

Workshop Manual Audi A6 2005 ➤

TDI injection and glow plug system (4-cyl. 2.0 ltr. unit injector, 4-valve)

Engine ID	BLB	BNA	BRE	BRF	BVG				
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Edition 07.2006

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List of Workshop Manual Repair Groups

Repair Group

23 - Mixture preparation - injection

28 - Glow plug system



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

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Audi A6 2005 ►

TDI injection and glow plug system (4-cyl. 2.0 ltr. unit injector, 4-valve) - Edition 07.2006



Audi

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23 – Mixture preparation - injection

1 Servicing diesel direct injection system

1.1 Safety precautions

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

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WARNING

- ◆ *Test equipment must always be secured on the rear seat and operated from that position by a second person.*
- ◆ *If test and measuring instruments are operated from front passenger's seat and the vehicle is involved in an accident, the person sitting in this seat could be seriously injured when the airbag is triggered.*

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

- ◆ Switch off the ignition before connecting or disconnecting injection or glow plug system wiring or tester cables.
- ◆ If the engine has to be operated at the starting speed without actually starting, e.g. to test compression pressure, detach the multi-pin connector for unit injectors on the cylinder head
⇒ [page 6](#).



Caution

- ◆ *Observe notes on procedure for disconnecting the battery
⇒ Rep. Gr. 27.*
- ◆ *Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.*

1.2 Rules for cleanliness

When working on the fuel supply/injection system, observe the following basic rules:

- ◆ Thoroughly clean all unions and surrounding areas before disconnecting.
- ◆ Place parts that have been removed on a clean surface and cover them over. Use plastic sheeting or paper. 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 if this can be avoided. Do not move the vehicle unless absolutely necessary.

- ◆ Also ensure that no diesel fuel comes into contact with the coolant hoses. Should this occur, the hoses must be cleaned immediately. Damaged hoses must be renewed.

1.3 Overview of fitting locations



Note

- ◆ *Some components are located beneath the engine cover panel. Removal ⇒ [page 5](#)*
- ◆ *Components "A" to "F" for vehicles with particulate filter are not shown in the diagram.*

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1 - Diesel direct injection system control unit -J248-

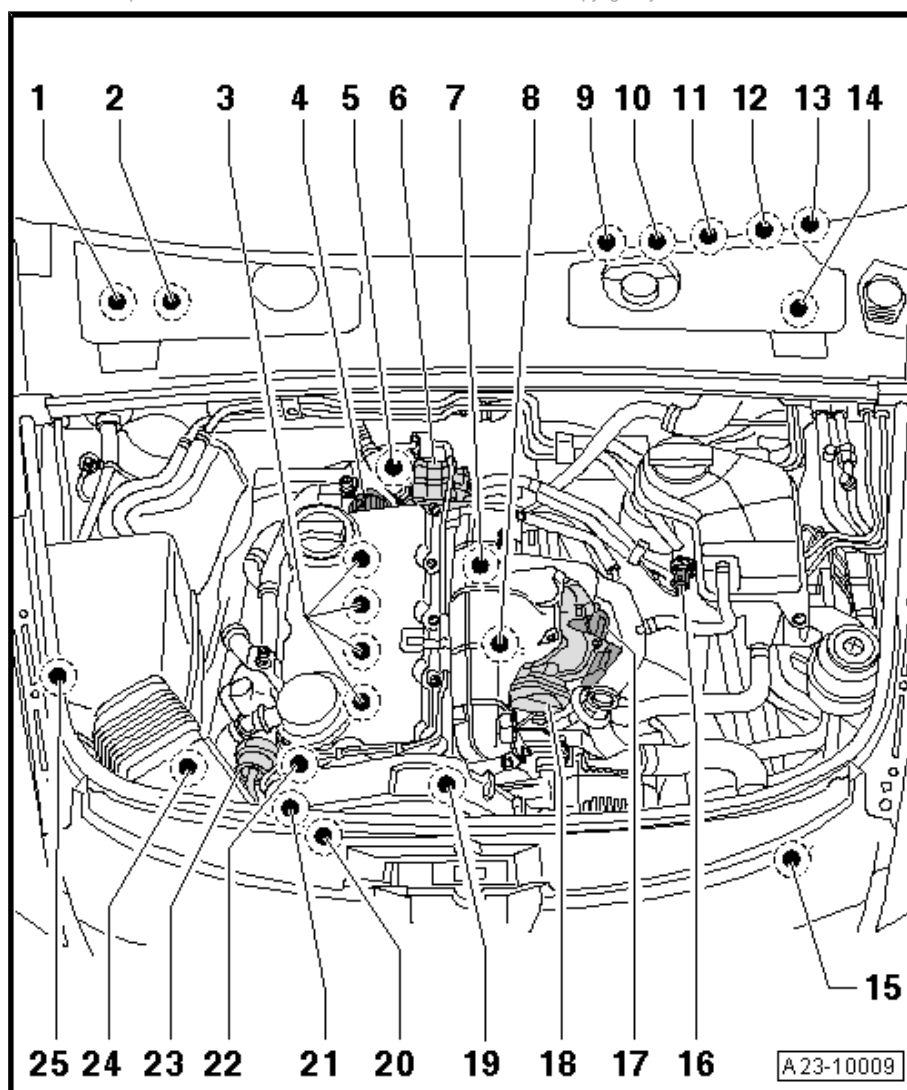
- ☐ With suppressor capacitor
- ☐ Fitting location ⇒ [page 6](#)
- ☐ Removing and installing ⇒ [page 33](#)

2 - Relay and fuse holder in electronics box in plenum chamber (right-side)

- ☐ With automatic glow period control unit -J179-
- ☐ With glow plug fuse - S125-
- ☐ Fitting location ⇒ [page 7](#)

3 - Unit injectors and glow plugs

- ☐ Unit injector solenoid valve, No. 1 cyl. -N240-
- ☐ Unit injector solenoid valve, No. 2 cyl. -N241-
- ☐ Unit injector solenoid valve, No. 3 cyl. -N242-
- ☐ Unit injector solenoid valve, No. 4 cyl. -N243-
- ☐ Removing and installing unit injectors



⇒ [page 22](#)

- ☐ Glow plug 1 -Q10-
- ☐ Glow plug 2 -Q11-
- ☐ Glow plug 3 -Q12-
- ☐ Glow plug 4 -Q13-
- ☐ Removing and installing metal glow plugs ⇒ [page 44](#)
- ☐ Removing and installing ceramic glow plugs ⇒ [page 41](#)



Caution

Due to the special properties of the material used, ceramic glow plugs are easily damaged and require extra care when handling and removing/installing.



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4 - Multi-pin connector

- ☐ For unit injectors and glow plugs
- ☐ Fitting location ⇒ [page 6](#)

5 - Coolant temperature sender -G62-

- ☐ Fitting location ⇒ [page 8](#)
- ☐ Dissipate cooling system pressure before removal if necessary

6 - Tandem pump

- ☐ Removing, installing and checking ⇒ Rep. Gr. 20

7 - Engine speed sender -G28-

- ☐ Fitting location ⇒ [page 8](#)

8 - 3-pin connector

- ☐ For Hall sender -G40-
- ☐ Fitting location ⇒ [page 9](#)

9 - Exhaust emissions warning lamp -K83-

- ☐ In instrument cluster

10 - Accelerator position sender -G79- with accelerator position sender 2 -G185-

- ☐ Fitting location ⇒ [page 6](#)

11 - Brake light switch -F- / brake pedal switch -F47- , clutch position sender -G476- , clutch pedal switch for engine start -F194-

- ☐ Fitting location ⇒ [page 7](#)

12 - 2-position relay and fuse holder behind dash panel (left-side)

- ☐ With low heat output relay -J359-
 - ☐ With high heat output relay -J360-
 - ☐ With heater element fuse 1 -S276-
 - ☐ With heater element fuse 2 -S277-
 - ☐ Fitting location ⇒ [page 10](#)
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13 - 9-position relay carrier behind driver's storage compartment

- ☐ With terminal 15 voltage supply relay -J329-
- ☐ Fitting location ⇒ [page 7](#)

14 - Relay and fuse holder in electronics box in plenum chamber (left-side)

- ☐ With fuel pump relay -J17-
- ☐ With terminal 30 voltage supply relay -J317-
- ☐ Fitting location ⇒ [page 7](#)

15 - Charge pressure sender -G31- with intake air temperature sender -G42-

- ☐ Fitting location ⇒ [page 8](#)

16 - Fuel temperature sender -G81-

- ☐ Fitting location ⇒ [page 8](#)

17 - Intake manifold flap motor -V157-

- ☐ Fitting location ⇒ [page 9](#)

18 - Exhaust gas recirculation valve -N18- with exhaust gas recirculation potentiometer -G212-

- ☐ Fitting location ⇒ [page 9](#)

19 - Hall sender -G40-

- ☐ For camshaft position
- ☐ Fitting location ⇒ [page 9](#)

20 - Solenoid valve for charge pressure control -N75-

- ☐ Fitting location ⇒ [page 9](#)

21 - Exhaust gas recirculation cooler change-over valve -N345-

- ☐ Fitting location ⇒ [page 10](#)

22 - Air filter bypass flap valve -N275- , variable intake manifold flap change-over valve -N239-

- ☐ Not on all vehicles (depending on equipment)
- ☐ Fitting location ⇒ [page 10](#)

23 - Vacuum unit

- ☐ For change-over for exhaust gas recirculation cooler

24 - Air mass meter -G70-

- ☐ Fitting location ⇒ [page 10](#)

25 - Vacuum unit

- ☐ For air filter bypass flap

A - Lambda probe -G39- with Lambda probe heater -Z19-

- ☐ Fitting location ⇒ [page 10](#)
- ☐ Removing and installing ⇒ [page 37](#)

B - Temperature sender before particulate filter -G506-

- ☐ Fitting location ⇒ [page 10](#)
- ☐ Removing and installing ⇒ Rep. Gr. 26

C - Temperature sender after particulate filter -G527-

- ☐ Fitting location ⇒ [page 11](#)
- ☐ Removing and installing ⇒ Rep. Gr. 26

D - Exhaust gas temperature sender 1 -G235-

- ☐ Fitting location ⇒ [page 11](#)
- ☐ Removing and installing ⇒ Rep. Gr. 26

E - Electrical connections on gearbox (left-side)

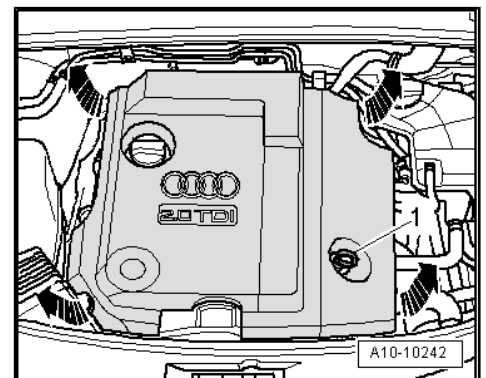
- ☐ For exhaust gas temperature sender 1 -G235-
- ☐ For temperature sender after particulate filter -G527-
- ☐ Fitting location ⇒ [page 11](#)

F - Electrical connectors on right side of bulkhead and exhaust gas pressure sensor 1 -G450-

- ☐ For exhaust gas pressure sensor 1 -G450-
- ☐ For temperature sender before particulate filter -G506-
- ☐ Fitting location ⇒ [page 11](#)

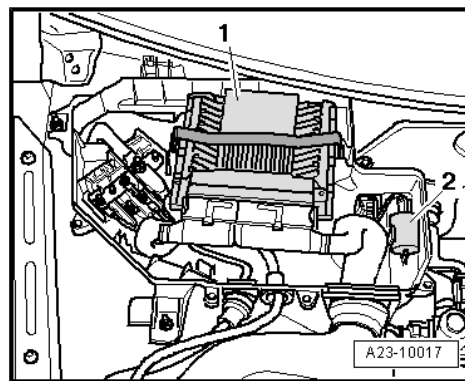
Removing engine cover panel

- Pull dipstick -1- out of guide tube.
- Pull off engine cover panel -arrows-.
- Re-insert dipstick in guide tube.



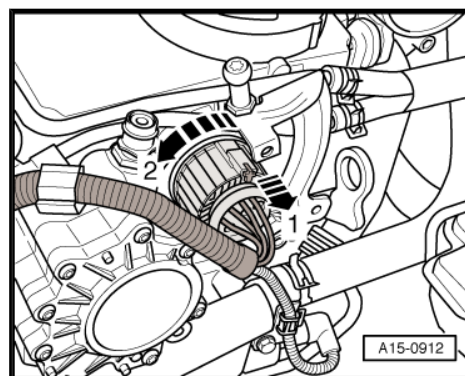
Fitting location of diesel direct injection system control unit -J248-

- 1 - Diesel direct injection system control unit -J248-
- 2 - Suppressor capacitor



Fitting location of multi-pin connector for unit injectors and glow plugs

- ◆ To disconnect, pull release pin -arrow 1- and slacken knurled nut -arrow 2-.



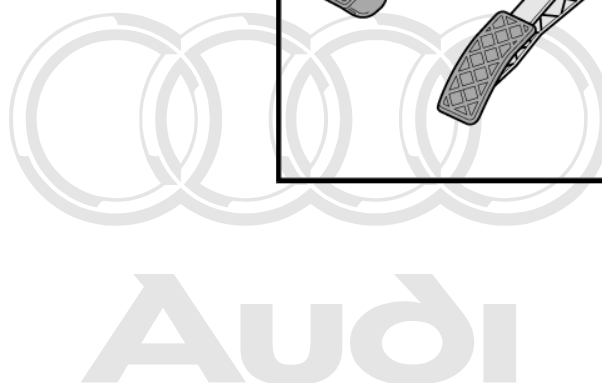
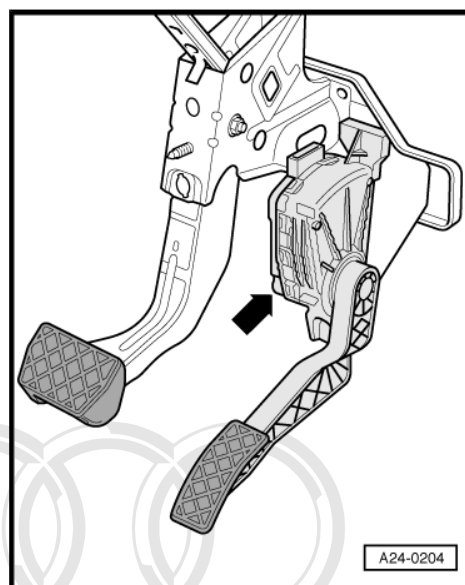
Fitting location of accelerator position sender -G79- / accelerator position sender 2 -G185-

- ◆ In accelerator pedal module -arrow-.



Note

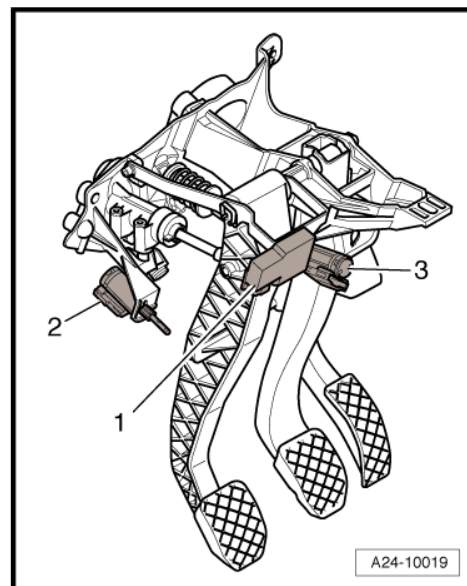
The accelerator position sender -G79- and accelerator position sender 2- -G185- are integrated in the accelerator pedal module and cannot be renewed individually.



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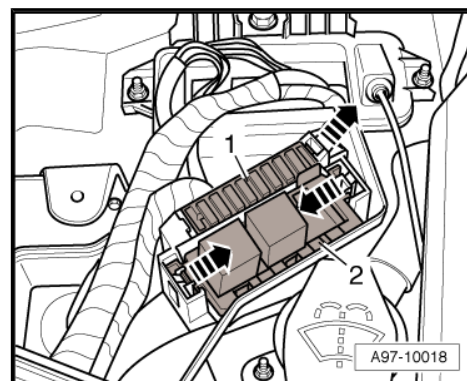
Fitting location of brake light switch -F- / brake pedal switch -F47-, clutch pedal switch for engine start -F194- and clutch position sender -G476-

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



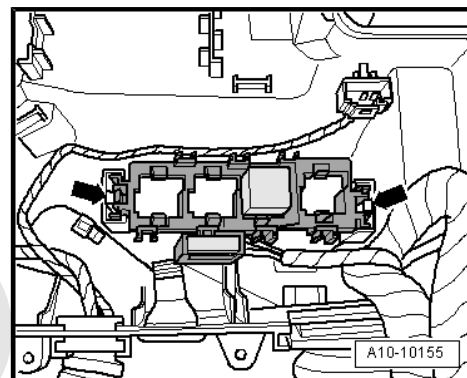
Fitting locations in relay and fuse holder in electronics box in plenum chamber (left-side)

- ◆ Fuel pump relay -J17- located in position "2.1".
- ◆ Terminal 30 voltage supply relay -J317- in position "3".



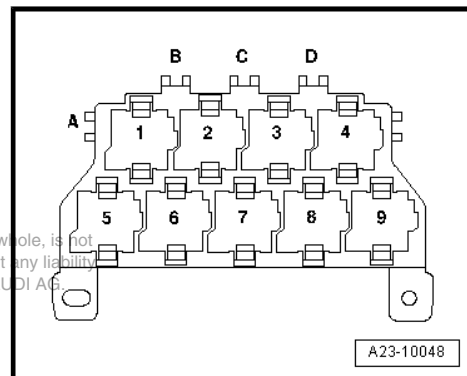
Fitting locations in relay and fuse holder in electronics box in plenum chamber (right-side)

- ◆ Automatic glow period control unit -J179- located in position "3"
- ◆ Glow plug fuse -S125- in position "B"



Fitting locations in 9-position relay carrier behind driver's storage compartment

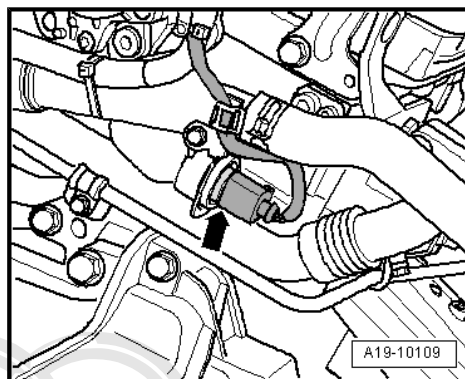
- ◆ Terminal 15 voltage supply relay -J329- in position -1-.



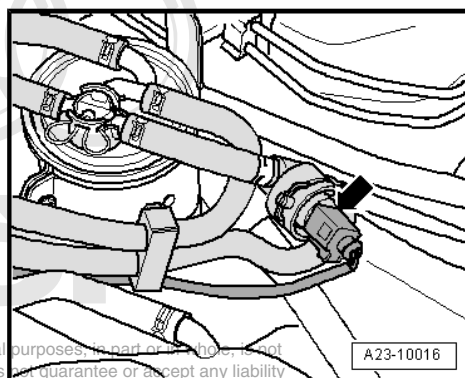
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Fitting location of coolant temperature sender -G62-

- ◆ At rear of engine -arrow-.


Fitting location of fuel temperature sender -G81-

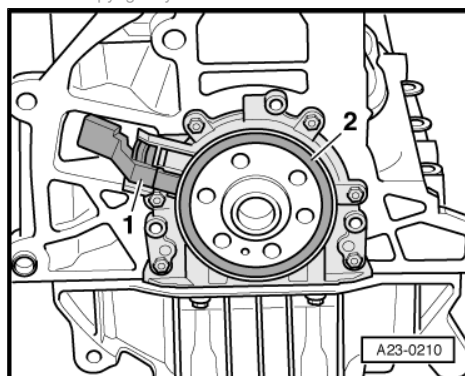
- ◆ At rear left in engine compartment -arrow-.



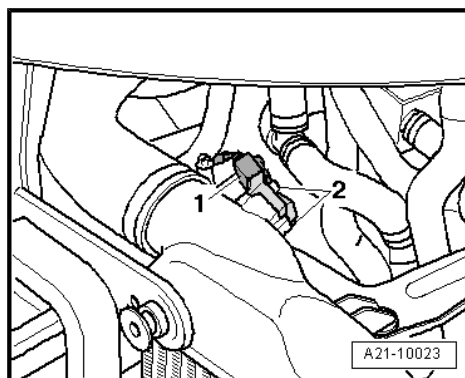
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Fitting location of engine speed sender -G28-

- ◆ On flywheel side of engine.
- 1 - Engine speed sender -G28-
- 2 - Sender wheel

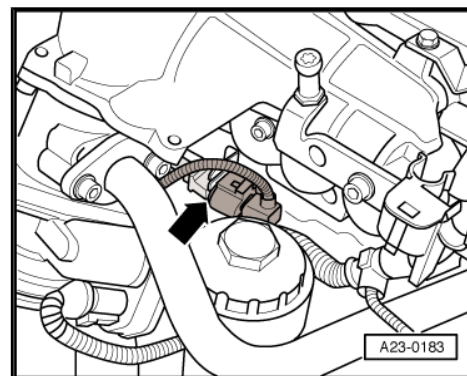

Fitting location of charge pressure sender -G31- with intake air temperature sender -G42-

- ◆ In charge air cooler at front left of engine compartment.
- 1 - Charge pressure sender -G31- with intake air temperature sender -G42-
- 2 - Securing bolt



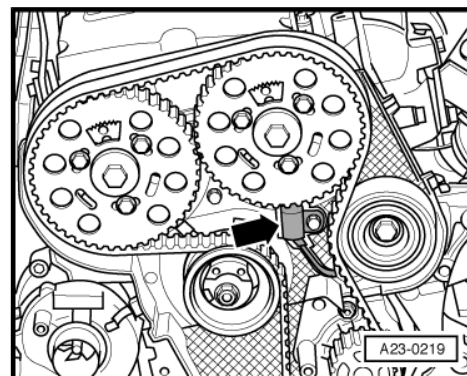
Fitting location of 3-pin connector for Hall sender -G40-

- ◆ On left of engine under intake manifold -arrow-.



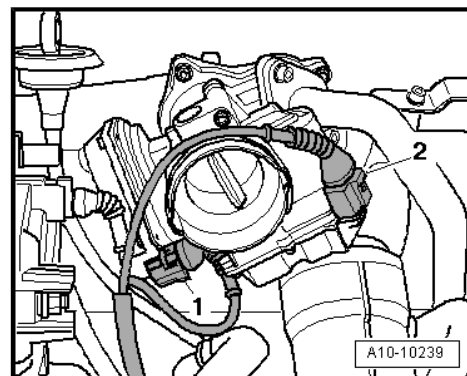
Fitting location of Hall sender -G40-

- ◆ At front left of engine -arrow-.



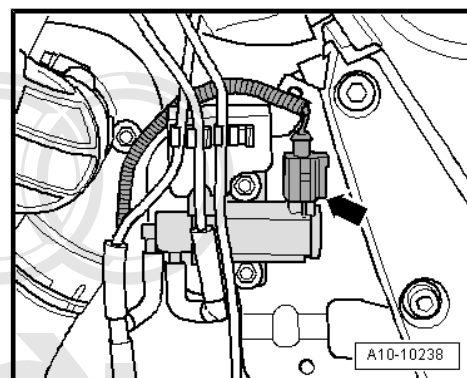
Fitting location of intake manifold flap motor -V157- and exhaust gas recirculation valve -N18- with exhaust gas recirculation potentiometer -G212-

- 1 - Exhaust gas recirculation valve -N18- with exhaust gas recirculation potentiometer -G212-
- 2 - Intake manifold flap motor -V157-



Fitting location of solenoid valve for charge pressure control -N75-

- ◆ At front right of engine -arrow-.



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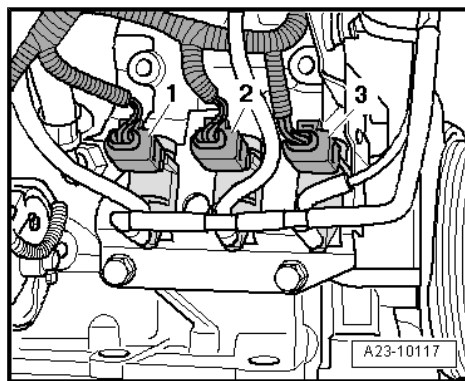
Fitting location of air filter bypass flap valve -N275- , variable intake manifold flap change-over valve -N239- , exhaust gas recirculation cooler change-over valve -N345-

- 1 - Air filter bypass flap valve -N275-
- 2 - Variable intake manifold flap change-over valve -N239-
- 3 - Exhaust gas recirculation cooler change-over valve -N345-



Note

Air filter bypass flap valve -N275- and variable intake manifold flap change-over valve -N239- are not fitted on all vehicles (depending on equipment)



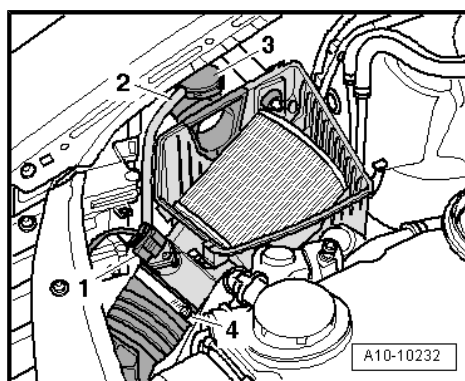
Fitting location of air mass meter -G70- and vacuum unit for air cleaner bypass flap

- 1 - Air mass meter -G70-
- 3 - Vacuum unit for air cleaner bypass flap



Note

Disregard items marked -2- and -4-.

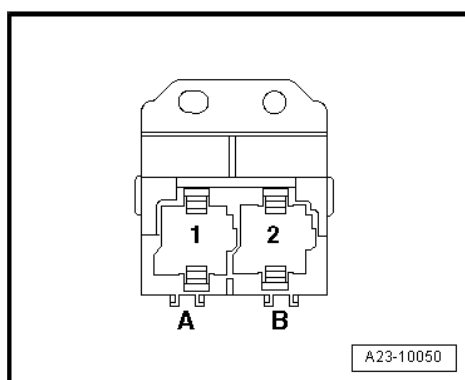


2-position relay and fuse holder behind dash panel (left-side)

1 - Low heat output relay -J359-
2 - High heat output relay -J360-

A - Heater element fuse 1 -S276-

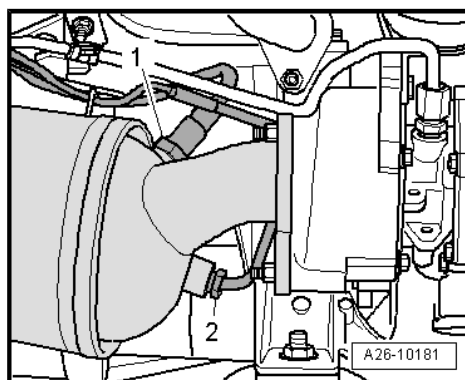
B - Heater element fuse 2 -S277-



Fitting location of Lambda probe -G39- with Lambda probe heater -Z19- and temperature sender before particulate filter -G506-

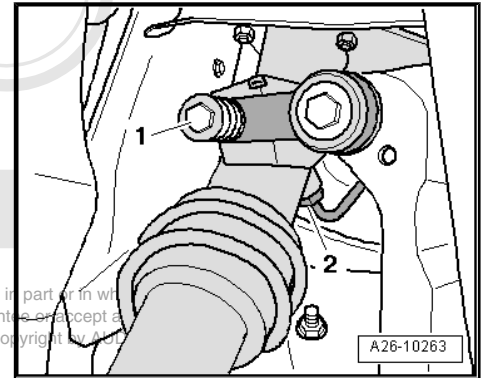
◆ In particulate filter

- 1 - Lambda probe -G39- with Lambda probe heater -Z19-
- 2 - Temperature sender before particulate filter -G506-



Fitting location of temperature sender after particulate filter - G527-

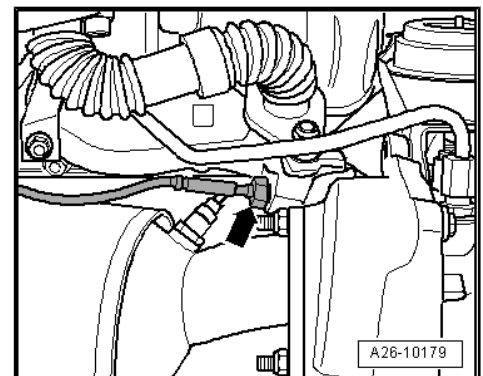
- ◆ In exhaust pipe behind particulate filter -item 2-



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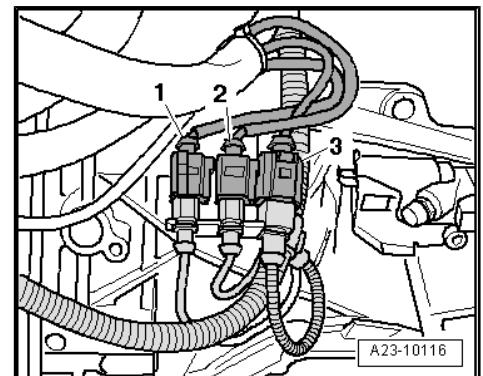
Fitting location of exhaust gas temperature sender 1 -G235-

- ◆ In turbocharger -arrow-



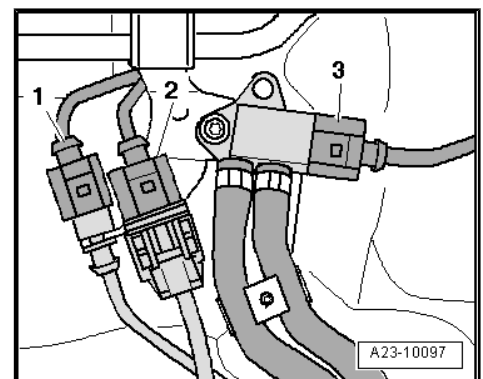
Electrical connections on gearbox (left-side)

- 1 - For exhaust gas temperature sender 1 -G235-
- 2 - For temperature sender after particulate filter -G527-
- 3 - Terminal 50



Electrical connectors on right side of bulkhead and exhaust gas pressure sensor 1 -G450-

- 1 - For temperature sender before particulate filter -G506-
- 2 - For Lambda probe -G39- with Lambda probe heater -Z19-
- 3 - Exhaust gas pressure sensor 1 -G450-



1.4 Air cleaner - exploded view

1 - Air hose

- ☐ To turbocharger

2 - Crankcase breather hose
3 - Vacuum hose

- ☐ From air filter bypass flap valve -N275- to vacuum unit for air cleaner bypass flap

4 - Air duct

- ☐ To wheel housing
- ☐ Clean out dirt and leaves, etc.

5 - Air duct

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

6 - 1.5 Nm
7 - Air duct

- ☐ Clean out dirt and leaves, etc.

8 - Air cleaner housing (top section)

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

9 - Air filter element

- ☐ Observe change intervals ⇒ Maintenance ; Booklet 405
- ☐ Removing and installing ⇒ [page 13](#)

10 - Air cleaner bypass flap
11 - Grommet
12 - Air cleaner housing (bottom section)

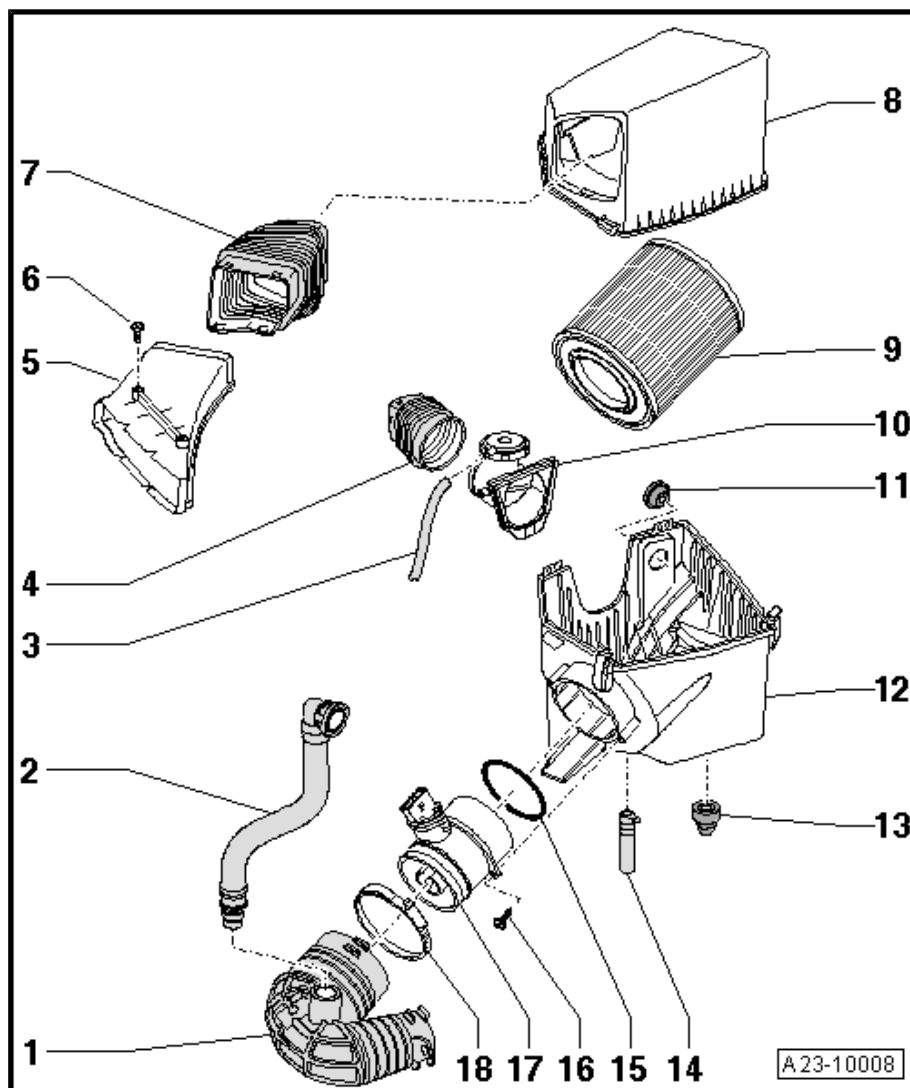
- ☐ Clean out salt deposits, dirt and leaves, etc.
- ☐ Blow out water drain (small hole in bottom section of air cleaner housing) with compressed air

13 - Grommet
14 - Breather hose
15 - O-ring

- ☐ Renew if damaged

16 - 1.5 Nm
17 - Air mass meter -G70-

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

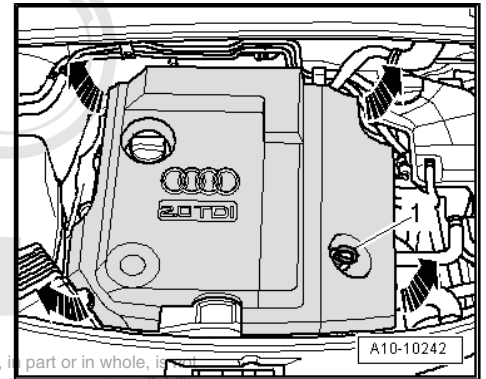
18 - Hose clip


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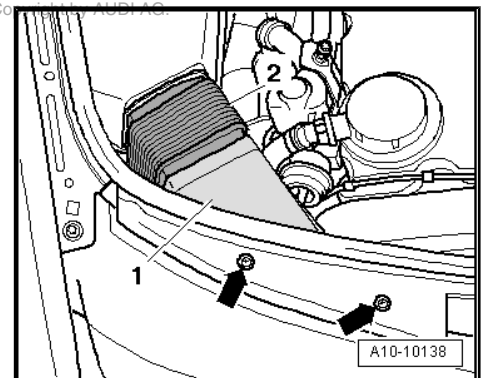
1.5 Removing and installing air filter element

Removing

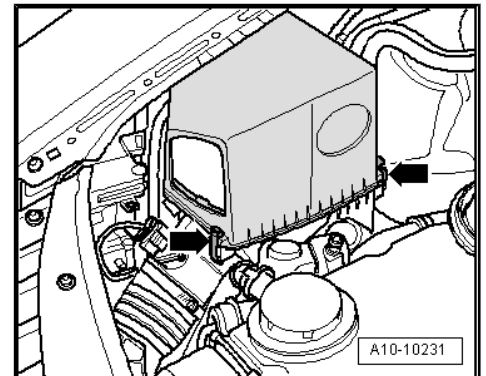
- Pull dipstick -1- out of guide tube.
- Pull off engine cover panel -arrows-.
- Re-insert dipstick in guide tube.



- Unscrew bolts -arrows-.
- Remove air ducts -1- and -2-.



- Release two retaining clips -arrows- and detach top section of air cleaner housing.



- Remove air filter element -1-.

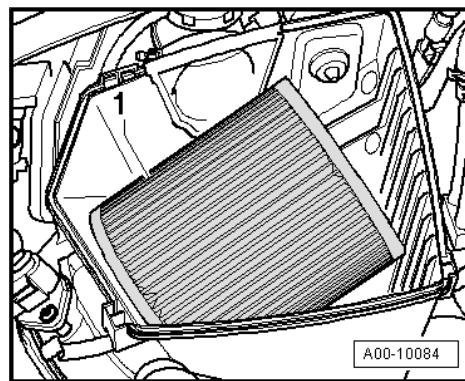
Installing

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



Note

- ◆ *If the air filter element is very dirty or wet, dirt or water could reach the air mass meter and affect the air mass value. This would lead to loss of power, since a smaller injection quantity is calculated.*
- ◆ *Always use genuine part for air filter element.*
- ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly. Do not use any lubricants containing silicone when assembling.*
- ◆ *The air cleaner housing MUST be clean.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue.*
- ◆ *To prevent malfunctions, cover all critical parts of the engine air intake tract (air mass meter, intake pipes, etc.) with a clean cloth when blowing out the air cleaner housing with compressed air.*
- ◆ *Please observe requirements for disposal.*
- 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); use a vacuum cleaner if necessary.
- Check for salt residue, dirt and leaves in air mass meter and air intake hose (engine intake side).
- Check for dirt and leaves in air duct going from lock carrier to air cleaner housing.
- When installing the air filter element, check that it is properly centred in the retainer in the air cleaner housing (bottom section).
- Fit the top section of the air cleaner housing carefully on the bottom section, without using force. Make sure the top section of the air cleaner housing is fitted straight on the air filter element (note position of sealing lip on air filter element).
- Ensure secure fit of intake hose at air mass meter -G70-.



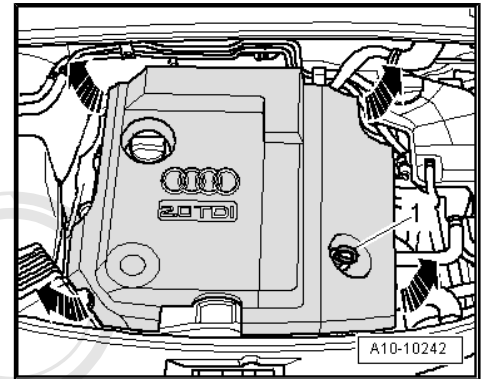
The remaining installation steps are carried out in the reverse sequence.

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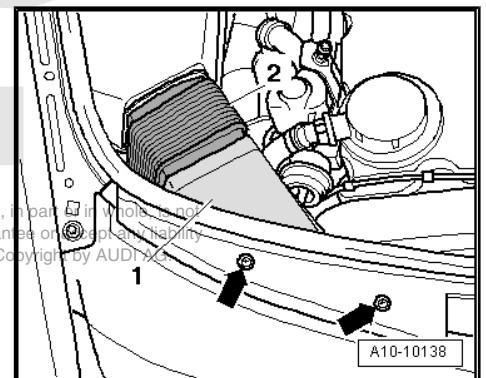
1.6 Removing and installing air mass meter -G70-

Removing

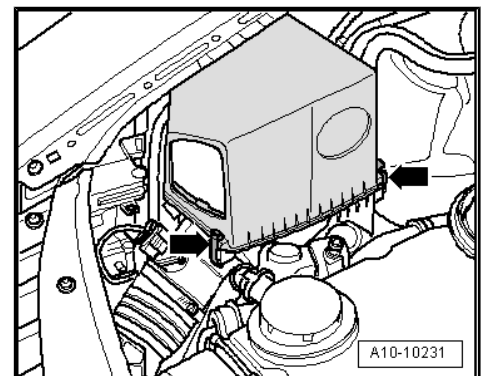
- Pull dipstick -1- out of guide tube.
- Pull off engine cover panel -arrows-.
- Re-insert dipstick in guide tube.



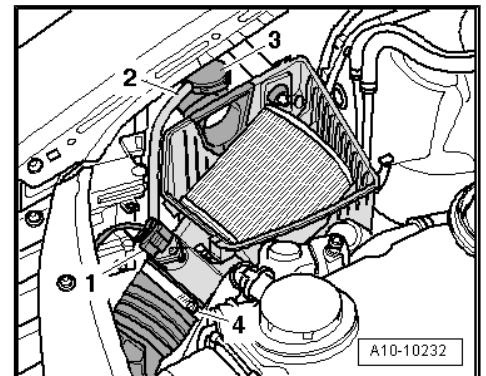
- Unscrew bolts -arrows-.
- Remove air ducts -1- and -2-.



- Release two retaining clips -arrows- and detach top section of air cleaner housing.



- Unplug electrical connector -1- at air mass meter -G70- .
- Loosen hose clip -4- to remove air intake hose.
- If fitted, disconnect vacuum hose -2- and lift vacuum unit -3- together with air flap off air cleaner housing.
- Disengage bottom section of air cleaner housing from retaining pin and remove.



- Unscrew two securing bolts -arrows- on air mass meter -G70- .
- Then carefully pull air mass meter -G70- out of guide on air cleaner housing.

Installing

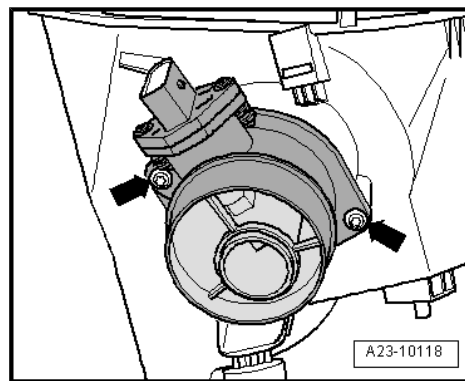
To ensure the proper function of the air mass meter it is important to observe the following notes and instructions.



Note

- ◆ *If the air filter element is very dirty or wet, dirt or water could reach the air mass meter and affect the air mass value. This would lead to loss of power, since a smaller injection quantity is calculated.*
- ◆ *Always use genuine part for air filter element.*
- ◆ *Use silicone-free lubricant when fitting air intake hose.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue.*
- Check for salt residue, dirt and leaves in air mass meter and air intake hose (engine intake side).
- Check for dirt in air duct leading to air filter element. Clean salt residue, dirt and leaves out of top and bottom sections of air cleaner housing (wash out or vacuum out if necessary). Removing and installing air filter element ⇒ [page 13](#) .

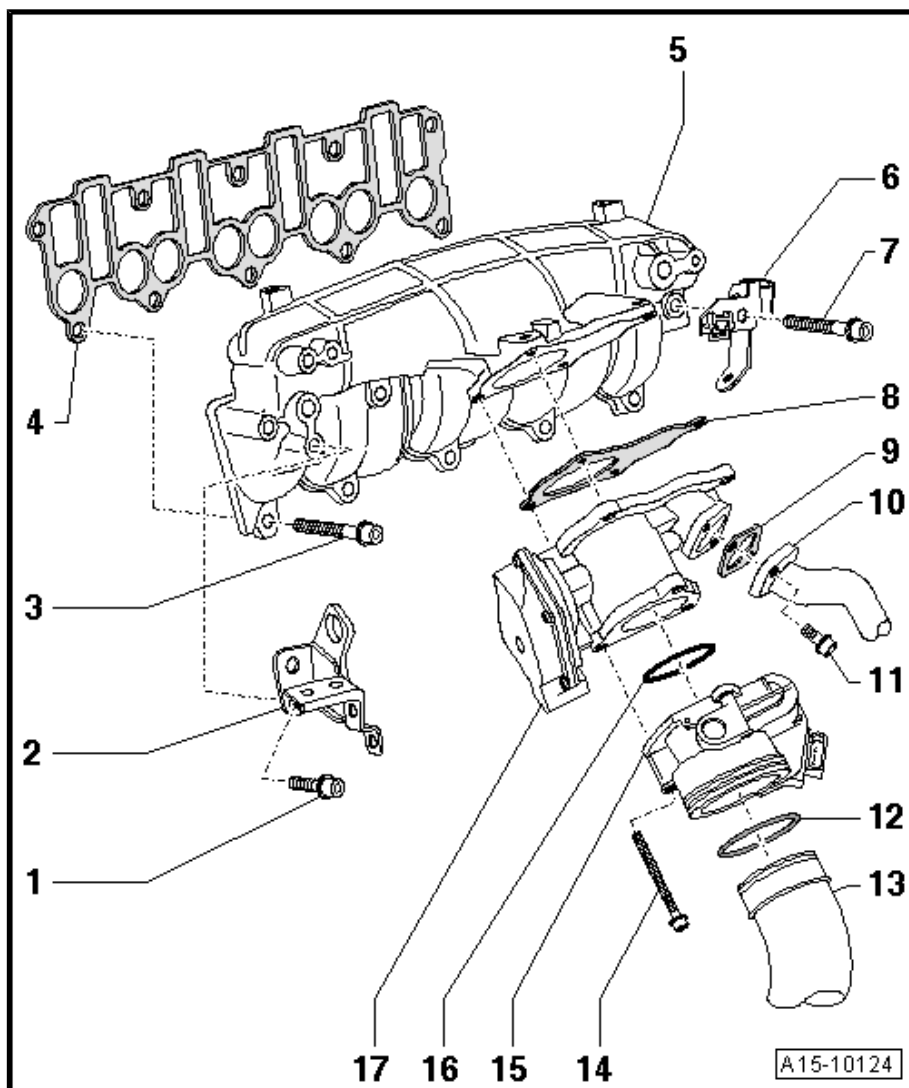
The remaining installation steps are carried out in the reverse sequence.



1.7 Intake manifold - exploded view

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- 1 - 22 Nm
- 2 - Lifting eye
- 3 - 22 Nm
 - ☐ Tighten in stages and in diagonal sequence
- 4 - Gasket
 - ☐ Renew
- 5 - Intake manifold
 - ☐ Illustration shows intake manifold without change-over flap
 - ☐ Removing and installing
⇒ [page 17](#)
- 6 - Bracket
 - ☐ For wiring harness
- 7 - 22 Nm
- 8 - Gasket
 - ☐ Renew
- 9 - Gasket
 - ☐ Renew
- 10 - Connecting pipe for exhaust gas recirculation
- 11 - 22 Nm
- 12 - Seal
 - ☐ Renew if damaged or leaking
- 13 - Air intake hose to charge air cooler
- 14 - 10 Nm
- 15 - Intake manifold flap motor -V157-
- 16 - O-ring
 - ☐ Renew
- 17 - Exhaust gas recirculation valve -N18- with exhaust gas recirculation potentiometer -G212-



1.8 Removing and installing intake manifold

Removing

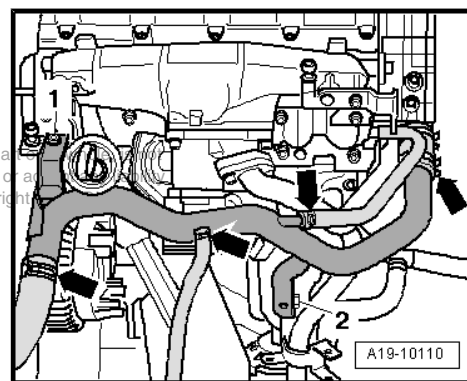
- Remove bolts -1- and -2-.



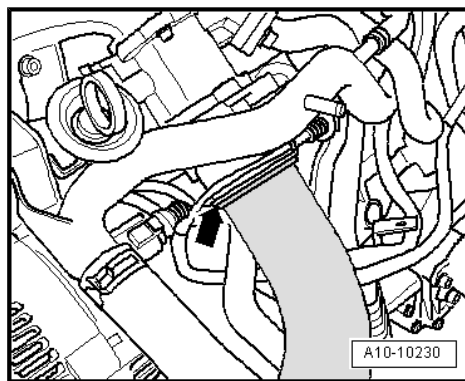
Note

Leave coolant hoses -arrows- connected.

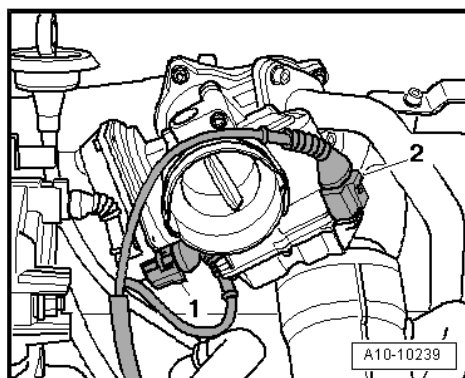
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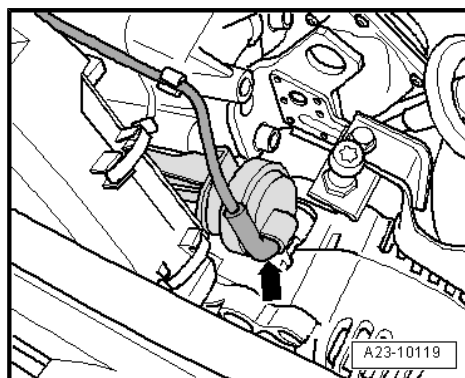
- Remove air intake hose at intake manifold flap motor -V157- by lifting retaining clip -arrow- slightly.



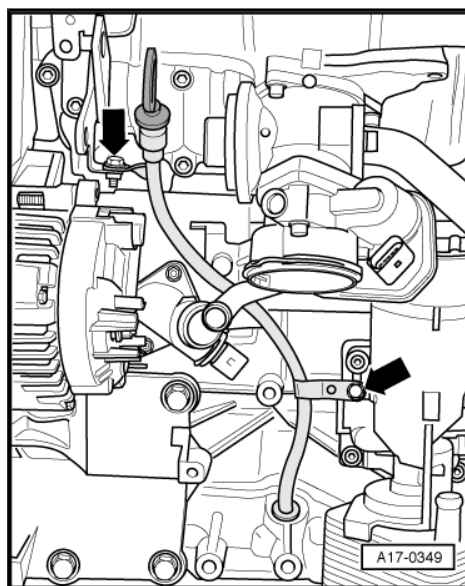
- Unplug electrical connectors at exhaust gas recirculation valve -N18- with exhaust gas recirculation potentiometer -G212- -item 1- and at intake manifold flap motor -V157- -item 2-.



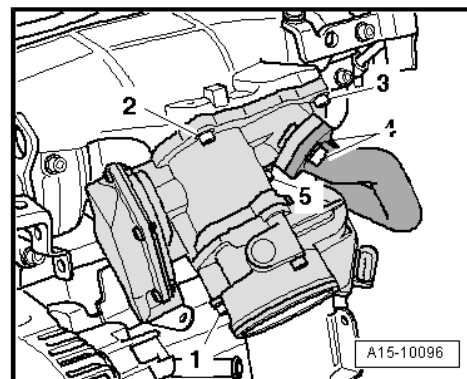
- If fitted, disconnect vacuum hose -arrow- at vacuum unit for intake manifold change-over.



- Unscrew bolt -top arrow-.



- Remove bolts -1 ... 5- and take out exhaust gas recirculation valve -N18- with exhaust gas recirculation potentiometer -G212- together with intake manifold flap motor -V157- .



- Unbolt intake manifold -arrows-.

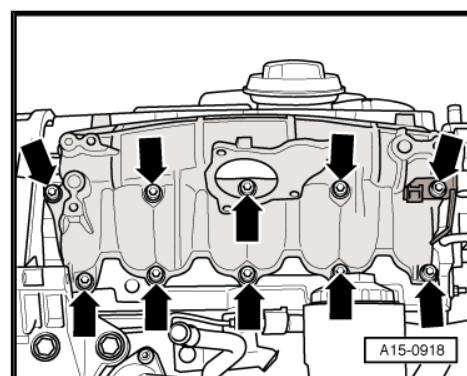
Installing

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

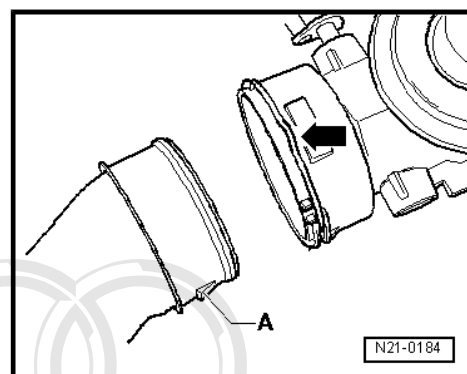


Note

Renew gaskets and seals.



- When installing air intake hoses with plug-in connectors, ensure that the securing clip -arrow- engages audibly on the retaining lug -A-.



Tightening torques

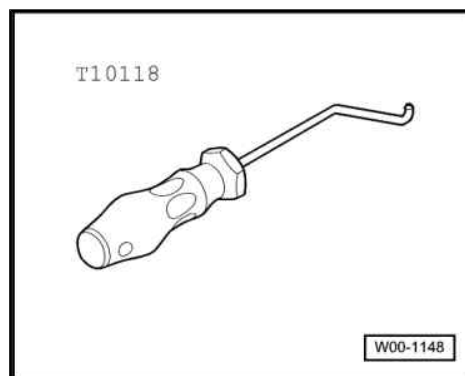
Component	Nm
Intake manifold to cylinder head	22
Guide tube for oil dipstick to engine lifting eye	10
Exhaust gas recirculation valve -N18- with exhaust gas recirculation potentiometer -G212- to intake manifold	10
Connecting pipe to exhaust gas recirculation valve -N18- with exhaust gas recirculation potentiometer -G212-	22
Intake manifold flap motor -V157- to exhaust gas recirculation valve -N18- with exhaust gas recirculation potentiometer -G212-	10
Coolant pipe (top) to:	
Engine lifting eye	10
Oil filter bracket	10

1.9 Removing and installing engine speed sender -G28-

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Special tools and workshop equipment required

◆ Assembly tool -T10118-



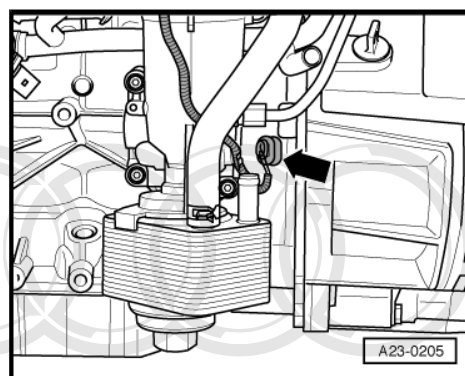
Removing

- Remove oil filter bracket ⇒ Rep. Gr. 17 .
- Unplug electrical connector at engine speed sender -G28- -arrow- using assembly tool -T10118- .



Note

To release electrical connector without assembly tool -T10118- , press connector on engine speed sender in with a screwdriver and at the same time lift release tab with a thin wire hook.



- Move wiring clear.
- Unscrew securing bolt -2- for engine speed sender -G28- -item 1-.

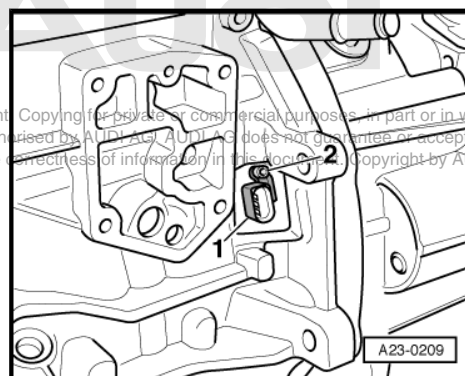
Installing

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

- Install oil filter bracket ⇒ Rep. Gr. 17 .

Tightening torque

Component	Nm
Engine speed sender -G28- to cylinder block	4.5



1.10 Removing and installing sender wheel for engine speed sender -G28-

The sender wheel for engine speed sender -G28- is removed and installed together with the rear sealing flange ⇒ Rep. Gr. 13 .

1.11 Servicing unit injectors



Note

Observe rules for cleanliness ⇒ [page 1](#) .

1 - 3 Nm + 90° (1/4 turn), + 180° (1/2 turn) further

- ☐ Use special wrench (long reach) -T10054- when removing
- ☐ Renew

2 - Rocker arm shaft

- ☐ With rocker arms
- ☐ Removing and installing
⇒ [page 22](#)

3 - 20 Nm + 90° (1/4 turn) further

- ☐ Renew

4 - Adjuster screw

- ☐ Renew

5 - Lock nut

6 - Unit injector

- ☐ Removing and installing
⇒ [page 22](#)
- ☐ Before installation oil O-rings and guide in cylinder head

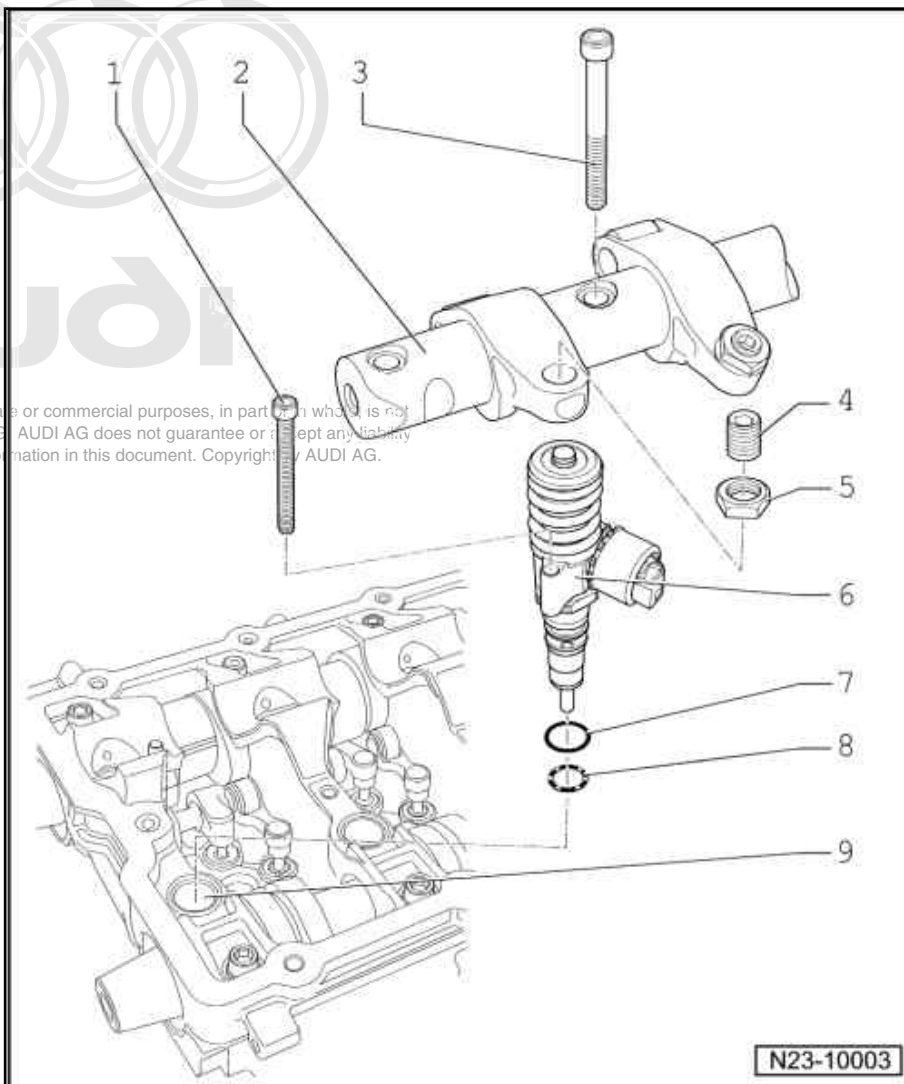
7 - O-ring

- ☐ Renewing ⇒ [page 27](#)

8 - O-ring

- ☐ Renewing ⇒ [page 27](#)

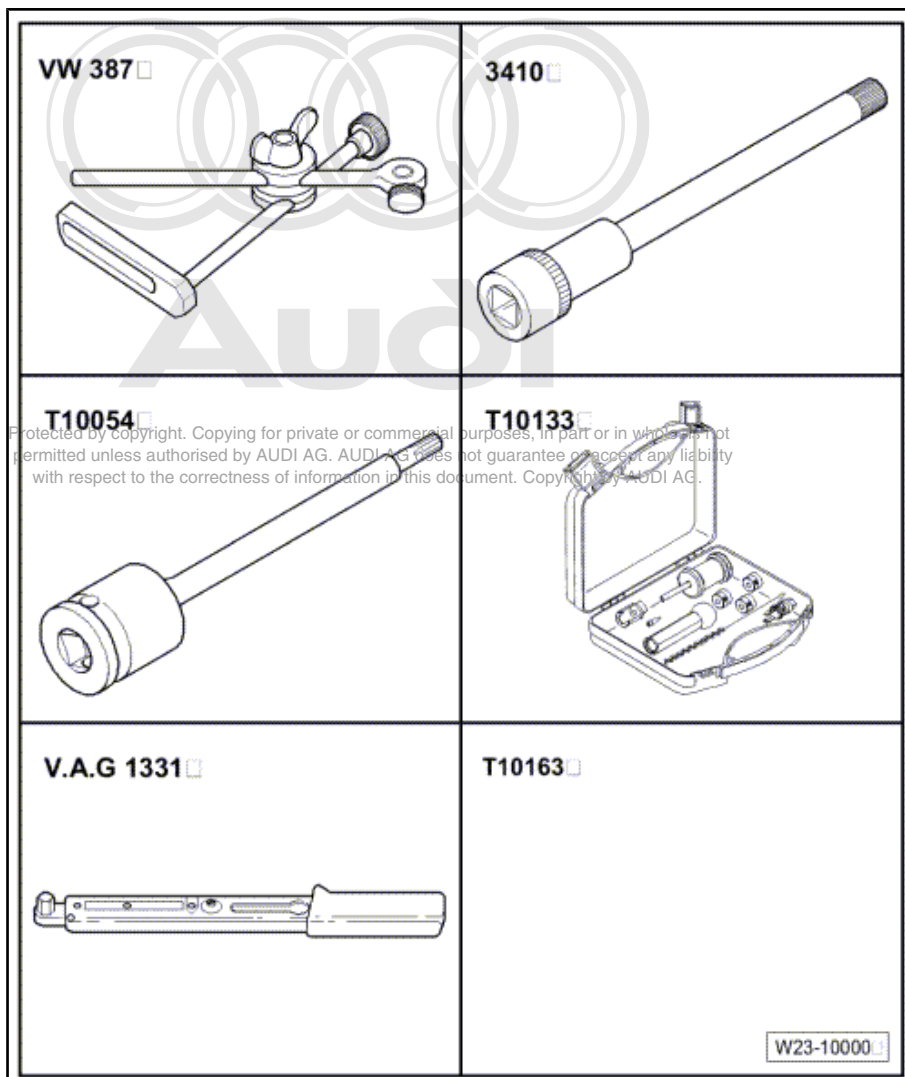
9 - Cylinder head



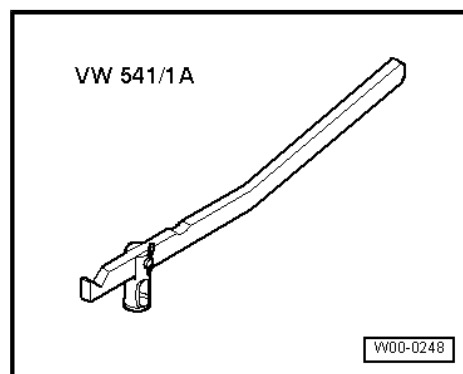
1.12 Removing and installing unit injectors

Special tools and workshop equipment required

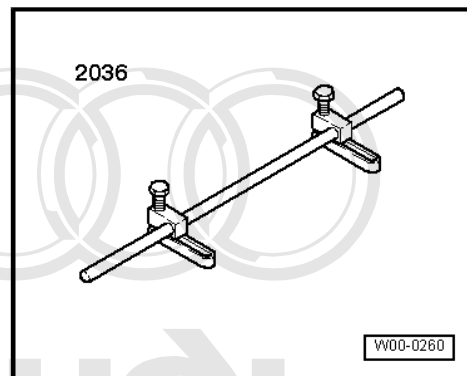
- ◆ Universal dial gauge bracket -VW 387-
- ◆ Socket -3410-
- ◆ Special wrench (long reach) -T10054-
- ◆ Tool set for FSI engines - T10133-
- ◆ Torque wrench -V.A.G 1331-
- ◆ Puller -T10163-



- ◆ Valve lever -VW 541/1 A- with press tool for VW 541 / 1 A and 2037 -VW 541/5-

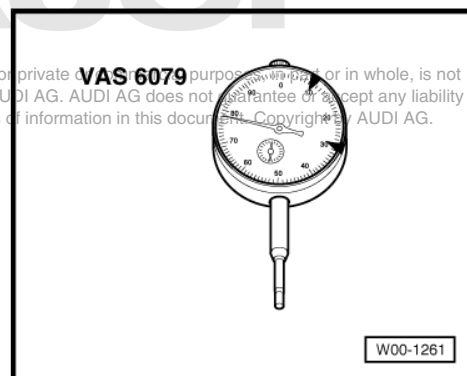


◆ Assembly device for valves -2036-



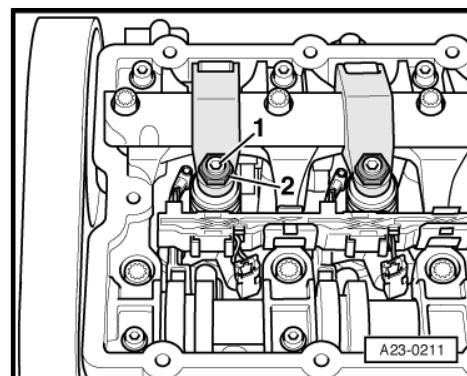
◆ Dial gauge -VAS 6079-

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Removing

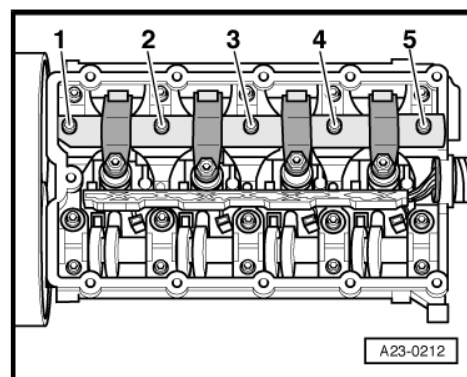
- Remove cylinder head cover ⇒ Rep. Gr. 15 .
- Turn crankshaft until both cams on cylinder of unit injector to be removed point symmetrically upwards. To do so:
 - ◆ Vehicles with manual gearbox: push vehicle forwards with 4th gear engaged and ignition switched off.
 - ◆ Vehicles with multitronic gearbox: remove noise insulation, remove torque reaction support and stop for torque reaction support, lever off cover cap from vibration damper and rotate crankshaft in clockwise direction via central bolt for vibration damper.
- Loosen the lock nuts -2- of the adjuster screws -1- on all unit injectors.
- Unscrew the adjuster screws until each rocker arm touches the tappet spring of the unit injector.
- Unscrew bolts -1, 3, 5- using socket -3410- .
- Unscrew bolts -2- and -4- using socket -3410- alternately in several stages.



Note

Do not pull bolts out of rocker arm shaft so that components remain attached to shaft. If necessary mark position on rocker arm.

- Detach rocker arm shaft.



- Detach electrical connectors from glow plugs -A- and from unit injectors -B-.

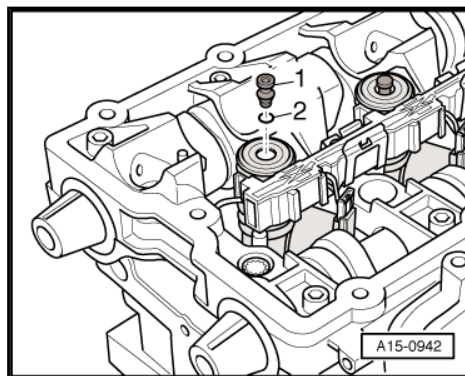
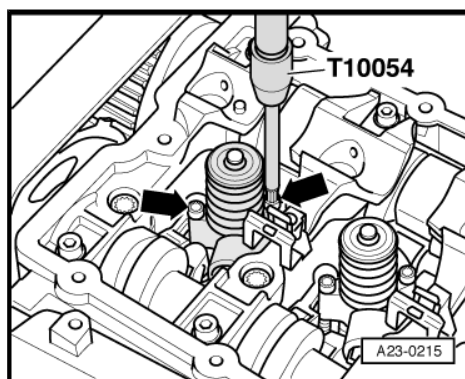
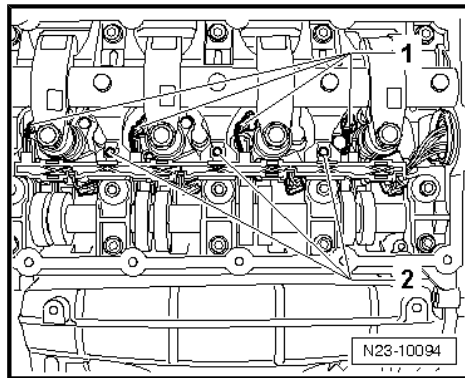


Caution

Only slacken or tighten the bolts at the retaining clips when removing and installing unit injectors. If the electrical wiring harness is released at the retaining clips, the clips will become bent and this may lead to a break in the wiring because of the increased amount of play.

- Remove bolts -arrows- at retaining clips and move entire electrical wiring harness clear to one side.
- Unscrew bolts -arrows- with special wrench (long reach) - T10054- .

- Pull out ball stud -1- from unit injector to be removed.



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- Insert puller -T10163- in bolt holes on unit injector.
- Turn spindle -A- down lightly onto the unit injector. Hand-tighten lock nut -B-.
- By tapping gently with screw striker -T10133/3-, lift the unit injector upwards out of its seat in the cylinder head.



Note

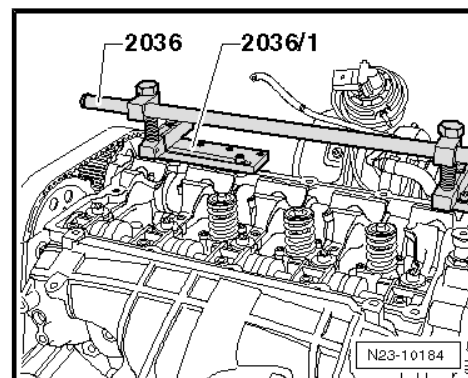
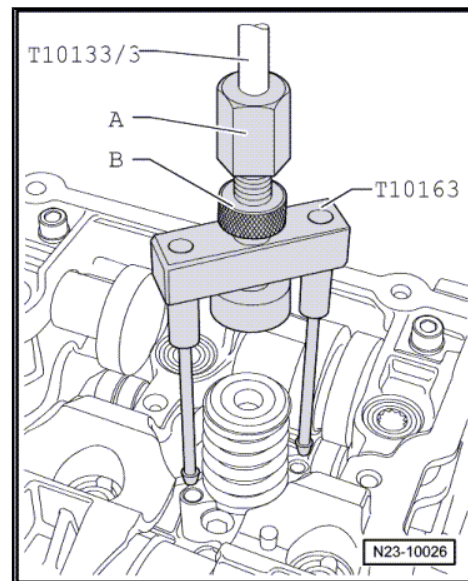
Mark cylinder numbers of unit injectors for re-installation.

Installing and adjusting



Note

- ◆ *Renew bolts on unit injectors.*
- ◆ *Before installation oil O-rings and guide in cylinder head.*
- ◆ *New unit injectors are supplied with new O-rings.*
- ◆ *When installing a new unit injector, you must also renew the appropriate adjuster screw in rocker arm.*
- ◆ *When re-installing the old unit injector, you must replace the O-rings ⇒ [page 27](#).*
- ◆ *Whenever an operation requires adjustment of a unit injector, the adjuster screw in the rocker arm and the ball stud of the unit injector must be cleaned and examined for signs of wear. Ball stud and adjuster screw must be renewed if signs of wear are found.*
- ◆ *Grease the contact surfaces between the ball stud and adjuster screw with lubricating grease -G 000 100-.*
- Before installing unit injector check that both O-rings are properly seated.
- The O-rings must not be twisted.
- The O-ring marked white is located in the lower groove on the unit injector.
- Lubricate seals and body of unit injector.
- Check seat of unit injector in cylinder head for dirt and any foreign particles (metal shavings/carbon etc.) and blow out with compressed air if necessary.
- Insert unit injector very carefully into cylinder head seat.
- Fit valve assembly device -2036- with securing plates -2036/1- onto retaining frame of cylinder head as shown.

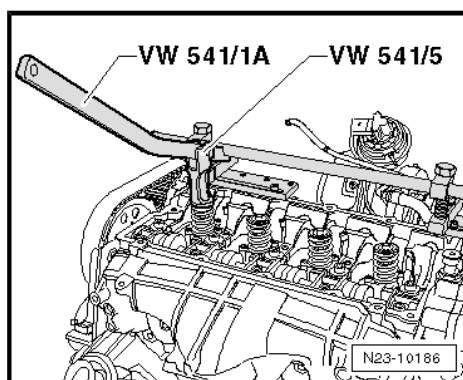
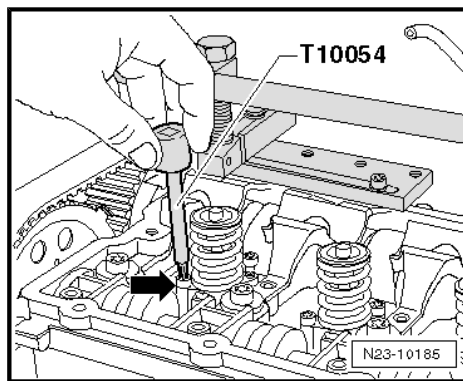




Caution

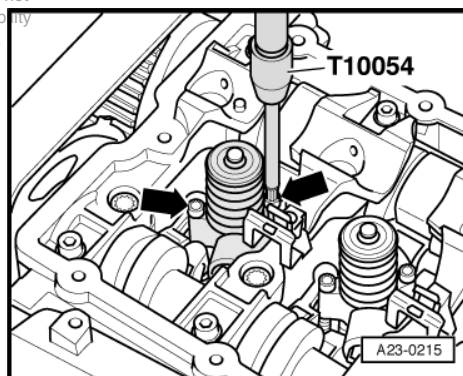
If the unit injector is pulled down by the securing bolts, there is a danger that the unit injector will be drawn into its seat at an angle. This may subsequently lead to engine running problems and starting problems. For this reason the unit injector must be pressed into its seat first and may be tightened only then.

- Insert new securing bolts and carefully screw in by hand without applying force until they make contact -arrow-.
- Then fit valve lever -VW 541/1 A- using press tool -VW 541/5- .
- Carefully press unit injector into its seat using valve lever -VW 541/1 A- while keeping the force applied.
- Then screw in securing bolts for unit injector by hand without applying force using special wrench (long reach) -T10054- until they make contact.

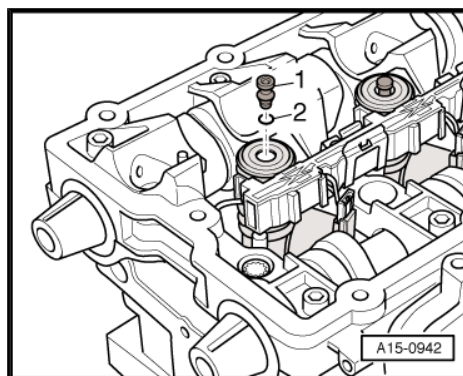


- Tighten bolts for unit injectors -arrows- as follows

1. Tighten with torque wrench to 3 Nm.
2. Turn 90° (1/4 turn) further using a rigid wrench.
3. Turn 180° (1/2 turn) further using a rigid wrench.

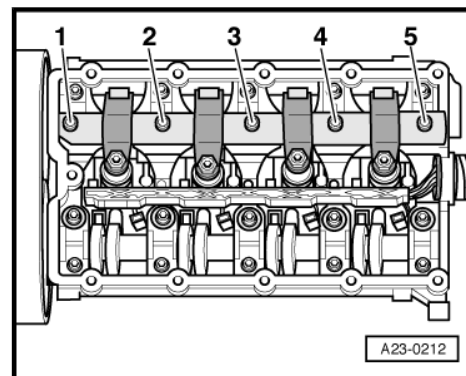


- Before inserting rocker arm shaft, check whether all ball studs -1- and O-rings -2- have been installed in unit injectors.

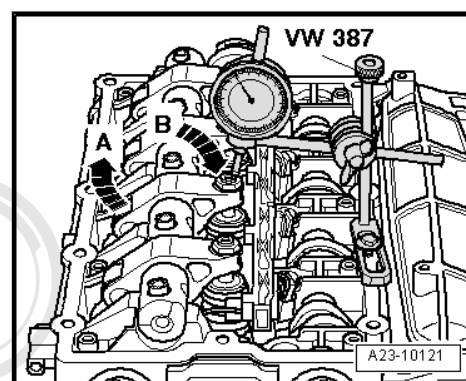


– Secure the rocker arm shaft as follows:

1. Tighten bolts -2- and -4- alternately in several stages until rocker arm shaft lies on bearing frame.
2. Tighten bolts -1-, -3- and -5- to 20 Nm + 90° (1/4 turn).
3. Tighten bolts -2- and -4- to 20 Nm + 90° (1/4 turn).



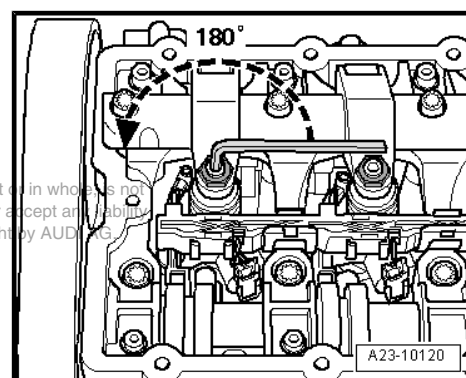
- Apply dial gauge -VAS 6079- to adjuster screw of unit injector, as shown in illustration.
- Turn crankshaft in direction of engine rotation until roller of rocker arm is located at tip of drive cam.
 - Roller side -arrow A- is at highest point.
 - Dial gauge -arrow B- is at lowest point.
- Remove dial gauge.
- Now turn the adjuster screw into rocker arm until significant resistance can be felt (unit injector is at limit stop).



- Turn adjuster screw 180° back off stop.
- Hold adjuster screw in this position and tighten lock nut to 30 Nm.

Perform further installation in reverse order, paying attention to the following:

- Install cylinder head cover ⇒ Rep. Gr. 15.

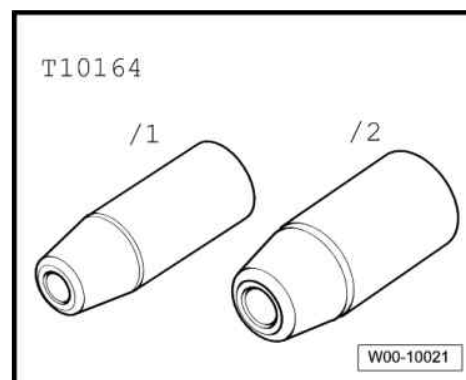


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1.13 Renewing O-rings for unit injectors

Special tools and workshop equipment required

- ◆ Assembly sleeves -T10164-



Removing

- Remove unit injector ⇒ [page 22](#).
- Lever old O-rings very carefully out of unit injector.

- Important: Ensure that no burrs are formed at the O-ring seats.

Installing



Note

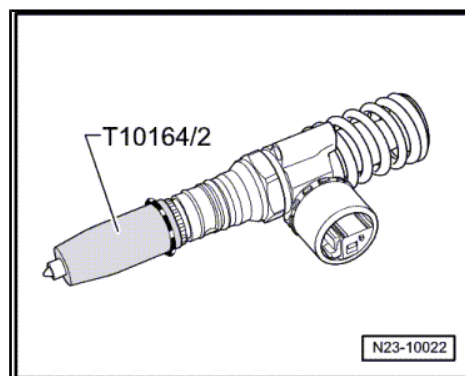
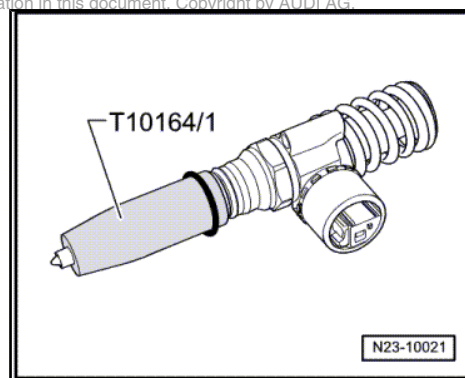
- ♦ *Always use the assembly sleeves to fit the O rings. Otherwise, the O-rings could get damaged.*
- ♦ *Take care to ensure correct allocation of O-rings to grooves.*
- Clean seating grooves for O-rings on unit injector very carefully.
- Fit assembly sleeve -T10164/1- onto unit injector, pushing it to the limit stop.



Note

Push the O-rings into position when assembling: do not roll them on. They must not be twisted when seated in the groove on the unit injector.

- Push upper (thicker) O-ring carefully onto assembly sleeve and into groove on unit injector.
- Remove assembly sleeve.
- Fit assembly sleeve -T10164/2- onto unit injector, pushing it to the limit stop.
- Carefully push lower O-ring (marked white) onto assembly sleeve and into groove on unit injector.
- Remove assembly sleeve.
- Install unit injector ⇒ [page 22](#) .



1.14 Electrical wiring harness for unit injectors and glow plugs - exploded view of components

1 - Electrical connector

- ☐ For glow plug connector

2 - Retaining clip



Caution

Only slacken or tighten the bolts at the retaining clips when removing and installing the electrical wiring harness. If the electrical wiring harness is released at the retaining clips, the clips will become bent and this may lead to a break in the wiring because of the increased amount of play.

3 - 10 Nm

4 - Adapter ring

- ☐ Make sure it is correctly positioned when installing

5 - Main connector

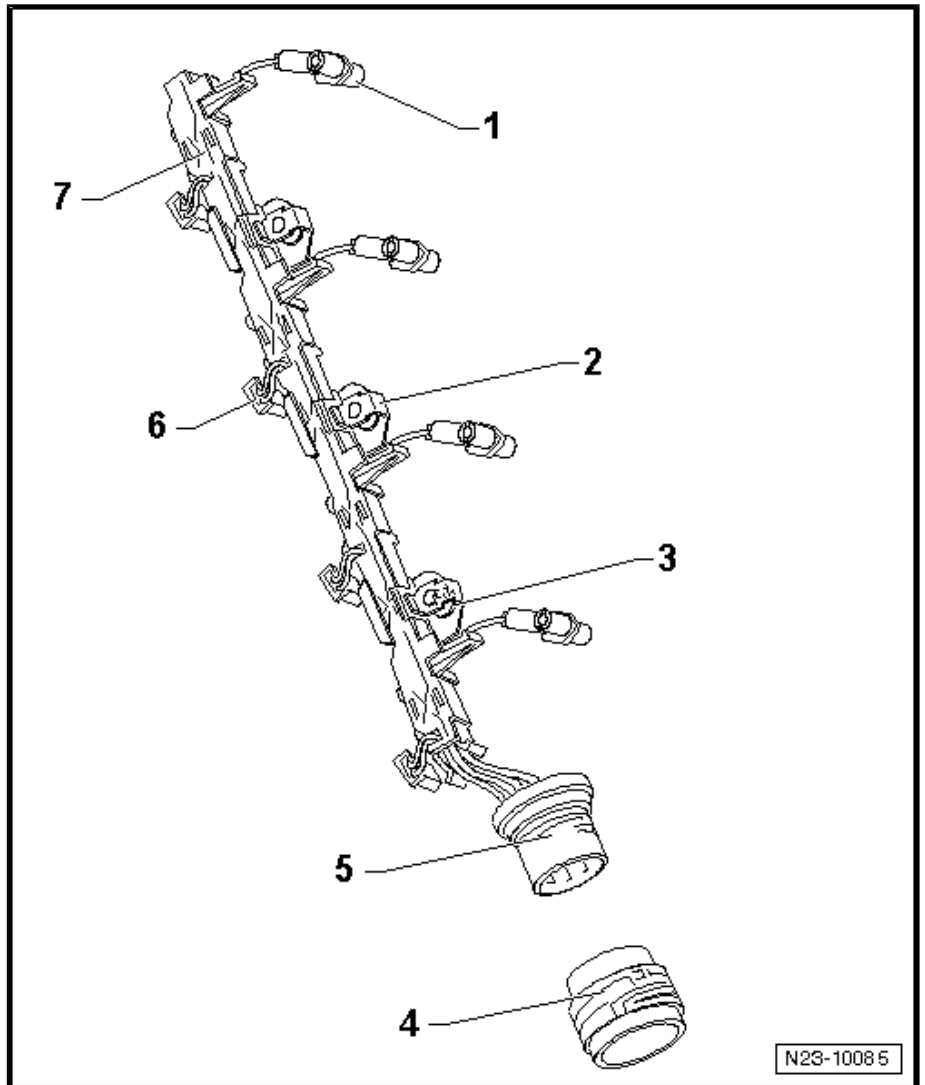
- ☐ Make sure it is correctly positioned when installing
- ☐ Note installation position of securing clip
⇒ [page 31](#)

6 - Electrical connector

- ☐ For unit injector

7 - Electrical wiring harness

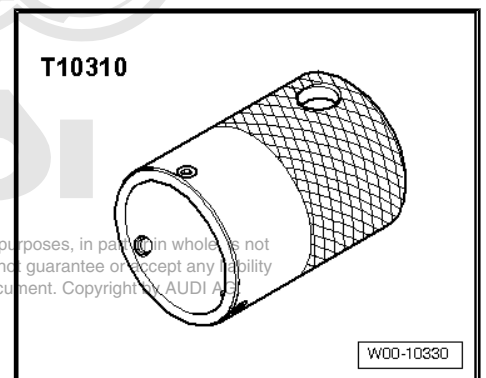
- ☐ Remove and install only together with -item 2-
- ☐ Removing and installing ⇒ [page 29](#)



1.15 Removing and installing electrical wiring harness for unit injectors and glow plugs

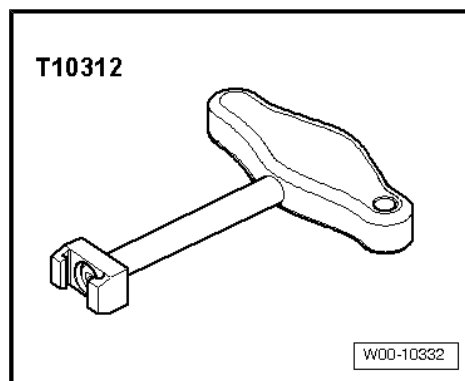
Special tools and workshop equipment required

- ◆ Special wrench -T10310-



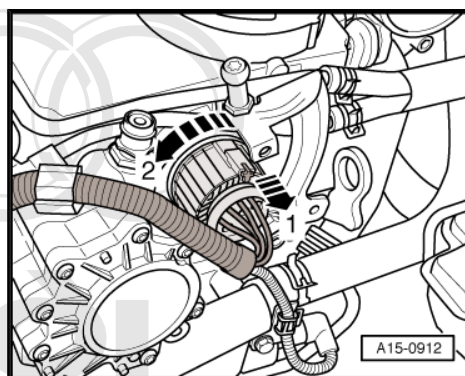
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◆ Puller -T10312-



Removing

- Remove cylinder head cover ⇒ Rep. Gr. 15 .
- To unplug multi-pin connector for unit injectors and glow plugs, pull release pin -arrow 1- and slacken knurled nut -arrow 2-.

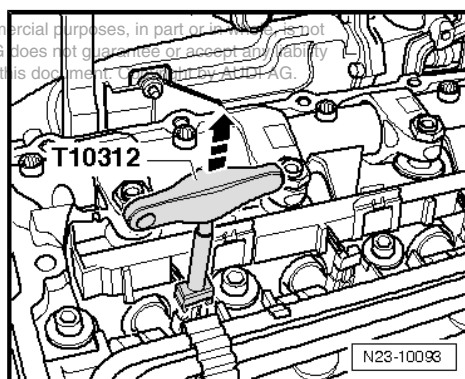


Note

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Puller -T10312- must be used to unplug electrical connectors on piezo unit injectors.

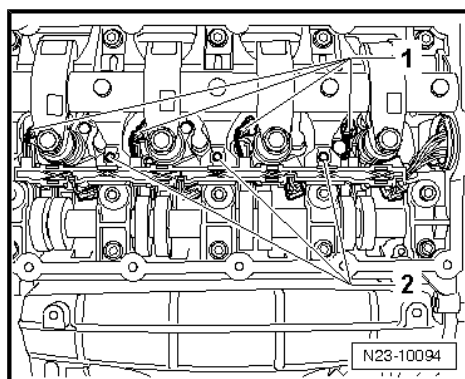
- Working from the side, slide puller -T10312- onto electrical connector on unit injector and pull off connector -arrow-.



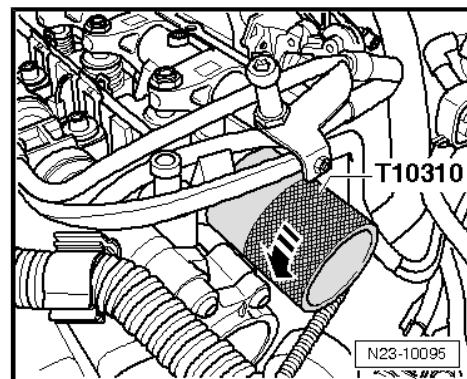
Caution

Only slacken or tighten the bolts at the retaining clips when removing and installing the electrical wiring harness. If the electrical wiring harness is released at the retaining clips, the clips will become bent and this may lead to a break in the wiring because of the increased amount of play.

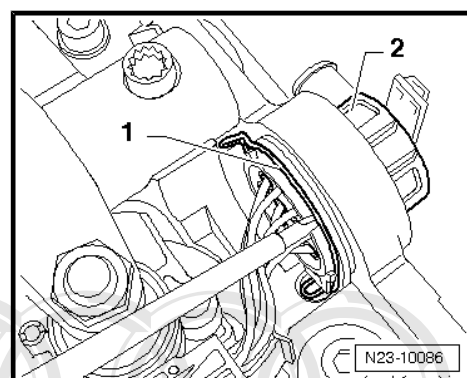
- Unplug electrical connectors on glow plugs -1-.
- Remove bolts -2- at retaining clips and detach entire electrical wiring harness.



- Apply special wrench -T10310- to adapter ring and slacken by turning 90° in anti-clockwise direction -arrow-.

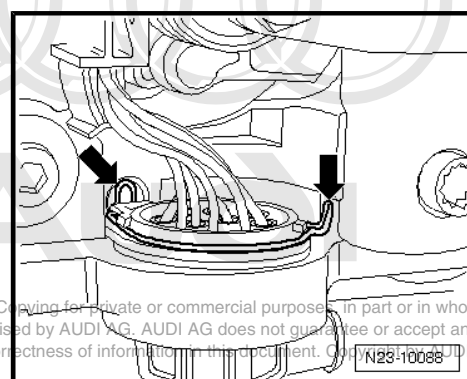


- Pull securing clip -1- slightly upwards using a screwdriver and push through main connector -2- towards inside.



Installing

- Insert wiring harness and tighten bolts at retaining clips.
- Guide main connector through opening in bearing frame.
- Fit retaining clip.
- The lugs -arrows- must return to the position as shown in illustration.



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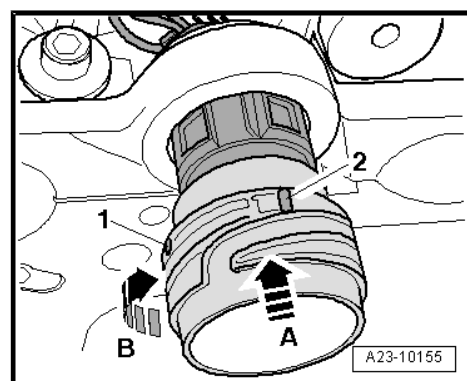
- Fit adapter ring at main connector -arrow A-.
- Long green line -2- faces upwards.
- Tighten adapter ring with special wrench -T10310- by turning 90° in clockwise direction -arrow B-.
- Short green line -1- now faces upwards.

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

- Install cylinder head cover ⇒ Rep. Gr. 15 .

Tightening torque

Component	Nm
Electrical wiring harness to cylinder head	10

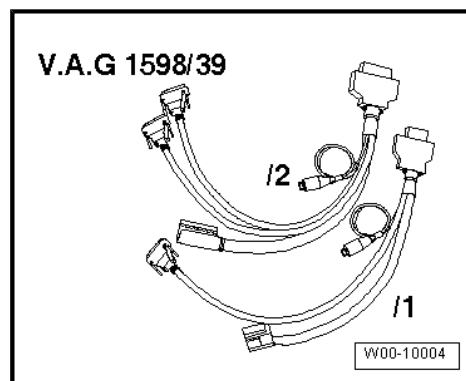


1.16 Wiring and component check with test box -V.A.G 1598/42-

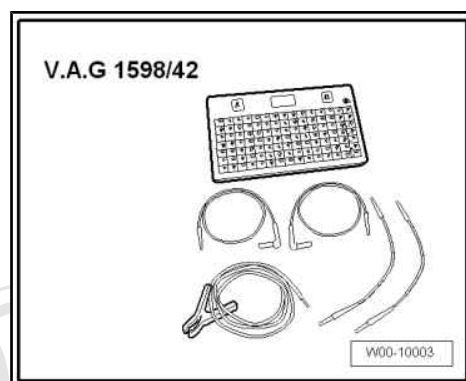
Special tools and workshop equipment required



◆ Adapter cable -V.A.G 1598/39-



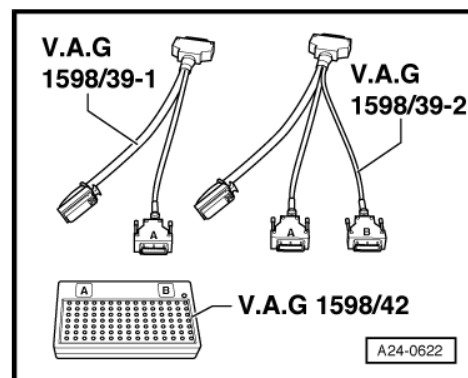
◆ Test box -V.A.G 1598/42-



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**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 leads.
- ◆ 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 lead -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 lead -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 1526C- etc.).



The engine control unit has to be removed before connectors can be unplugged from engine control unit ⇒ [page 33](#).

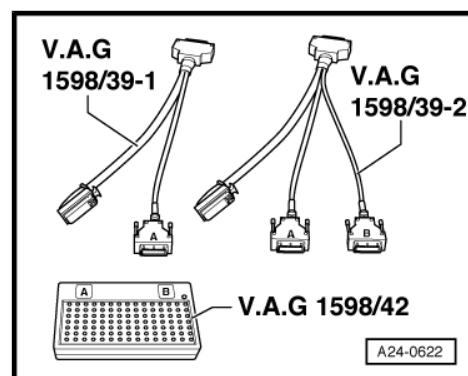
**Caution**

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

- Connect the test box -V.A.G 1598/42- to wiring harness with adapter lead -V.A.G 1598/39-1- or adapter lead -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.
- After completing tests re-install engine control unit ⇒ [page 33](#).

After re-connecting the engine control unit the following operations must be performed:

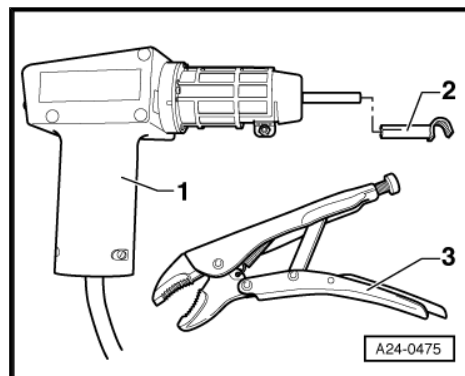
- Interrogate fault memory and erase, if necessary.



1.17 Removing and installing engine control unit

Special tools and workshop equipment required

- ◆ Hot air blower, 220 V/ 50 HZ -VAS 1978/14- -item 1-

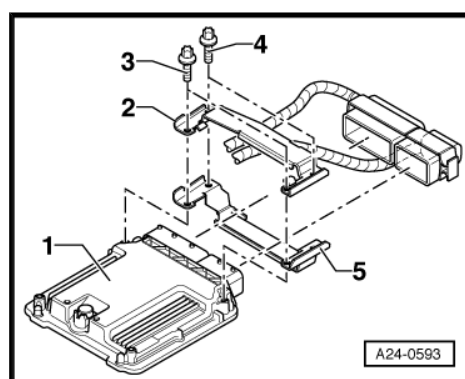


- ◆ Shrink element for hot air blower -VAS 1978/15- -item 2-
- ◆ Vice-grip pliers -3- (commercially available)



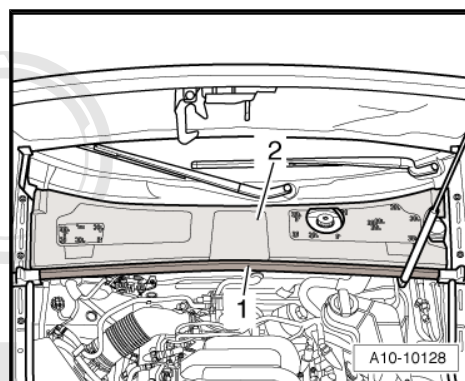
Note

- ◆ 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).

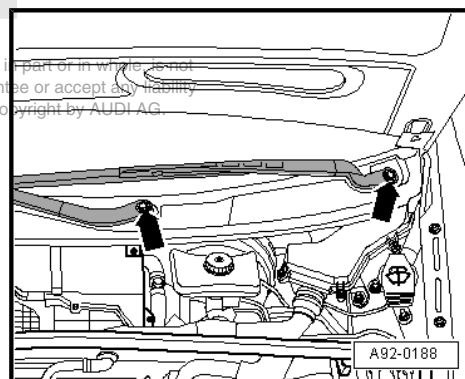


Removing

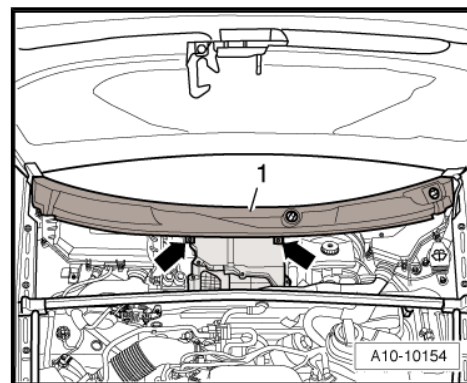
- When renewing engine control unit, select diagnosis object “Renew engine control unit” in “Guided Fault Finding” ⇒ Vehicle diagnosis, testing and information system VAS 5051.
- Switch off ignition and remove ignition key.
- Pull off rubber seal -1- on plenum chamber cover.
- Detach plenum chamber cover -2-.



- 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, remove nuts and take off wiper arms.



- Remove bolts -arrows- for cowl panel grille -1-.
- Pull cowl panel grille off windscreen.

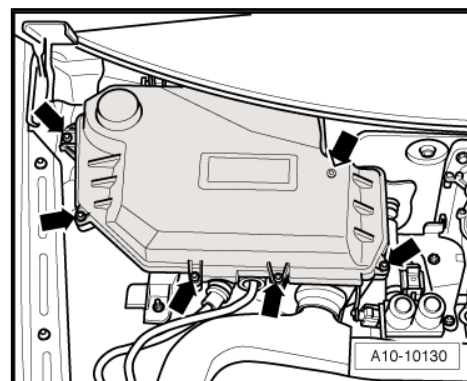


- Unscrew bolts -arrows- and take off cover for electronics box in engine compartment (right-side).



WARNING

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

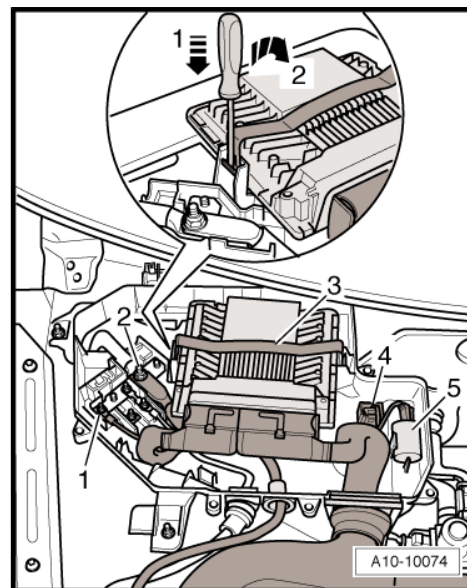


- Carefully lever out the retaining strap -2- using a screwdriver -arrows 1 and 2- and remove the engine control unit from the electronics box.



Caution

The following procedure must be followed exactly to prevent any damage (burning) to wiring, connectors, insulation and control units. Observe operating instructions for hot air blower.



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

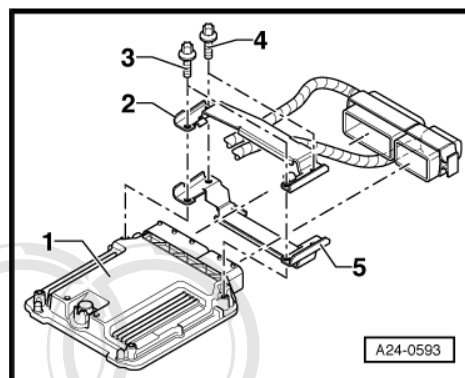
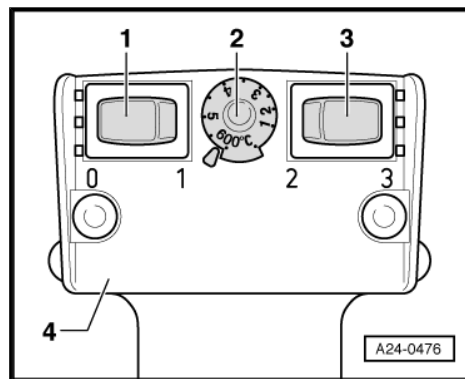

Note

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.

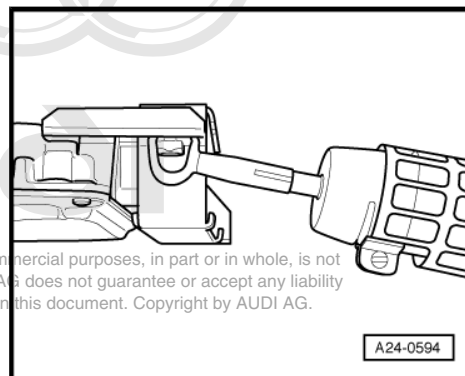

WARNING

Parts of the protective housing will become very hot as a result of heating the shear bolts. Take care to avoid burns. Try to ensure that only the thread is heated and none of the nearby components. These should be covered if necessary.

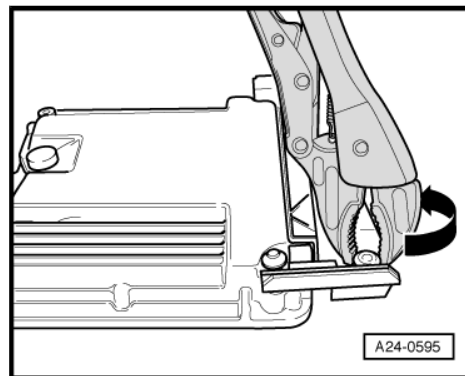
- Carry out the following operations on the two shear bolts -4- in turn.



- Place the nozzle of the hot air blower close to the shear bolt on the protective housing.
- Switch on the hot air blower and heat the bolt for approximately 20 ... 25 seconds.



- Unscrew shear bolts using vice-grip pliers -arrow-.



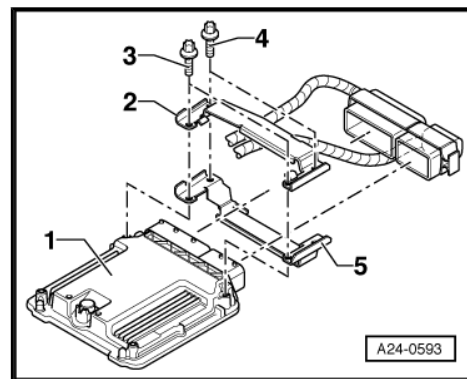
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Note

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.

- Unscrew the two shear bolts -3-.
- Release locking plate -2- for control unit connectors.
- Release retaining tabs and unplug connectors from engine control unit.



Note

When the connectors are disconnected 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:

- Protective housing must be fitted back on engine control unit.
- Clean threaded holes for shear bolts to remove any residue from locking fluid. This can be done using a thread tap.
- Use new shear bolts.

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

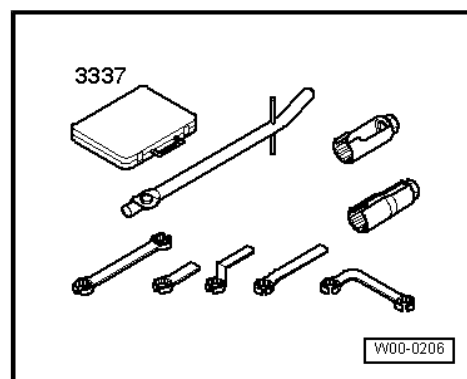
- Activate engine control unit in “Guided Fault Finding” “Renew engine control unit” ⇒ Vehicle diagnosis, testing and information system VAS 5051.

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

Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set -3337-



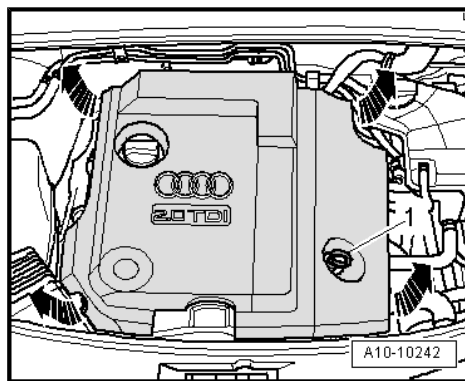
Removing



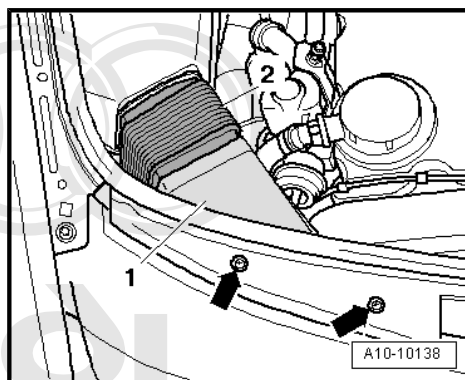
Note

- ◆ *Fit all heat insulation sleeves in the original position when installing.*
- ◆ *All cable ties which are released or cut open when removing must be fitted in the same position when installing.*

- Pull dipstick -1- out of guide tube.
- Pull off engine cover panel -arrows-.
- Re-insert dipstick in guide tube.

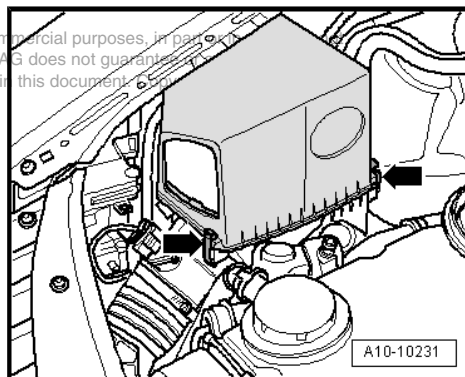


- Unscrew bolts -arrows-.
- Remove air ducts -1- and -2-.

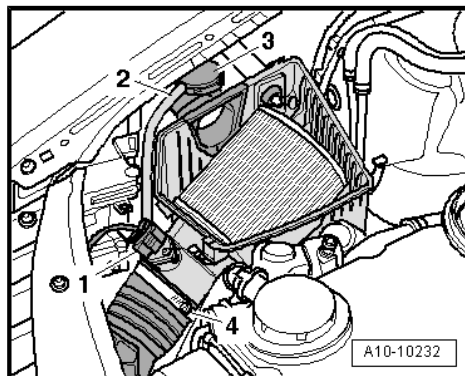


- Release two retaining clips -arrows- and detach top section of air cleaner housing.

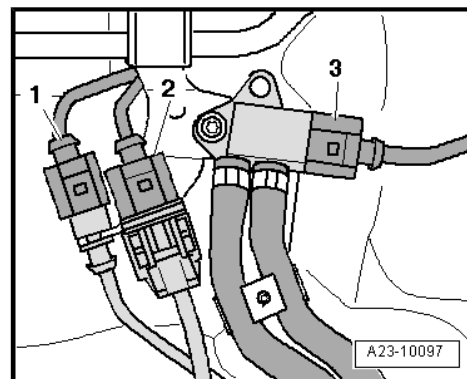
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- Unplug electrical connector -1- at air mass meter -G70-.
- Loosen hose clip -4- to remove air intake hose.
- If fitted, disconnect vacuum hose -2- and lift vacuum unit -3- together with air flap off air cleaner housing.
- Disengage bottom section of air cleaner housing from retaining pin and remove.



- Detach electrical connector -2- for Lambda probe -G39- and Lambda probe heater -Z19- from bracket.
- Unplug electrical connector and move wiring clear.



- Unscrew Lambda probe -1- using Lambda probe open ring spanner set -3337-.



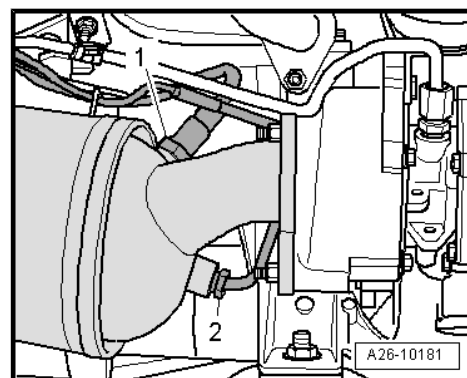
Note

Disregard -item 2-.

Installing

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

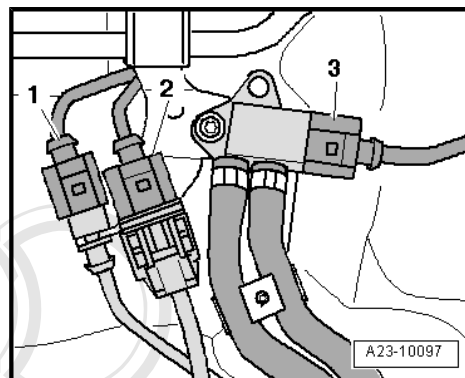
- ◆ Threads of new Lambda probes are already greased with assembly paste; the paste must not get into the slots on the probe body
- ◆ When re-using the old Lambda probe, grease thread with high-temperature lubricant; the lubricating paste must not get into the slots of the probe body; High-temperature lubricant ⇒ Parts catalogue
- ◆ Tightening torque: 55 Nm.
- ◆ 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.



1.19 Removing and installing exhaust gas pressure sensor 1 -G450-

Removing

- Mark hoses on exhaust gas pressure sensor 1 -G450- -item 3- for re-installation.
- Unbolt pressure sensor from bulkhead.
- Unplug electrical connector and disconnect hoses.
- Release hose clips and spray both hoses with silicone-free lubricant.
- Carefully disconnect the hoses from their connections (take care to keep the hoses straight: the connections can break off easily).



Installing

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



Note

- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) → **Parts catalogue**.*
- ◆ *Fit all cable ties in the original positions when installing.*
- Blow through hoses (towards particulate filter) with compressed air.
- Connect hoses to exhaust gas pressure sensor 1 -G450- according to markings made earlier.

28 – Glow plug system

1 Glow plug system

1.1 Different types of glow plugs

Two different types of glow plugs are installed in the 4-cylinder TDI engine in Audi A6 vehicles.

Engine code letters BLB, BNA

- ◆ These engines are fitted exclusively with metal glow plugs.

Engine code letters BRE, BRP, BVG

- ◆ These engines are fitted exclusively with NGK ceramic glow plugs, which are colour-coded with a "white, or possibly silver-coloured" seal.



Caution

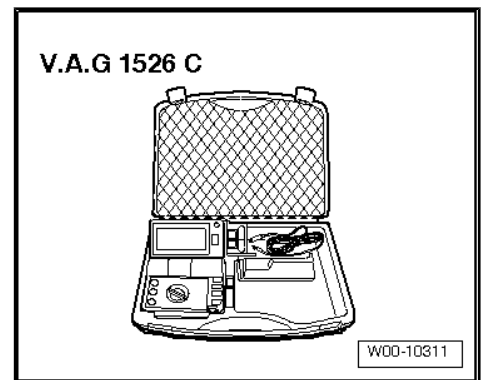
Important: Always observe the special instructions for handling ceramic glow plugs. The metal glow plugs do not require any special handling procedures → page 42.

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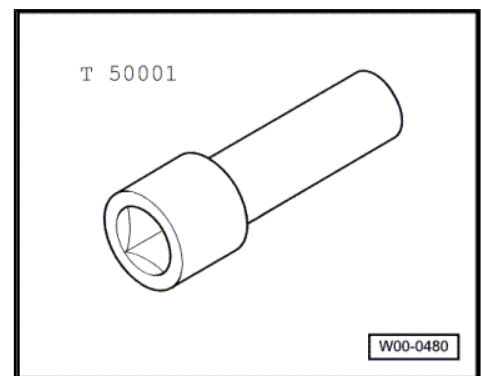
1.2 Removing and installing ceramic glow plugs

Special tools and workshop equipment required

- ◆ Hand-held multimeter -V.A.G 1526C-



- ◆ Socket -T50001-



- ◆ Torque wrench
- ◆ Hose -N 020 150 05- approx. 250 mm long

Note the following points regarding ceramic glow plugs:



Caution

- ◆ *Due to the special properties of the material used, ceramic glow plugs are easily damaged and require extra care when handling and removing/installing.*
- ◆ *Transport and store only in original packaging or packed separately in bubble wrap.*
- ◆ *Do not remove new ceramic glow plugs from packaging until they are ready to be fitted.*
- ◆ *Ceramic glow plugs are sensitive to knocks and bending. For this reason, ceramic glow plugs which have been dropped (even from a height of only about 2 cm) must not be installed, even if no damage is apparent (hair-line cracks may not be visible).*
- ◆ *Always install a new ceramic glow plug if you are not sure the old one is in perfect condition.*
- ◆ *Damaged glow plugs (e.g. heater pin of the glow plug is damaged) will invariably cause engine damage.*
- ◆ *If the heater pin of the glow plug is damaged, the fragments must be removed from the combustion chamber before starting the engine for the first time, otherwise this will invariably cause mechanical damage (piston seizure). If necessary, the cylinder head must be removed.*
- ◆ *To check compression, select function "Systems with self-diagnosis capability" in "Guided Fault Finding" ⇒ Vehicle diagnosis, testing and information system VAS 5051.*
- ◆ *The ceramic glow plugs must not be removed when checking cylinder compression.*
- ◆ *The software of the engine control unit is specifically adapted to either the ceramic or the metal glow plugs, so it is important to install the correct type.*
- ◆ *Mixed installation of ceramic glow plugs and metal glow plugs on the same engine is not permissible.*

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Removing

- Before removal, the ceramic glow plugs must be burnt clean using the "Final control diagnosis" function ⇒ Vehicle diagnosis, testing and information system VAS 5051.
- Remove cylinder head cover ⇒ Rep. Gr. 15.
- Detach electrical connectors at glow plugs.



Caution

When loosening a ceramic glow plug, do not exceed the maximum release torque of 20 Nm. When loosening, always use socket -T50001- and a torque wrench.

- Carefully slacken glow plug. Do not exceed the maximum release torque of 20 Nm.

If the glow plug cannot be unscrewed with the maximum permitted torque of 20 Nm:

- Apply a suitable release agent (commercially available) and then try to unscrew the glow plug again.

**Note**

If it is still not possible to slacken the glow plug with the maximum release torque of 20 Nm after applying the release agent, remove the cylinder head and then unscrew the glow plug.

- Fit hose -N 020 150 05- (approx. 250 mm long) onto glow plug and unscrew glow plug, taking care to keep it straight.
- Carefully pull ceramic glow plug out from above using hose. Take care to prevent glow plug from contacting other parts.

Installing**Caution**

- ◆ **IMPORTANT:** *always observe the precautions listed above.*
- ◆ *The threads in the cylinder head and on the ceramic glow plugs must be dry, and free of oil and grease.*

- Clean combustion deposits out of glow plug openings in cylinder head before installing glow plugs.
- Screw in ceramic glow plugs finger-tight.

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**Caution**

It is most important to keep to the specified tightening torque for the glow plugs (threads dry, and free of oil and grease). The heater pins of the glow plugs can break if this torque setting is not observed, which would invariably cause engine damage.

Check function of ceramic glow plugs after installation and before starting engine for the first time.

- Connect multimeter (resistance test range) to contact and casing of glow plug.
- Specification: less than 1 Ω ,

If specification is exceeded (resistance more than 1 Ω):

- Remove ceramic glow plug again and check whether the heater pin is broken.

**Caution**

If the heater pin is broken, the fragments must be completely removed from the combustion chamber before starting the engine for the first time, otherwise this will invariably cause mechanical damage (piston seizure). If necessary, the cylinder head must be removed.

- Re-attach electrical connectors, making sure that they are securely seated.
 - Additionally check ceramic glow plugs via self-diagnosis $\Rightarrow$ Vehicle diagnosis, testing and information system VAS 5051.
1. Interrogate and erase fault memory of engine control unit. Do not start engine.

2. Perform final control diagnosis.
3. Interrogate fault memory of engine control unit once again.
Do not start engine.


Note

The engine must not be started if the fault memory has registered a fault relating to the ceramic glow plugs.

- Check electrical wiring and connectors, make sure connectors are securely seated.

Tightening torque

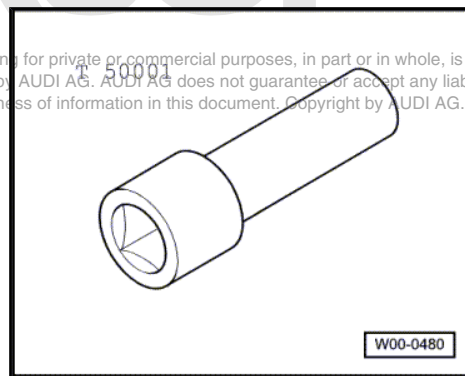
Component	Nm
Ceramic glow plug in cylinder head	8 ... 11

1.3 Removing and installing metal glow plugs

Special tools and workshop equipment required

- ◆ Socket -T50001-

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Removing

- Switch off ignition.
- Remove cylinder head cover ⇒ Rep. Gr. 15 .
- Detach electrical connectors at glow plugs.
- Remove glow plugs using socket -T50001- .

Installing

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

- Install cylinder head cover ⇒ Rep. Gr. 15 .

Tightening torque

Component	Nm
Metal glow plug in cylinder head	8 ... 11

