Workshop Manual

Audi TT 2007 ➢

Direct petrol injection and ignition system (5-cyl. 2.5 ltr. 4-valve turbo)									
Engine ID	CEP A								

Edition 03.2009

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

Repair Group

24 - Mixture preparation - injection

28 - Ignition system

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

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24 – Mixture preparation - injection

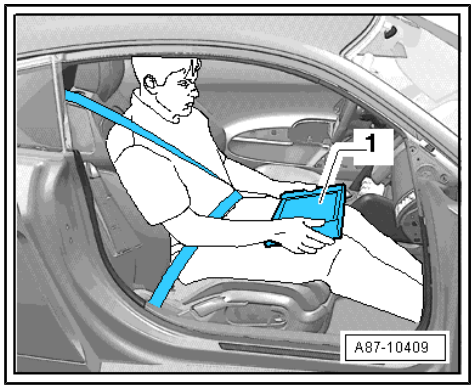
1 Safety precautions and rules for cleanliness

1.1 General notes on self-diagnosis

- The engine control unit has a self-diagnosis capability. Before carrying out repairs and fault finding, the fault memory must be interrogated. The vacuum hoses and connections must also be checked (unmetered air).
- Fuel hoses in engine compartment must only be secured with spring-type clips. O-type clips or screw-type clips must not be used.
- A voltage of at least 11.5 V is required for proper operation of the electrical components.
- Do not use sealants containing silicone. Particles of silicone drawn into the engine will not be burnt in the engine and will damage the Lambda probes.
- The vehicles are fitted with a crash/fuel shut-off system. This system is designed to reduce the risk of a vehicle fire after a crash by deactivating the fuel pump via the fuel pump control unit.

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.*

- *Move the passenger's seat back as far as it will go.*
- *Use only vehicle diagnosis and service information system -VAS 5052 A- or diagnosis system -VAS 5053- .*
- *The test equipment -1- must rest flat on the passenger's thighs (as shown in illustration) and must be operated by the passenger.*

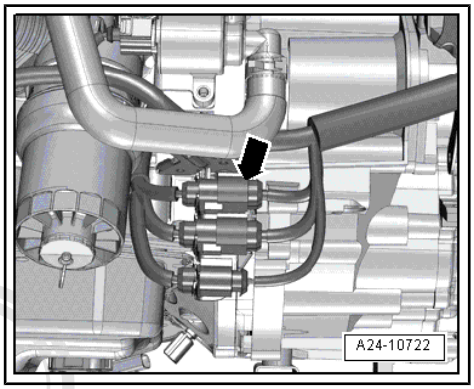
When working on the fuel system note the following warnings:

WARNING

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

- *The fuel 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.*

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



- Persons wearing a cardiac pacemaker must at all times maintain a safe distance from high-voltage components such as the ignition system and gas-discharge headlights.
- Do not open any fuel line connections while the engine is running.
- Always switch off the ignition before connecting or disconnecting injection or ignition system wiring or tester cables.
- 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.
- If the fault memory has been erased, you must generate the readiness code again.
- Always switch off the ignition before cleaning the engine.
- Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.
- If 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.
- Additionally unplug electrical connector -arrow- for injectors.

– Then connect vehicle diagnostic, testing and information system -VAS 5051B- and generate readiness code in engine control unit using “Guided Fault Finding” mode.

1.3 Rules for cleanliness when working on fuel supply system and injection system

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.
- Seal off open pipes/lines and connections immediately with clean plugs, e.g. from engine bung set -VAS 6122- .
- Place parts that have been removed on a clean surface and cover them over. Use only lint-free cloths.
- Carefully cover or seal open components if repairs cannot be carried out immediately.
- Only install clean components; replacement parts should only be unpacked immediately prior to installation. Do not use parts that have been previously unpacked and stored away loose (e.g. in toolboxes, etc.).
- When the system is open: Do not work with compressed air. Do not move the vehicle unless absolutely necessary.
- Protect unplugged electrical connectors against dirt and moisture and make sure connections are dry when attaching.

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

WARNING

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

- *The injection system consists of a high-pressure section (maximum approx. 125 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 residual pressure of approx. 7 bar. The procedure is described below.*

Reducing fuel pressure in high-pressure section

– Connect up the vehicle diagnostic, testing and information system -VAS 5051B- .

– 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.

– With engine idling, pull out fuse for fuel pump control unit -J538- ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

Note

Removing the fuse will interrupt the voltage supply “terminal 30” for the fuel pump control unit -J538- .

– Observe fuel pressure displayed on diagnostic system.

• The fuel pressure will decrease very quickly because the mechanical high-pressure pump is no longer being supplied with fuel from the fuel tank by the fuel pump -G23- .

– 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.

- *The fuel lines are still filled with fuel, however the fuel is no longer under high pressure. Wear safety goggles and protective clothing when opening the fuel system.*
- *Before opening the high-pressure section, wrap a cloth around the connection.*

– The high-pressure system must be opened “immediately” after reducing the fuel pressure; wrap a clean cloth around the connection. Catch the escaping fuel.

The following operations must be performed after completing repair work:

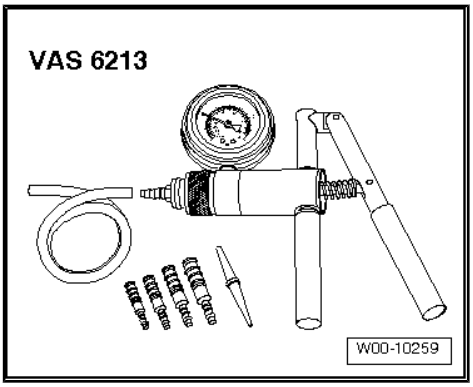
– Refit fuse.

– Then connect vehicle diagnostic, testing and information system -VAS 5051B- and generate readiness code in engine control unit using “Guided Fault Finding” mode.

1.5 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 fault 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.

2 Injection system

2.1 Technical data

Engine data		2.5 ltr. / 4V / 250 kW engine
Idling speed is not adjustable (controlled by idling speed stabilisation).		680 ... 920 rpm
Maximum rpm governed by deactivation of fuel injectors		6900 rpm
Fuel pressure	Initial fuel pressure up to high-pressure pump (generated by electric fuel pump in fuel tank)	7 bar
	Pressure in high-pressure fuel circuit (generated by mechanical single-plunger pump) at a coolant temperature of approx. 85°C.	17.5 ... 125 bar (depending on operating conditions)

2.2 Fitting locations - overview

Part 1

1 - Intake manifold flap valve -N316-

2 - Fuel pressure sender for low pressure -G410-

3 - Injector, cylinder 2 -N31-

- ❑ Removing and installing ⇒ page 26

4 - Injector, cylinder 1 -N30-

5 - Hall sender -G40-

- ❑ Inlet side
- ❑ Removing and installing ⇒ page 56

6 - Ignition coil 1 with output stage -N70-

- ❑ Removing and installing ⇒ page 54

7 - Ignition coil 2 with output stage -N127-

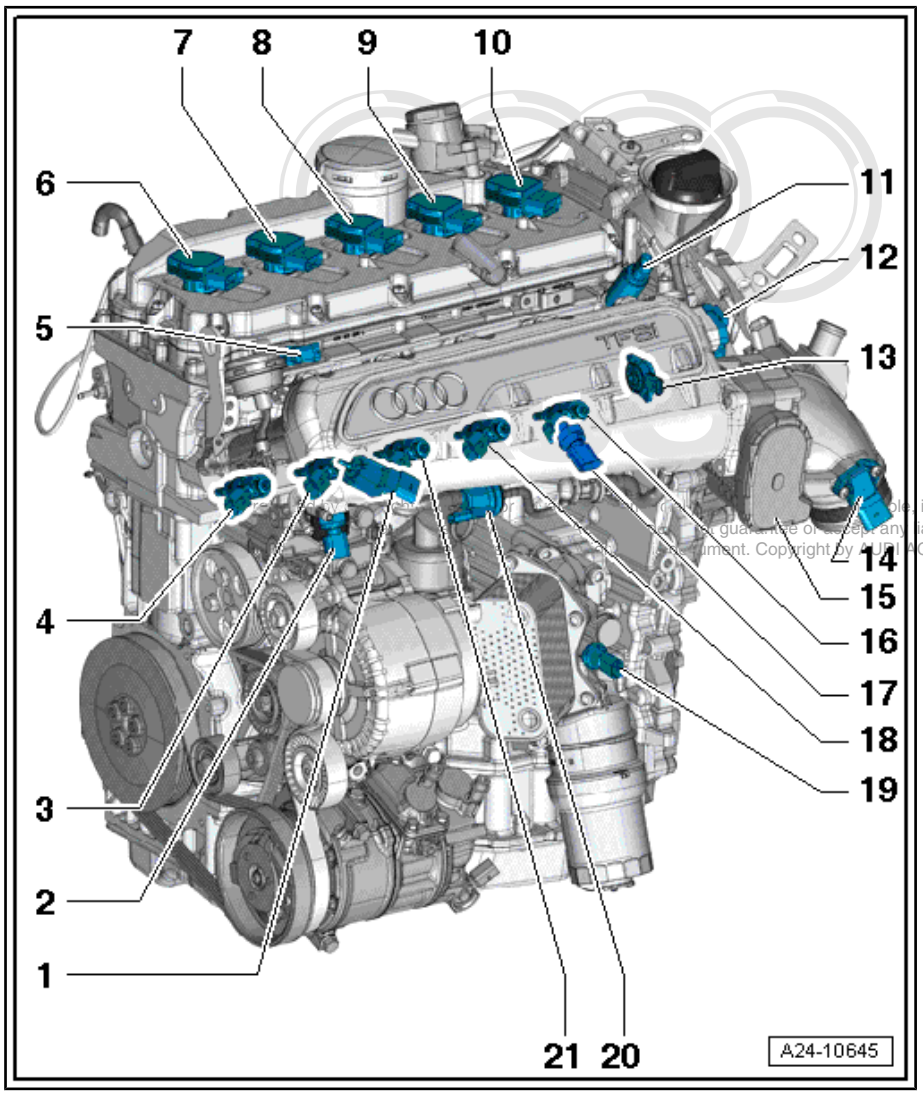
8 - Ignition coil 3 with output stage -N291-

9 - Ignition coil 4 with output stage -N292-

10 - Ignition coil 5 with output stage -N323-

11 - Camshaft control valve 1 -N205-

- ❑ Fitting location ⇒ page 11
- ❑ Removing and installing ⇒ Rep. Gr. 15



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

- ❑ Removing and installing ⇒ page 17

13 - Intake manifold flap potentiometer -G336-

- ❑ After renewing, perform “Adaption” in “Guided Functions” under “Adapting potentiometer for air flow control flaps”

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

- ❑ Removing and installing ⇒ Rep. Gr. 21

15 - Throttle valve module -J338-

- ❑ Including throttle valve drive for electric throttle -G186- , throttle valve drive angle sender 1 for electric throttle -G187- and throttle valve drive angle sender 2 for electric throttle -G188-
- ❑ Removing and installing ⇒ page 18
- ❑ After renewing, perform “Adaption” in “Guided Functions”

16 - Injector, cylinder 5 -N83-

17 - Fuel pressure sender -G247-

- ❑ Removing and installing ⇒ page 30

18 - Injector, cylinder 4 -N33-

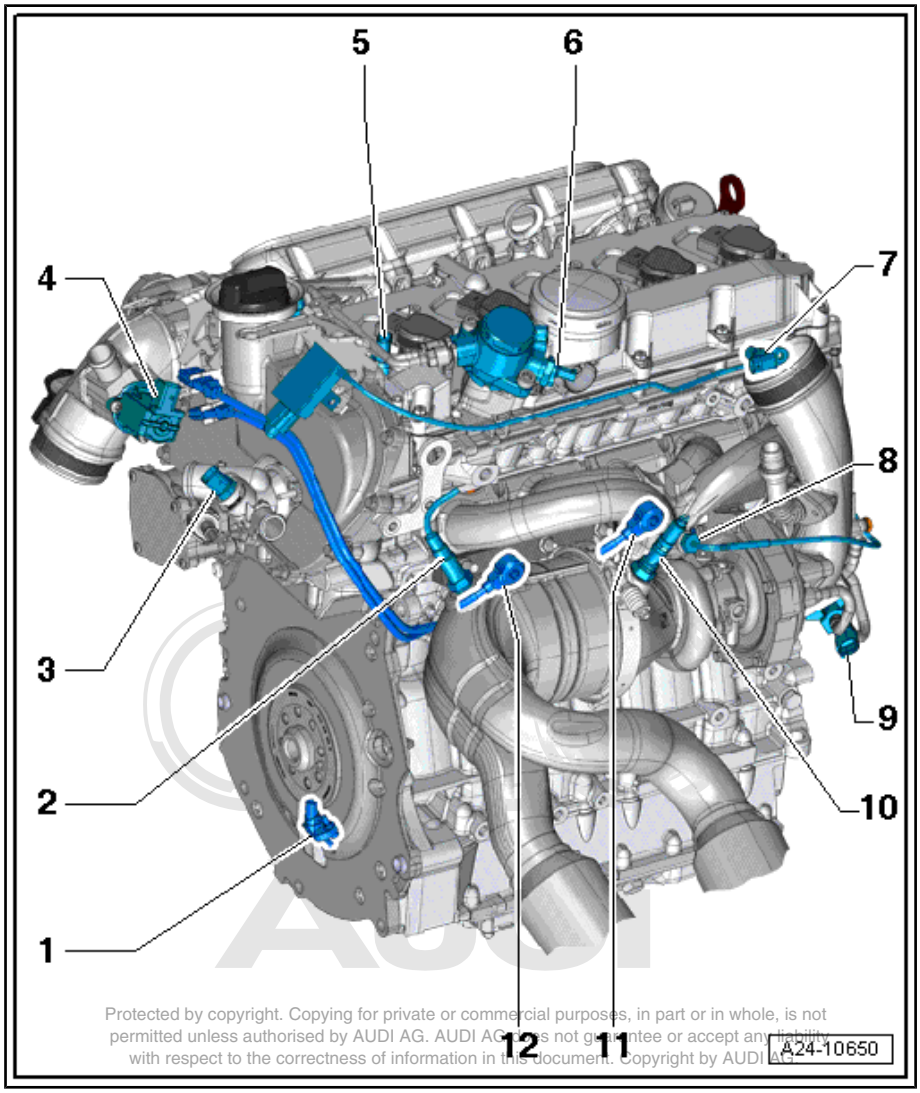
19 - Oil pressure switch -F22-

- ❑ Removing and installing ⇒ Rep. Gr. 17

20 - Activated charcoal filter solenoid valve 1 -N80-

21 - Injector, cylinder 3 -N32-

Part 2



1 - Engine speed sender -G28-

- ❑ Removing and installing ⇒ page 57

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

- ❑ Fitting location of connector ⇒ page 10
- ❑ Removing and installing ⇒ page 42

3 - Coolant temperature sender -G62-

- ❑ Removing and installing ⇒ Rep. Gr. 19

4 - Turbocharger air recirculation valve -N249-

- ❑ Removing and installing ⇒ Rep. Gr. 21

5 - Exhaust camshaft control valve 1 -N318-

- ❑ Removing and installing ⇒ Rep. Gr. 15

6 - Fuel metering valve -N290-

- ❑ Combined with high-pressure pump
- ❑ Cannot be renewed separately

7 - Hall sender 3 -G300-

- ❑ Exhaust side
- ❑ Removing and installing ⇒ page 56

8 - Exhaust gas temperature sender 1 -G235-

- ❑ Removing and installing ⇒ Rep. Gr. 26

9 - Charge pressure control solenoid valve -N75-

10 - Lambda probe before catalytic converter -G39- with Lambda probe heater -Z19-

- ❑ Fitting location of connector ⇒ page 10
- ❑ Removing and installing ⇒ page 40

11 - Knock sensor 1 -G61-

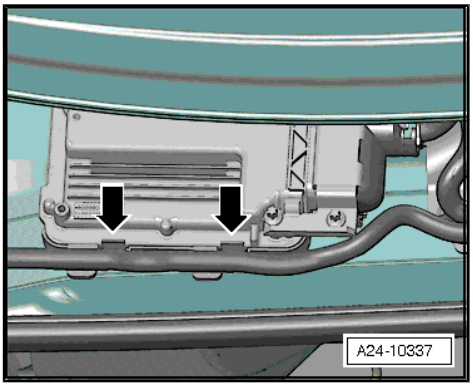
- ❑ Fitting location of connector ⇒ page 10
- ❑ Removing and installing ⇒ page 55

12 - Knock sensor 2 -G66-

- ❑ Fitting location of connector ⇒ page 10
- ❑ Removing and installing ⇒ page 55

Fitting location of engine control unit -J623-

- In electronics box (plenum chamber)
- Removing and installing ⇒ page 47

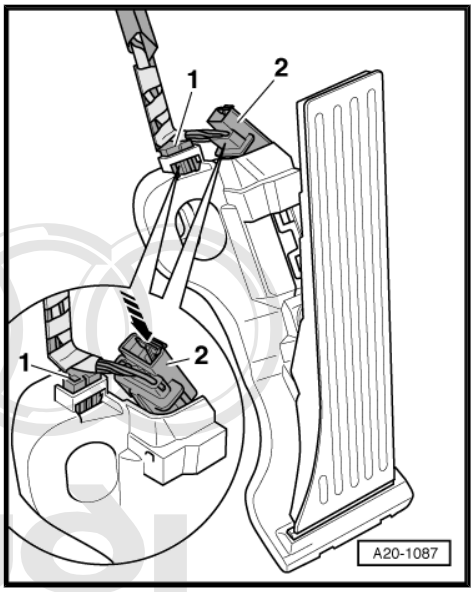


Fitting location of accelerator position sender -G79- with accelerator position sender 2 -G185-

- Combined with accelerator pedal module
- Removing and installing accelerator pedal module ⇒ Rep. Gr. 20

Note

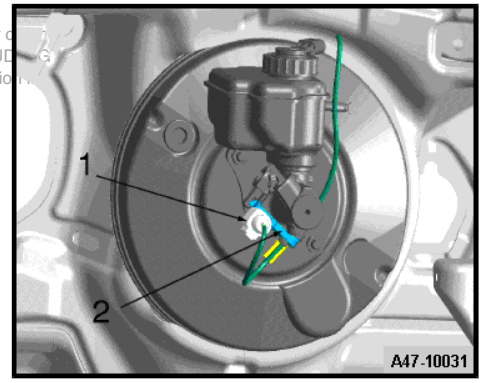
The illustration shows the set-up for left-hand drive vehicles.



Fitting location of brake light switch -F- with brake pedal switch -F47-

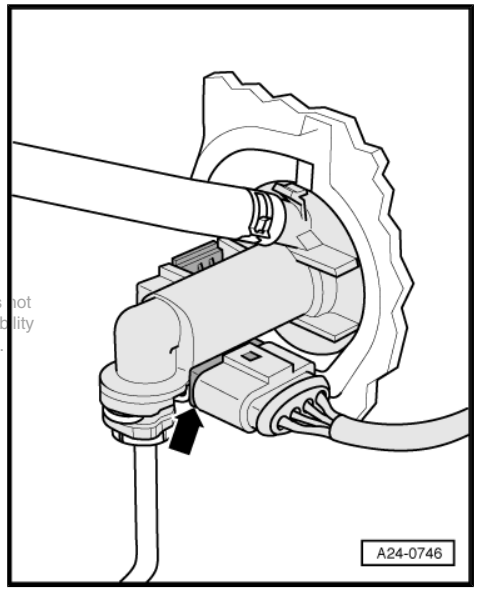
1 - Brake light switch -F- with brake pedal switch -F47-

- On brake master cylinder
- Removing and installing ⇒ Rep. Gr. 47



Fitting location of clutch position sender -G476-

- On clutch master cylinder-arrow-.
- Removing and installing ⇒ Rep. Gr. 30

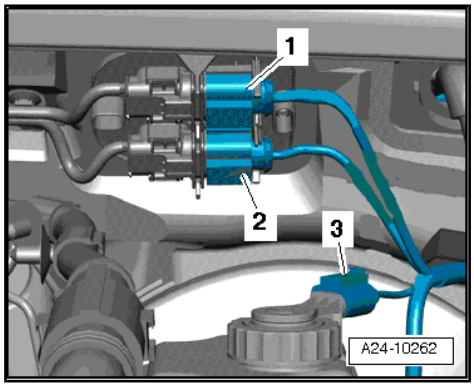


Fitting location of electrical connectors for Lambda probes

1 - For Lambda probe, before catalytic converter -G39- with Lambda probe heater -Z19-

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

- At plenum chamber partition panel

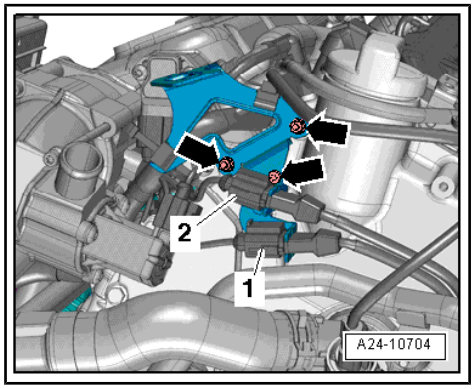


Fitting location of electrical connectors for knock sensors

1 - For knock sensor 2 -G66-

2 - For knock sensor 1 -G61-

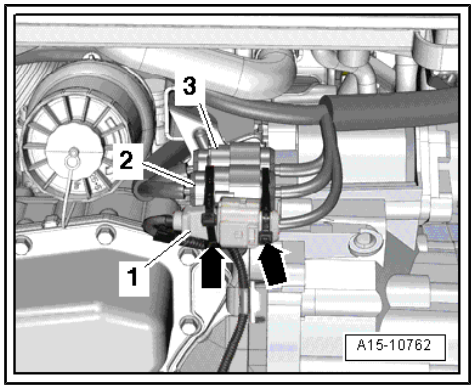
- On cylinder head cover



Fitting location of electrical connectors on cylinder head

1 - For engine speed sender -G28-

3 - For injectors

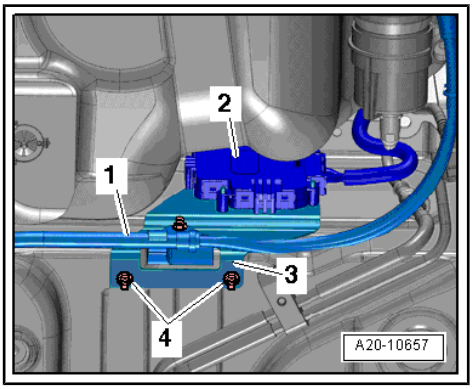


Fitting location of fuel pump control unit -J538-

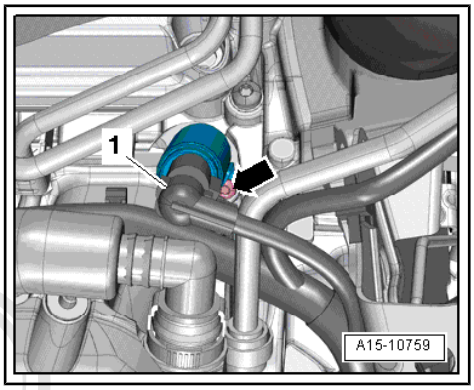
2 - Fuel pump control unit -J538-

3 - Bracket

♦ On underside in front of fuel tank



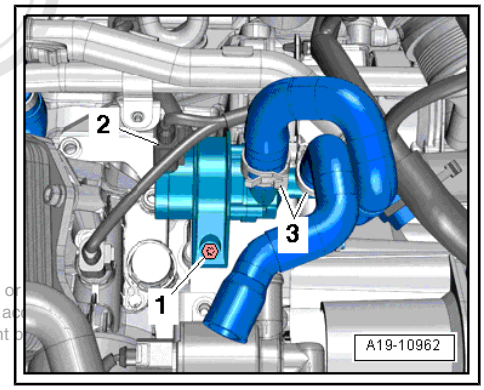
Camshaft control valve 1 -N205-



Fitting location of continued coolant circulation pump -V51-

2 - Continued coolant circulation pump -V51-

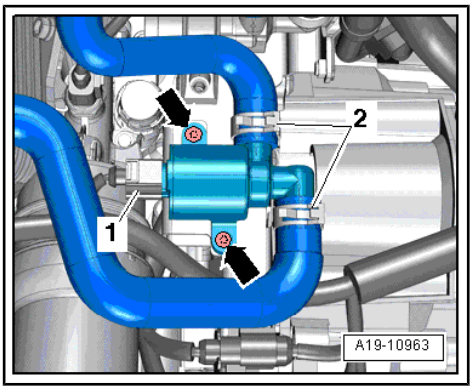
♦ On cylinder block (inlet side)



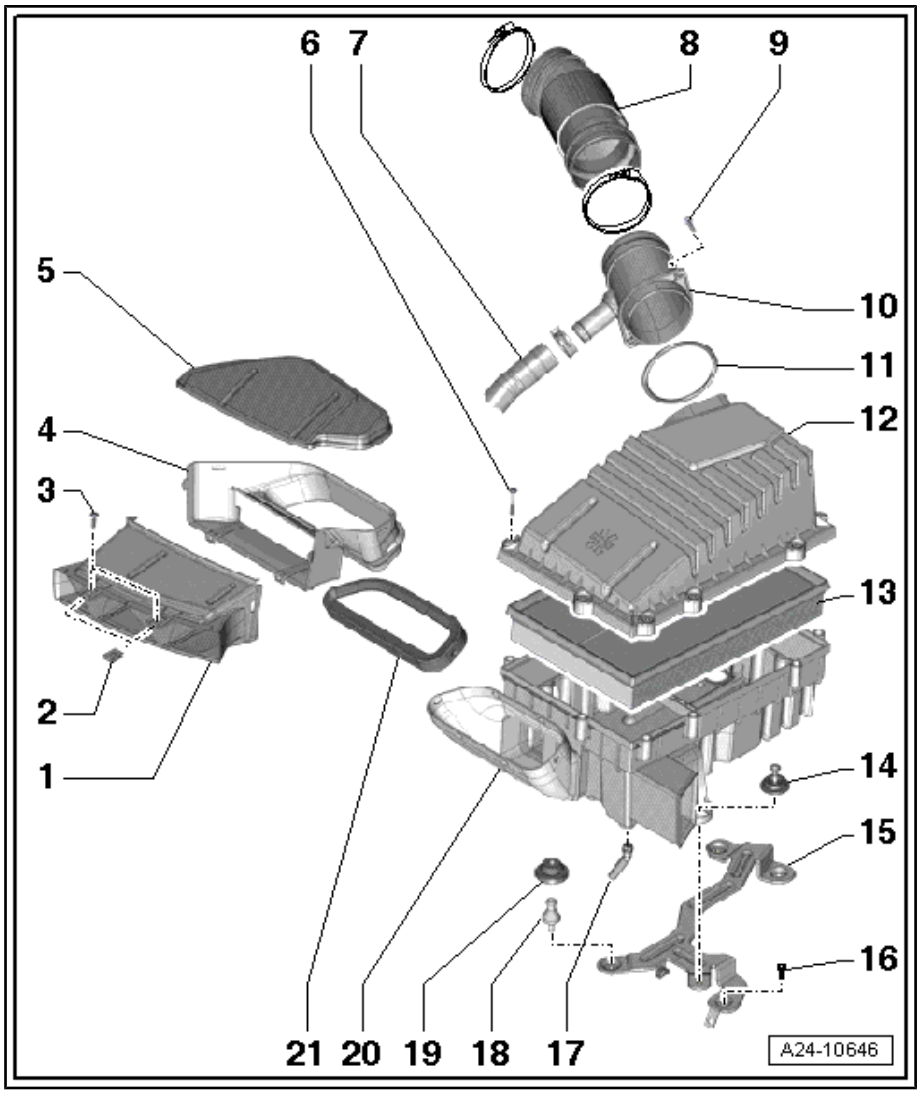
Fitting location of solenoid for coolant circuit -N492-

1 - Solenoid for coolant circuit -N492-

♦ On cylinder block (inlet side)



2.3 Air cleaner - exploded view



1 - Front air duct
- ❑ Clean out dirt, leaves and salt deposits

2 - Clip nut

3 - Bolt
- ❑ 1.5 Nm

4 - Lower part of air duct
- ❑ Clean out dirt, leaves and salt deposits

5 - Air duct cover

6 - Bolt
- ❑ 5 Nm

7 - Hose
- ❑ For crankcase breather

8 - Air hose

9 - Bolt
- ❑ 3 Nm

10 - Air pipe

11 - Seal
- ❑ Renew if damaged

12 - Air cleaner (top section)
- ❑ Clean out salt deposits, dirt and leaves, etc.

13 - Air filter element
- ❑ Always use genuine part for air filter element
- ❑ Removing and installing ⇒ page 13
- ❑ Observe change intervals ⇒ Maintenance ; Booklet 810

14 - Bolt
- ❑ With captive rubber grommet
- ❑ 10 Nm

15 - Bracket
- ❑ For air cleaner housing

16 - Bolt
- ❑ With captive rubber grommet
- ❑ 10 Nm

17 - Water drain
- ❑ Clean

18 - Retaining peg
- ❑ 10 Nm

19 - Rubber grommet

20 - Air cleaner (bottom section)
- ❑ Clean out salt deposits, dirt and leaves, etc.
- ❑ Removing and installing ⇒ page 15

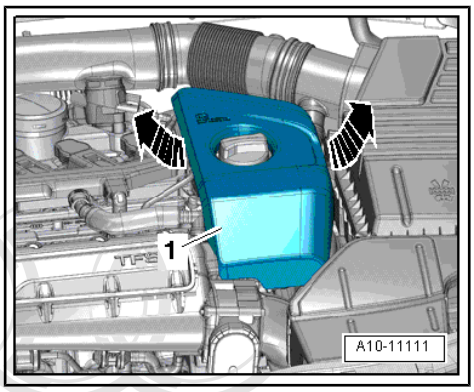
21 - Seal

- ❑ Clipped into air cleaner (bottom section)

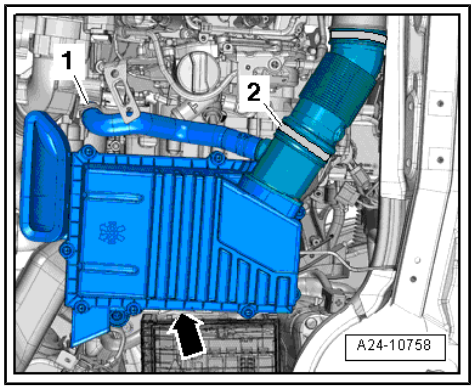
2.4 Removing and installing air filter element

Removing

– Lift off engine cover panel -1- -arrows-.



– Remove all bolts from air cleaner (top section) -arrow- and swivel air cleaner (top section) away upwards.
– Take out air filter element.



Installing

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

- Tightening torques
⇒ “2.3 Air cleaner - exploded view”, page 12

Note

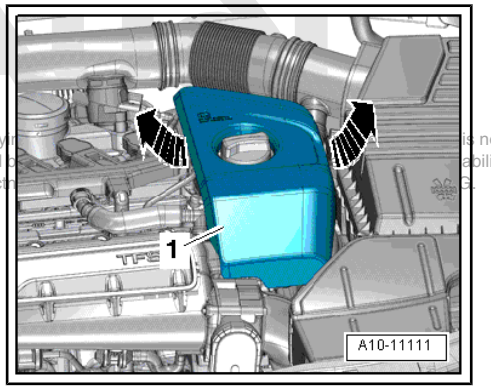
- *Always use genuine part for air filter element.*
- *The inside of the air cleaner housing must be clean.*
- *To prevent malfunctions, cover the air pipes etc. with clean cloths when blowing out the air cleaner housing with compressed air.*
- *Hose connections and air pipes and hoses must be free of oil and grease before assembly.*
- *Do not use any lubricants containing silicone when assembling.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *To ensure that the air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*

– Blow out water drain (small hole in bottom section of air cleaner housing) with compressed air.
– Clean salt residue, dirt and leaves out of air cleaner housing (top and bottom sections), using a vacuum cleaner if necessary.
– Check for salt residue, dirt and leaves in air hoses (engine intake side).
– Check for dirt and leaves in air duct going from lock carrier to air cleaner housing.
– When fitting air filter element, check that it is properly centred in the retainer in the air cleaner (bottom section).
– Carefully fit top section of air cleaner onto bottom section, without using any force. When doing so, make sure that the air cleaner (top section) is fitted straight on the air filter element (note the position of the sealing lip on the air filter element).

2.5 Removing and installing air cleaner housing

Removing

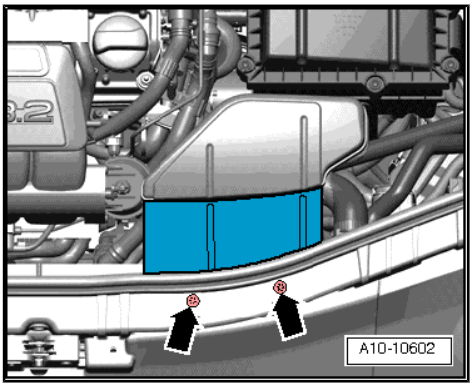
– Lift off engine cover panel -1- -arrows-.



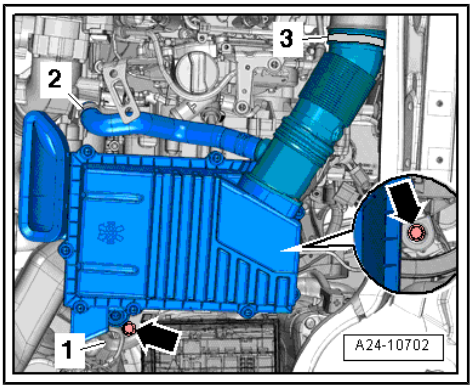
Note

Fit all cable ties in the original positions when installing.

– Unscrew bolts -arrows- and remove air duct.



– Release hose clips -2- and -3- and disconnect air hoses.
– Move clear electrical wiring harness -1- at bracket for air cleaner housing.
– Unscrew bolts -arrows- and detach air cleaner housing.



Installing

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

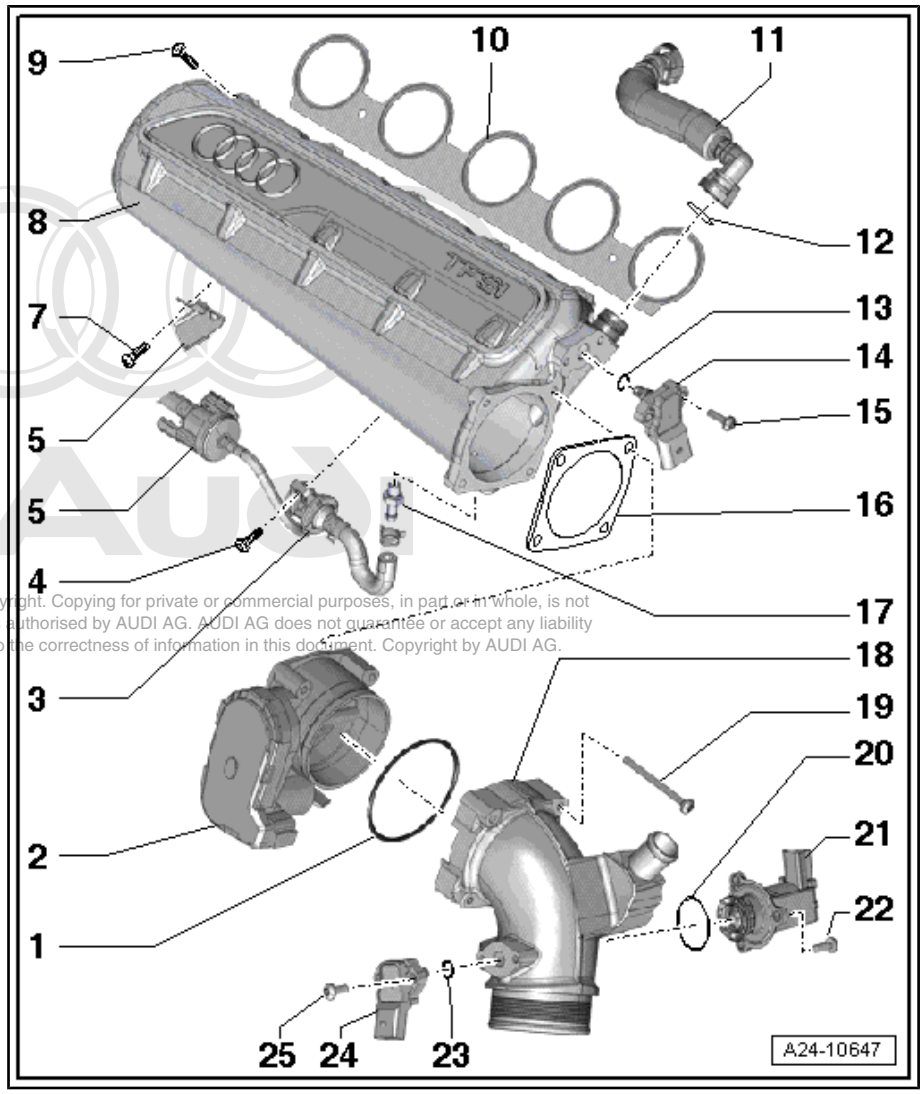
- Tightening torques
  ⇒ “2.3 Air cleaner - exploded view”, page 12

Note

- *Hose connections and air pipes and hoses must be free of oil and grease before assembly.*
- *Do not use any lubricants containing silicone when assembling.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *To ensure that the air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*

– Check for dirt and leaves in air duct going from lock carrier to air cleaner housing.

2.6 Intake manifold (top section) - exploded view



1 - Seal
- ❑ Renew

2 - Throttle valve module - J338-
- ❑ Removing and installing ⇒ page 18
- ❑ After renewing, perform “Adaption” in “Guided Functions”

3 - Non-return valve

4 - Bolt
- ❑ 9 Nm

5 - Activated charcoal filter solenoid valve 1 -N80-

6 - Bracket

7 - Bolt
- ❑ 9 Nm

8 - Intake manifold (top section)
- ❑ Removing and installing ⇒ page 20

9 - Bolt
- ❑ Tightening torque and sequence ⇒ page 17

10 - Gasket
- ❑ Renew

11 - Hose
- ❑ For crankcase breather

12 - O-ring
- ❑ Renew

13 - O-ring
- ❑ Renew

14 - Intake air temperature sender -G42- / intake manifold pressure sender -G71-
- ❑ Removing and installing ⇒ page 17

15 - Bolt
- ❑ 9 Nm

16 - Gasket
- ❑ Renew

17 - Union
- ❑ Apply locking fluid when installing; refer to ⇒ Electronic parts catalogue
- ❑ 20 Nm

18 - Intake connecting pipe

19 - Bolt
- ❑ 9 Nm

20 - O-ring

- ❑ Renew

21 - Turbocharger air recirculation valve -N249-

- ❑ Removing and installing ⇒ Rep. Gr. 21

22 - Bolt

- ❑ 9 Nm

23 - O-ring

- ❑ Renew

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

- ❑ Removing and installing ⇒ Rep. Gr. 21

25 - Bolt

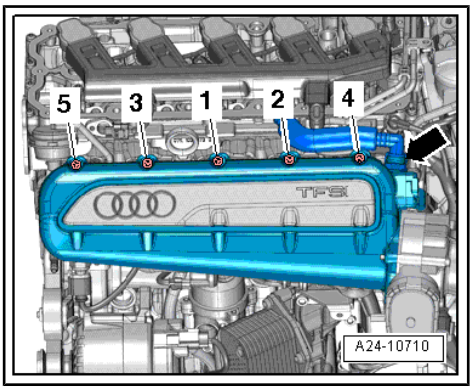
- ❑ 9 Nm

Intake manifold (top section) - tightening torque and sequence

– Tighten bolts for intake manifold in the sequence -1 to 5-.

♦ Initially screw in bolts by hand until they make contact.

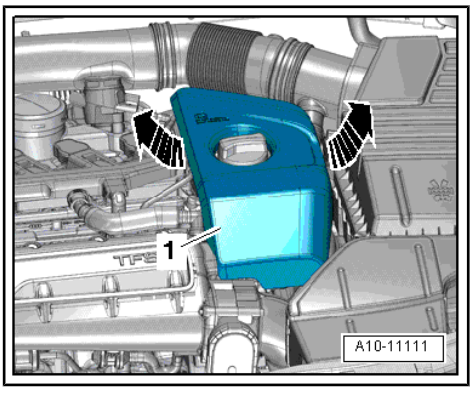
♦ Subsequently tighten to 9 Nm



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

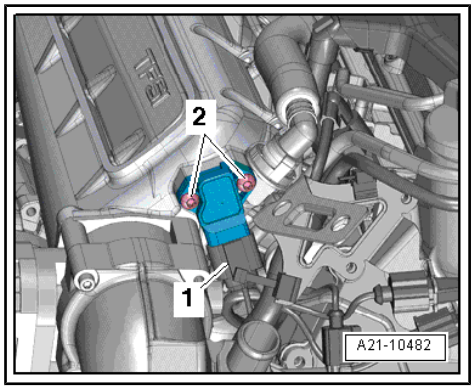
Removing

– Lift off engine cover panel -1- -arrows-.



– Unplug electrical connector -1-.

– Unscrew bolts -2- and detach intake air temperature sender -G42- / intake manifold pressure sender -G71- .



Installing

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

- Tightening torques
  ⇒ “2.6 Intake manifold (top section) - exploded view”, page 16

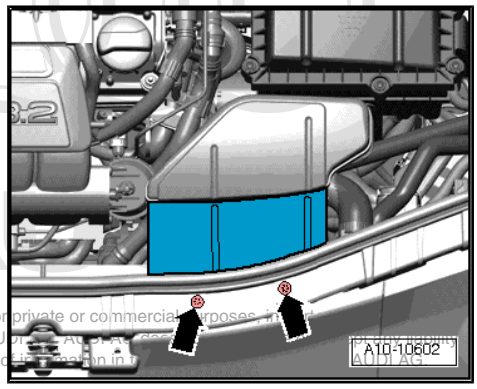
Note

Fit new O-ring.

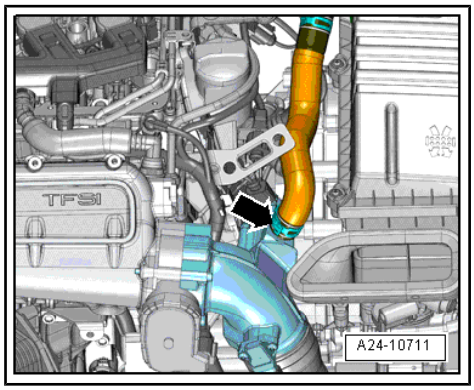
2.8 Removing and installing throttle valve module -J338-

Removing

– Unscrew bolts -arrows- and remove air duct.

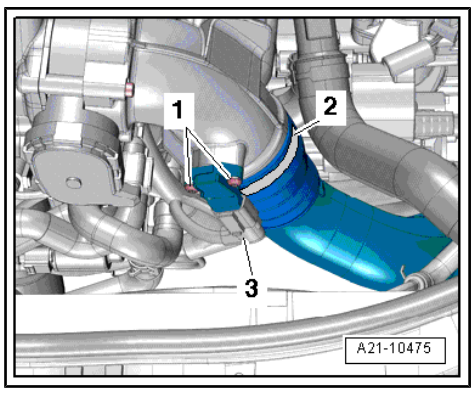


– Release hose clip -arrow- and detach air hose.



– Loosen hose clip -2-.

– Unplug electrical connector -3- at charge air pressure sender -G31- / intake air temperature sender 2 -G299- .



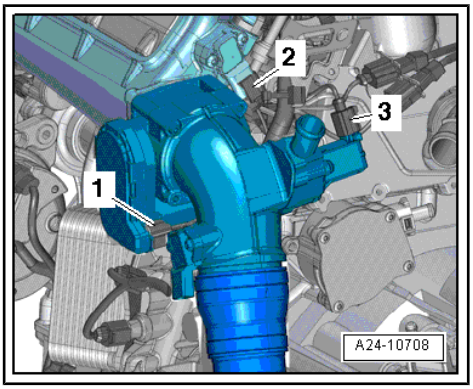
Note

Disregard -item 1-.

– Unplug electrical connectors:

1 - Throttle valve module -J338-

3 - Turbocharger air recirculation valve -N249-



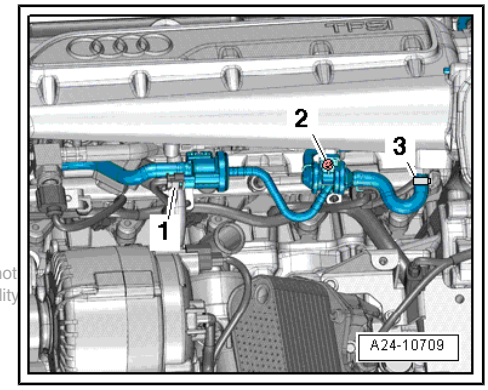
Note

Disregard -item 2-.

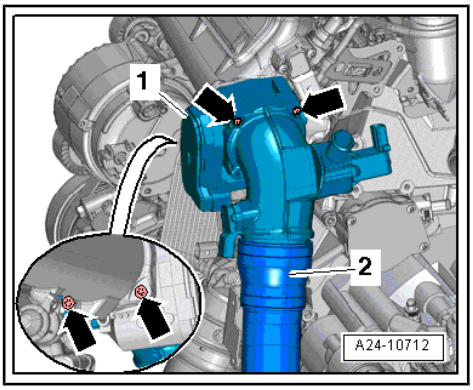
– Disengage activated charcoal filter solenoid valve 1 -N80- -item 1-.

– Remove bolt -2-.

– Release hose clip -3- and detach hose.



– Remove bolts -arrows- and detach throttle valve module -J338- -item 1- with connection from air hose -2-.



Installing

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

- Tightening torques
  ⇒ “2.6 Intake manifold (top section) - exploded view”, page 16 and ⇒ “2.3 Air cleaner - exploded view”, page 12

Note

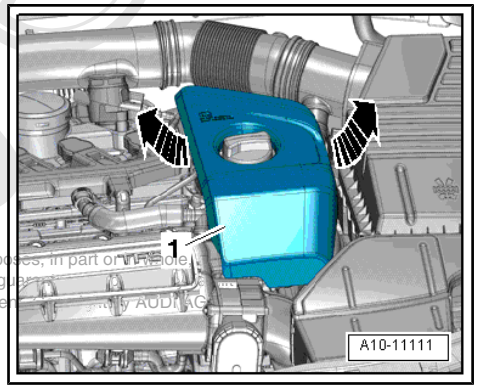
- *Renew gasket and O-ring.*
- *Hose connections and air pipes and hoses must be free of oil and grease before assembly.*
- *Do not use any lubricants containing silicone when assembling.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *To ensure that the air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*

– After renewing, perform “Adaption” in “Guided Functions” - VAS 5051B- .

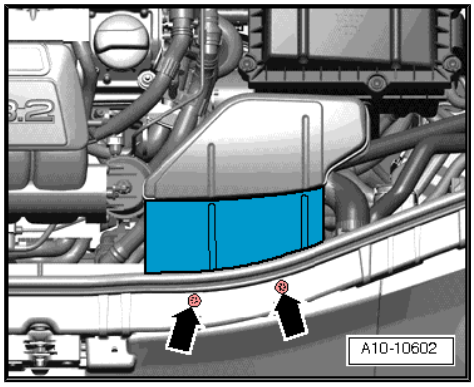
2.9 Removing and installing intake manifold (top section)

Removing

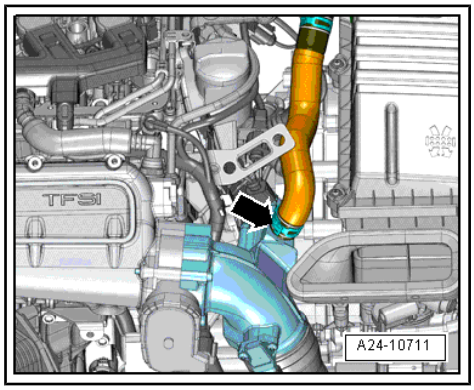
– Lift off engine cover panel -1- -arrows-.



– Unscrew bolts -arrows- and remove air duct.



– Release hose clip -arrow- and detach air hose.

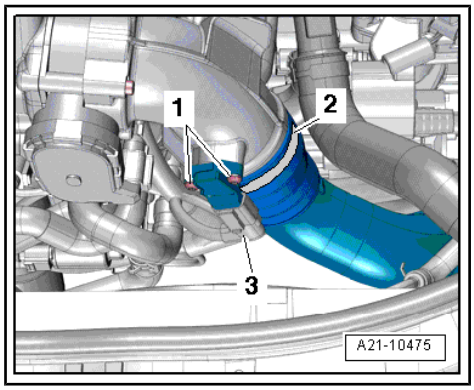


– Loosen hose clip -2-.

– Unplug electrical connector -3- at charge air pressure sender -G31- / intake air temperature sender 2 -G299- .

Note

Disregard -item 1-.

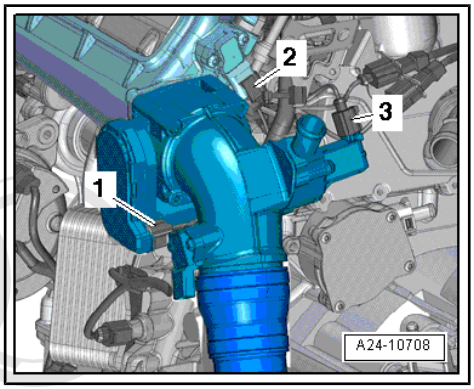


– Unplug electrical connectors:

1 - Throttle valve module -J338-

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

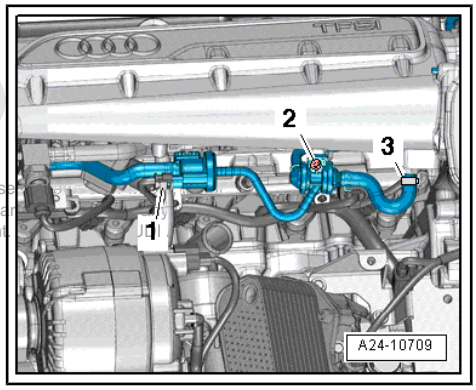
3 - Turbocharger air recirculation valve -N249-



– Disengage activated charcoal filter solenoid valve 1 -N80- -item 1-.

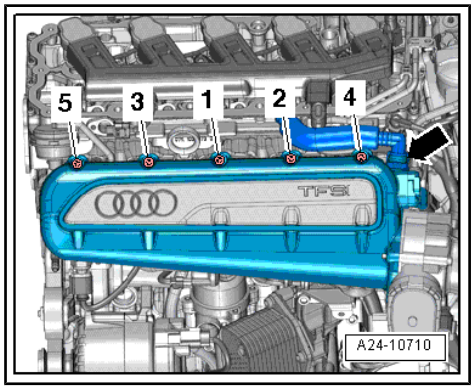
– Remove bolt -2-.

– Release hose clip -3- and detach hose.



– Press release tabs and disconnect crankcase breather hose -arrow-.

– Unscrew bolts -1 ... 5- and detach intake manifold (top section).



Caution

Risk of damage to engine.

- ***Block off the openings of the intake ports in the cylinder head with a clean cloth to prevent small items from dropping into the engine.***

Installing

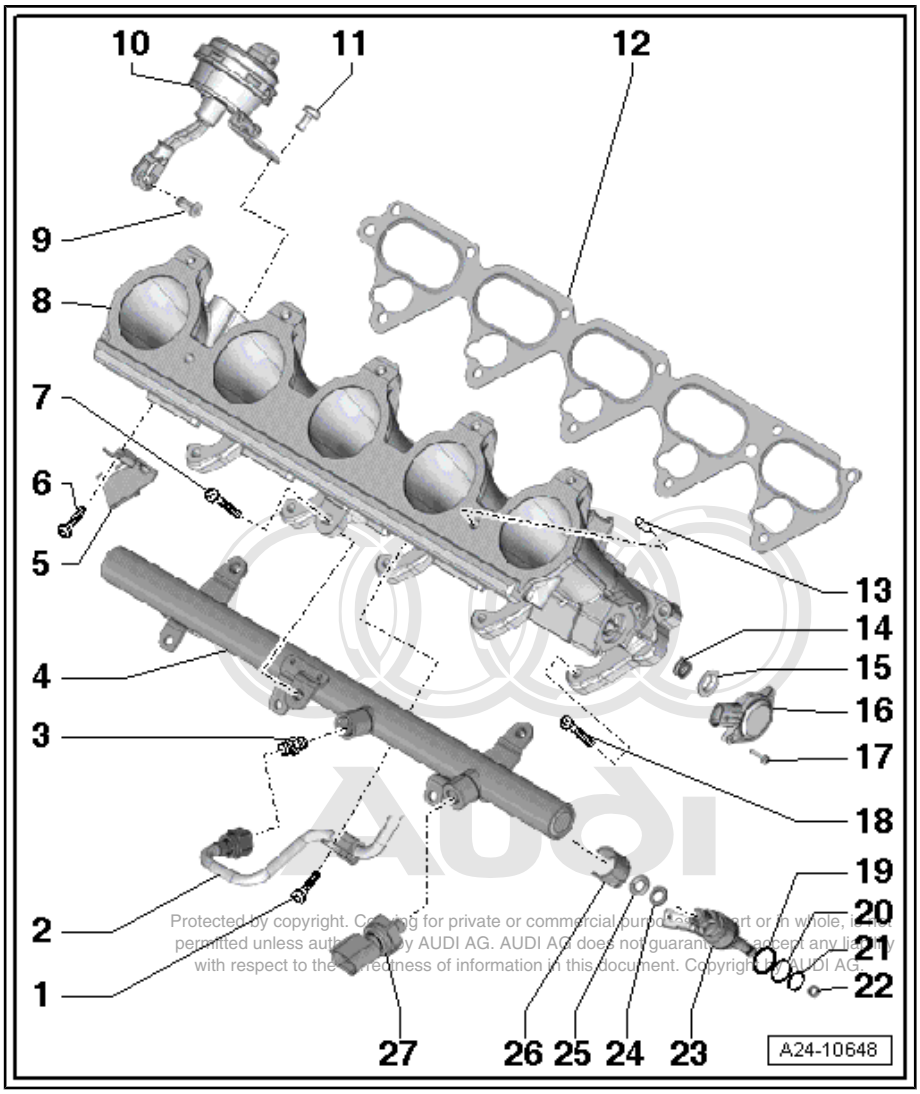
Installation is carried out in the reverse order; note the following:

- Tightening torques
  ⇒ "2.6 Intake manifold (top section) - exploded view", page 16 ,
  ⇒ Fig. " Intake manifold (top section) - tightening torque and sequence " , page 17 and
  ⇒ "2.3 Air cleaner - exploded view", page 12 .

Note

- *Renew gasket and O-ring.*
- *Hose connections and air pipes and hoses must be free of oil and grease before assembly.*
- *Do not use any lubricants containing silicone when assembling.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *To ensure that the air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*

2.10 Intake manifold (bottom section), fuel rail and injectors - exploded view



1 - Bolt
- ❑ 9 Nm

2 - High-pressure pipe

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

- ❑ Reducing fuel pressure in high-pressure section of injection system ⇒ page 4
- ❑ Connections must not be damaged
- ❑ Do not alter shape
- ❑ Removing and installing ⇒ page 37
- ❑ 27 Nm

3 - Threaded connection
- ❑ 40 Nm

4 - Fuel rail
- ❑ Removing and installing ⇒ page 24

5 - Bracket

6 - Bolt
- ❑ 9 Nm

7 - Bolt
- ❑ 9 Nm

8 - Intake manifold (bottom section)
- ❑ With vacuum unit for intake manifold flaps
- ❑ Removing and installing ⇒ page 24

9 - Locking pin

10 - Vacuum unit

11 - Bolt
- ❑ 9 Nm

12 - Gasket
- ❑ Renew

13 - Dowel pin

14 - Seal

15 - Washer

16 - Intake manifold flap potentiometer -G336-

- ❑ After renewing, perform “Adaption” in “Guided Functions” under “Adapting potentiometer for air flow control flaps”

17 - Bolt

- ❑ 2.5 Nm

18 - Bolt

- ❑ 9 Nm

19 - Sealing element (top)

20 - Sealing element (bottom)

21 - Circlip

22 - Combustion chamber ring seal

- ❑ Do not apply grease to ring seal or use any other lubricants
- ❑ Renewing ⇒ “2.12 Removing and installing injectors”, page 26

23 - Injector

- ❑ Removing and installing ⇒ page 26

24 - Spacer ring

- ❑ Renew if damaged

25 - O-ring

- ❑ Renew
- ❑ Lubricate lightly with clean engine oil

26 - Support ring

- ❑ Renew
- ❑ Via this support ring, the fuel rail exerts the clamping force that holds the injector in the cylinder head
- ❑ Clipped to -item 23-

27 - Fuel pressure sender -G247-

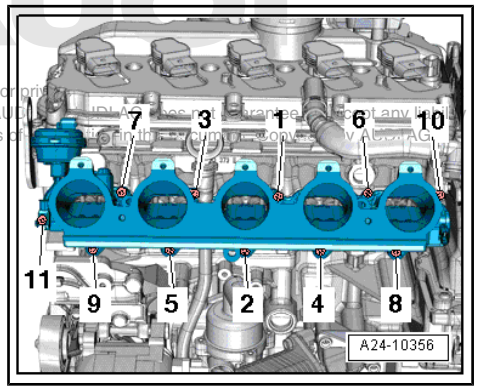
- ❑ Removing and installing ⇒ page 30
- ❑ 25 Nm

Intake manifold (bottom section) - tightening torque and tightening sequence

– Tighten bolts and nuts for intake manifold (bottom section) in the sequence -1 to 11- in 2 stages.

♦ Tighten initially to 7 Nm

♦ Subsequently tighten to 9 Nm

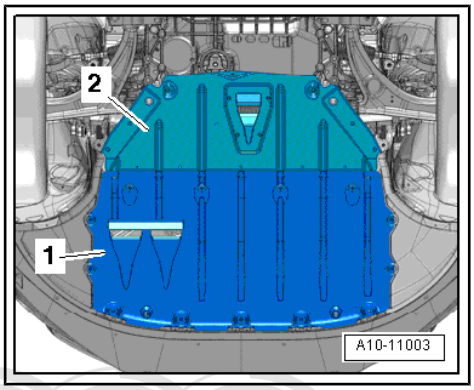


2.11 Removing and installing intake manifold (bottom section) with fuel rail

Removing

– Remove intake manifold (top section) ⇒ page 20 .

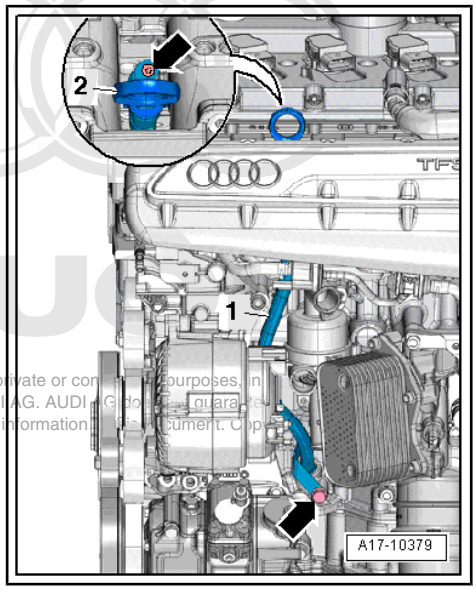
– Remove high-pressure pipe ⇒ page 37 .
– Remove front noise insulation -1- ⇒ Rep. Gr. 66 .



Note

Fit all cable ties in the original positions when installing.

– Pull out oil dipstick -2-.
– Remove bolts -arrows- and lift off guide tube -1- for oil dipstick.



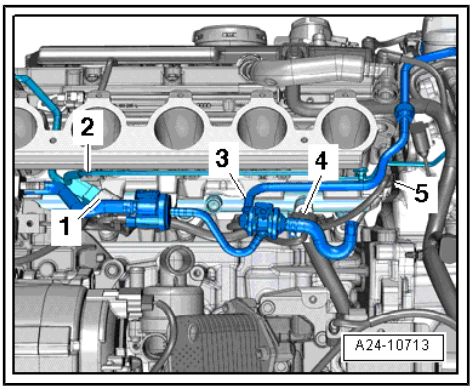
– Unplug electrical connectors:

1 - Intake manifold flap valve -N316-

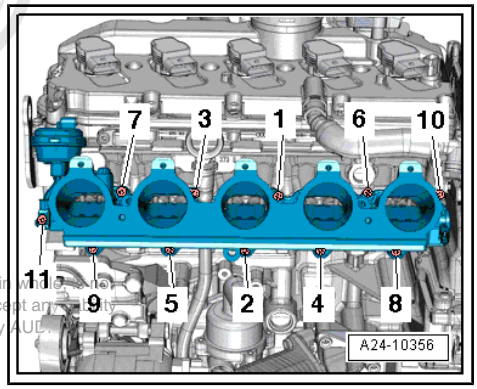
4 - Fuel pressure sender -G247-

5 - Intake manifold flap potentiometer -G336-

– Disconnect vacuum hose -2- and hose -3- from activated charcoal filter and move clear.
– Move electrical wiring clear.



– Loosen bolts in the sequence -11 ... 1-.
– Remove bolts and detach intake manifold (bottom section).



Caution

Risk of damage to engine.

- ***Block off the openings of the intake ports in the cylinder head with a clean cloth to prevent small items from dropping into the engine.***

Note

Injectors must be removed before gasket for intake manifold (bottom section) can be detached.

– Remove injectors ⇒ page 26 .

Installing

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

- Tightening torque
  ⇒ Fig. " Intake manifold (bottom section) - tightening torque and tightening sequence " , page 24 .

Note

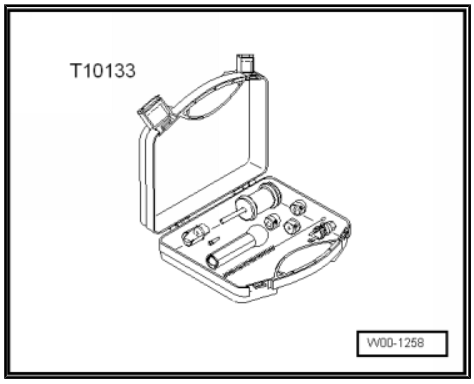
- *Renew gaskets and O-rings.*
- *Injectors must be installed after gasket for intake manifold (bottom section) has been attached.*

– Install injectors ⇒ page 26 .
– Secure dipstick guide tube ⇒ Rep. Gr. 17 .
– Install high-pressure pipe ⇒ page 37 .
– Install intake manifold (top section) ⇒ page 20 .
– Install noise insulation ⇒ Rep. Gr. 66 .

2.12 Removing and installing injectors

Special tools and workshop equipment required

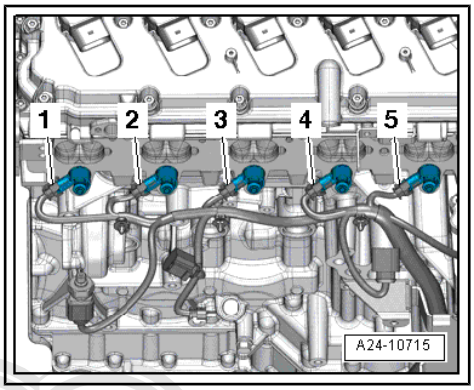
- Tool set for FSI engines -T10133-



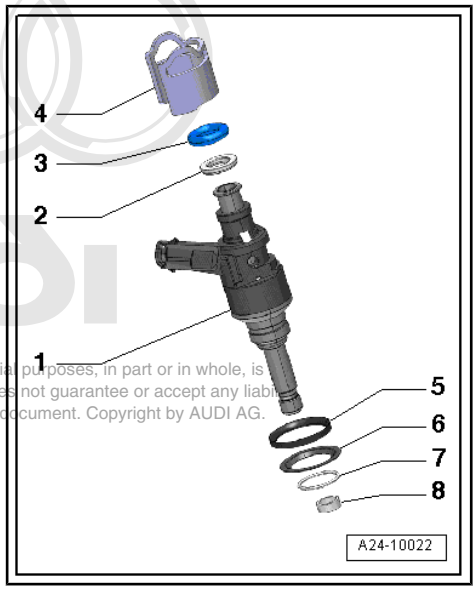
Removing

– Remove intake manifold (top section) ⇒ page 20 .

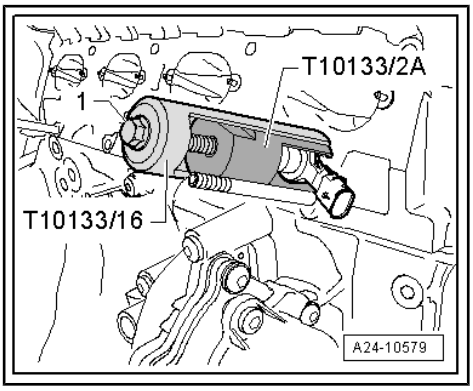
– Remove intake manifold (bottom section) ⇒ page 24 .
– Unplug electrical connectors -1 to 5- at injectors.



– Detach support ring -4- from injector -1-.



– Apply puller -T10133/2A- to groove on injector.
– Attach removal tool -T10133/16- to puller.
– Pull out injector by screwing in bolt -1-.
– Repeat procedure for each injector.
– Detach gasket for intake manifold (bottom section).

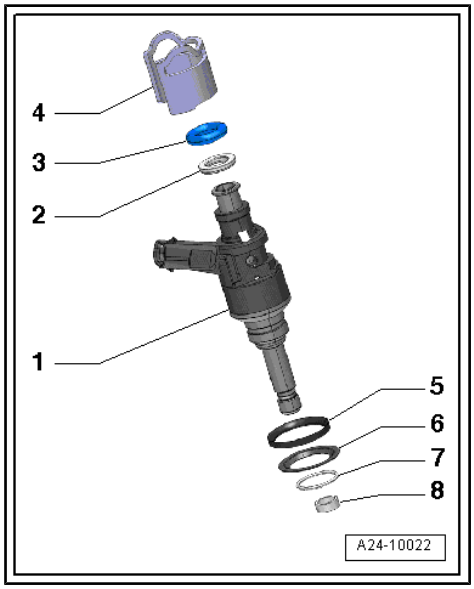


Dismantling injector

– Pull O-ring -3- and spacer ring -2- off injector -1-.

– Detach circlip -7-, sealing element (top) -5- and sealing element (bottom) -6-.

– Carefully remove old combustion chamber ring seal -8-. To do so, cut open seal using knife or prise open with small screwdriver and then pull off forwards.

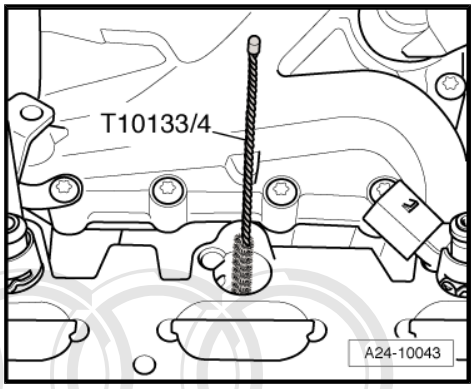


Note

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

Installing

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

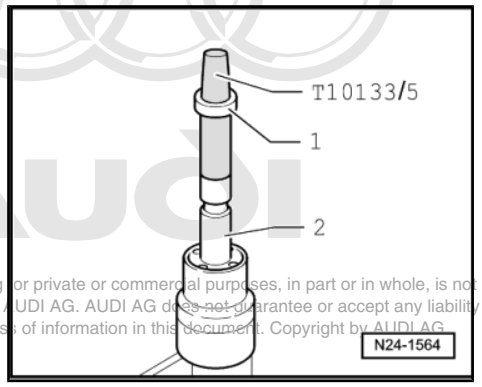


Note

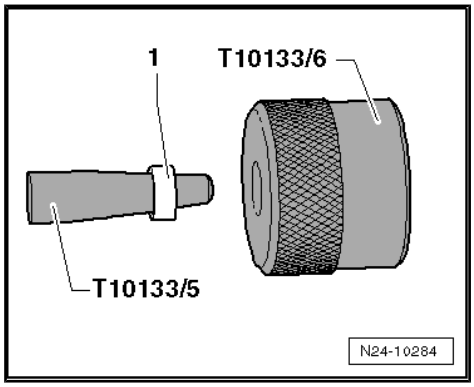
- *Renew combustion chamber ring seal and O-ring.*
- *Renew spacer ring if damaged.*

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

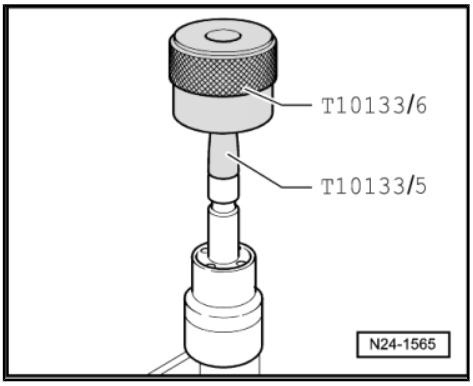
– Fit assembly cone -T10133/5- with new combustion chamber ring seal -1- onto injector -2-.



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



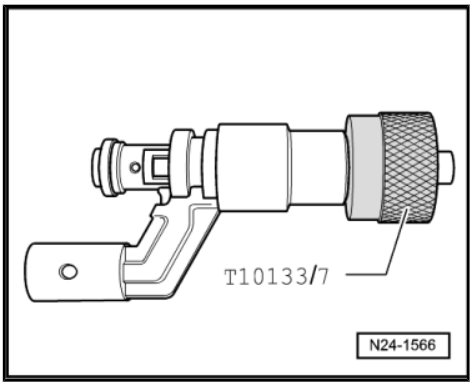
– Turn round assembly sleeve -T10133/6- and slide combustion chamber ring seal into groove.



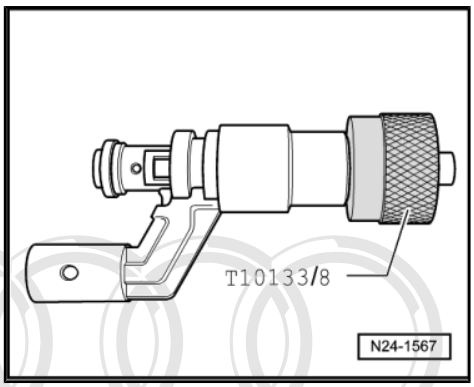
Note

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

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



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

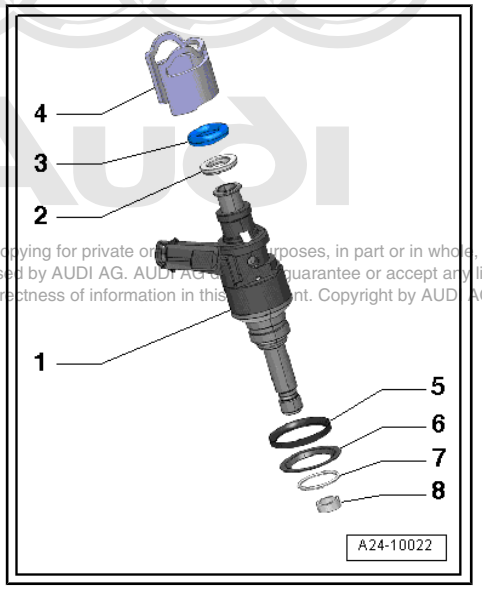


– Before installing new injector -1-, lubricate new O-ring -3- lightly with clean engine oil.

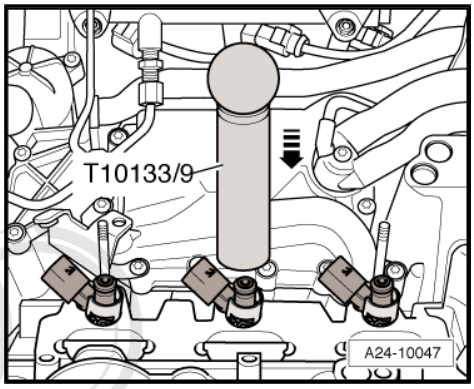
Note

The combustion chamber ring seal -8- must not be lubricated.

– Fit gasket for intake manifold (bottom section).



– Use assembly tool -T10133/9- to push injector as far as it will go into hole in cylinder head.



Note

It should be possible to insert injector easily. If necessary wait until the combustion chamber ring seal has contracted sufficiently.

– Check that injector is seated correctly in cylinder head:

• Electrical connector of injector must engage in recess in cylinder head.

– Install intake manifold (bottom section) ⇒ page 24 .

– Install intake manifold (top section) ⇒ page 20 .

2.13 Removing and installing fuel pressure sender -G247-

Removing

WARNING

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

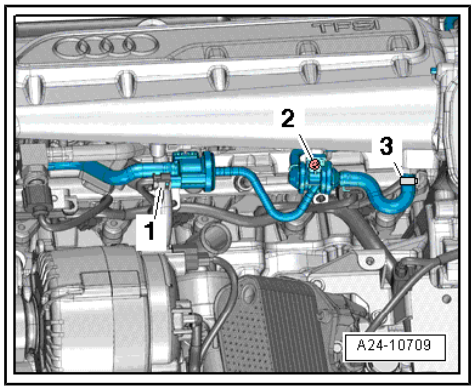
- ***The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening the system.***

– Reduce fuel pressure in high-pressure section of injection system ⇒ page 4 .

– Disengage activated charcoal filter solenoid valve 1 -N80- -item 1-.

– Remove bolt -2-.

– Release hose clip -3- and detach hose.

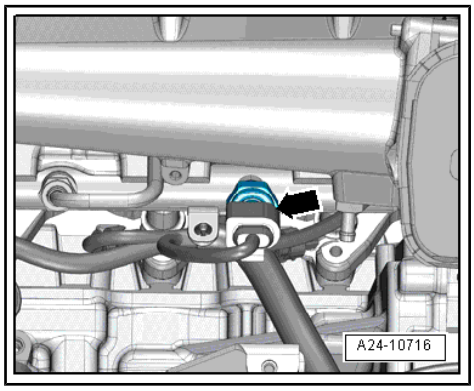


Note

Place a cloth underneath to catch escaping fuel.

– Unplug electrical connector -arrow-.

– Unscrew fuel pressure sender -G247- .



Installing

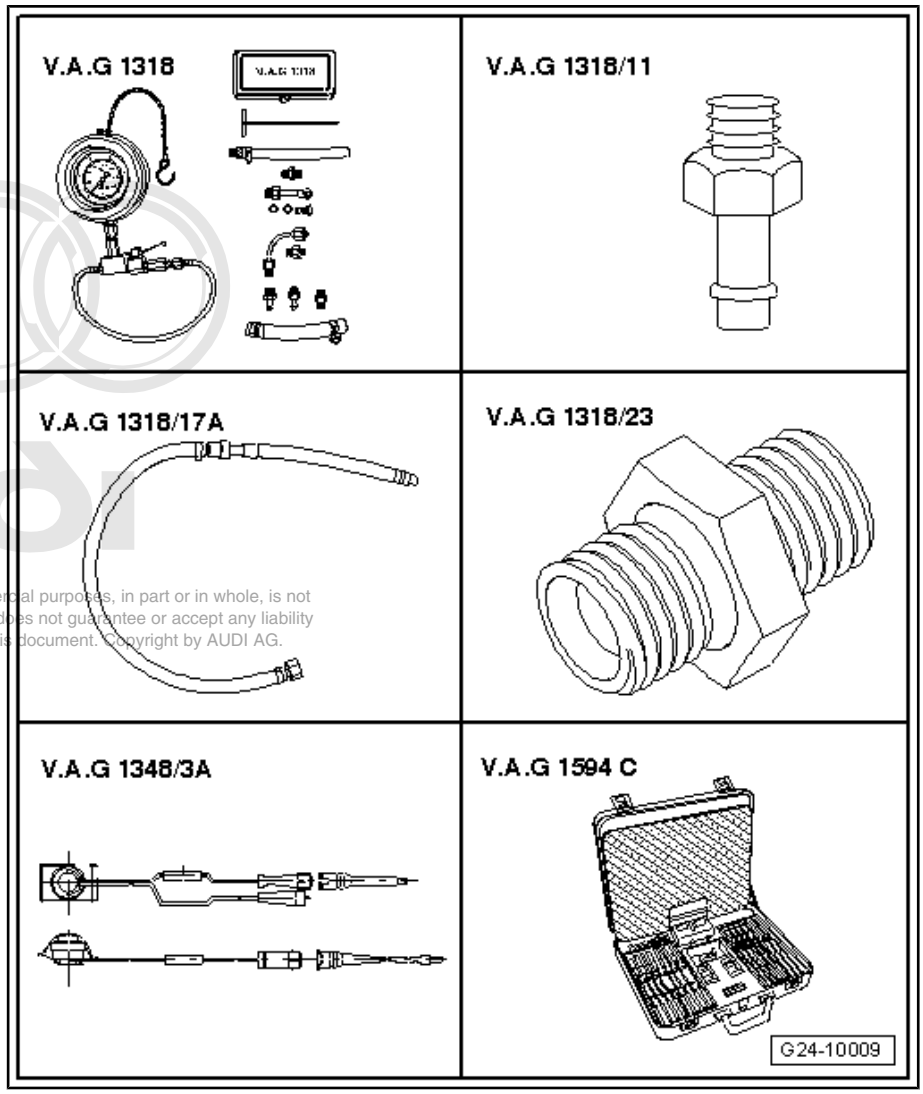
Install in reverse order.

• Tightening torques
⇒ “2.10 Intake manifold (bottom section), fuel rail and injectors - exploded view”, page 23 and
⇒ “2.3 Air cleaner - exploded view”, page 12

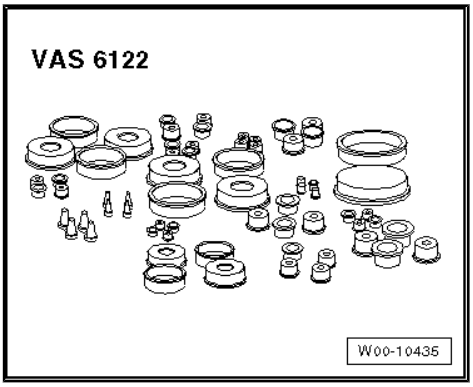
2.14 Checking fuel pressure and residual pressure (up to high-pressure pump)

Special tools and workshop equipment required

- K-Jetronic pressure tester -V.A.G 1318-
- Adapter -V.A.G 1318/11-
- Adapter set -V.A.G 1318/17A-
- Connector -V.A.G 1318/23-
- Remote control -V.A.G 1348/3A- for V.A.G 1348 with adapter cable -V.A.G 1348/3-3-
- Auxiliary measuring set -V.A.G 1594C-



- Engine bung set -VAS 6122-



- Fuel-resistant measuring container

Test conditions

- Battery voltage at least 12.5 V
- Fuel filter OK.

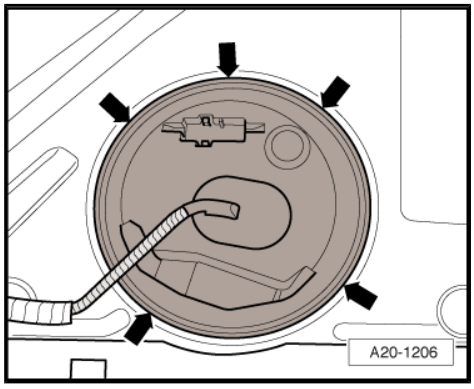
- Fuel tank at least $^1/_4$ full.
- Fuel pump control unit -J538- OK; check in “Guided Fault Finding” mode using vehicle diagnostic, testing and information system -VAS 5051B- .
- Ignition off.

Checking fuel pressure

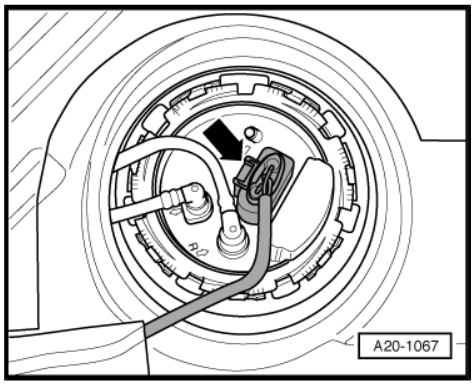
– TT Coupé: Remove rear seat bench ⇒ Rep. Gr. 72 .

– TT Roadster: Remove back panel trim (right-side) ⇒ Rep. Gr. 70 .

– Unclip retaining tabs -arrows- for flange cover.



– Unplug electrical connector -arrow- at flange.



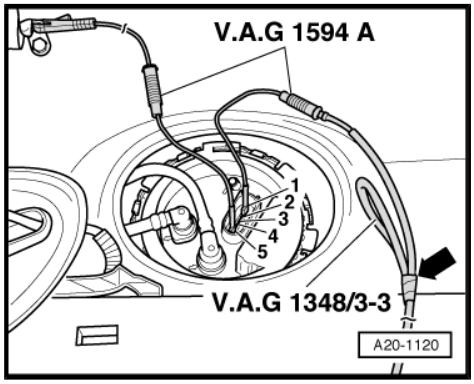
– Connect remote control -V.A.G 1348/3A- for V.A.G 1348 to contact -1- using adapter cable -V.A.G 1348/3-3- and test lead from auxiliary measuring set -V.A.G 1594C- .

– Tape off 2nd connector contact of adapter cable -V.A.G 1348/3-3- with insulating tape -arrow- to prevent short circuits.

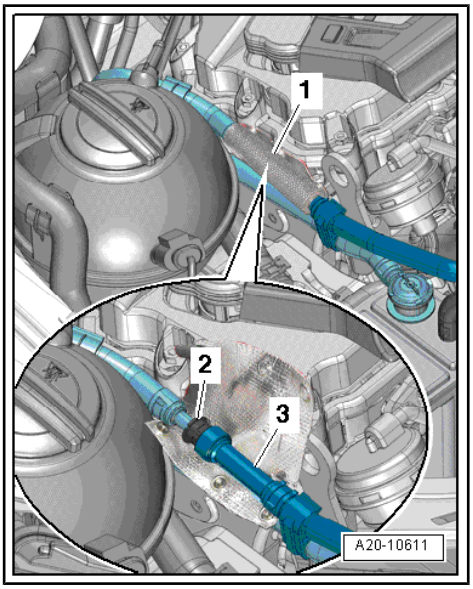
– Connect contact -5- to the body (earth) using a test lead from auxiliary measuring set -V.A.G 1594C- .

– Connect crocodile clip to battery “+” (remote positive terminal in engine compartment).

– Remove filler cap from fuel filler neck.



– Disengage fuel supply line from retainer and remove heat insulation sleeve -1- at fuel supply line connection.



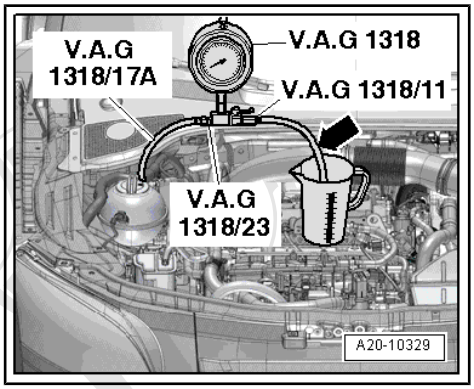
WARNING

Risk of injury - fuel system operates under high pressure.

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

– Disconnect fuel supply line -3- (pull release ring -2-).

– Seal off open pipes/lines and connections with clean plugs from engine bung set -VAS 6122- .



– Screw connector -V.A.G 1318/23- and adapter -V.A.G 1318/17A- onto K-Jetronic pressure tester -V.A.G 1318- .

– Fit adapter -V.A.G 1318/17A- onto disconnected fuel supply line.

– Screw adapter -V.A.G 1318/11- onto K-Jetronic tester -V.A.G 1318- .

– Attach test hose -arrow- and hold end of hose in measuring container.

– Open cut-off valve on pressure tester.

• Lever must point in direction of flow.

– Press and hold remote control switch until K-Jetronic pressure tester -V.A.G 1318- shows no further increase in pressure.

• Specification: approx. 6 bar (4 ... 8 bar)

If specification is not attained, check delivery rate of fuel pump ⇒ Rep. Gr. 20 .

Checking residual pressure

– Check system for leaks and check residual pressure by watching the drop in pressure on the K-Jetronic pressure tester -V.A.G 1318- .

• After 10 minutes pressure should still be at least 3.0 bar.

If the residual pressure drops below 3 bar:

♦ Check union between K-Jetronic pressure tester -V.A.G 1318- and fuel supply line for leaks.

♦ Check K-Jetronic pressure tester -V.A.G 1318- for leaks.

♦ Check fuel lines and their connections for leaks.

♦ Renew fuel filter with integral fuel pressure regulator ⇒ Rep. Gr. 20 .

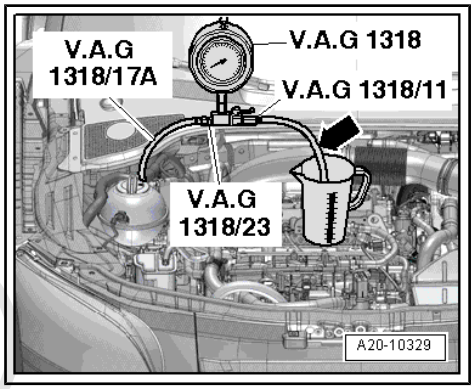
♦ If fuel filter is OK, renew fuel pump ⇒ Rep. Gr. 20 .

Assembling

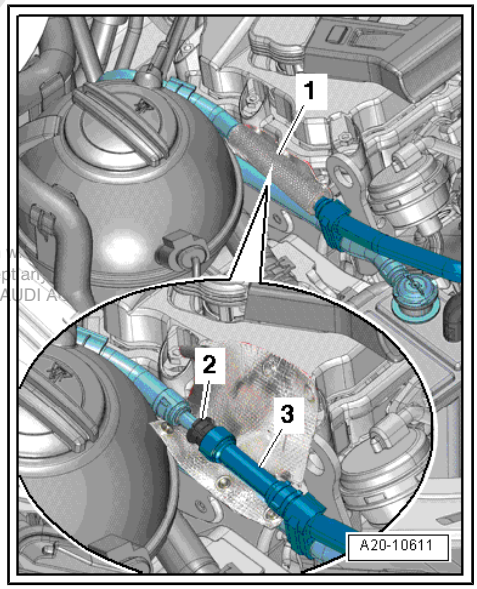
Installation is carried out in the reverse order; note the following:

Note

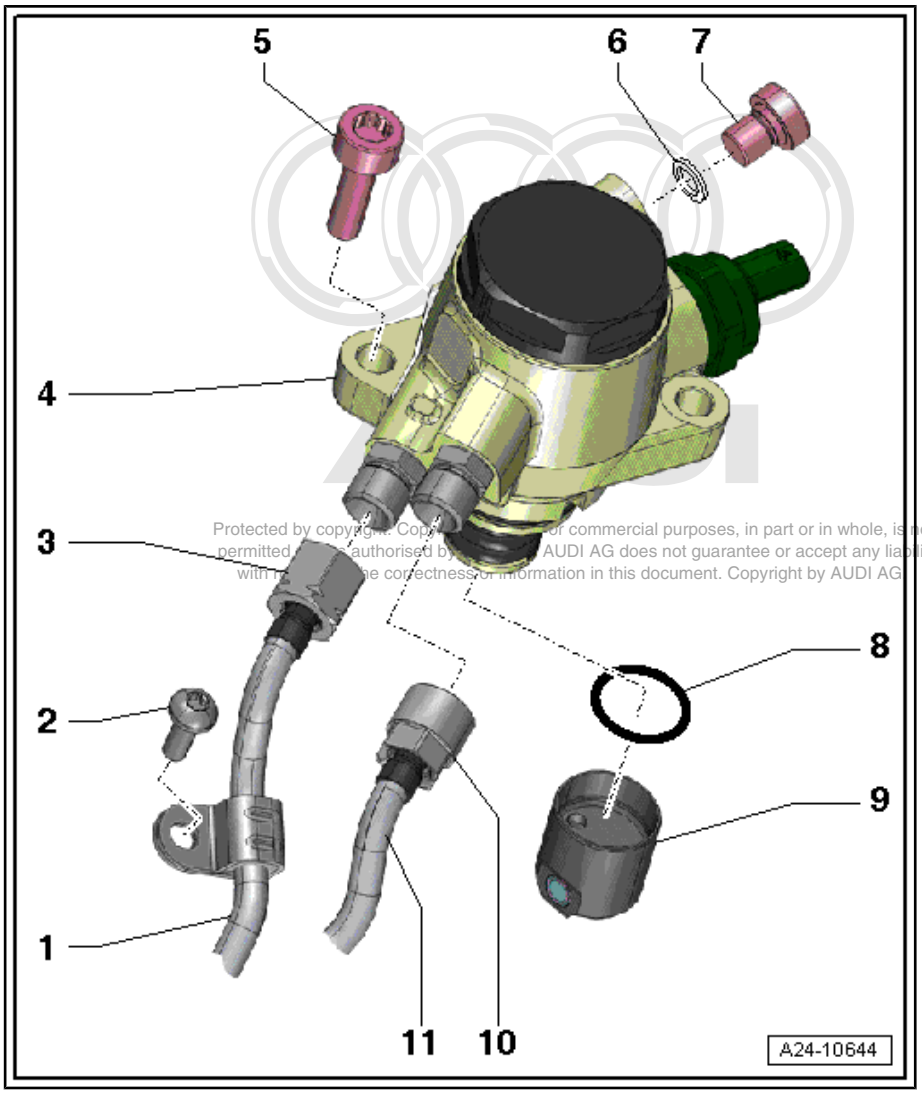
Before removing the pressure tester, release the fuel pressure by opening the cut-off valve. Hold end of test hose -arrow- in measuring container.



– Re-attach fuel supply line -3- (make sure that all parts are clean and that there are no leaks).
– Engage fuel supply line at retainer and re-attach heat insulation sleeve -1- at fuel supply line connection.
– TT Coupé: Install rear seat bench ⇒ Rep. Gr. 72 .
– TT Roadster: Install back panel trim (right-side) ⇒ Rep. Gr. 70 .



2.15 High-pressure pump - exploded view



1 - High-pressure pipe

> **WARNING**
> *Risk of injury - fuel system operates under high pressure.*
> *The fuel pressure in the high-pressure section of the injection system must be reduced to a residual pressure prior to opening the system.*

- ❑ Reducing fuel pressure in high-pressure section of injection system ⇒ page 4
- ❑ Version fitted in vehicle may differ from illustration
- ❑ Tighten connecting piece to 40 Nm (always make sure that connecting piece is tightened to specified torque before installing fuel line)
- ❑ Connections must not be damaged
- ❑ Do not alter shape
- ❑ Lubricate thread lightly with oil
- ❑ Removing and installing ⇒ page 37

2 - Bolt

- ❑ 9 Nm

3 - Union nut

- ❑ Connections must not be damaged
- ❑ 27 Nm

4 - High-pressure pump

- ❑ Removing and installing ⇒ page 36

5 - Bolt

- ❑ 20 Nm

6 - Seal

- ❑ Renew

7 - Screw plug

- ❑ 15 Nm

8 - O-ring

- ❑ Renew

9 - Roller tappet

10 - Union nut

- ❑ Connections must not be damaged
- ❑ 27 Nm

11 - Fuel supply pipe

2.16 Removing and installing high-pressure pump

Removing

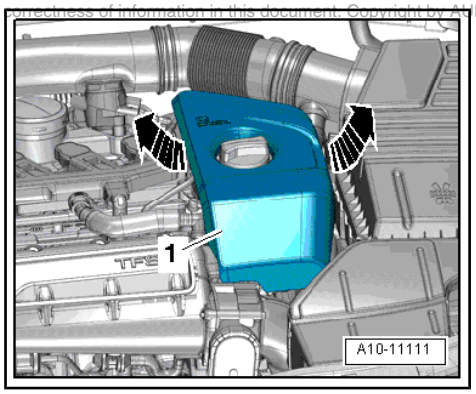
WARNING

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

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

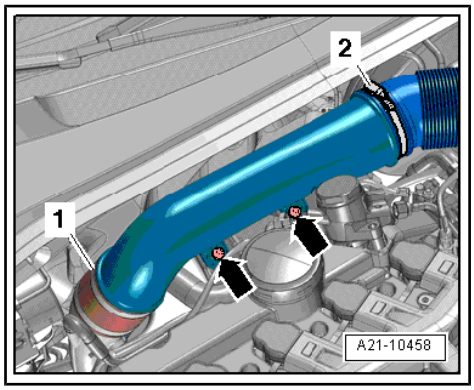
– Reduce fuel pressure in high-pressure section of injection system ⇒ page 4 .

– Lift off engine cover panel -1- -arrows-.



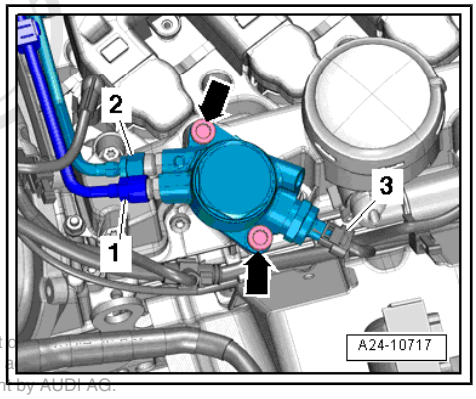
– Remove bolts -arrows-.

– Release hose clips -1- and -2- and remove air pipe.



Note

Place a cloth underneath to catch escaping fuel.



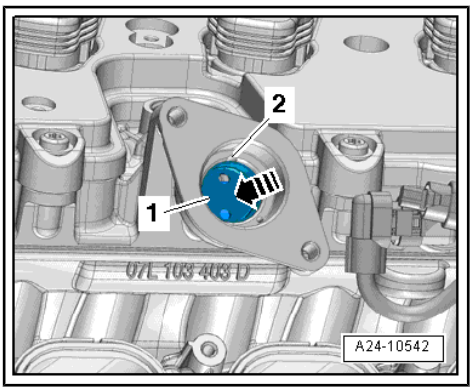
– Unscrew union nuts -1- and -2-.
– Unplug electrical connector -3- for fuel metering valve -N290- .
– Remove bolts -arrows-.
– Carefully press fuel lines to the side and detach high-pressure fuel pump.

Installing

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

Note

- *Renew O-ring for high-pressure pump.*
- *The connections of the high-pressure pipes must not be damaged.*

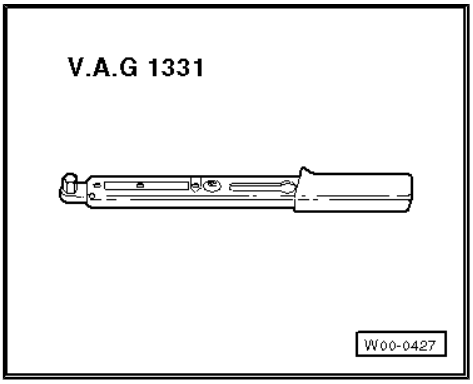


– Check roller tappet -1- for damage and renew if necessary.
– Lightly lubricate roller tappet with oil and fit in cylinder head so that guide -2- is in correct position -arrow-.
– Fit high-pressure pump and press downwards in guide as far as stop.
– Tighten bolts hand tight in small steps.
– Tighten bolts alternately to specified torque.
• Tightening torque
⇒ “2.15 High-pressure pump - exploded view”, page 35 .
– Install air pipe ⇒ Rep. Gr. 21 .

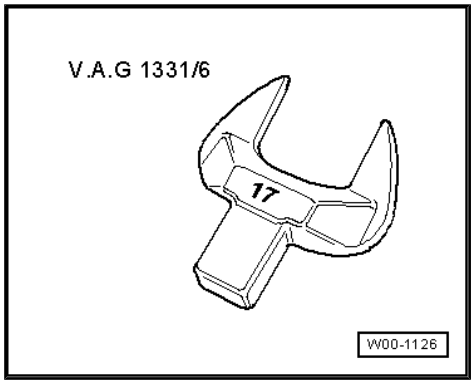
2.17 Removing and installing high-pressure pipe

Special tools and workshop equipment required

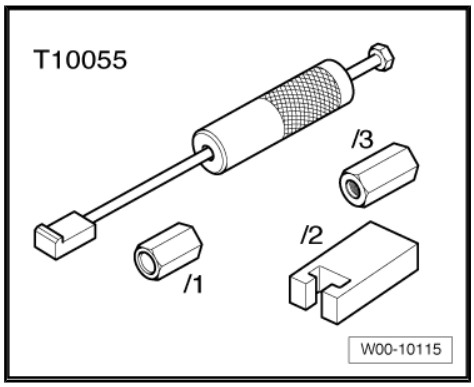
- Torque wrench -V.A.G 1331-



♦ Tool insert, AF 17 -V.A.G 1331/6-



♦ Puller -T10055-



Removing

WARNING

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

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

– Reduce fuel pressure in high-pressure section of injection system ⇒ page 4 .

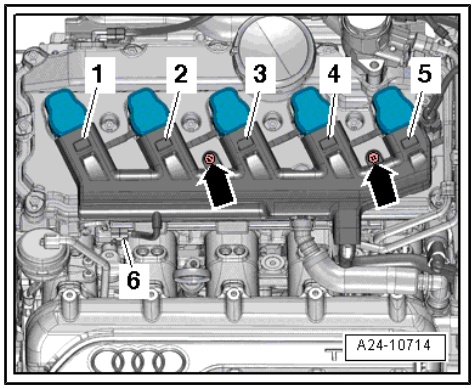
– Remove intake manifold (top section) ⇒ page 20 .

– Remove bolts -arrows-.

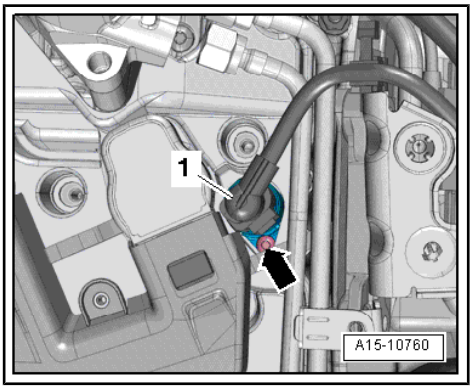
– Unplug electrical connector -6- for Hall sender 3 -G300- .

– Release electrical connectors and unplug connectors from ignition coils -1 ... 5- simultaneously.

– Move electrical wiring harness to left side.



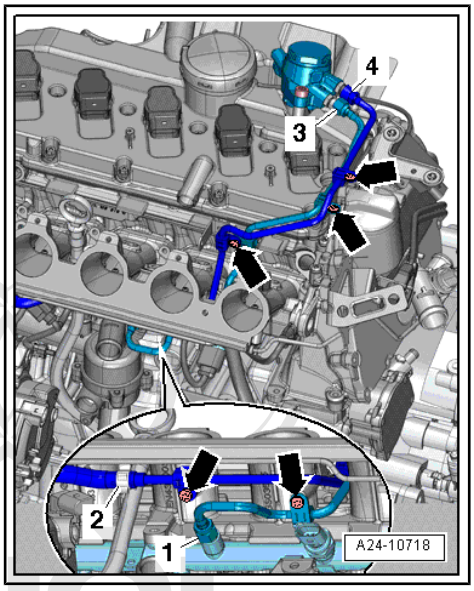
– Unplug electrical connector -1- at exhaust camshaft control valve 1 -N318- .



Note

Disregard -arrow-.

– Remove bolts -arrows- and union nut -4-.
– Release hose clip -2- and detach fuel hose.
– Detach fuel supply line.
– Remove union nuts -1- and -3- and detach high-pressure pipe.



Note

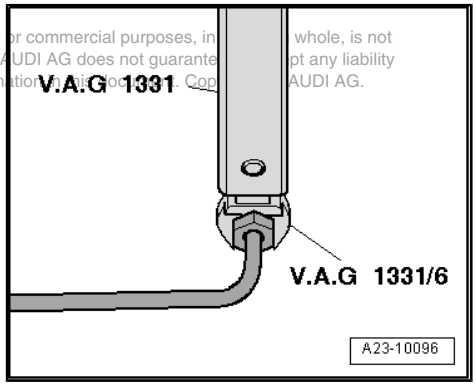
Do not attempt to bend high-pressure pipe to a different shape.

Installing

Note

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

– First tighten union nut by hand until it makes contact, making sure that high-pressure pipe is not under tension.
– Tighten union nut with torque wrench -V.A.G 1331- and 17 mm tool insert -V.A.G 1331/6- ; to do so, counterhold at hexagon flats of threaded connection with an open-end spanner.



- Tightening torques
⇒ “2.15 High-pressure pump - exploded view”, page 35 and
⇒ “2.10 Intake manifold (bottom section), fuel rail and injectors - exploded view”, page 23

– Do not tighten bolt for retainer until high-pressure pipe has been tightened.
– Install intake manifold (top section) ⇒ page 20 .

2.18 Lambda probes - overview

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 probe body. For high-temperature paste refer to ⇒ Electronic parts catalogue*
- *When installing, it is important to re-attach the Lambda probe wiring at the same locations to prevent it from coming into contact with the exhaust pipe.*

1 - Electrical connector

- ❑ For exhaust temperature sender 1 -G235-

2 - Bolts

- ❑ 5 Nm

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

- ❑ Removing and installing ⇒ page 42
- ❑ 55 Nm

4 - Lambda probe -G39- with Lambda probe heater -Z19-

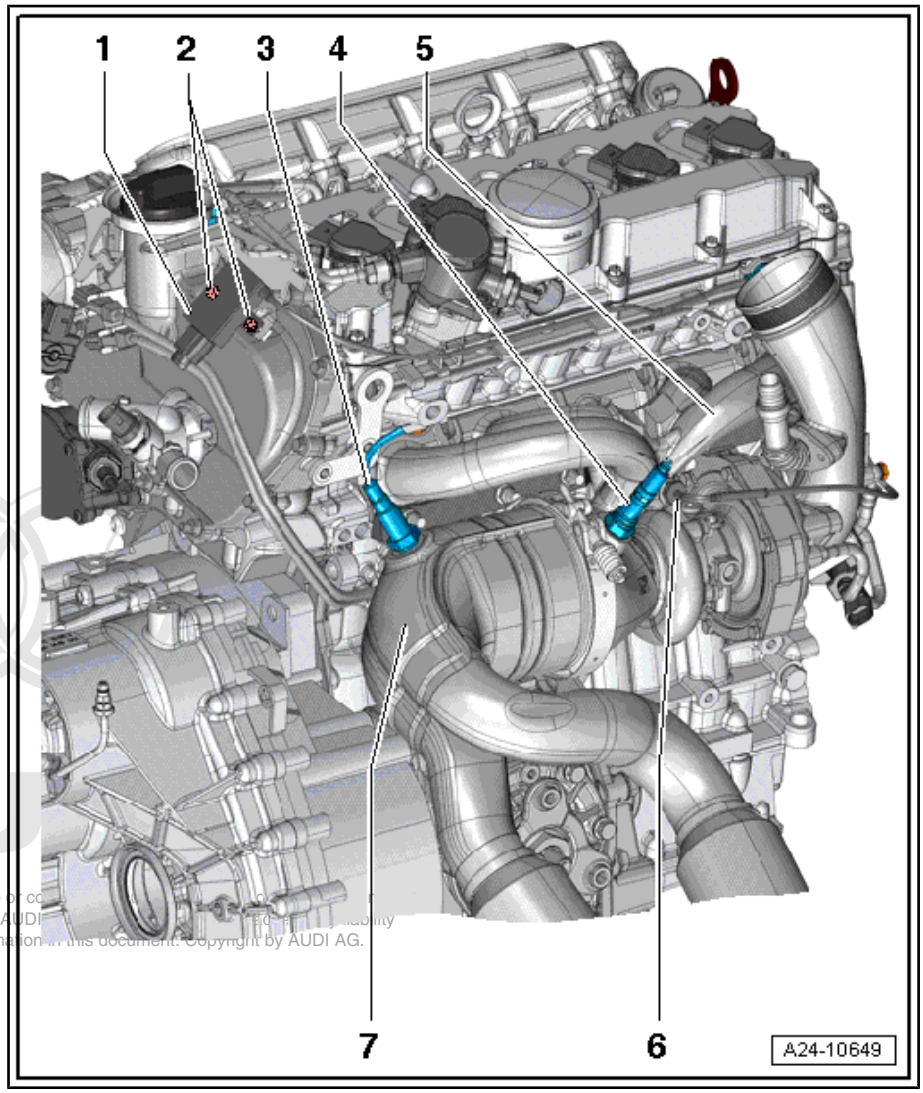
- ❑ Removing and installing ⇒ page 40
- ❑ 55 Nm

5 - Turbocharger

6 - Exhaust gas temperature sender 1 -G235-

- ❑ Removing and installing ⇒ Rep. Gr. 26

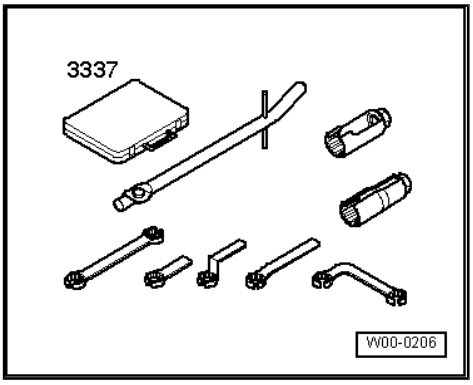
7 - Starter catalytic converter



2.19 Removing and installing Lambda probe -G39- with Lambda probe heater -Z19-

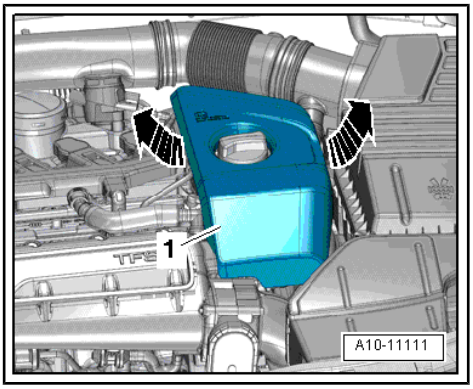
Special tools and workshop equipment required

♦ Lambda probe open ring spanner set -3337-



Removing

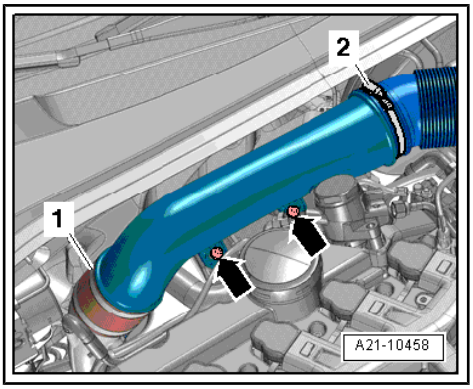
– Lift off engine cover panel -1- -arrows-.



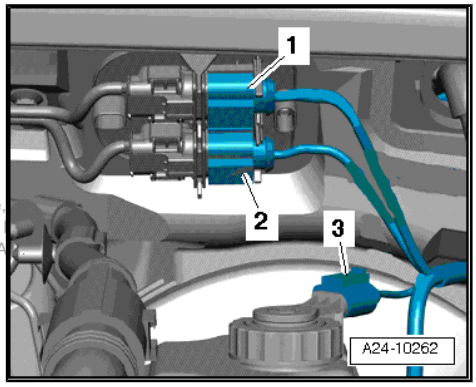
Note

Fit cable ties in the original positions when installing.

– Remove bolts -arrows-.
– Release hose clips -1- and -2- and remove air pipe.



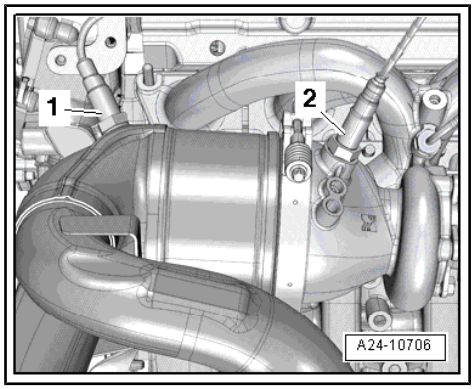
– Remove electrical connector -1- for Lambda probe -G39- from bracket and unplug connector.
– Move clear electrical wiring for Lambda probe.



Note

Disregard -items 2, 3-.

– Unscrew Lambda probe -G39- -item 2- using a tool from Lambda probe open ring spanner set -3337- .



Note

Disregard -item 1-.

Installing

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

- Tightening torque
  ⇒ “2.18 Lambda probes - overview”, page 40 .

Note

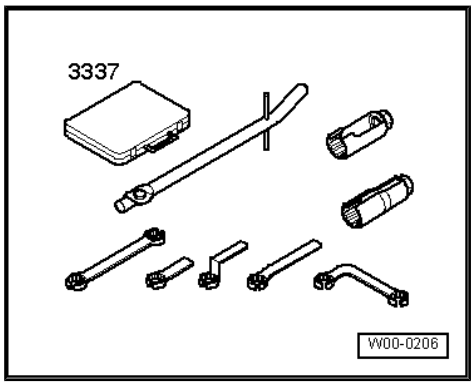
- *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the probe body. For high-temperature paste refer to ⇒ Electronic parts catalogue*
- *When installing, it is important to re-attach the Lambda probe wiring at the same locations to prevent it from coming into contact with the exhaust pipe.*

– Install air pipe ⇒ Rep. Gr. 21 .

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

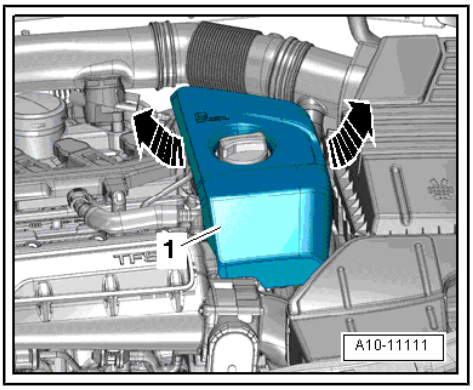
Special tools and workshop equipment required

- Lambda probe open ring spanner set -3337-



Removing

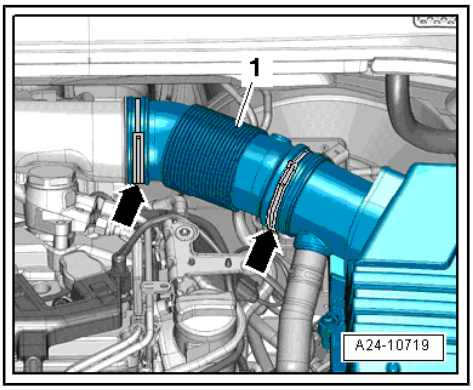
– Lift off engine cover panel -1- -arrows-.



Note

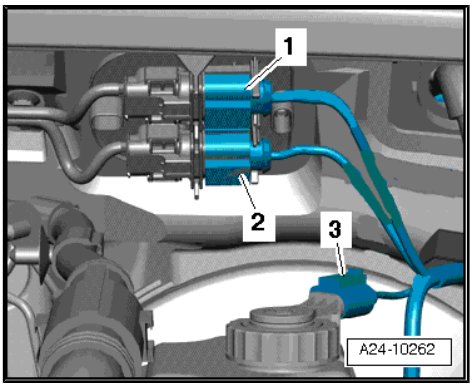
Fit cable ties in the original positions when installing.

– Release hose clips -arrows- and detach air pipe -1-.



– Remove electrical connector -2- for Lambda probe after catalytic converter -G130- from bracket and unplug connector.

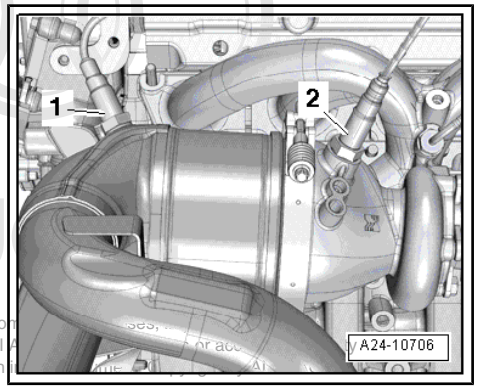
– Move clear electrical wiring for Lambda probe.



Note

Disregard -items 1, 3-.

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



Note

Disregard -item 2-.

Installing

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

- Tightening torque
  ⇒ “2.18 Lambda probes - overview”, page 40 .

Note

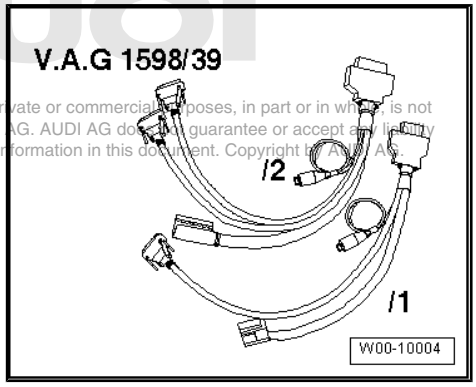
- *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the probe body. For high-temperature paste refer to ⇒ Electronic parts catalogue*
- *When installing, it is important to re-attach the Lambda probe wiring at the same locations to prevent it from coming into contact with the exhaust pipe.*
- *Hose connections and air pipes and hoses must be free of oil and grease before assembly.*
- *Do not use any lubricants containing silicone when assembling.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *To ensure that the charge air hoses can be properly secured at their connections, spray rust remover onto the worm thread of used hose clips before installing.*

3 Engine control unit

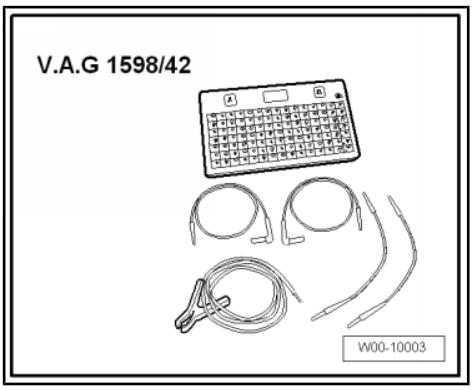
3.1 Wiring and component check with test box -V.A.G 1598/42-

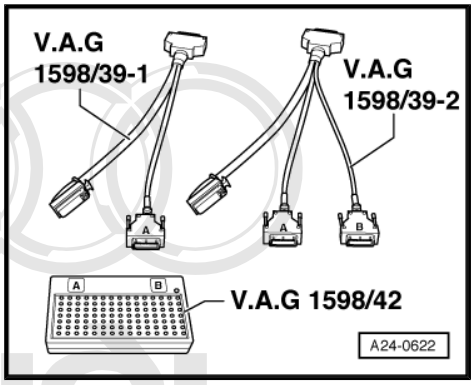
Special tools and workshop equipment required

- Adapter cable -V.A.G 1598/39-



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

The engine control unit has to be removed before connectors can be unplugged from engine control unit ⇒ page 47 .

Caution

Electronic components are susceptible to damage.

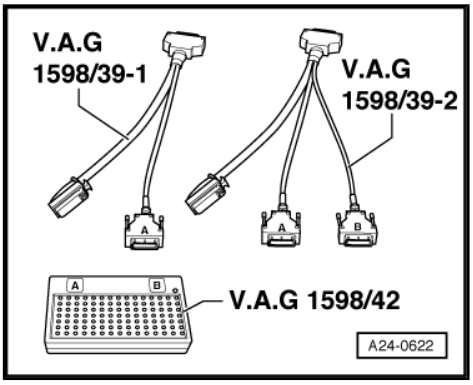
- ***Select the appropriate measuring range before connecting the test leads and observe test requirements.***

– Connect test box -V.A.G 1598/42- to wiring harness with adapter cable -V.A.G 1598/39-1- or adapter cable -V.A.G 1598/39-2- . Connect earth clip of test box to negative terminal of battery. The instructions for performing the individual tests indicate whether or not the engine control unit itself also needs to be connected to the test box.

– Carry out test as described in relevant repair procedure.

– The locking plate must always be re-fitted on the engine control unit ⇒ page 47 .

– Interrogate and, if necessary, erase fault memory: vehicle diagnostic, testing and information system -VAS 5051B- .



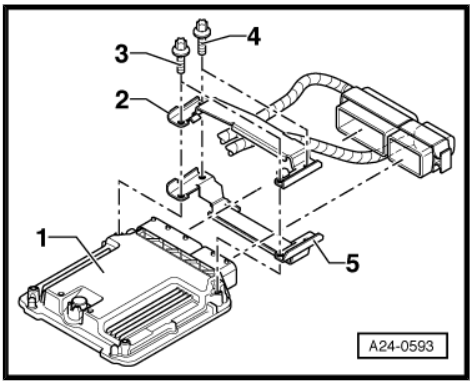
Note

After completion of the “Guided Fault Finding” routine, the diagnostic system will attempt to erase the fault memories of all control units. If this is not successful, the remaining faults registered in the memories must be rectified before all fault memories can be erased.

3.2 Removing and installing engine control unit -J623-

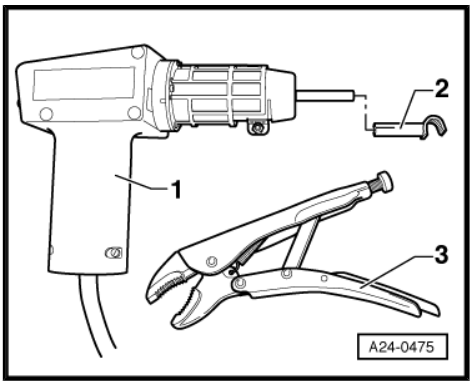
Note

- *A metal locking plate -5- is bolted to the engine control unit -1-. To make it more difficult to unscrew the shear bolts -4- for locking plate -2-, their threads have been coated with locking fluid.*
- *The protective housing has to be removed before the connectors can be unplugged from the engine control unit (e.g. to connect the test box or renew the engine control unit).*



Special tools and workshop equipment required

- Hot air blower -VAS 1978/14A- -1- with shrink element for hot air blower -VAS 1978/15A- -2- from wiring harness repair set -VAS 1978B-



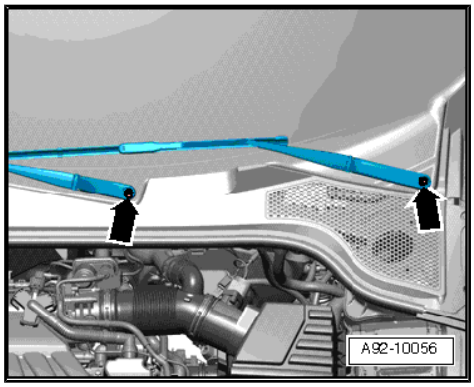
- Small vice-grip pliers -3- (commercially available)

Removing

– If engine control unit is to be renewed, select test sequence/function “Replace engine control unit” in “Guided Functions” mode, vehicle diagnostic, testing and information system -VAS 5051B- .

– Switch off ignition and take out ignition key.

– Lever off caps on windscreen wiper arms with a screwdriver.
– Loosen hexagon nuts -arrows- several turns.
– Loosen wiper arms from wiper shafts by tilting slightly.
– Completely remove hexagon nuts and detach wiper arms from wiper shafts.



Note

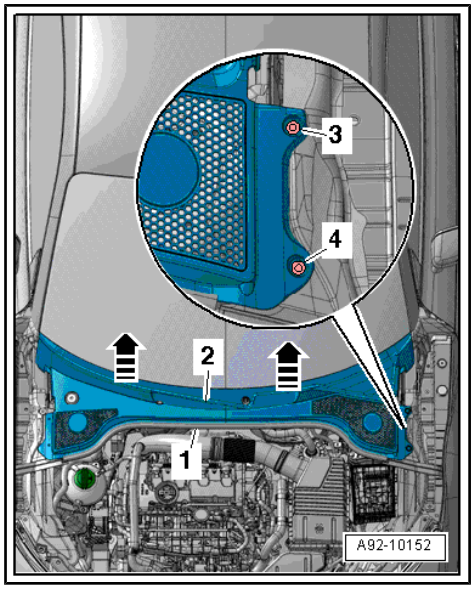
Use puller (commercially available) to remove wiper arms if necessary.

– Remove seal -1-.

Caution

Risk of damage to plenum chamber cover.

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



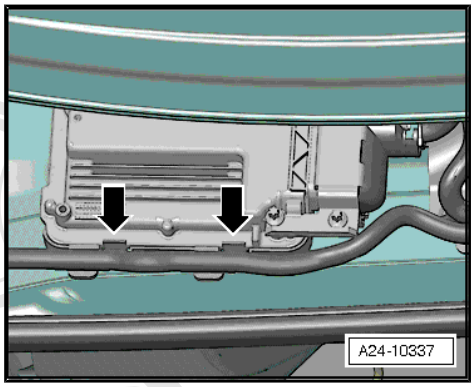
– Starting at edge of windscreen, carefully pull plenum chamber cover -2- vertically upwards off retainer at windscreen -arrows-.

Note

Disregard -items 3, 4-.

– Move clear engine wiring harness at rear of plenum chamber partition panel.

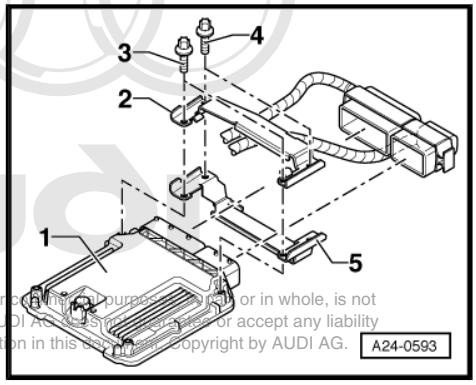
– Release clips -arrows- and take out engine control unit -J623- .



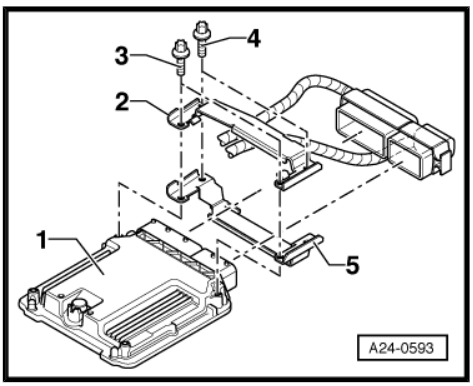
Note

Cover painted surfaces with a cloth to prevent scratching.

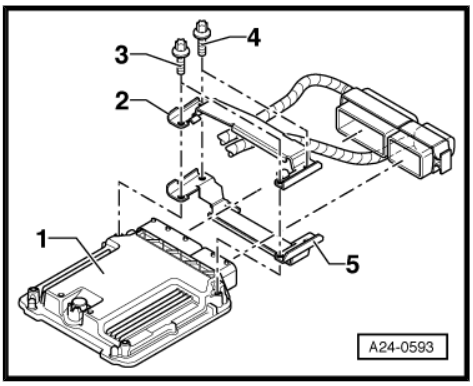
To help prevent unauthorised access to the connectors on the engine control unit, the control unit is secured by means of shear bolts to a locking plate and a metal casing.



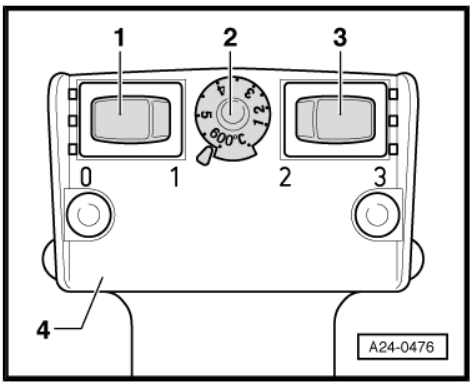
The threads of the two shear bolts -4- which are not screwed into the engine control unit are secured with locking fluid. To unscrew these two bolts, the threads must therefore be heated with the hot air blower.



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



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

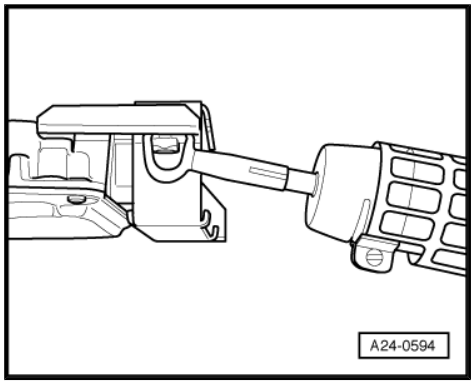


WARNING

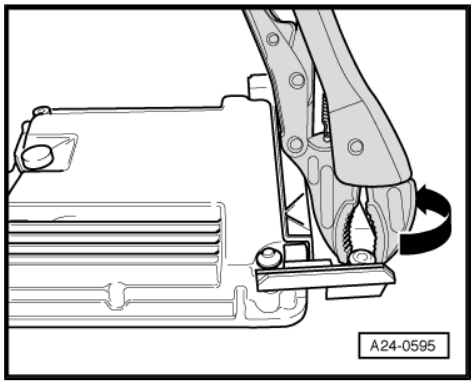
Heating the thread of the locking plate also heats up the shear bolts and parts of the metal housing. Take care to avoid burns. It is also important to ensure that only the thread is heated and none of the surrounding components if at all possible. These should be covered if necessary.

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

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



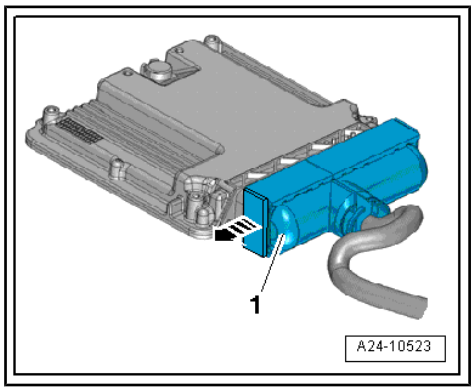
- Unscrew shear bolts using suitable vice-grip pliers (see arrow in illustration).
- The two shear bolts screwed into the engine control unit do not need to be heated. They can be removed without heating.
- Detach metal locking plate from connectors.
- Unscrew both securing bolts from engine control unit -J623- .



- Release connectors -1- on engine control unit -J623- and unplug connectors.
- Take out old engine control unit -J623- and install new engine control unit -J623- .

Note

When the connectors are unplugged from the engine control unit, the learnt values are erased, but the contents of the fault memory remain intact.



Installing

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

- Re-fit locking plate on engine control unit.
- Clean threaded holes for shear bolts to remove any residue from locking fluid. This can be done using a thread tap.
- Use new shear bolts.

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

- Activate engine control unit via vehicle diagnostic, testing and information system -VAS 5051B- in “Guided Functions”, test sequence/function “Replace engine control unit”.
- Install wiper arms ⇒ Rep. Gr. 92 .

28 – Ignition system

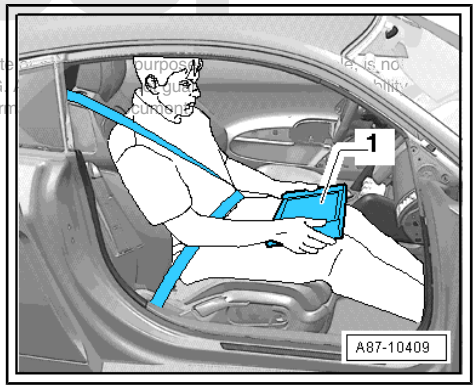
1 General notes and safety precautions

1.1 General notes on ignition system

- The engine control unit has a self-diagnosis capability. Before carrying out repairs and fault finding, the fault memory must be interrogated.
- 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 fault 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 fault 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.

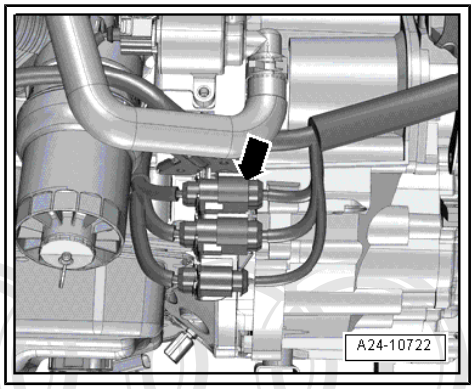
Persons sitting in the front passenger's seat could be injured if the airbag is triggered in an accident.

- *The use of test equipment while driving causes distraction.*
- *There is an increased risk of injury if test equipment is not secured.*
- *Move the passenger's seat back as far as it will go.*
- *Use only vehicle diagnosis and service information system -VAS 5052 A- or diagnosis system -VAS 5053- .*
- *The test equipment -1- must rest flat on the passenger's thighs (as shown in illustration) and must be operated by the passenger.*

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

- ♦ Do not touch or disconnect ignition coils 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.
- ♦ 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 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.
- ♦ Additionally unplug electrical connector -arrow- for injectors.

– Then connect vehicle diagnostic, testing and information system -VAS 5051B- and generate readiness code in engine control unit using “Guided Fault Finding” mode.

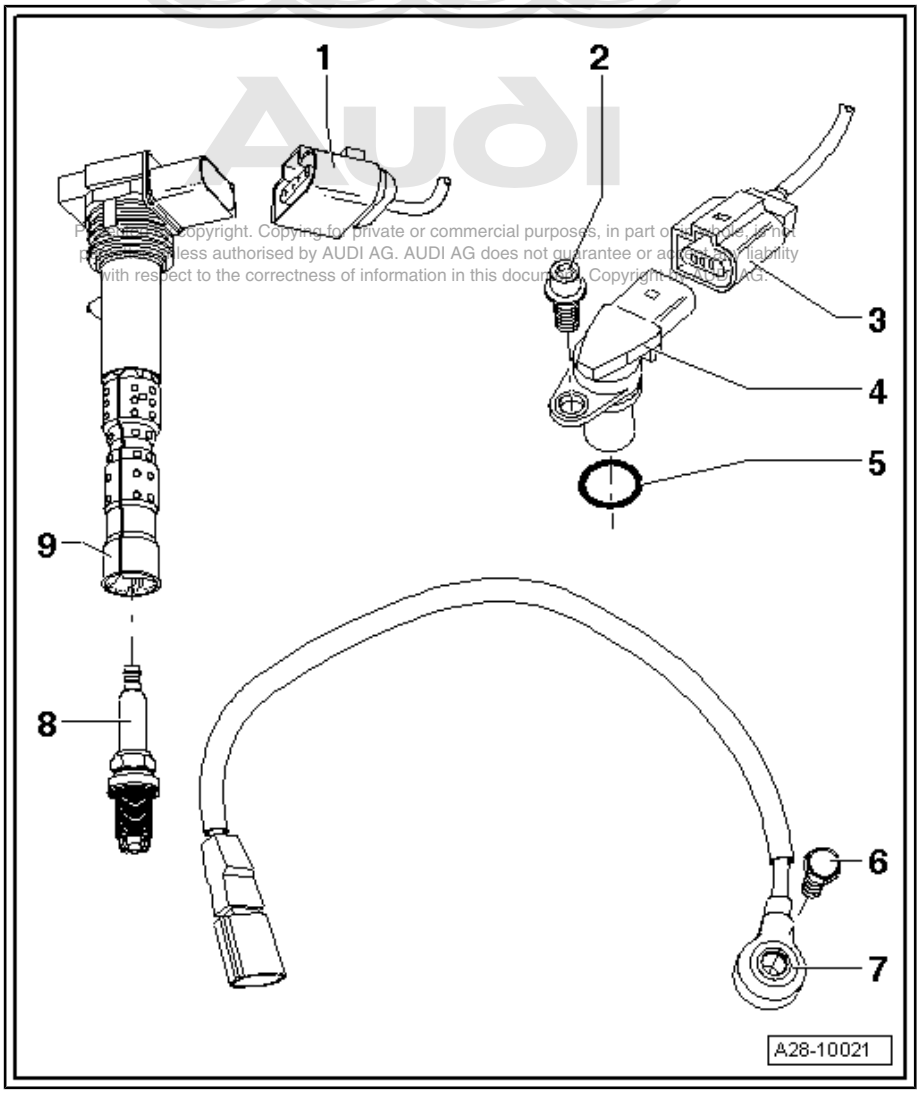


2 Servicing ignition system

2.1 Test data

Engine data		2.5 ltr. / 4V / 250 kW engine
Idling speed (not adjustable)		
Ignition timing		Not adjustable (determined by control unit)
Ignition system		Multi-coil system with 5 ignition coils (output stages integrated) connected directly to spark plugs via spark plug connectors
Spark plugs	Designations	⇒ Data sheets for exhaust emission test
	Tightening torque	⇒ Maintenance ; Booklet 810
Firing order		1-2-4-5-3

2.2 Ignition system - exploded view



1 - 4-pin connector
- ❑ For ignition coil

2 - Bolt
- ❑ 10 Nm

3 - 3-pin connector
- ❑ For Hall sender

4 - Hall sender
- ❑ Hall sender -G40-
- ❑ Hall sender 3 -G300-
- ❑ Removing and installing ⇒ page 56

5 - O-ring
- ❑ Renew if damaged
- ❑ Lubricate lightly with clean engine oil

6 - Bolt
- ❑ The tightening torque influences the function of the knock sensor
- ❑ 20 Nm

7 - Knock sensor
- ❑ Knock sensor 1 -G61-
- ❑ Knock sensor 2 -G66-
- ❑ Contact surfaces between knock sensor and cylinder block must be free of corrosion, oil and grease
- ❑ Removing and installing ⇒ page 55

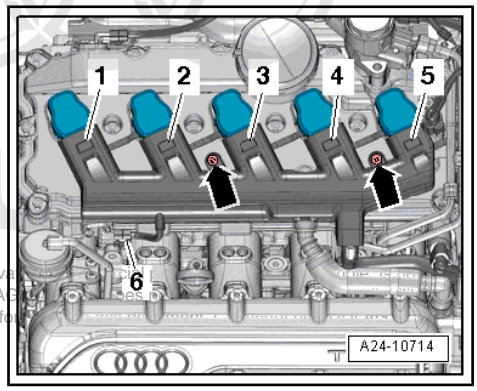
8 - Spark plug
- ❑ Remove and install with spark plug socket and extension -3122 B- ⇒ Maintenance ; Booklet 810

9 - Ignition coil

- ❑ Ignition coil 1 with output stage -N70-
- ❑ Ignition coil 2 with output stage -N127-
- ❑ Ignition coil 3 with output stage -N291-
- ❑ Ignition coil 4 with output stage -N292-
- ❑ Ignition coil 5 with output stage -N323-
- ❑ Removing and installing ⇒ page 54

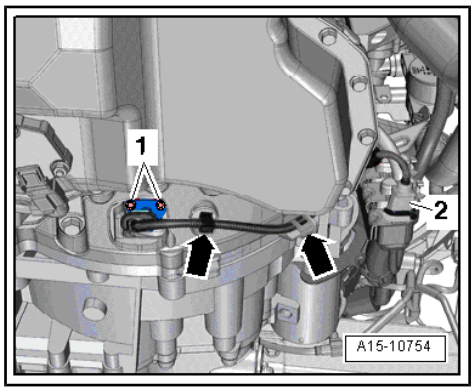
Electrical connectors for ignition coils - tightening torque

– Tighten bolts -arrows- to 5 Nm.



Engine speed sender -G28- - tightening torque

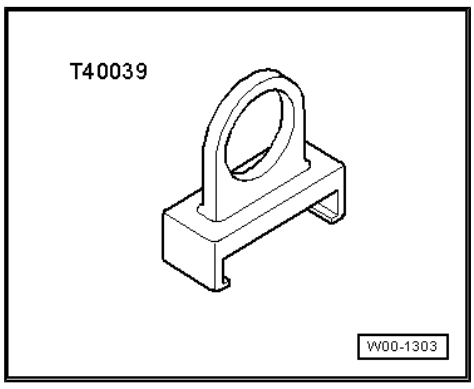
– Tighten bolts -1- to 4.5 Nm.



2.3 Removing and installing ignition coils

Special tools and workshop equipment required

♦ Puller -T40039-

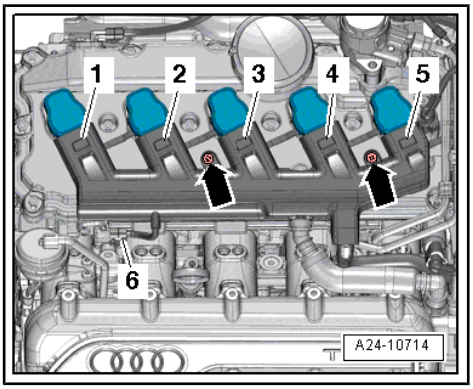


Removing

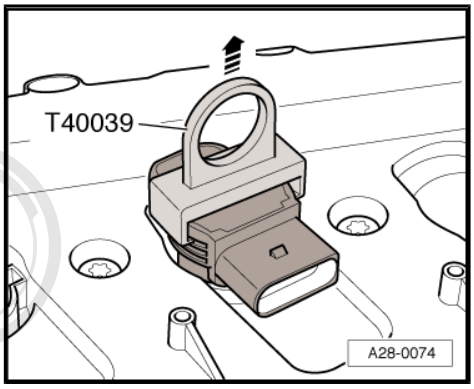
– Unplug electrical connector -6- for Hall sender 3 -G300- .

– Remove bolts -arrows-.

– Release electrical connectors and unplug connectors from ignition coils -1 ... 5- simultaneously.



– Slide puller -T40039- onto ignition coil with output stage and pull off ignition coil -arrow-.



Installing

– Fit all ignition coils loosely into spark plug holes.

– Align ignition coils with connectors and attach all connectors onto ignition coils simultaneously.

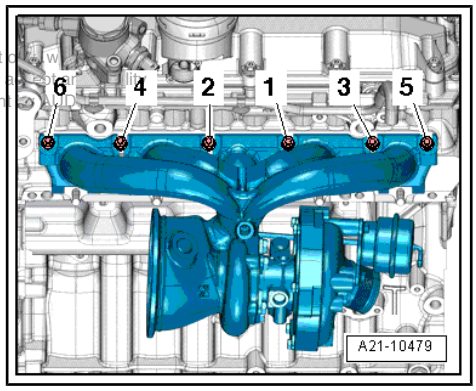
– Press ignition coils onto spark plugs by hand evenly (do not use tool).

– Secure electrical wiring guide for ignition coils to cylinder head cover ⇒ page 54 .

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

Removing

– Remove turbocharger ⇒ Rep. Gr. 21 .



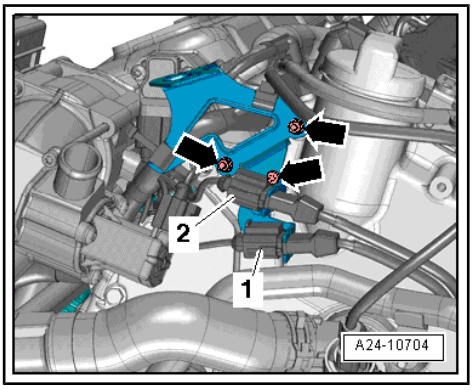
– Detach appropriate electrical connector from bracket and unplug:

1 - For knock sensor 2 -G66-

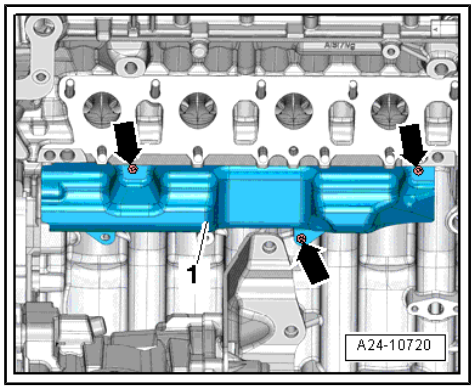
2 - For knock sensor 1 -G61-

Note

Disregard -arrows-.



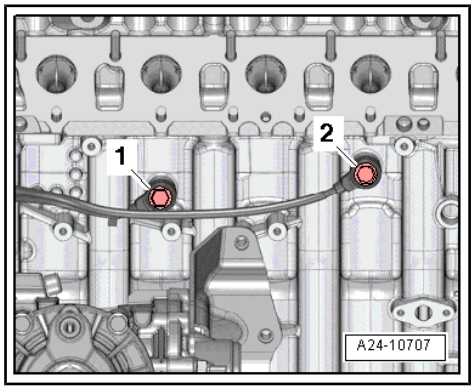
– Remove bolts -arrows- and detach heat shield -1-.



– Remove corresponding bolt and detach knock sensor:

1 - Knock sensor 2 -G66-

2 - Knock sensor 1 -G61-



Installing

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

- Tightening torque
  ⇒ “2.2 Ignition system - exploded view”, page 53 .

– Install turbocharger ⇒ Rep. Gr. 21 .

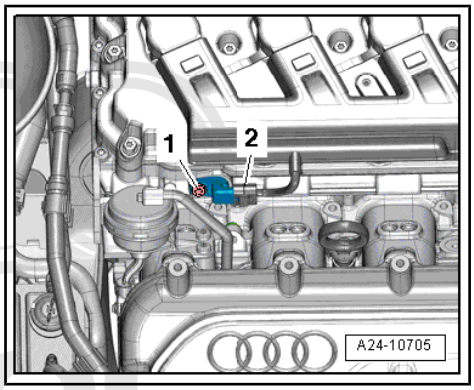
2.5 Removing and installing Hall senders - G40- / -G300-

Removing

Hall sender -G40-

– Unplug electrical connector -2-.

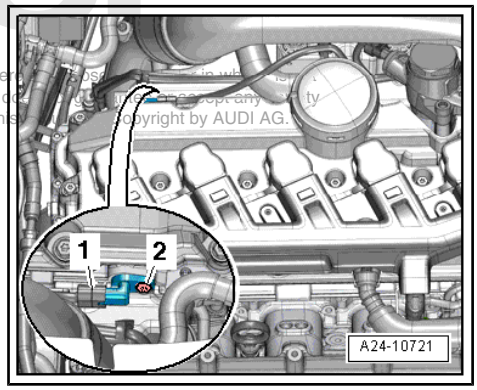
– Unscrew bolt -1- and remove Hall sender -G40- .



Hall sender 3 -G300-

– Unplug electrical connector -1-.

– Unscrew bolt -2- and remove Hall sender 3 -G300-.



Installing

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

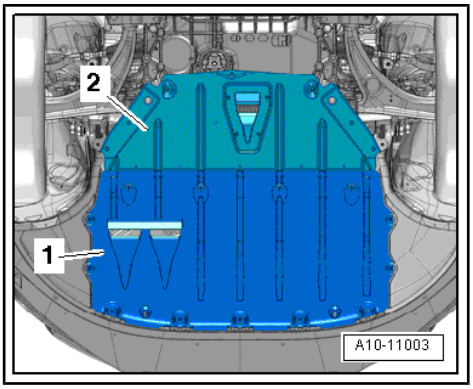
- Tightening torque
  ⇒ “2.2 Ignition system - exploded view”, page 53 .

Note

Fit new O-rings.

2.6 Removing and installing engine speed sender -G28-

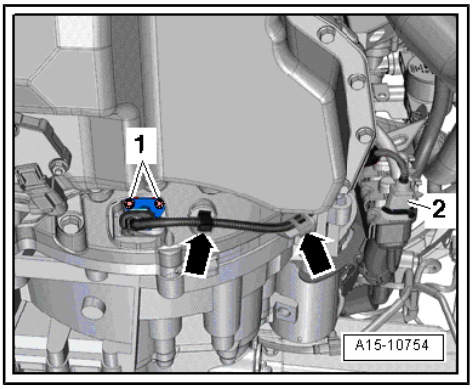
Removing



Note

Fit all cable ties in the original positions when installing.

– Remove front noise insulation -1- ⇒ Rep. Gr. 66 .



– Move electrical connector -2- clear and disconnect.
– Move electrical wiring harness clear -arrows-.
– Unscrew bolts -1- and detach engine speed sender -G28- .

Installing

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

- Tightening torque
  ⇒ Fig. “ Engine speed sender -G28- - tightening torque “ , page 54 .

– Install noise insulation ⇒ Rep. Gr. 66 .