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Before removing the pressure tester, release the fuel pressure by opening the drain tap (centre hose). Hold end of hose into a measuring container.



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



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8 Lambda probe

⇒ ["8.1 Exploded view - Lambda probe", page 44](#)

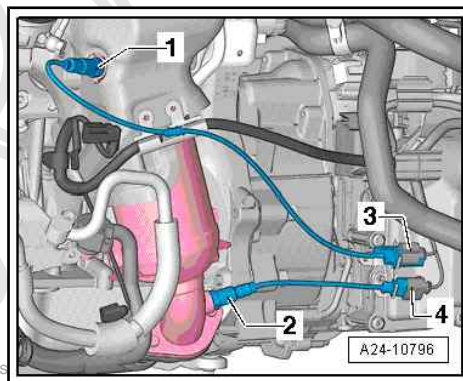
⇒ ["8.2 Removing and installing Lambda probe G39 and Lambda probe heater Z19 before catalytic converter", page 44](#)

⇒ ["8.3 Removing and installing Lambda probe after catalytic converter G130 and Lambda probe 1 heater after catalytic converter Z29", page 45](#)

8.1 Exploded view - Lambda probe

Lambda probes

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



Note

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

- Tightening torque 55 Nm

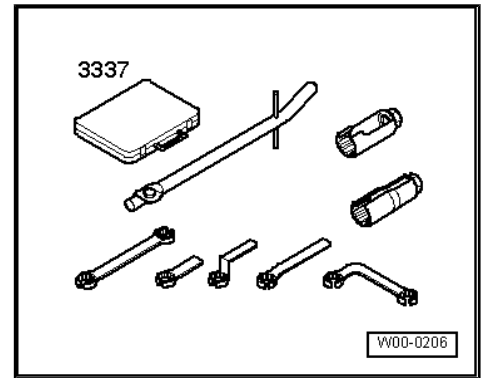
Removing and installing Lambda probe -G39- and Lambda probe heater -Z19- ⇒ [page 44](#) .

Removing and installing Lambda probe after catalytic converter -G130- and Lambda probe 1 heater after catalytic converter -Z29- ⇒ [page 45](#)

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

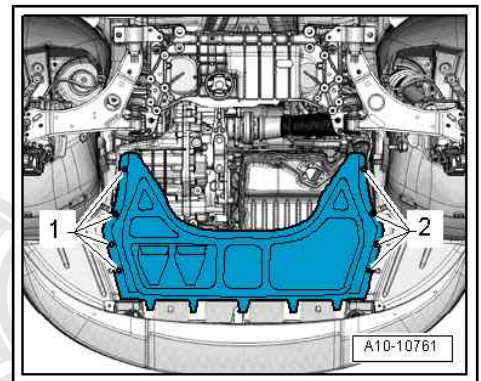
Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set -3337-



Removing

- Remove noise insulation ⇒ Rep. gr. 66 .



- Unplug electrical connector -3- for Lambda probe -G39- and Lambda probe heater -Z19- .
- Unscrew Lambda probe -G39- -1- using tool from Lambda probe open ring spanner set -3337- .

Installing

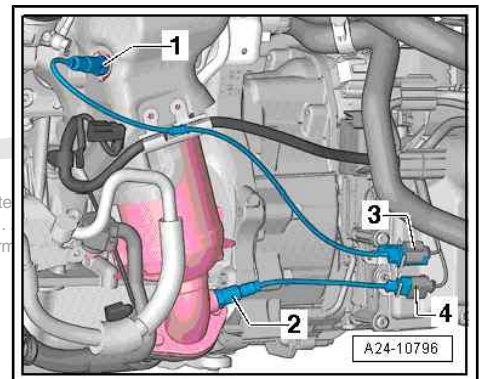
When installing, note the following:

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Note

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



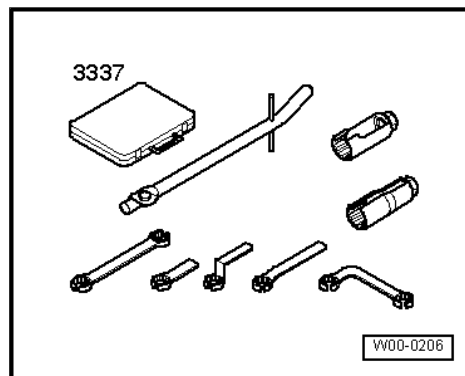
Tightening torques:

- ◆ ⇒ ["8.1 Exploded view - Lambda probe", page 44](#)

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

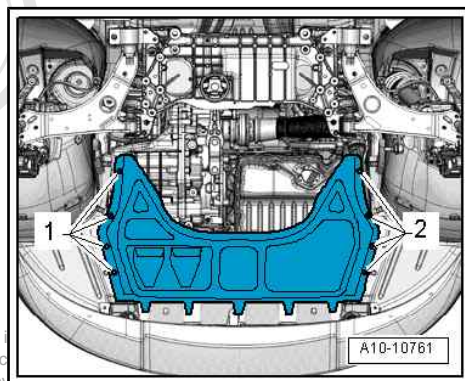
Special tools and workshop equipment required

◆ Lambda probe open ring spanner set -3337-



Removing

- Remove noise insulation ⇒ Rep. gr. 66 .



- Unplug electrical connector -4- for Lambda probe after catalytic converter -G130- and Lambda probe heater -Z19- .
- Unscrew Lambda probe after catalytic converter -G130- -2- using tool from Lambda probe open ring spanner set -3337- .

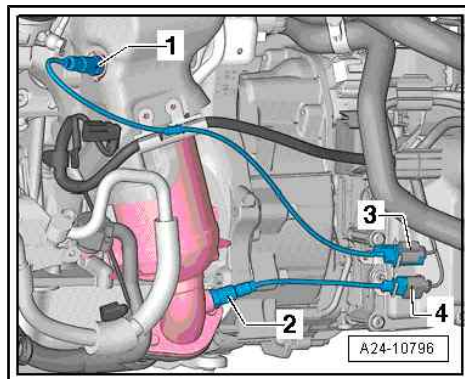
Installing

When installing, note the following:



Note

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



Tightening torques:

- ◆ ⇒ [“8.1 Exploded view - Lambda probe”, page 44](#)

9 Engine control unit

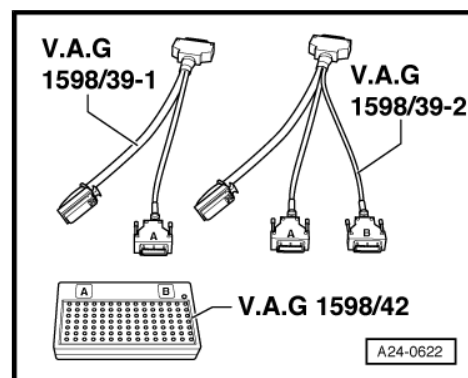
⇒ **"9.1 Wiring and component check with test box V.A.G 1598/42", page 47**

⇒ **"9.2 Removing and installing engine control unit J623", page 48**

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

The engine control unit has to be removed before connectors can be unplugged from engine control unit ⇒ **page 48**.



Caution

Electronic components are susceptible to damage.

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

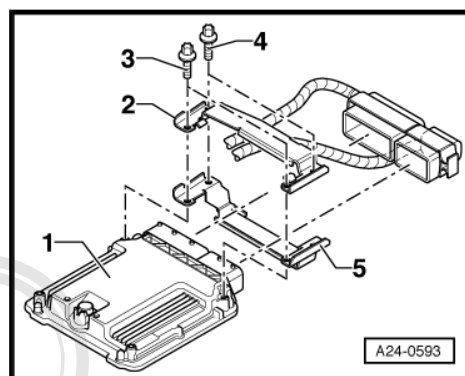
- Connect test box -V.A.G 1598/42- to wiring harness with adapter cable -V.A.G 1598/39-1- or adapter cable -V.A.G 1598/39-2- . Connect earth clip of test box to negative terminal of battery. The instructions for performing the individual tests indicate whether or not the engine control unit itself also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

9.2 Removing and installing engine control unit -J623-



Note

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

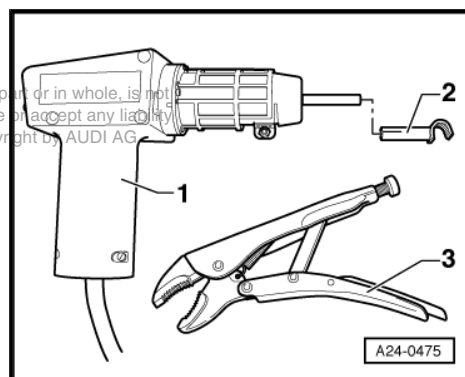


The following special tools are required if a protective housing is fitted:

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-

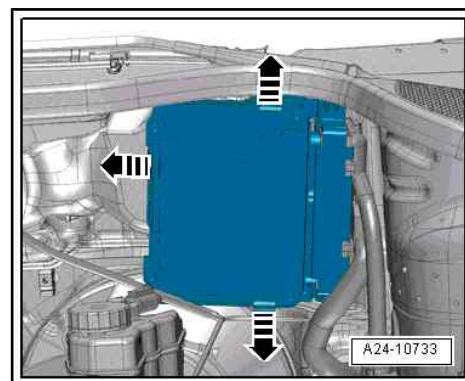
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- ◆ Mole grips (commercially available) -3-
- ◆ Vehicle diagnostic tester

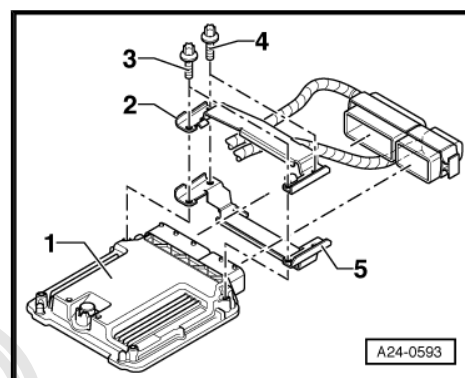
Removing

- When renewing engine control unit, select diagnosis object “Replace engine control unit” in “Guided Functions” mode of ⇒ Vehicle diagnostic tester.
- Switch off ignition and take out ignition key.
- Remove air cleaner housing.
- Release fasteners -arrows- and detach engine control unit - J623- from bracket.



Note

- ◆ *The threads of the two shear bolts -4- which are not screwed into the engine control unit -1- are secured with locking fluid. To unscrew these two bolts, the threads must therefore be heated with the hot air blower.*
- ◆ *The threads of the two shear bolts -3- which are screwed into the engine control unit are not secured with locking fluid. Do not apply heat to the threads in the control unit housing; this is not necessary and would cause overheating of the control unit.*



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Caution

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

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

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



Note

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

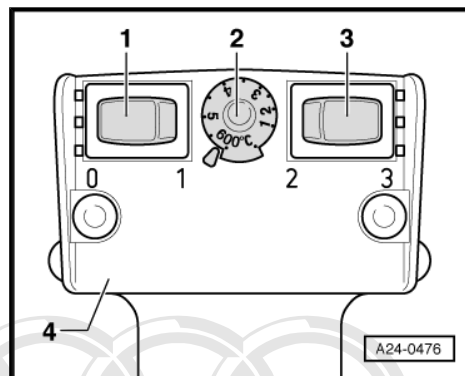


WARNING

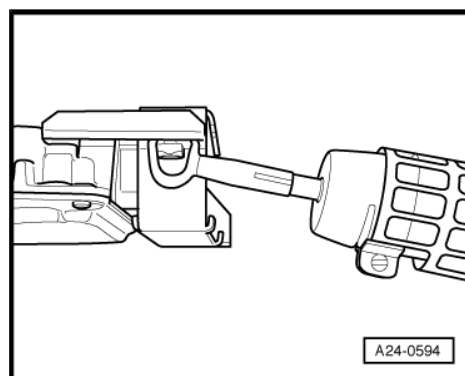
Risk of burns.

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

- Attach shrink element for hot air blower -VAS 1978/15A- to hot air blower -VAS 1978/14A- .
- Hold shrink element on hot air blower close to shear bolt on protective housing.
- Switch on hot air blower and heat bolt for 20 ... 25 seconds.



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

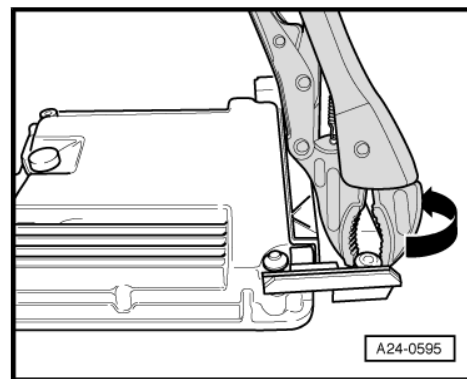
Installing

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

- After installation, the protective housing must be re-fitted on the engine control unit -J623- .
- Clean threaded holes for shear bolts to remove any residue from locking fluid. This can be done using a thread tap.
- Always use new shear bolts.

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

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



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28 – Ignition system

1 General notes and safety precautions

⇒ **"1.1 General notes on ignition system", page 52**

⇒ **"1.2 Safety precautions", page 52**

1.1 General notes on ignition system

- ◆ The engine control unit has a self-diagnosis capability.
- ◆ A voltage of at least 11.5 V is required for proper operation of the electrical components.
- ◆ Certain tests may lead to a fault being detected by the control unit and stored. The event memory should therefore be interrogated and (if necessary) erased after completing the tests and any repair work that may be required.
- ◆ If the engine starts, runs for a short period and then cuts out after completing fault finding, repairs or component tests, this may be due to the immobiliser 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. After completing the work, interrogate and erase the event memory.
- ◆ Always switch off the ignition before cleaning the engine.

2 Ignition system

⇒ [“2.1 Test data”, page 53](#)

⇒ [“2.2 Exploded view - Ignition system”, page 54](#)

⇒ [“2.3 Removing and installing knock sensor 1 G61”, page 55](#)

⇒ [“2.4 Removing and installing Hall sender G40”, page 55](#)

⇒ [“2.5 Removing and installing engine speed sender G28”, page 55](#)

2.1 Test data

Engine data	1.2 ltr. / 77 kW 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 system with 4 ignition coils (output stages integrated) connected directly to spark plugs via spark plug connectors The ignition coils can be removed from the cylinder head using puller - T40039 - .
Firing order	1-3-4-2

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2.2 Exploded view - ignition system

1 - Cable guide

2 - Bolt

- 8 Nm

3 - Cover

4 - Connector for Hall sender - G40-

5 - Hall sender -G40-

- Renew O-ring
- Fitting location: cylinder head cover

6 - Bolt

- 10 Nm

7 - Spark plug connector with ignition cable

Note markings on ignition cables

- ◆ Ignition transformer D = cylinder 1 ignition cable
- ◆ Ignition transformer B = cylinder 2 ignition cable
- ◆ Ignition transformer C = cylinder 3 ignition cable
- ◆ Ignition transformer A = cylinder 4 ignition cable
- Use puller -T10112 A- for removing and installing

8 - Spark plug

- 30 Nm
- Remove and install with puller -T10112 A- and spark plug socket and extension -3122 B-

9 - Knock sensor 1 -G61-

- Fitting location: beneath intake manifold on cylinder block
- Removing and installing ⇒ [page 55](#)

10 - Connector for knock sensor 1 -G61-

11 - Bolt

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

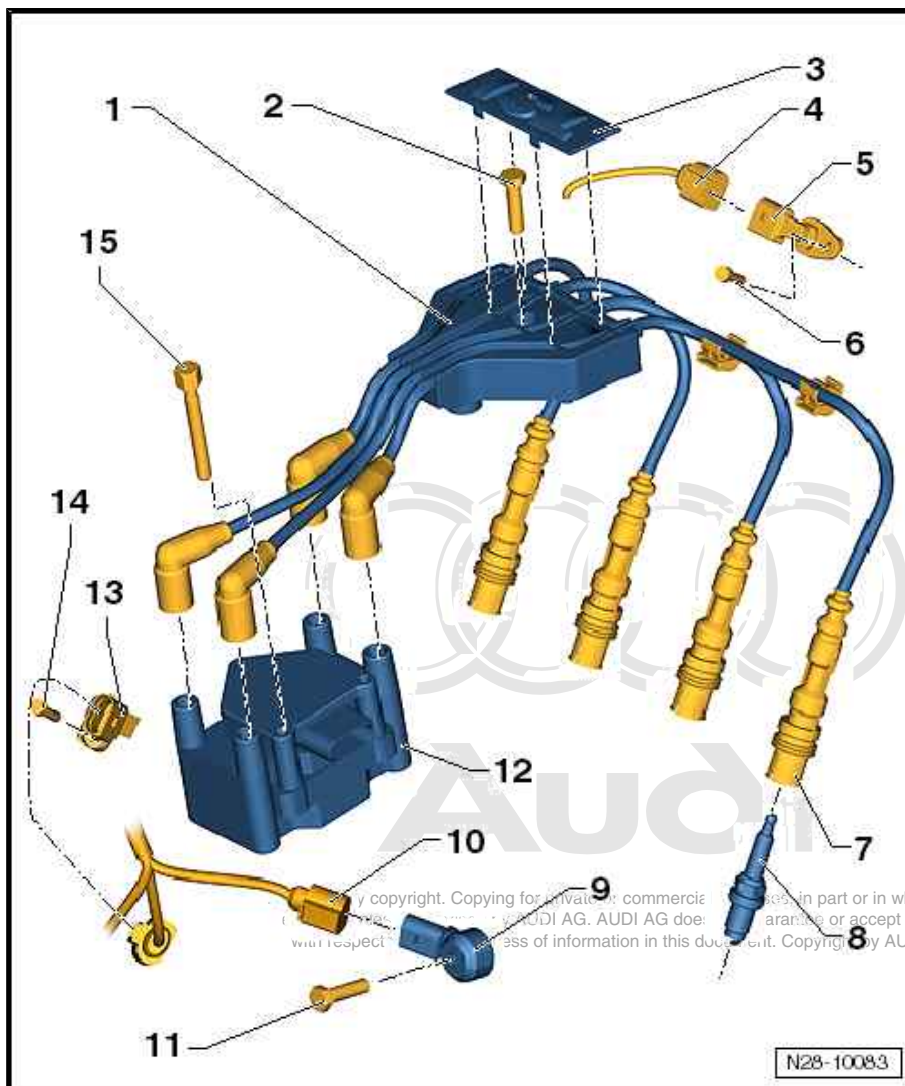
12 - Ignition transformer -N152-

Note markings on ignition cables

- ◆ Ignition transformer D = cylinder 1 ignition cable
- ◆ Ignition transformer B = cylinder 2 ignition cable
- ◆ Ignition transformer C = cylinder 3 ignition cable
- ◆ Ignition transformer A = cylinder 4 ignition cable

13 - Engine speed sender -G28-

- Fitting location: beneath intake manifold (gearbox end)



- ❑ Removing and installing ⇒ [page 55](#)

14 - Bolt for engine speed sender -G28-

- ❑ 5 Nm

15 - Bolt for ignition transformer -N152-

- ❑ 7 Nm

2.3 Removing and installing knock sensor 1 -G61-

Removing

Knock sensor 1 -G61- -3-

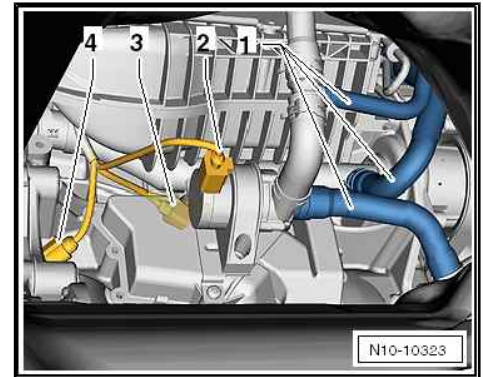
- Remove intake manifold
⇒ [“4.3 Removing and installing intake manifold”, page 21](#) .
- Unplug electrical connector at knock sensor 1 -G61- .
- Remove knock sensor 1 -G61- .

Installing

- Install in reverse order.
- Install intake manifold ⇒ [page 21](#) .

Tightening torques:

- ◆ ⇒ [“2.2 Exploded view - ignition system”, page 54](#)



2.4 Removing and installing Hall sender - G40-

Removing

- Unplug electrical connector at Hall sender -G40- and remove Hall sender -G40- -7-.

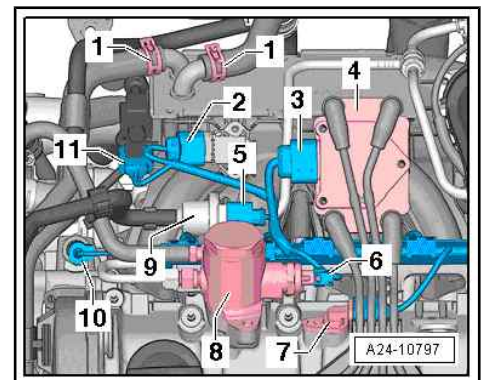
Installing

- Install in reverse order.

Tightening torques:

- ◆ ⇒ [“2.2 Exploded view - ignition system”, page 54](#)

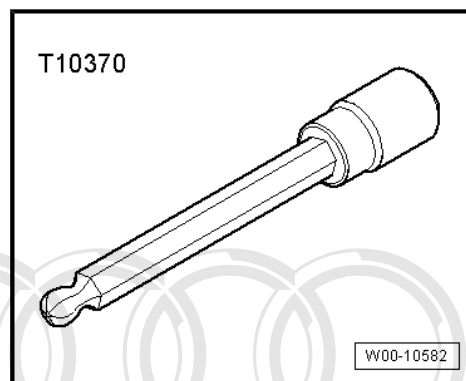
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2.5 Removing and installing engine speed sender -G28-

Special tools and workshop equipment required

◆ Socket -T10370-



Removing

The fitting location of the engine speed sensor is below the intake manifold on the crankshaft sealing flange (flywheel end).

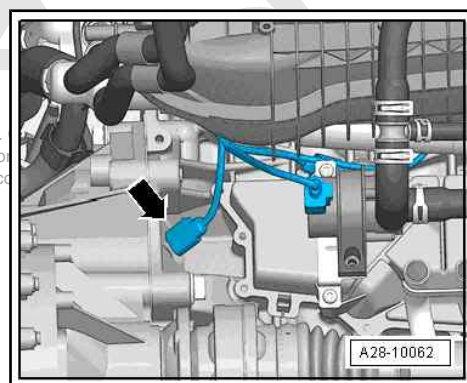
- Detach electrical connector -arrow- at engine speed sender - G28- .
- Unscrew securing bolt for engine speed sender -G28- using socket -T10370- .
- Pull out engine speed sender -G28- .

Installing

- Install engine speed sender -G28- .

Tightening torques:

- ◆ ⇒ ["2.2 Exploded view - ignition system", page 54](#)



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