Workshop Manual
Audi A8 2003 ➤

Simos direct petrol injection and ignition system (6-cyl. 3.2 ltr. 4-valve)

Engine ID	BPK	AUK							

Edition 05.2006

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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.

Contents

24 – Mixture preparation - injection

1 Servicing Simos injection system

1.1 Safety precautions

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

WARNING

- *The fuel system operates under high pressure. The pressure in the high-pressure part of the injection system must be reduced to a residual pressure prior to opening the system ⇒ page 2 .*
- *A clean cloth must then be wrapped around the connection and the residual pressure dissipated by carefully loosening the connection.*

- Always switch off the ignition before connecting or disconnecting electrical wiring for the injection or ignition system or tester cables.
- Certain tests may lead to a fault being detected by the control unit and stored. After completing all tests and repair work therefore interrogate fault memory and erase, if necessary. If you have erased fault memory, you must then generate readiness code in engine control unit in “Guided fault finding” mode.
- Always switch off the ignition before cleaning the engine.

Caution

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

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

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.*

1.2 Rules for cleanliness when working on the injection system

Even small amounts of dirt can cause faults in the injection system. When working on the fuel supply/injection system, pay careful attention to the following basic rules:

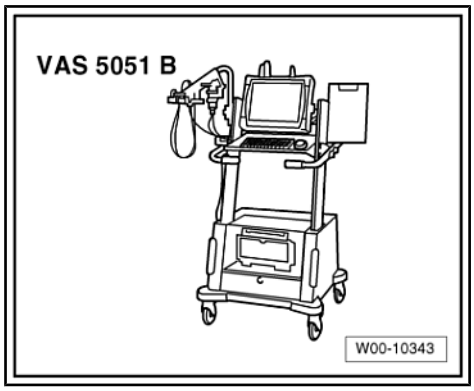
- Carefully clean connection points and the surrounding area with engine cleaner or brake cleaner and dry thoroughly before opening.
- Plug open lines and connections with suitable protective caps immediately.
- Place parts that have been removed on a clean surface and cover them over. Use only lint-free cloths.
- Only install clean components; replacement parts should only be unpacked immediately prior to installation. Do not use parts that have been previously unpacked and stored away loose (e.g. in toolboxes, etc.).
- When the system is open: Do not work with compressed air. Do not move the vehicle unless absolutely necessary.

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

- The injection system consists of a high-pressure section (maximum approx. 110 bar) and a low-pressure section (approx. 6 bar).
- Prior to opening the high-pressure section (e.g. when removing the high-pressure pump, fuel rail, injectors, intake manifold flap air-flow control motor, a fuel line, or any other component located in the high-pressure section of the injection system) the fuel pressure in the high-pressure section must be reduced to a residual pressure of approx. 8 bar. The procedure is described below.

Special tools and workshop equipment required

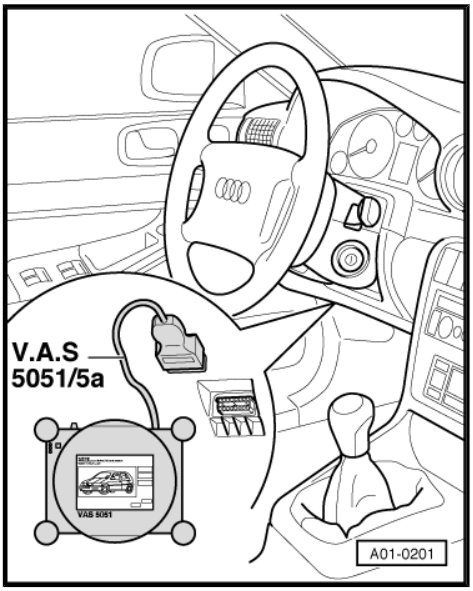
- Vehicle diagnostic, testing and information system -VAS 5051B- with diagnosis lead -VAS 5051/5A-



Procedure

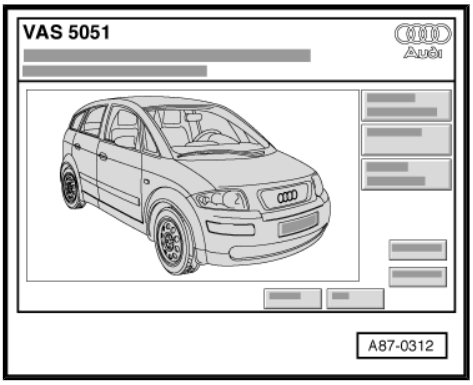
– Start engine and run at idling speed.

– Connect vehicle diagnostic, testing and information system -VAS 5051B- with diagnostic cable -VAS 5051/5A- .



Display on -VAS 5051B- :

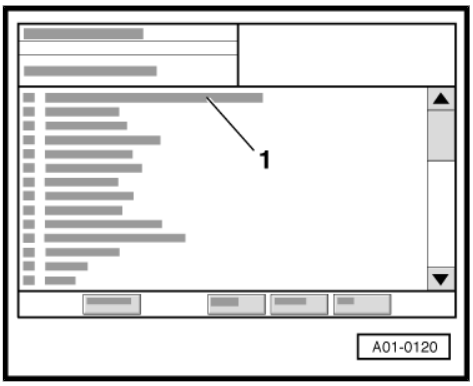
– Press the Vehicle self-diagnosis key.



Display on -VAS 5051B- :

– From list -1- select vehicle system “01 Engine electronics”.

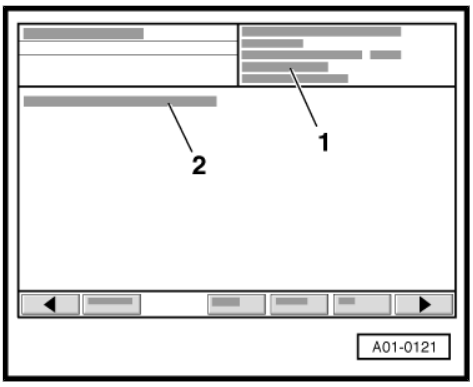
– Wait until next display appears on tester.



Display on -VAS 5051B- :

1 – Engine control unit identification.

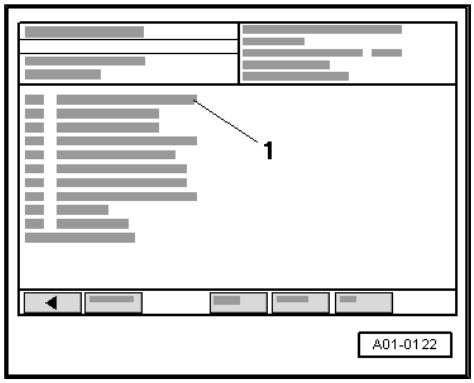
– Press the → key.



Display on -VAS 5051B- :

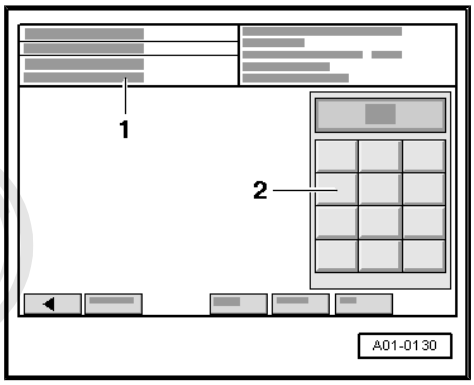
1 - Selection of diagnostic functions

– From list -1- select diagnostic function “04 - Basic setting”.



Display on -VAS 5051B- :

– In zone -2- enter “140” for “display group 140” and confirm the entry by pressing the Q key.



Display on -VAS 5051B- :

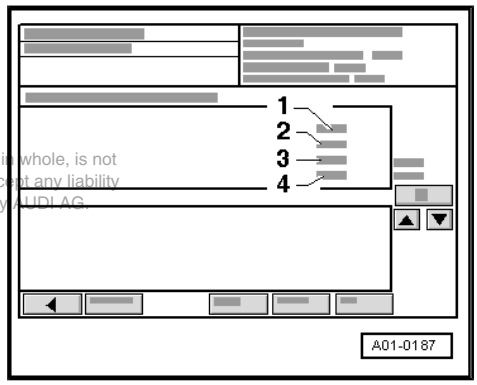
Example

1 - 42 %

2 - 39.76 bar

3 - 40.63 bar

4 - inactive



– Activate basic setting by touching button A.

Display on -VAS 5051B- :

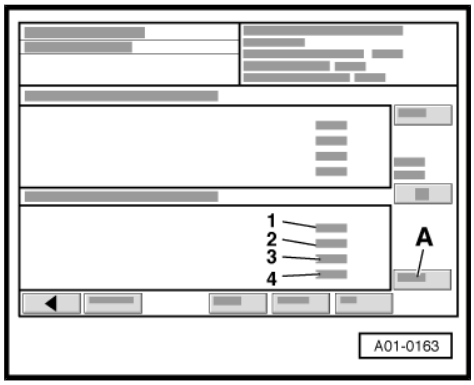
Example

1 - 0 %

2 - 0 bar

3 - 5.46 bar

4 - reduce



The fuel rail is still filled with fuel, however it is no longer under high pressure.

Components or lines can now be opened. A clean cloth must be wrapped around the connections. Catch the escaping fuel.

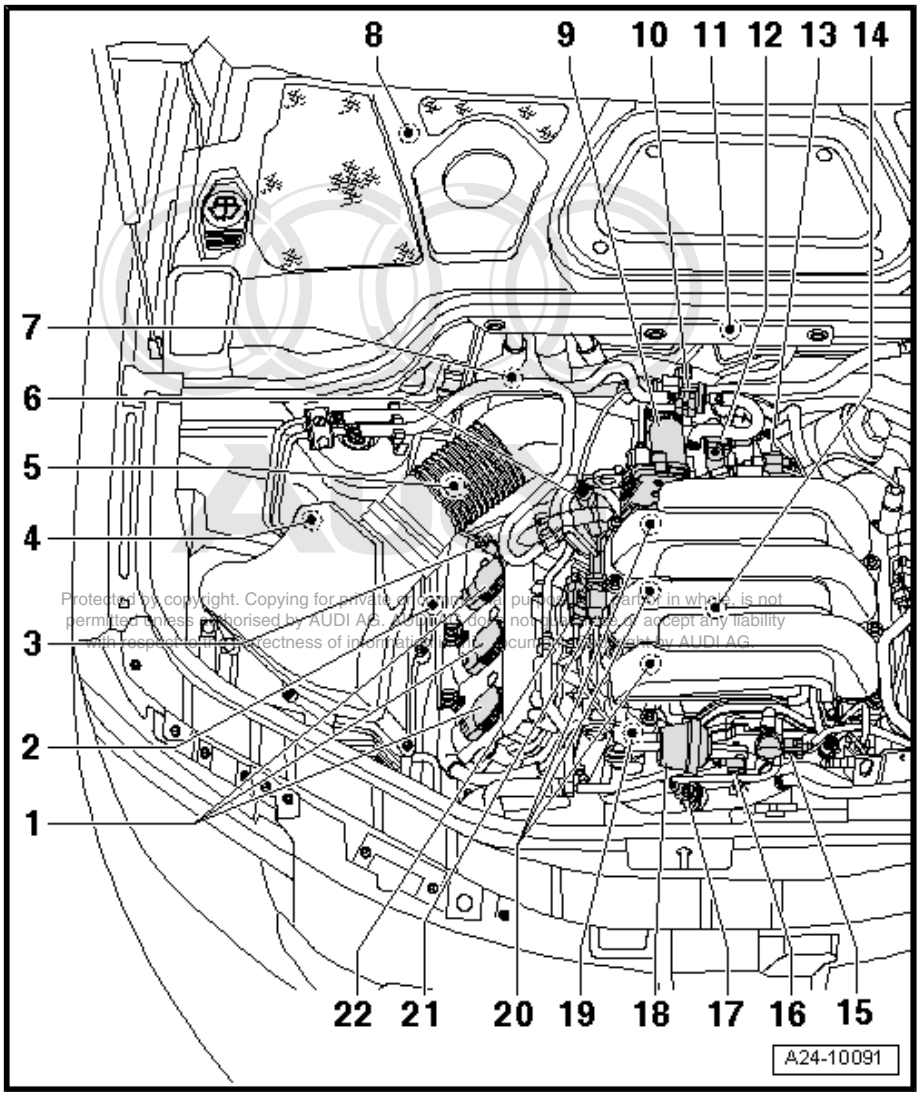
1.4 Technical data

Engine code letters	AUK (3.2 ltr. / 4V / 188 kW engine)	BPK (3.2 ltr. / 4V / 191 kW engine)
Idling speed[1)]	650 ... 750 rpm	

Engine code letters	AUK (3.2 ltr. / 4V / 188 kW engine)	BPK (3.2 ltr. / 4V / 191 kW engine)
Fuel pressure after high-pressure pump	approx. 35 bar	
Fuel pressure before high-pressure pump	approx. 6 bar	
• 1) Not adjustable		

1.5 Overview of fitting locations

Engine compartment (right-side)



1 - Ignition coils for cylinder bank 1

- ❑ Ignition coil 1 with output stage -N70-
- ❑ Ignition coil 2 with output stage -N127-
- ❑ Ignition coil 3 with output stage -N291-
- ❑ Removing and installing ⇒ page 49

2 - Hall sender 3 -G300-

- ❑ Fitting location ⇒ page 10

3 - Inlet camshaft control valve 1 -N205-

- ❑ Fitting location ⇒ page 10

4 - Variable intake manifold change-over valve -N335-

- ❑ Fitting location ⇒ page 12

5 - Lambda probe -G39-

- ❑ Fitting location ⇒ page 9
- ❑ Fitting location of connector ⇒ page 9
- ❑ Removing and installing ⇒ page 41

6 - Exhaust camshaft control valve 1 -N318-

- ❑ Fitting location ⇒ page 10

7 - Lambda probe after catalytic converter -G130-

- ❑ Fitting location ⇒ page 9
- ❑ Fitting location of connector ⇒ page 9
- ❑ Removing and installing ⇒ page 44

8 - Engine control unit -J623-

- ❑ Fitting location ⇒ page 8
- ❑ Removing and installing ⇒ page 38
- ❑ After renewing, adapt throttle valve module in mode “Guided Fault Finding”, option “Adapt throttle valve module”

- After renewing on vehicles with automatic gearbox, also perform kick-down adaption in “Guided Fault Finding”, option “Adapt kickdown point”

9 - Throttle valve module -J338-

- After renewing adapt in mode “Guided Fault Finding”, option “Adapt throttle valve module”.

10 - Activated charcoal filter solenoid valve 1 -N80-

11 - Bracket for connectors

- Fitting locations of connectors ⇒ page 9

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

- Fitting location ⇒ page 11

13 - Intake manifold flap valve -N316-

Fitting location ⇒ page 11

14 - Knock sensor 1 -G61-

- Fitting location ⇒ page 11
- Fitting location of connector ⇒ page 10

15 - Variable intake manifold position sender -G513-

- Fitting location ⇒ page 11

16 - Variable intake manifold flap change-over valve -N239-

- Fitting location ⇒ page 11

17 - Coolant temperature sender -G62-

- Fitting location ⇒ page 11

18 - Actuator for intake manifold changeover

19 - Intake manifold flap potentiometer -G336-

- Fitting location ⇒ page 11
- After renewing, adapt in mode “Guided Fault Finding”, option “Adapt intake manifold flap potentiometer”

20 - Injectors, cylinder bank 1

- Injector, cylinder 1 -N30-
- Injector, cylinder 2 -N31-
- Injector, cylinder 3 -N32-
- Removing and installing ⇒ page 26

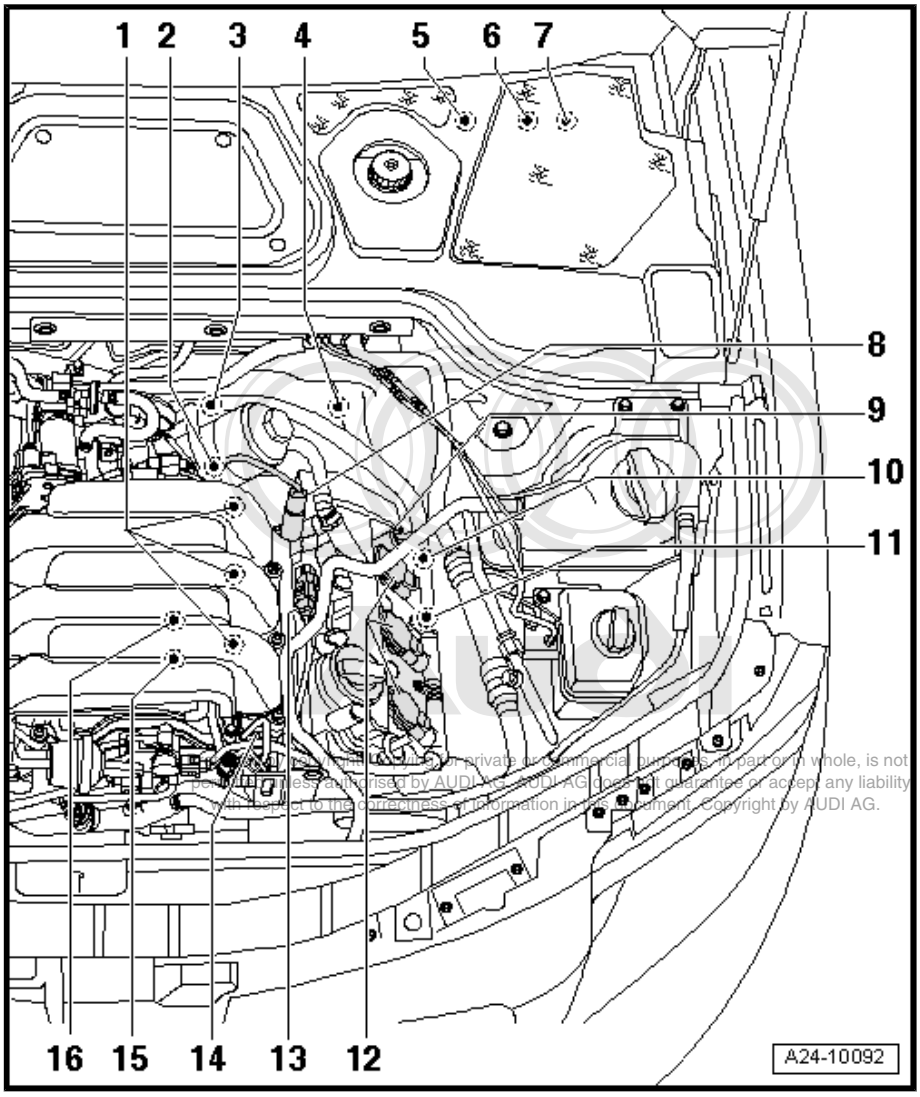
21 - Fuel pressure sender for low-pressure section -G410-

- Fitting location ⇒ page 12

22 - Hall sender -G40-

- Fitting location ⇒ page 10

Engine compartment (left-side)



1 - Injectors, cylinder bank 2

- ❑ Injector, cylinder 4 - N33-
- ❑ Injector, cylinder 5 - N83-
- ❑ Injector, cylinder 6 - N84-
- ❑ Removing and installing ⇒ page 26

2 - Intake manifold flap potentiometer 2 -G512-

- ❑ Fitting location ⇒ page 12
- ❑ After renewing, adapt in mode “Guided Fault Finding”, option “Adapt intake manifold flap potentiometer”

3 - Engine speed sender -G28-

- ❑ Fitting location ⇒ page 12

4 - Lambda probe 2 after catalytic converter -G131-

- ❑ Fitting location ⇒ page 9
- ❑ Fitting location of connector ⇒ page 9
- ❑ Removing and installing ⇒ page 46

5 - Instrument cluster

- ❑ With exhaust emissions warning lamp -K83- (“MIL” lamp) and electronic power control fault lamp -K132- (“EPC” lamp)

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

- ❑ In accelerator pedal module; fitting location ⇒ page 8

7 - Brake light switch -F- / brake pedal switch -F47-

- ❑ Fitting location ⇒ page 9

8 - Inlet camshaft control valve 2 -N208-

Fitting location ⇒ page 10

9 - Exhaust camshaft control valve 2 -N319-

- ❑ Fitting location ⇒ page 10

10 - Lambda probe 2 -G108-

- ❑ Fitting location ⇒ page 9
- ❑ Fitting location of connector ⇒ page 9
- ❑ Removing and installing ⇒ page 43

11 - Hall sender 4 -G301-

- ❑ Fitting location ⇒ page 10

12 - Ignition coils for cylinder bank 2

- ❑ Ignition coil 4 with output stage -N292-
- ❑ Ignition coil 5 with output stage -N323-

- ❑ Ignition coil 6 with output stage -N324-
- ❑ Removing and installing ⇒ page 49

13 - Hall sender 2 -G163-

- ❑ Fitting location ⇒ page 10

14 - High-pressure pump

- ❑ With fuel metering valve -N290-
- ❑ Fitting location ⇒ page 11

15 - Fuel pressure sender -G247-

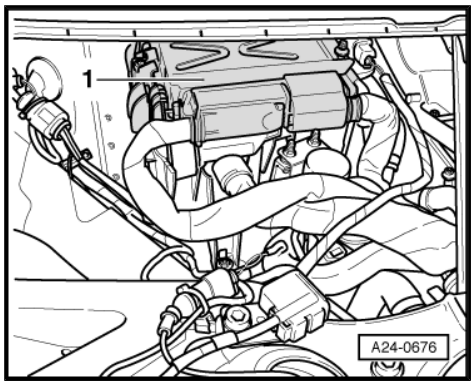
- ❑ Fitting location ⇒ page 12

16 - Knock sensor 2 -G66-

- ❑ Fitting location ⇒ page 12
- ❑ Fitting location of connector ⇒ page 10

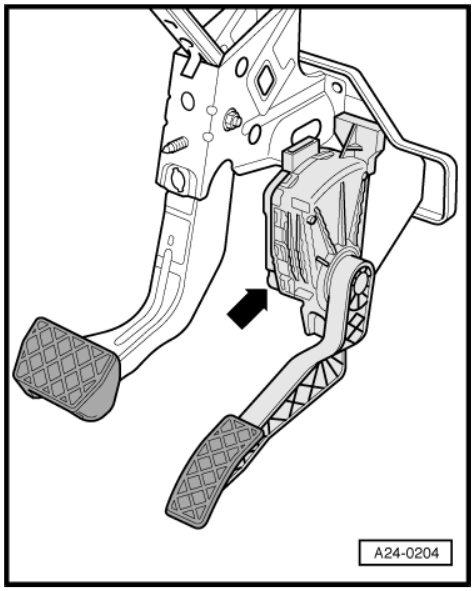
Fitting location of engine control unit -J623-

♦ The engine control unit -J623- -Item 1- is located on top of electronics box at plenum chamber.



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

♦ In accelerator pedal module -arrow-.

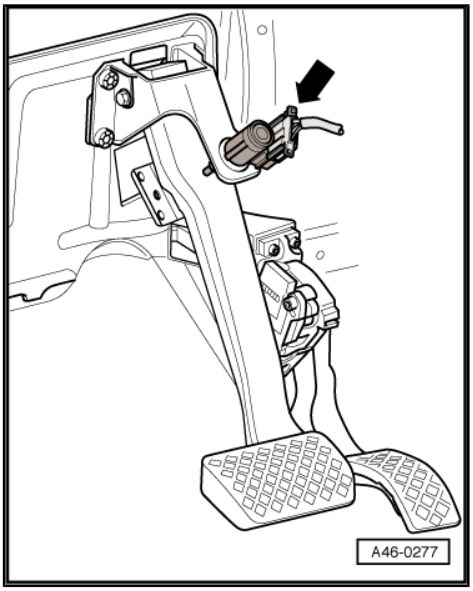


Note

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

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

- On pedal bracket -arrow-.

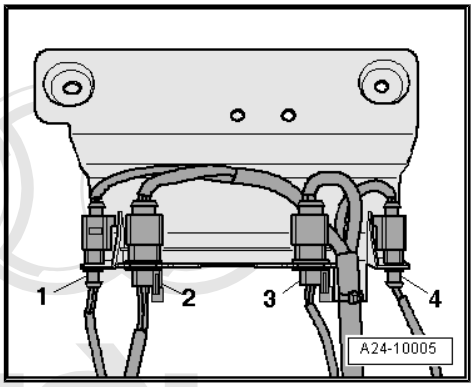


Note

Install switches only once to ensure they are fitted tightly.

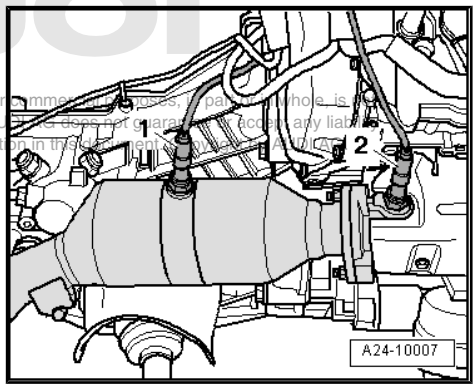
Bracket for connectors on bulkhead

1 - To Lambda probe after catalytic converter -G130-
2 - To Lambda probe -G39-
3 - To Lambda probe 2 -G108-
4 - To Lambda probe 2 after catalytic converter -G131-



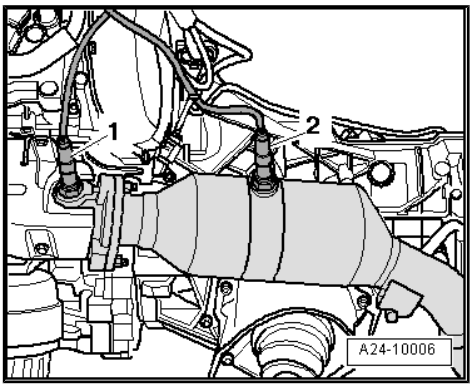
Fitting location of Lambda probes on cylinder bank 1 (right-side)

1 - Lambda probe after catalytic converter -G130-
2 - Lambda probe -G39-



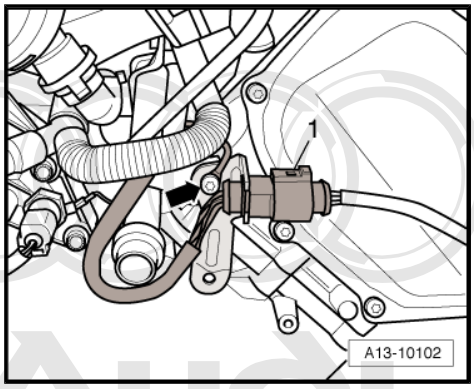
Fitting location of Lambda probes on cylinder bank 2 (left-side)

1 - Lambda probe 2 -G108-
2 - Lambda probe 2 after catalytic converter -G131-



Electrical connectors at rear right of engine

1 - To injectors on cylinder bank 1



Note

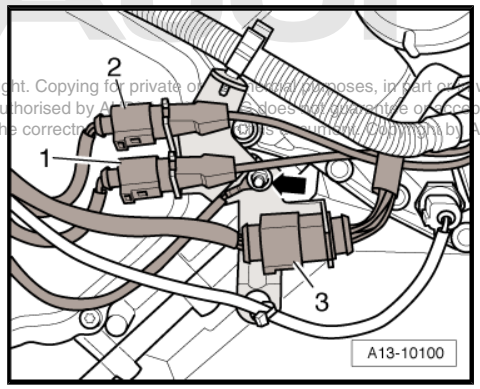
The -arrow- indicates the earth point.

Electrical connectors at rear left of engine

1 - Green; to knock sensor 1 -G61-

2 - Grey; to knock sensor 2 -G66-

3 - To injectors on cylinder bank 2 and to fuel pressure sender -G247-



Note

The -arrow- indicates the earth point.

Hall senders and camshaft control valves (bank 1)

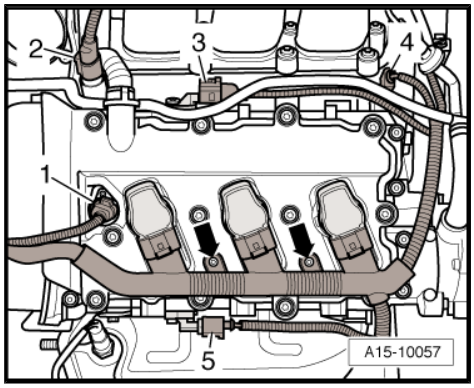
1 - Exhaust camshaft control valve 1 -N318-

2 - Inlet camshaft control valve 1 -N205-

3 - Hall sender -G40-

4 - Intake manifold flap potentiometer -G336-

5 - Hall sender 3 -G300-



Note

Disregard -arrows-.

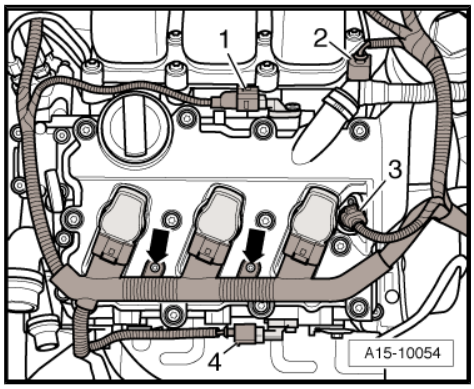
Hall senders and camshaft control valves (bank 2)

1 - Hall sender 2 -G163-

2 - Inlet camshaft control valve 2 -N208-

3 - Exhaust camshaft control valve 2 -N319-

4 - Hall sender 4 -G301-



Note

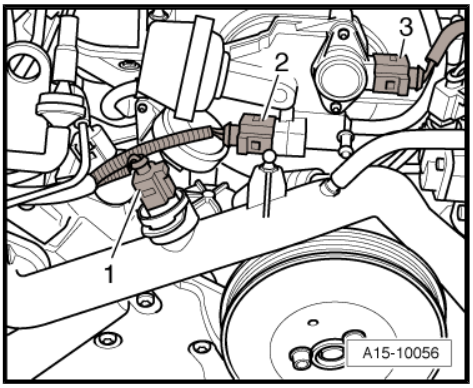
Disregard -arrows-.

Fitting location: at front of engine

1 - Coolant temperature sender -G62-

2 - Variable intake manifold flap change-over valve -N239-

3 - Variable intake manifold position sender -G513-



Fitting location: at rear of intake manifold

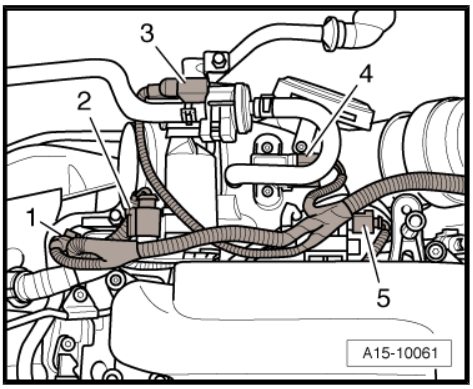
1 - Inlet camshaft control valve 1 -N205-

2 - Throttle valve module -J338-

3 - Activated charcoal filter solenoid valve 1 -N80-

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

5 - Intake manifold flap valve -N316-

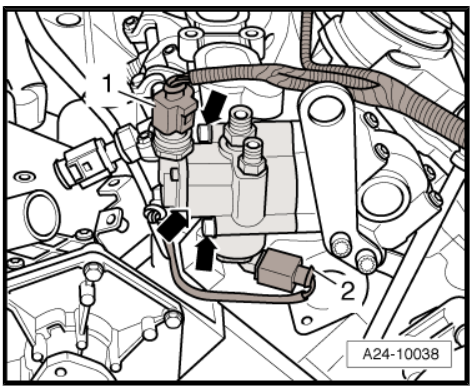


Fitting locations at high-pressure pump

2 - Fuel metering valve -N290-

Note

- *-Item 1- is not fitted.*
- *Disregard -arrows-.*



Fitting locations below intake manifold on cylinder bank 1 (right-side)

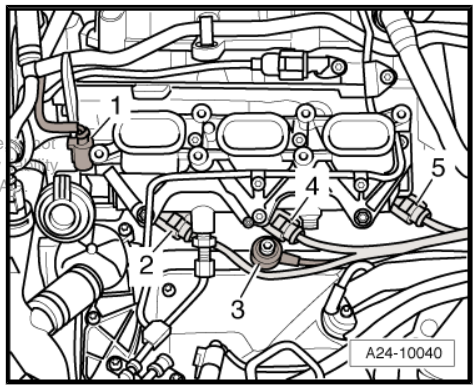
1 - Intake manifold flap potentiometer -G336-

2 - Injector, cylinder 1 -N30-

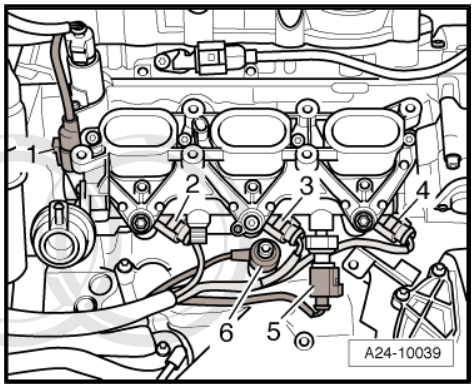
3 - Knock sensor 1 -G61-

4 - Injector, cylinder 2 -N31-

5 - Injector, cylinder 3 -N32-



Fitting locations below intake manifold on cylinder bank 2 (left-side)



1 - Intake manifold flap potentiometer 2 -G512-

2 - Injector, cylinder 6 -N84-

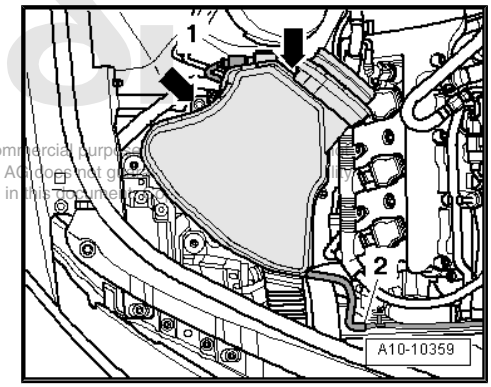
3 - Injector, cylinder 5 -N83-

4 - Injector, cylinder 4 -N33-

5 - Fuel pressure sender -G247-

6 - Knock sensor 2 -G66-

Fitting location of variable intake manifold change-over valve -N335-



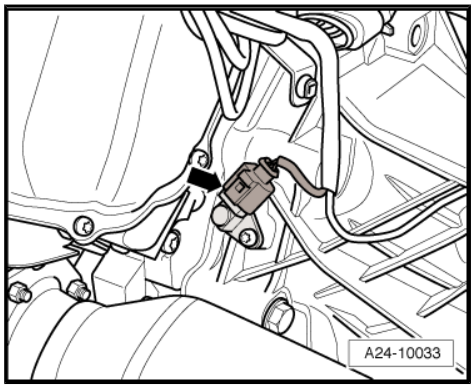
1 - Variable intake manifold change-over valve -N335-

2 - Vacuum hose to variable intake manifold change-over valve

Note

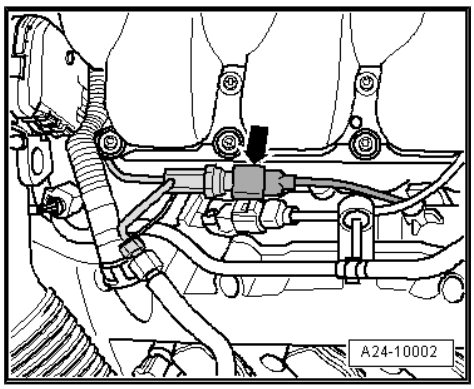
Disregard -arrows-.

Fitting location of engine speed sender -G28-



- At front left of gearbox housing -arrow-.

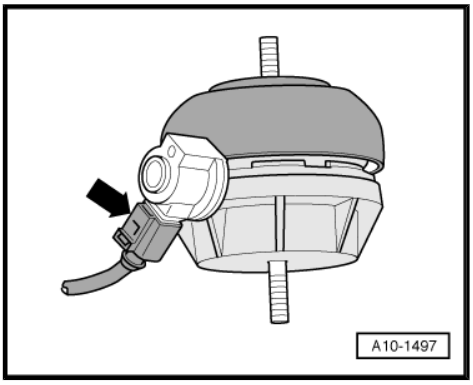
Fitting location of fuel pressure sender for low-pressure section -G410-



- On right side of cylinder head -arrow-.

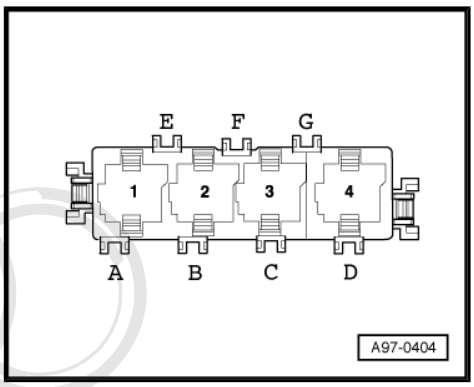
Fitting location of solenoid valves for electro-hydraulic engine mountings and valves for gearbox mountings

- Electro-hydraulic engine mounting solenoid valve (left-side) -N144-
- Electro-hydraulic engine mounting solenoid valve (right-side) -N145-
- Gearbox mounting valve 1 -N262-
- Gearbox mounting valve 2 -N263-



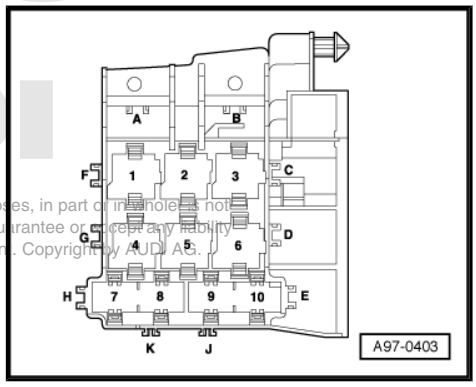
Fitting location of Motronic current supply relay -J271-

- Motronic current supply relay -J271- at position -2- on relay carrier in electronics box (plenum chamber)



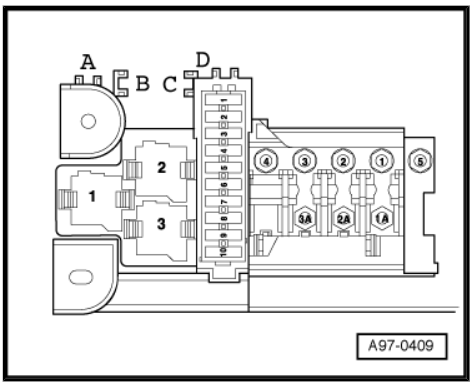
Fitting location of terminal 15 voltage supply relay -J329-

- Terminal 15 voltage supply relay -J329- at position -3- on relay carrier behind dash panel (left-side)



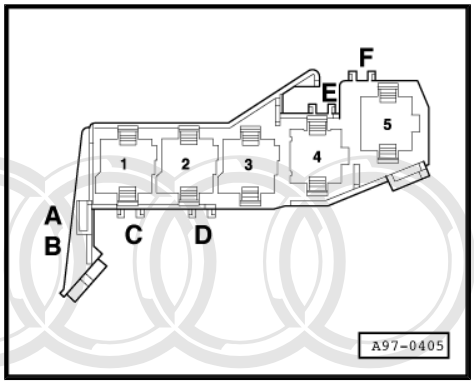
Fitting location of cold start relay for fuel pump -J748-

- Cold start relay for fuel pump -J748- at position -3- in relay and fuse holder in luggage compartment (right-side)



Fitting location of engine component current supply relay -J757-

- Engine component current supply relay -J757- at position -4- on relay carrier in front passenger's footwell



1.6 Air cleaner - exploded view

1 - Water drain hose

- ❑ Check for dirt and clean as required (inspect valve)
- ❑ Water drain must function properly

2 - Air cleaner housing (bottom section)

- ❑ Clean any salt deposits or leaves and dirt out of air cleaner housing (bottom section)
- ❑ Check for dirt in water drain (inspect valve)

3 - Bolt

4 - Air filter element

- ❑ Always use genuine part for air filter element
- ❑ Removing and installing ⇒ page 15
- ❑ Intervals for changing filter ⇒ Maintenance ; Booklet 404

5 - Air duct

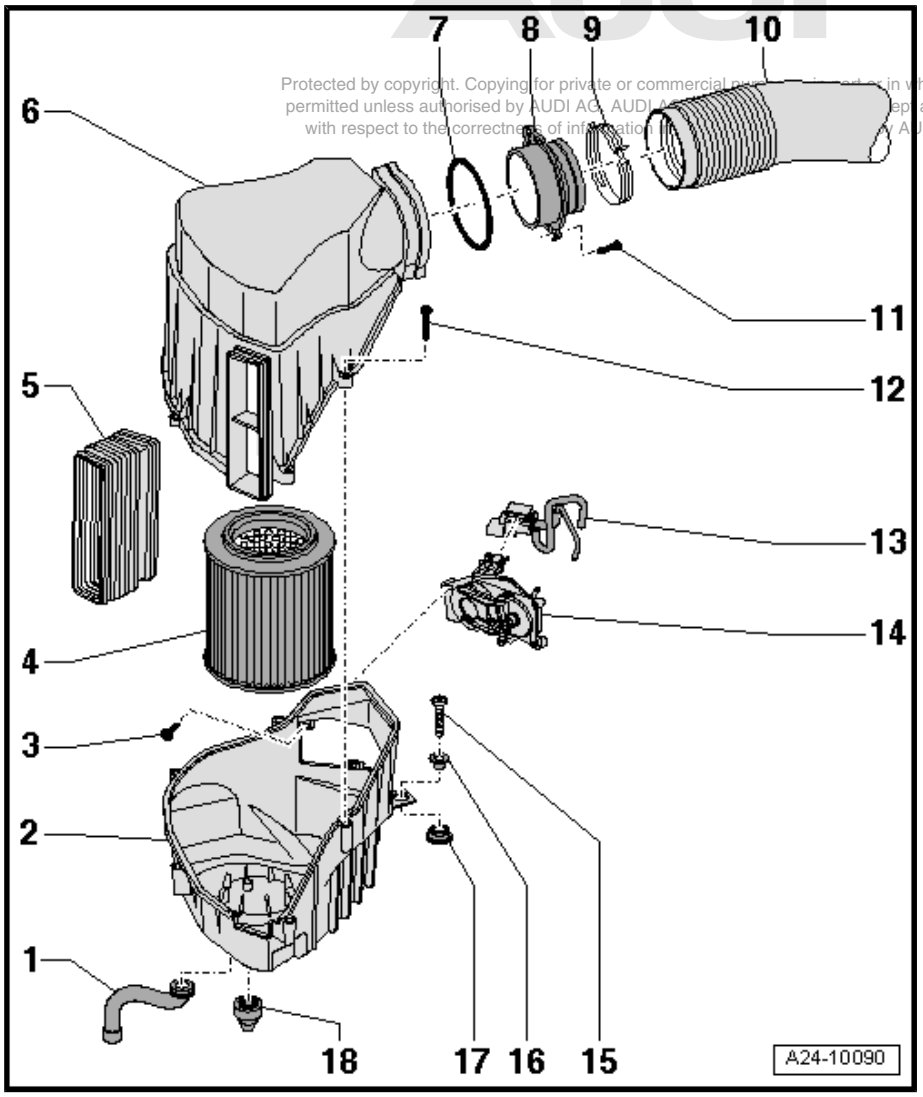
- ❑ Clean dirt and leaves out of air duct

6 - Air cleaner housing (top section)

- ❑ Clean any salt deposits or leaves and dirt out of air cleaner housing (top section)

7 - O-ring

- ❑ Renew



8 - Intake connecting pipe

9 - Spring-type hose clip

10 - Air hose

11 - Cross-head screw

12 - Cross-head screw

13 - Variable intake manifold change-over valve -N335-

14 - Air flap

- ❑ Vacuum-controlled

15 - 5 Nm

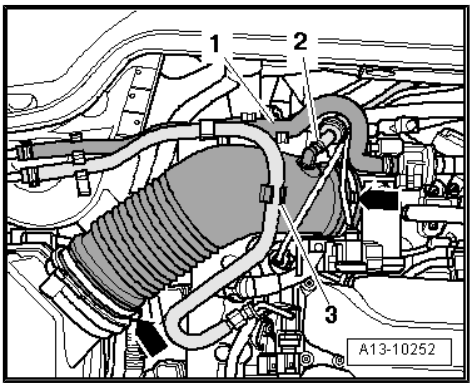
16 - Spacer sleeve

17 - Rubber grommet

18 - Rubber mounting

1.7 Removing and installing air filter element

Removing

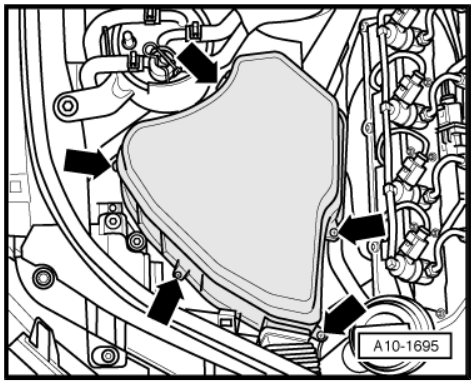


– Pull non-return valve -2- off connection at air intake hose.

– Unclip vacuum line -1- and fuel line -3- from retainer on air intake hose.

– Release hose clips -arrows- and remove air intake hose.

– Remove bolts from top section of air cleaner housing -arrows-.
– Detach air cleaner housing (top section).
– Take out air filter element.



Installing

Note

- *Always use genuine part for air filter element.*
- *Hose connections and hoses for air intake 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 (intake pipes, etc.) with a clean cloth when blowing out the air cleaner housing with compressed air.*
- *Please observe requirements for disposal.*

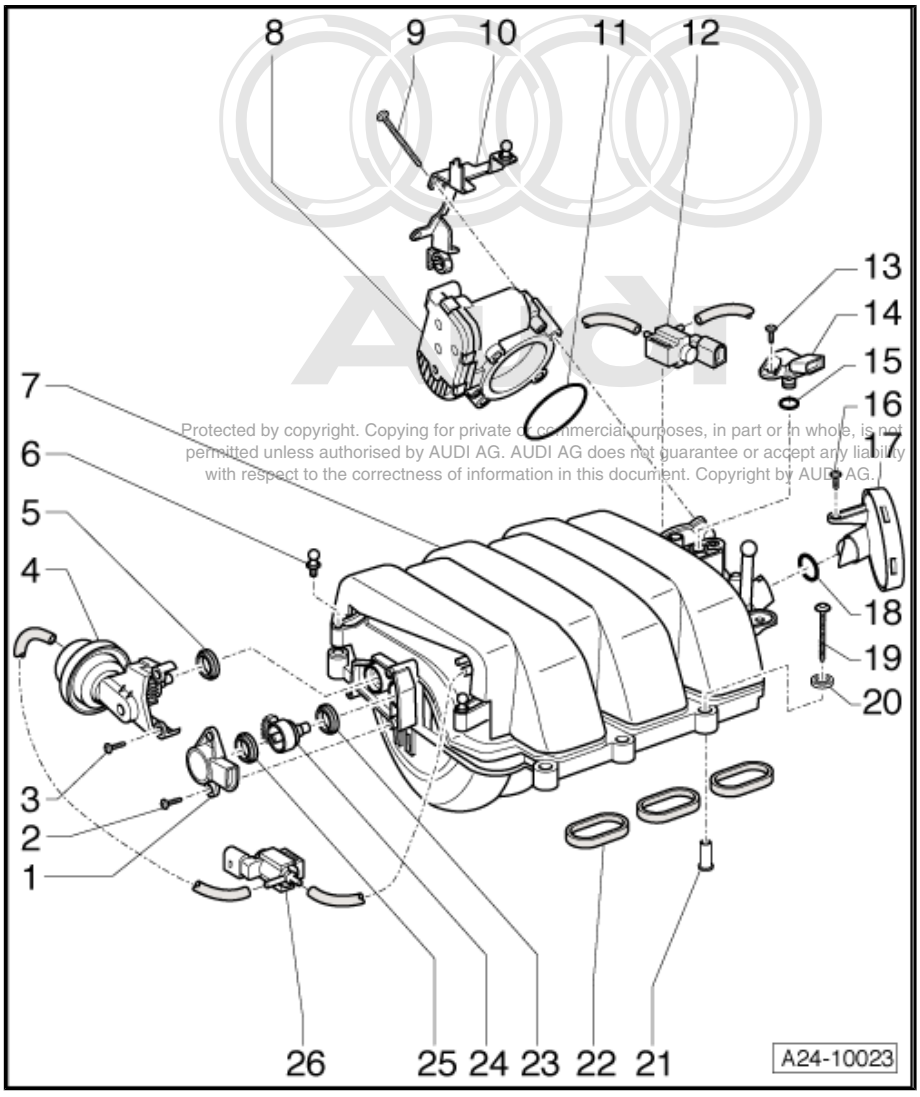
– Blow out water drain (small hole in bottom section of air cleaner housing) with compressed air.
– Clean salt residue, dirt and leaves out of air cleaner housing (top and bottom sections); use a vacuum cleaner if necessary.
– Check for salt residue, dirt and leaves in air intake hose (engine intake 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).

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

Tightening torque

Component	Nm
Hose clips (9 mm wide)	3

1.8 Intake manifold (top section) - exploded view of components



1 - Variable intake manifold position sender -G513-

2 - 2.5 Nm

3 - 2.5 Nm

4 - Actuator for intake manifold change-over

- ❑ Installation position of toothed segments for intake manifold change-over ⇒ page 18
- ❑ Replacement part is combined with -item 24- as one unit

5 - Seal

- ❑ Renew if damaged
- ❑ When renewing lever out with screwdriver
- ❑ Press in by hand

6 - Ball stud, 2.5 Nm

7 - Intake manifold (top section)

- ❑ Removing and installing ⇒ page 18

8 - Throttle valve module -J338-

9 - 5 Nm

10 - Bracket for wiring harness

11 - Seal

- ❑ Renew

12 - Intake manifold flap valve -N316-

13 - 2.5 Nm

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

15 - O-ring

- ❑ Renew

16 - 2.5 Nm

17 - Pressure control valve for crankcase breather system

18 - O-ring

- ❑ Renew

19 - 6 Nm

20 - Washer

21 - Sleeve

22 - Gaskets

- ❑ Renew

23 - Seal

- ❑ Renew if damaged

- ❑ When renewing lever out with screwdriver
- ❑ Press in by hand

24 - Lever with toothed segment

- ❑ For intake manifold change-over
- ❑ Installation position of toothed segments ⇒ page 18
- ❑ Replacement part is combined with -item 4- as one unit

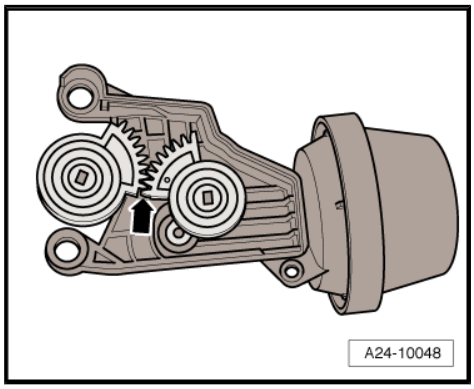
25 - Seal

- ❑ Renew if damaged
- ❑ When renewing lever out with screwdriver
- ❑ Press in by hand

26 - Variable intake manifold flap change-over valve -N239-

Installation position of toothed segments for intake manifold change-over

- The lower edges of the toothed segments must be flush -arrows-.



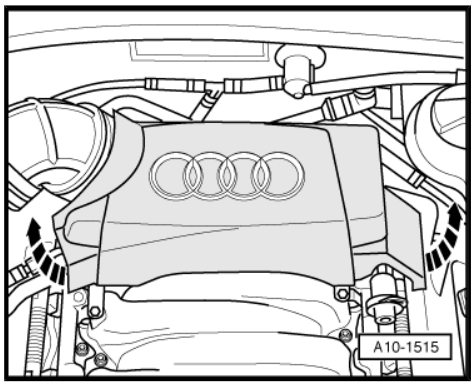
1.9 Removing and installing intake manifold (top section)

Removing

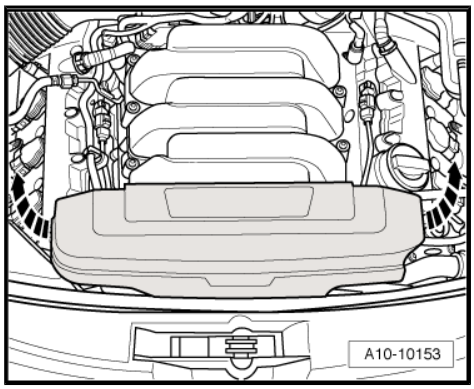
Note

All cable ties which are released or cut open when removing must be fitted in the same position when installing.

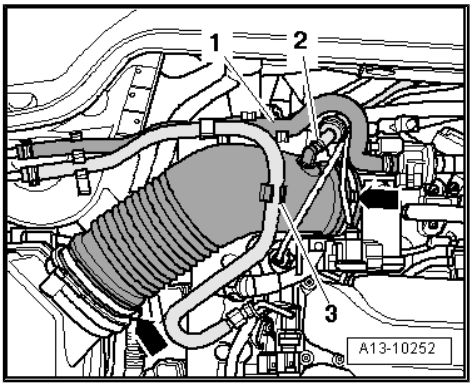
– Pull off engine cover (rear) -arrows-.



– Pull off engine cover (front) -arrows-.



– Pull non-return valve -2- off connection at air intake hose.
– Unclip vacuum line -1- and fuel line -3- from retainer on air intake hose.
– Release hose clips -arrows- and remove air intake hose.



– Unplug electrical connectors:

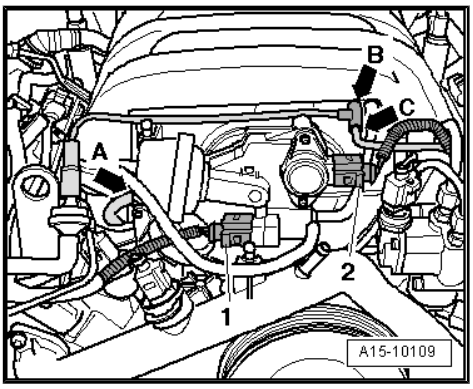
1 - Variable intake manifold flap change-over valve -N239-

2 - Variable intake manifold position sender -G513-

– Pull off the vacuum hoses -arrow A- and -arrow B-.

USA models:

– Disconnect vacuum hose -arrow C- leading to leak diagnostic pump.



All models:

– Unplug electrical connectors:

1 - Inlet camshaft control valve 1 -N205-

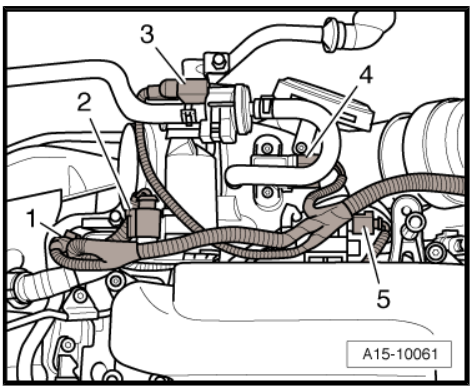
2 - Throttle valve module -J338-

3 - Activated charcoal filter solenoid valve 1 -N80-

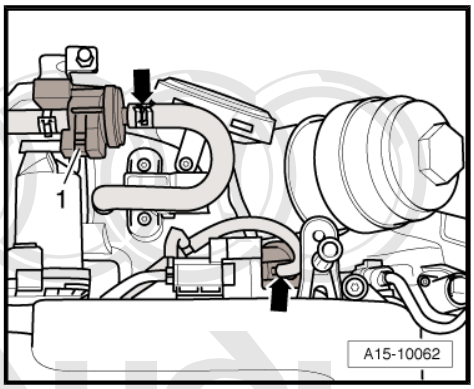
4 - Intake air temperature sender -G42- / intake manifold pressure sender -G71-

5 - Intake manifold flap valve -N316-

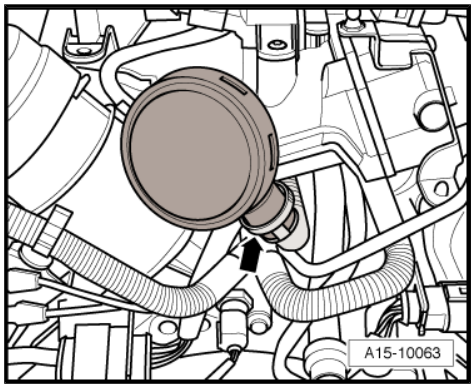
– Move electrical wiring harness clear.



– Detach vacuum hoses -arrows-.
– Detach active charcoal filter system solenoid valve 1 -N80- -item 1- from throttle valve module -J338- .



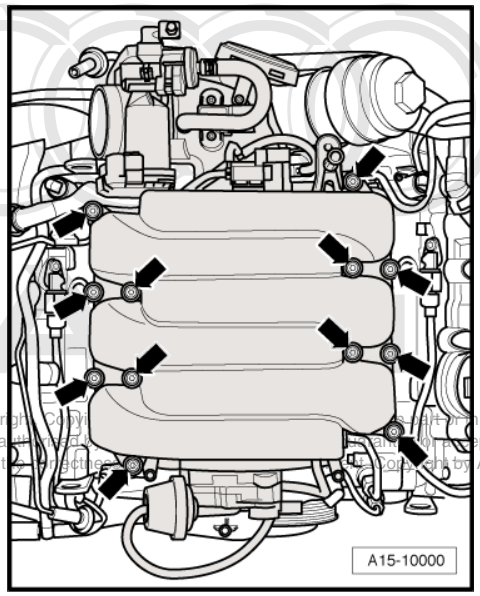
– Pull crankcase breather hose off pressure control valve -arrow-.



Note

Shown from rear with engine removed for illustration purposes.

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



Note

Seal intake ports on cylinder heads with clean cloths.

Installing

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

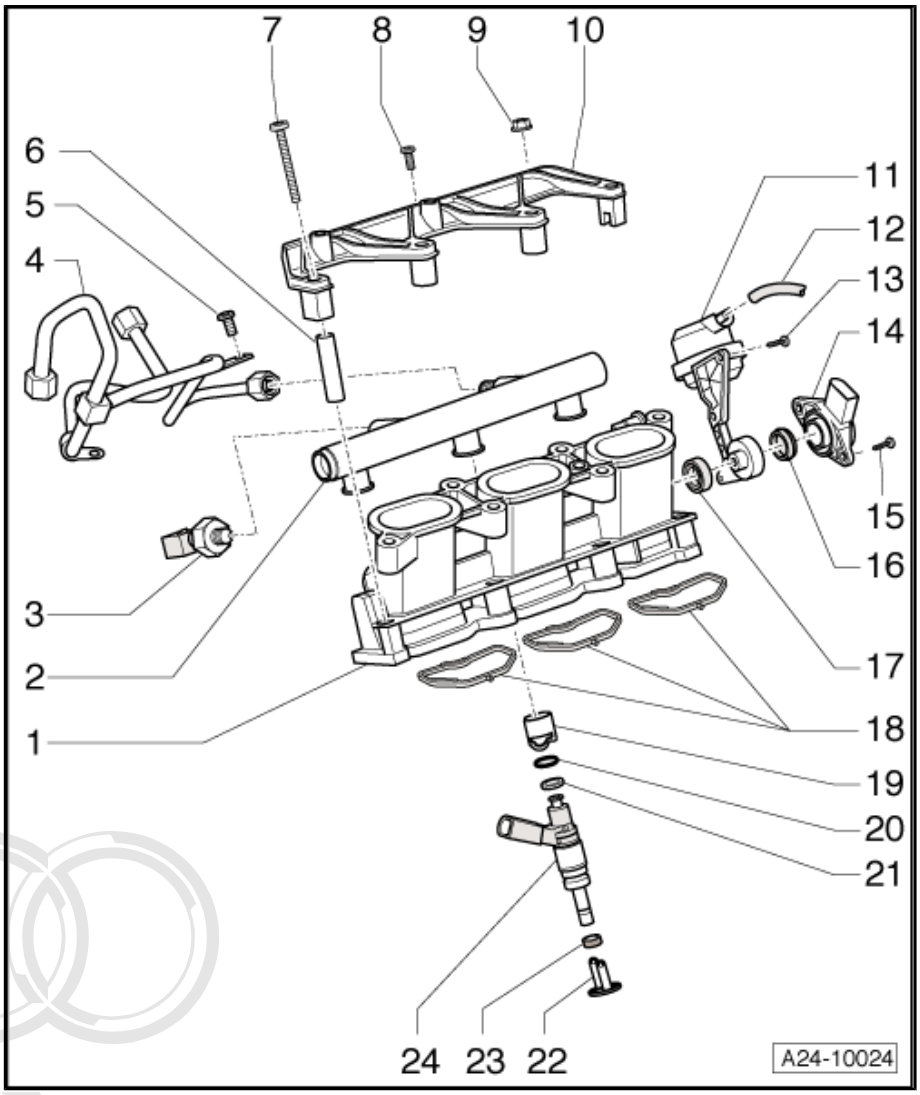
Note

- *Renew gaskets, seals and O-rings.*
- *Fit all cable ties in the original positions when installing.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue.*

Tightening torques

Component	Nm
Intake manifold (top section) to intake manifold (bottom section)	6 1)
Hose clips (9 mm wide)	3
• 1) Tighten in stages and in diagonal sequence	

1.10 Intake manifold (bottom section) - exploded view of components



1 - Bottom section of intake manifold

- ❑ Removing and installing ⇒ page 23
- ❑ After installing, adapt the two intake manifold flap potentiometers in mode “Guided Fault Finding”, option “Adapt intake manifold flap potentiometer”

2 - Fuel rail

3 - Fuel pressure sender - G247-

4 - High-pressure pipes

> **WARNING**
>
> *The pressure in the high-pressure part of the injection system must be reduced to a residual pressure prior to opening the system ⇒ page 2 .*
>
> *A clean cloth must then be wrapped around the connection and the residual pressure dissipated by carefully loosening the connection.*

- ❑ Do not alter shape
- ❑ Tightening high-pressure pipes ⇒ page 25

5 - 10 Nm

6 - Sleeve

7 - 10 Nm

8 - 2.5 Nm

9 - 10 Nm

10 - Retainer for fuel rail

11 - Vacuum unit for actuating intake manifold flaps

12 - Vacuum hose

- ❑ To intake manifold flap valve -N316-

13 - 2.5 Nm

14 - Intake manifold flap potentiometer

- ❑ Left side: intake manifold flap potentiometer 2 -G512- , right side: intake manifold flap potentiometer - G336-

15 - 2.5 Nm

16 - Seal

- ❑ Renew if damaged
- ❑ When renewing lever out with screwdriver

- ❑ Press in by hand

17 - Seal

- ❑ Renew if damaged
- ❑ When renewing lever out with screwdriver
- ❑ Press in by hand

18 - Gaskets

- ❑ Renew

19 - Support ring

- ❑ Make sure it is correctly seated
- ❑ Via this support ring, the fuel rail exerts the force which holds the injector in the cylinder head

20 - O-ring

- ❑ Renew
- ❑ Lubricate lightly with clean engine oil

21 - Spacer ring

- ❑ Renew if damaged

22 - Radial compensation element

- ❑ Renew if damaged
- ❑ Clip onto support ring -item 19-

23 - Combustion chamber ring seal

- ❑ Renewing ⇒ “1.12 Removing and installing injectors”, page 26

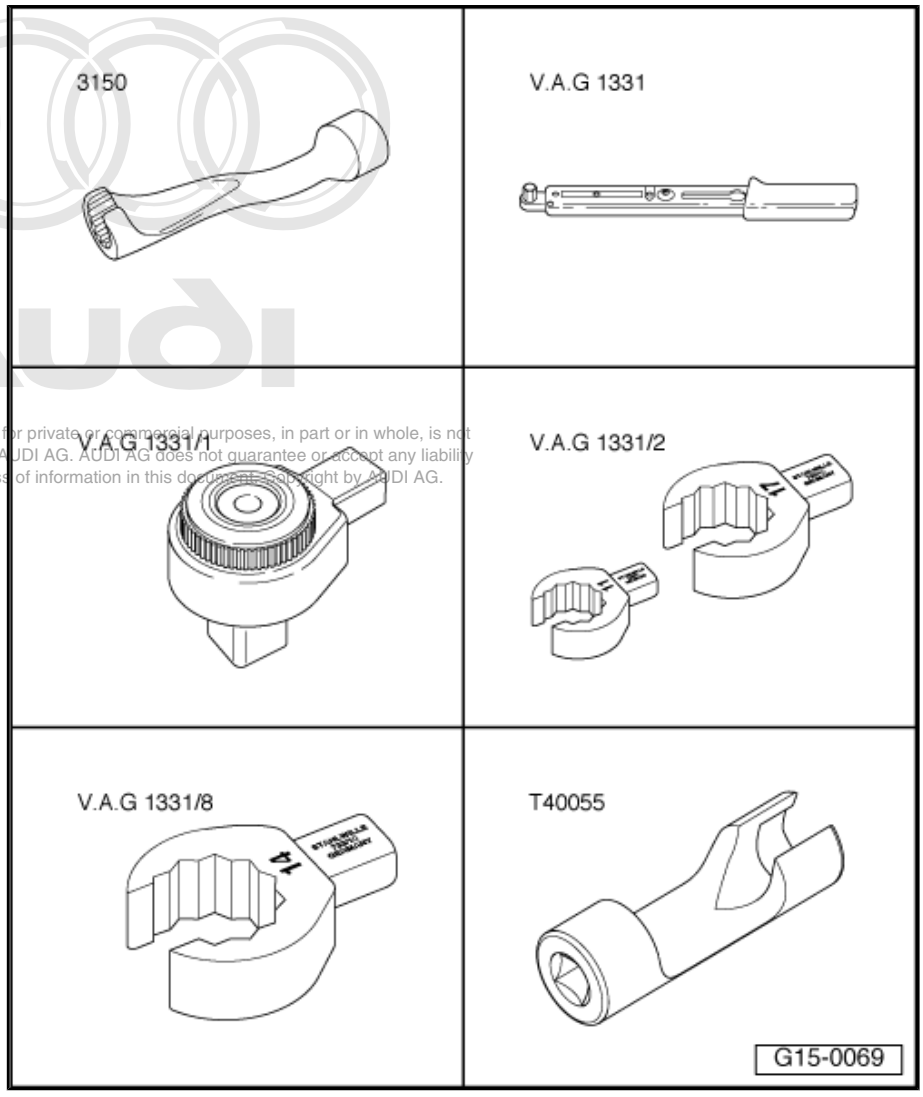
24 - Injector

Removing and installing ⇒ page 26

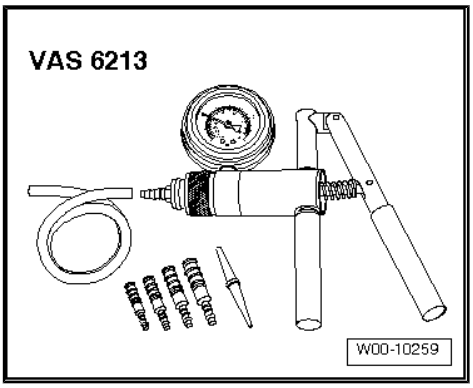
1.11 Removing and installing intake manifold (bottom section) with fuel rail

Special tools and workshop equipment required

- Socket, 14 mm -3150-
- Torque wrench -V.A.G 1331-
- Ratchet -V.A.G 1331/1-
- Tool insert (open-end ring spanner, 17 mm) -V.A.G 1331/2-
- Socket insert AF 14, flared ring spanner -V.A.G 1331/8-
- Socket -T40055-



- Hand-operated vacuum pump -VAS 6213-



Removing

Note

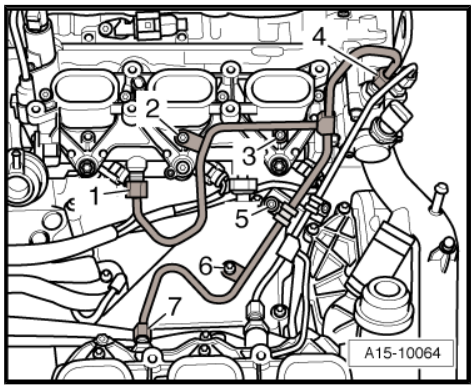
The following description shows the removal and installation of the left-side intake manifold (bottom section). The procedure for the other side is identical.

WARNING

- ***The fuel system operates under high pressure. The pressure in the high-pressure part of the injection system must be reduced to a residual pressure prior to opening the system ⇒ page 2 .***
- ***A clean cloth must then be wrapped around the connection and the residual pressure dissipated by carefully loosening the connection.***

– Remove intake manifold (top section) ⇒ page 18 .

– Remove high-pressure pipe by unscrewing bolts and union nuts -1 … 7-.

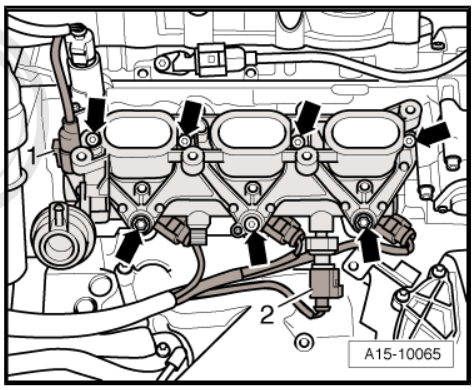


– Unplug electrical connectors:

1 - Intake manifold flap potentiometer 2 -G512-

2 - Fuel pressure sender -G247-

– Unscrew bolts and nuts -arrows- and detach intake manifold (bottom section) with fuel rail.



Note

Seal intake ports on cylinder heads with clean cloths.

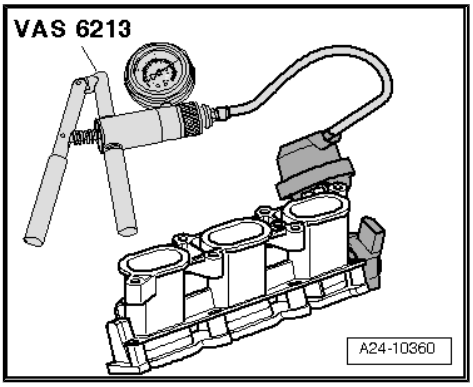
Installing

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

Note

- *Renew gaskets, seals and O-rings.*
- *Lightly lubricate O-rings for injectors with clean engine oil.*

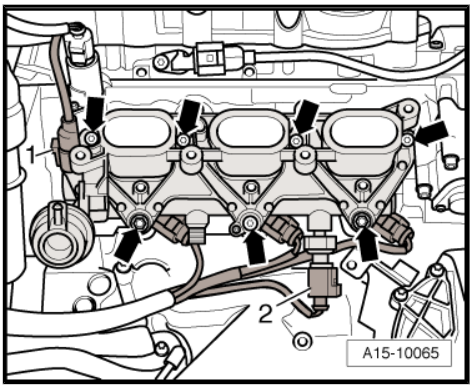
– Connect hand-operated vacuum pump -VAS 6213- to vacuum unit for actuating intake manifold flaps as shown in illustration.
– Use hand-operated vacuum pump to generate vacuum.
• This will cause the intake manifold flaps to open.



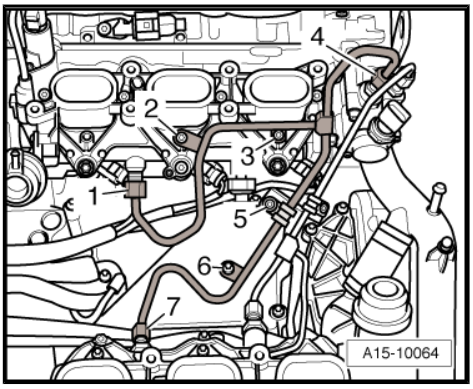
Note

If the intake manifold flaps are not opened, they can catch on the guide plates in the cylinder head when the intake manifold (bottom section) is installed.

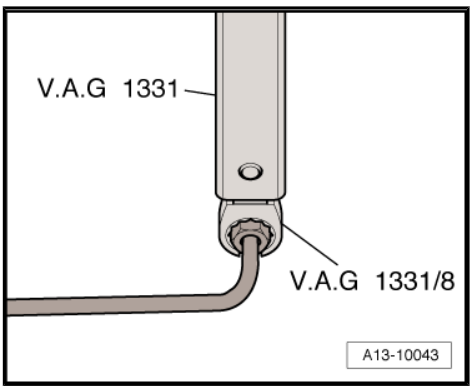
– Install intake manifold (bottom section) and press fuel rail evenly down onto injectors.
– Tighten bolts -arrows- for intake manifold (bottom section) in diagonal sequence and in stages.
– Disconnect hand-operated vacuum pump from vacuum unit for actuating intake manifold flaps.
– Plug in electrical connectors -1- and -2-.



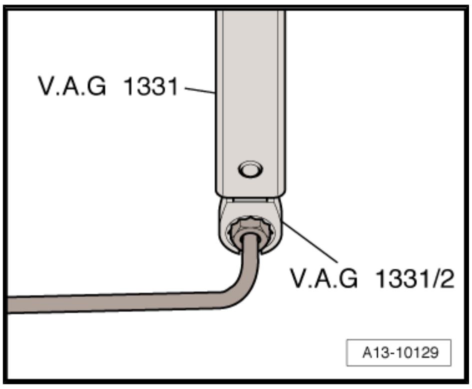
– First hand-tighten union nuts -1-, -4- and -7- for high-pressure pipes, then hand-tighten pipe mountings -2-, -3-, -5- and -6-.
– Ensure that high-pressure pipes are not under tension.



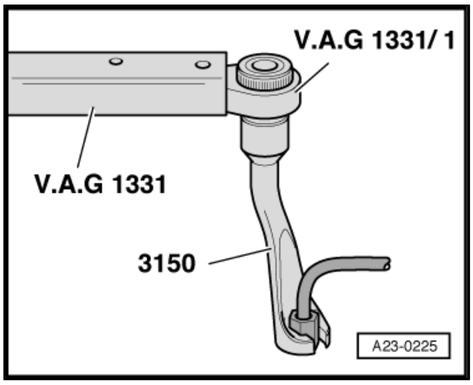
– To tighten union of high-pressure pipe (14 mm) at fuel rail, use torque wrench -V.A.G 1331- with socket insert AF 14, flared ring spanner -V.A.G 1331/8- .



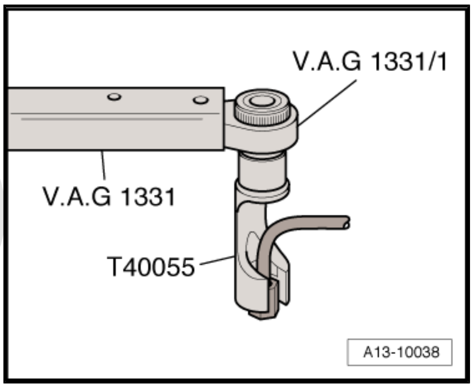
– To tighten union of high-pressure pipe (17 mm) at fuel rail, use torque wrench -V.A.G 1331- with tool insert (open-end ring spanner, 17 mm) -V.A.G 1331/2- .



– To tighten union of high-pressure pipe (14 mm) at high-pressure pump, use torque wrench -V.A.G 1331- with ratchet -V.A.G 1331/1- and socket, 14 mm -3150- .



– To tighten union of high-pressure pipe (17 mm) at high-pressure pump, use torque wrench -V.A.G 1331- with ratchet -V.A.G 1331/1- and socket -T40055- .



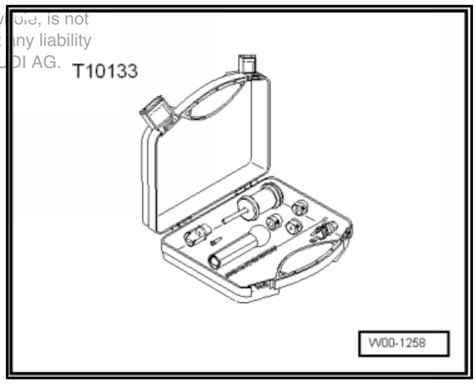
Tightening torques

Component		Nm
Intake manifold (bottom section) to cylinder head		9
High-pressure pipes to:	High-pressure pump	25
	Fuel rail	25

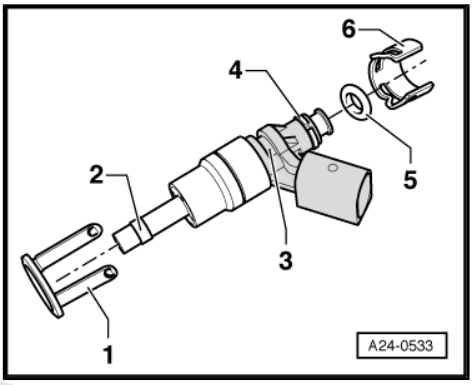
1.12 Removing and installing injectors

Special tools and workshop equipment required

♦ Tool set for FSI engines -T10133-



High-pressure injector - exploded view of components



1 - Radial compensation element (renew if damaged)

2 - Combustion chamber ring seal (teflon ring seal) - renew; when fitting, do not grease ring or use any other lubricant.

3 - Groove on injector

4 - Spacer ring (renew if damaged)

5 - O-ring (renew; apply thin coating of clean engine oil prior to installation)

6 - Support ring (via the support ring the fuel rail exerts force which secures injector in cylinder head)

Removing

WARNING

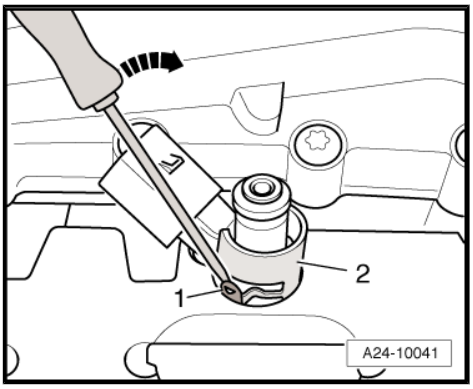
- *The fuel system operates under high pressure. The pressure in the high-pressure part of the injection system must be reduced to a residual pressure prior to opening the system ⇒ page 2 .*
- *A clean cloth must then be wrapped around the connection and the residual pressure dissipated by carefully loosening the connection.*

– Remove intake manifold (top section) ⇒ page 18 .

– Remove corresponding bottom section of intake manifold ⇒ page 23 .

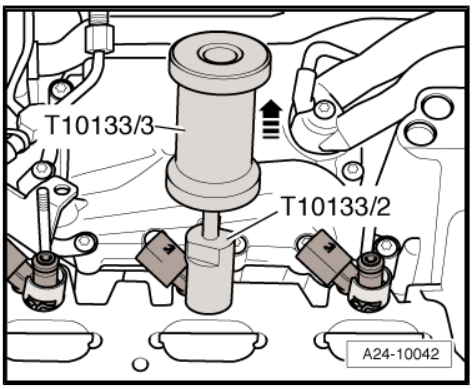
If injectors cannot be pulled out of cylinder head by hand, proceed as follows:

– Use a screwdriver to bend retainer tabs -1- of radial compensation element to side -arrow- and pull support ring -2- off injector.



– Screw striker -T10133/3- onto puller -T10133/2- .

– Insert puller -T10133/2- into groove on injector and carefully knock out injector.

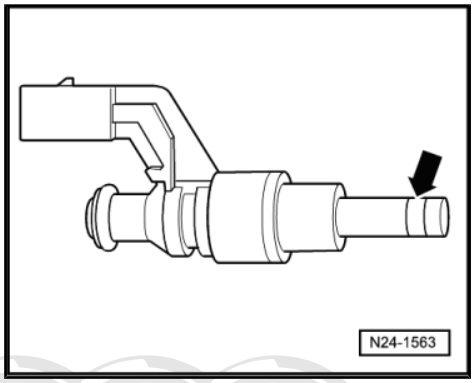


Note

When inserting the puller, there is a risk of destroying the radial compensation element due to the retainer tabs breaking.

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

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

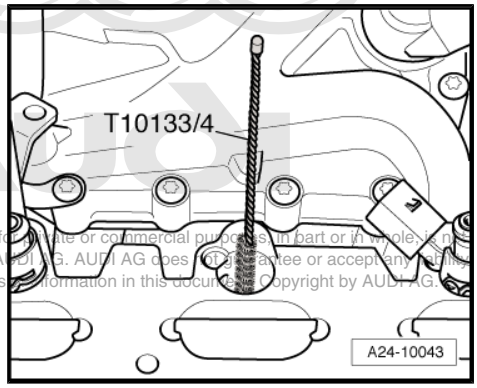


Installing

Note

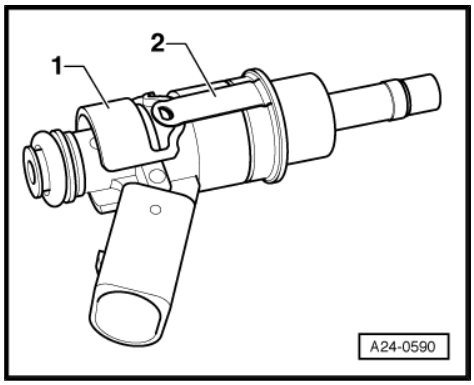
- *Renew combustion-chamber ring seal and O-ring.*
- *Renew spacer ring if damaged.*
- *Lightly lubricate O-rings for injectors with clean engine oil.*
- *The injector pipes must be re-installed on the same cylinders.*

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

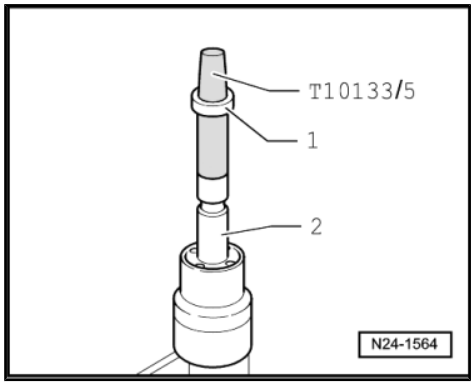


– Clip radial compensation element -1- into support ring -2-.

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

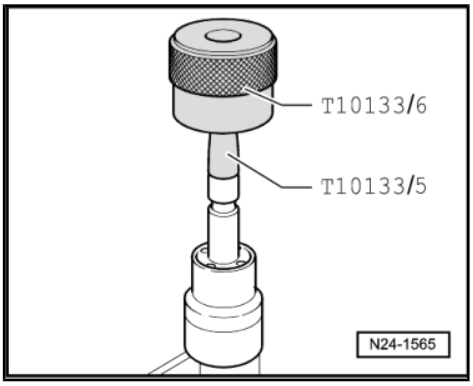


– Fit assembly cone -T10133/5- with new combustion chamber ring seal -1- onto injector -2-.



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

– Turn assembly sleeve -T10133/6- upside down and push combustion chamber ring seal into sealing ring groove.

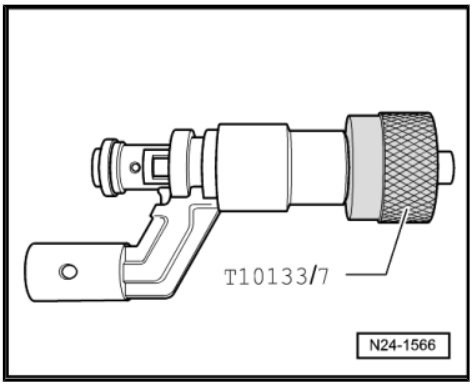


Note

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°).

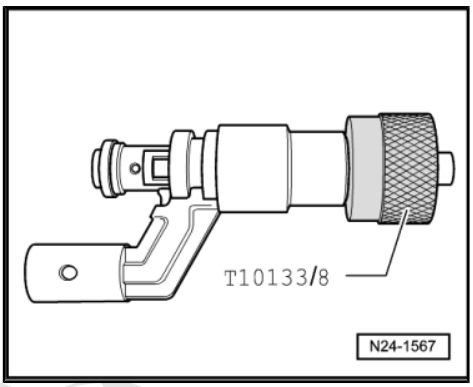
– Pull calibration sleeve -T10133/7- off again by turning it in the opposite direction.



– 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.

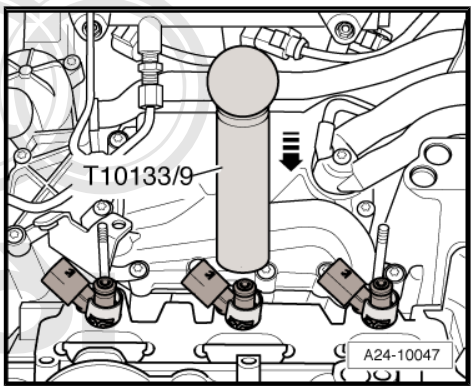
– Lubricate new O-ring lightly with clean engine oil before installing.



Note

The combustion-chamber ring seal must not be lubricated.

– 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.

– Make sure injector is in correct installation position in cylinder head:

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

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

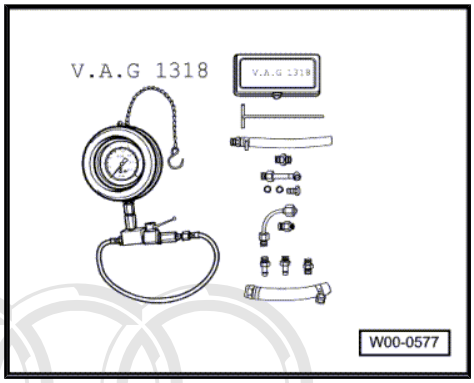
– Install bottom section of intake manifold ⇒ page 23 .

– Install intake manifold (top section) ⇒ page 18 .

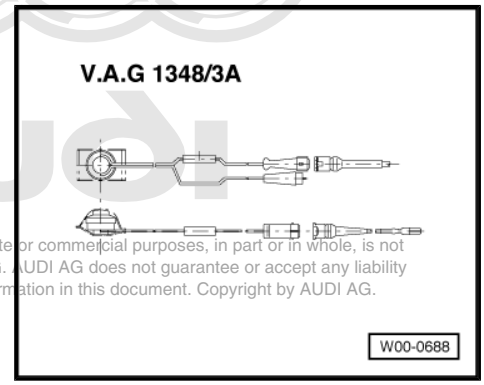
1.13 Checking fuel pressure and residual pressure (up to high-pressure pump)

Special tools and workshop equipment required

- K-Jetronic pressure tester -V.A.G 1318-



- Adapter set -V.A.G 1318/10-12-
- Remote control -V.A.G 1348/3A- for V.A.G 1348 with adapter cable -V.A.G 1348/3-3-



- Fuel-resistant measuring container

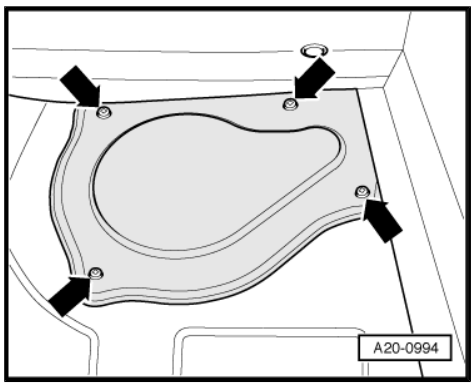
Test conditions

- Battery voltage at least 12.5 V
- Fuel filter OK
- Fuel tank at least $^1/_4$ full.
- Fuel pump control unit -J538- OK; checking ⇒ Rep. Gr. 20 .
- Ignition off.

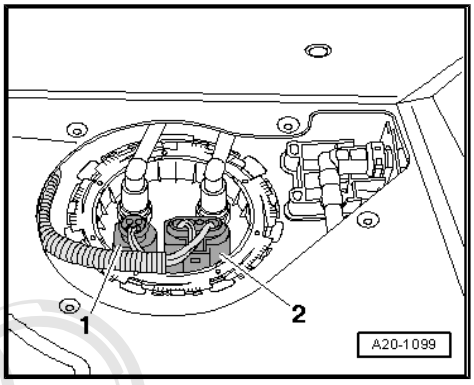
Checking fuel pressure

– Remove luggage compartment floor lining.

– Unscrew cover for flange (right-side) -arrows-.



– Carefully release electrical connector -2- from flange (right-side) and unplug.



Note

Disregard -item 1-.

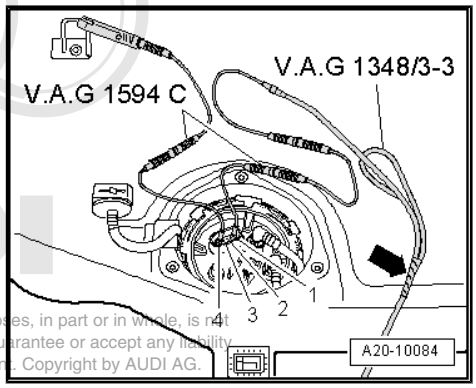
– Connect remote control for V.A.G 1348 -V.A.G 1348/3A- to contact -1- using adapter cable -V.A.G 1348/3-3- and test lead from auxiliary measuring set -V.A.G 1594C- .

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

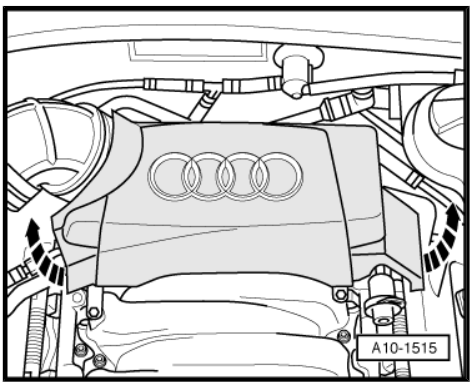
– Move switch of remote control -V.A.G 1348/3A- for V.A.G 1348 to front of engine compartment.

– Connect contact -4- to body earth via an improvised auxiliary lead.

– Connect crocodile clamp to battery "+".



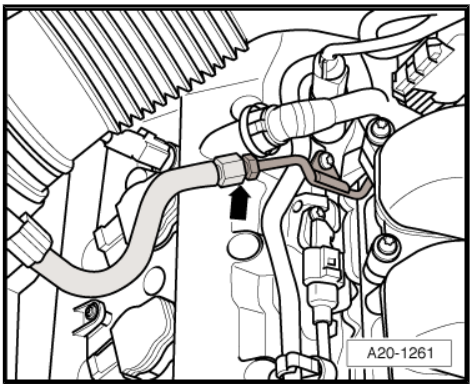
– Pull off engine cover (rear) -arrows-.



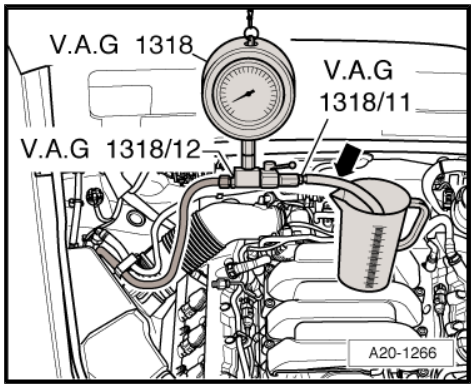
WARNING

- *The fuel system operates under high pressure. The pressure in the high-pressure part of the injection system must be reduced to a residual pressure prior to opening the system ⇒ page 2 .*
- *A clean cloth must then be wrapped around the connection and the residual pressure dissipated by carefully loosening the connection.*

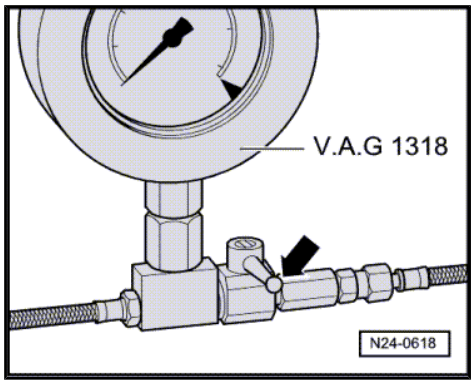
– Disconnect fuel line -arrow-.



– Connect K-Jetronic pressure tester -V.A.G 1318- with adapters -V.A.G 1318/11- and -V.A.G 1318/12- to fuel pipe.
– Fit auxiliary hose -arrow- onto pressure gauge and hold it into container to catch any escaping fuel.
– Open cut-off valve on pressure tester. Lever points in direction of flow.
– Bleed fuel system by pressing remote control briefly.



– Close cut-off tap on pressure gauge. Lever is at right angle to direction of flow -arrow-.
– Press switch on remote control until pressure gauge shows no further increase in pressure.
• Specification: approx. 6 bar



If specification is not obtained:

– Check fuel pump delivery rate ⇒ Rep. Gr. 20 .

Checking residual pressure

– Check leak-tightness and residual pressure by watching the drop in pressure on the pressure gauge.
• After 10 minutes pressure should still be at least 3.75 bar.

If the residual pressure drops below 3.75 bar:

♦ Check union between pressure gauge and fuel line for leaks.
♦ Test pressure gauge for leaks.
♦ Check fuel lines and their connections for leaks.
♦ Renew fuel filter with integral fuel pressure regulator ⇒ Rep. Gr. 20 .
♦ Renew fuel pump ⇒ Rep. Gr. 20 .

Assembly 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 a container under the connection.

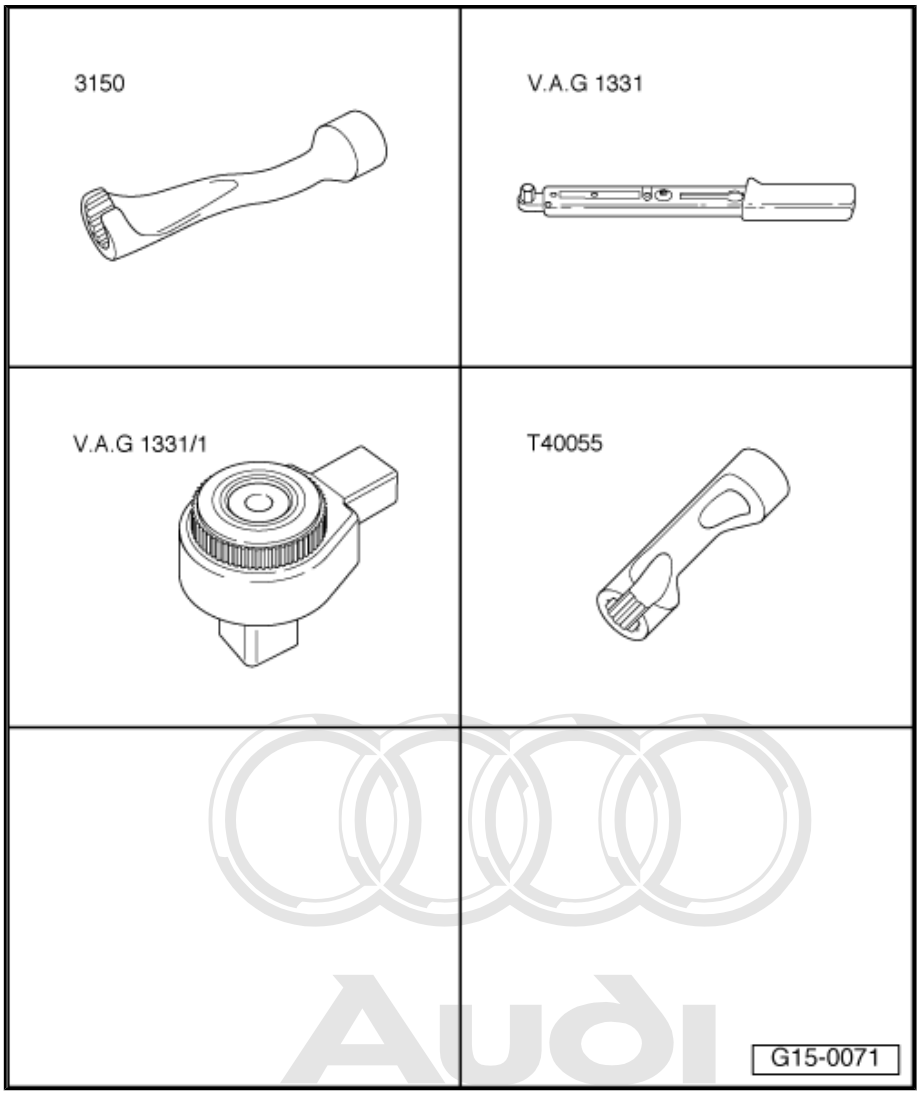
Tightening torque

Component	Nm
Fuel line to fuel rail	28

1.14 Removing and installing high-pressure pump

Special tools and workshop equipment required

- Socket, 14 mm -3150-
- Torque wrench -V.A.G 1331-
- Ratchet -V.A.G 1331/1-
- Socket -T40055-



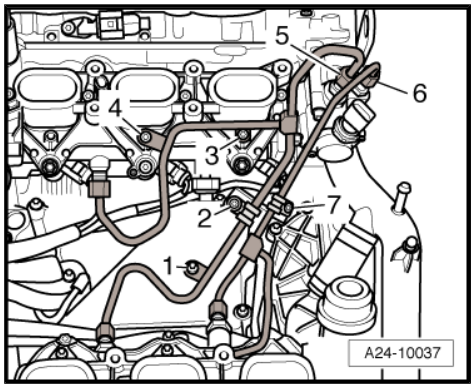
Removing

WARNING

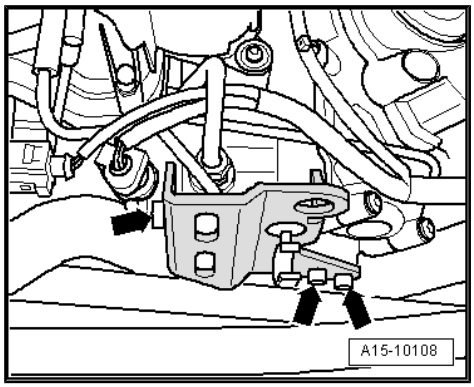
- *The fuel system operates under high pressure. The pressure in the high-pressure part of the injection system must be reduced to a residual pressure prior to opening the system ⇒ page 2 .*
- *A clean cloth must then be wrapped around the connection and the residual pressure dissipated by carefully loosening the connection.*

– Drain off coolant ⇒ Rep. Gr. 19 .
– Remove coolant pipe (front) ⇒ Rep. Gr. 19 .
– Remove intake manifold (top section) ⇒ page 18 .

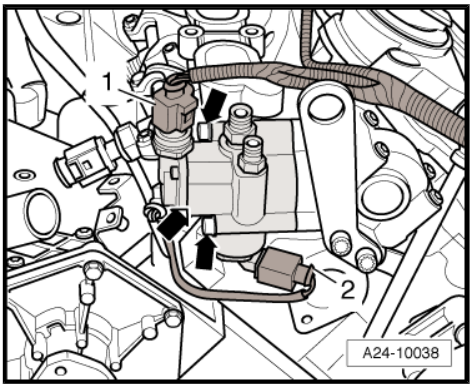
– Unscrew bolts -1 to 4- and -7-.
– Loosen union nuts -5- and -6-.



– Unbolt lifting eye -arrows-.



– Unplug electrical connector -2-.



Note

Disregard -item 1-.

– Remove bolts -arrows-.
– Carefully lift high-pressure pipes.

Note

Do not bend pipes to a different shape.

– Take off high-pressure pump together with plunger.

Installing

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

Note

Renew O-ring.

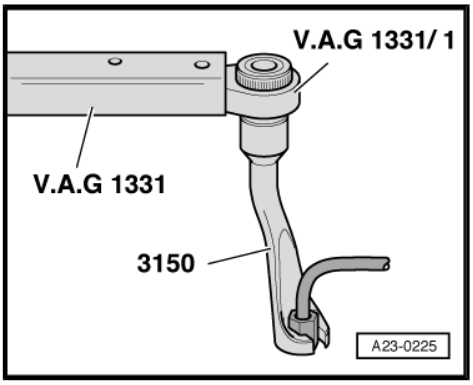
– Only lift high-pressure pipes slightly to fit the high-pressure pump.

Note

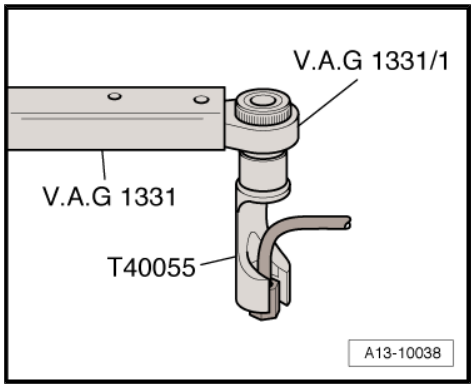
- *The connections of the high-pressure pipes must not be damaged.*
- *Do not attempt to bend high-pressure pipes to a different shape.*

– Insert high-pressure pump with plunger in cylinder head and tighten.
– Tighten union nuts on high-pressure pipes hand-tight initially.
– Ensure that high-pressure pipes are not under tension.

– To tighten union of high-pressure pipe (14 mm) at high-pressure pump, use torque wrench -V.A.G 1331- with ratchet -V.A.G 1331/1- and socket, 14 mm -3150- .



– To tighten union of high-pressure pipe (17 mm) at high-pressure pump, use torque wrench -V.A.G 1331- with ratchet -V.A.G 1331/1- and socket -T40055- .



– Install intake manifold (top section) ⇒ page 18 .
– Install coolant pipe (front) ⇒ Rep. Gr. 19 .
– Fill cooling system ⇒ Rep. Gr. 19 .

Tightening torques

Component	Nm
High-pressure pump to cylinder head	10
High-pressure pipes to high-pressure pump	25

1.15 Bleeding fuel system

In order to prevent damage to the catalytic converter, the fuel system must be bled after working on the fuel pipes or the fuel filter.

Procedure

– Start engine and let it run at moderate speed for several minutes and then switch off.

Note

To begin with, the engine may not run smoothly due to air in fuel system.

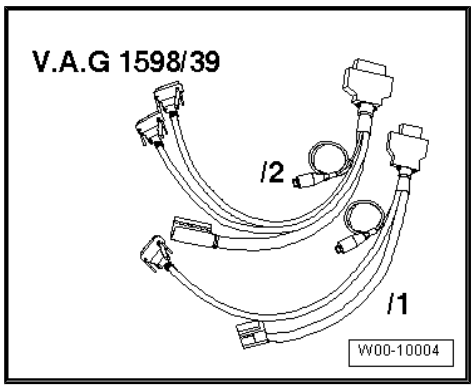
– Check fuel system for leaks.
– Interrogate fault memory and erase, if necessary.
– After completing the repair, road-test the vehicle. Accelerate with full throttle at least once. Then inspect fuel system for leaks again.

– Interrogate fault memory and erase, if necessary. If you have erased fault memory, you must then generate readiness code in engine control unit in “Guided fault finding” mode ⇒ Vehicle diagnosis, testing and information system VAS 5051.

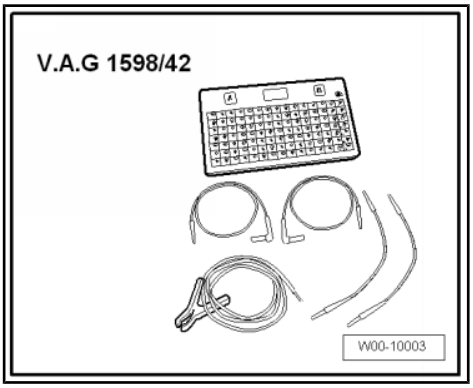
1.16 Wiring and component check with test box -V.A.G 1598/42-

Special tools and workshop equipment required

♦ Adapter cable -V.A.G 1598/39-

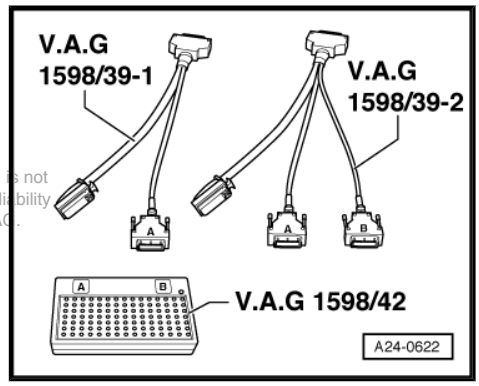


- Test box -V.A.G 1598/42-



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 38 .

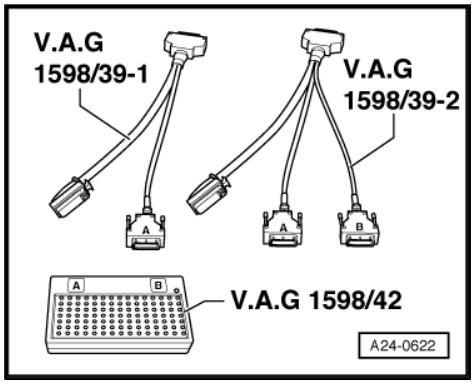
Caution

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 38 .



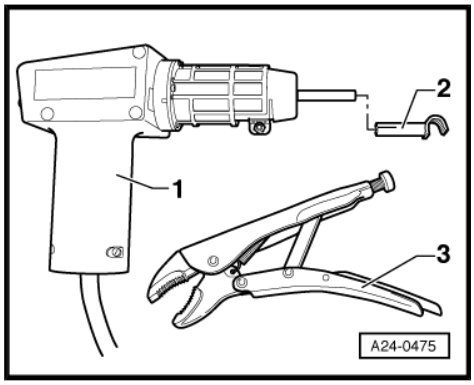
After re-connecting the engine control unit the following operations must be performed:

– Interrogate fault memory and erase, if necessary. If you have erased fault memory, you must then generate readiness code in engine control unit in “Guided fault finding” mode ⇒ Vehicle diagnosis, testing and information system VAS 5051.

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- with nozzle attachment -2- from wiring harness repair set -VAS 1978A-

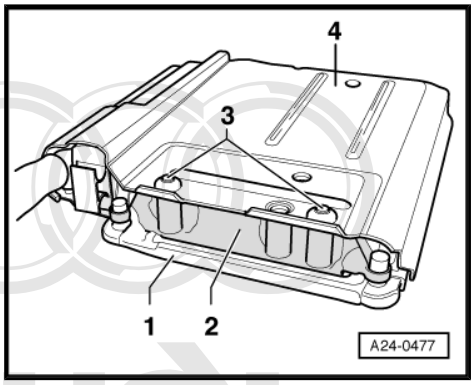


♦ Vice-grip pliers -3- (commercially available)

Note

♦ *The engine control unit -1- is bolted to the protective housing -4-. To make it more difficult to unscrew the shear bolts -3- 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).*

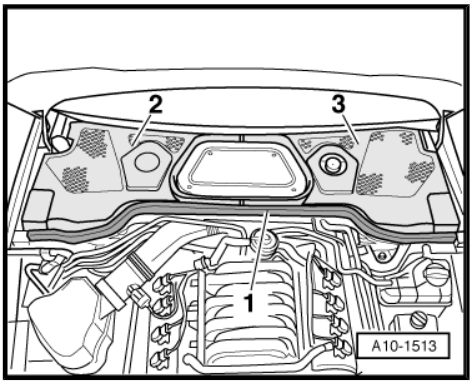


Removing

– 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.

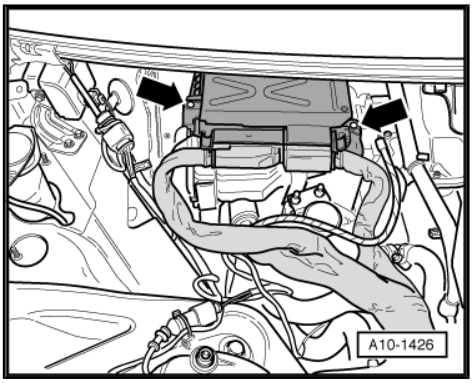
– Pull off rubber seal -1- on plenum chamber covers.
– Detach plenum chamber cover (right-side) -2-.



Note

Disregard -item 3-.

– Unclip cover for engine control unit.
– Remove bolts -arrows-.
– Detach both retainers and engine control unit from electronics box (plenum chamber).
– Lay aside engine control unit with electrical connectors attached.
– Disconnect 81-pin connector at engine control unit.



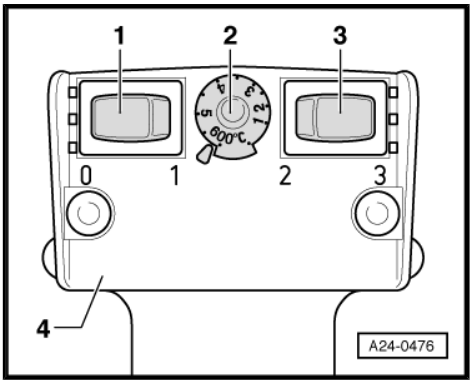
Note

- *The 60-pin connector is secured with the protective housing and remains attached when removing the engine control unit.*
- *When the engine control unit is disconnected, the learnt values are erased but the contents of the fault memory remain intact.*

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.

– 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”.

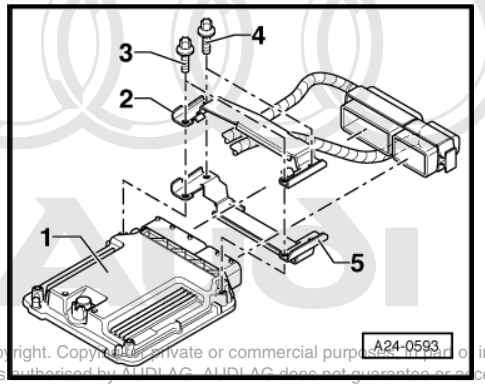


Note

Then use hot air blower to heat threaded holes in protective housing into which shear bolts have been screwed. This step reduces inhibiting action of locking fluid on shear bolt thread and makes it easier to unscrew these bolts.

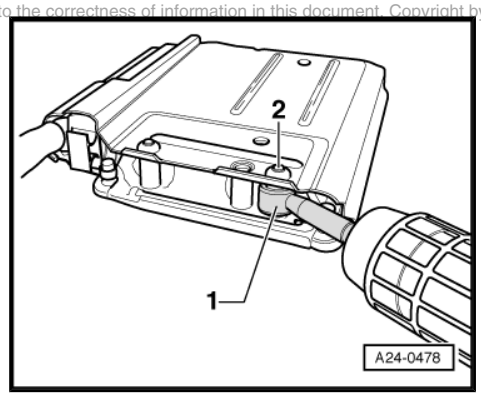
WARNING

Parts of protective housing will become very hot as result of heating 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.

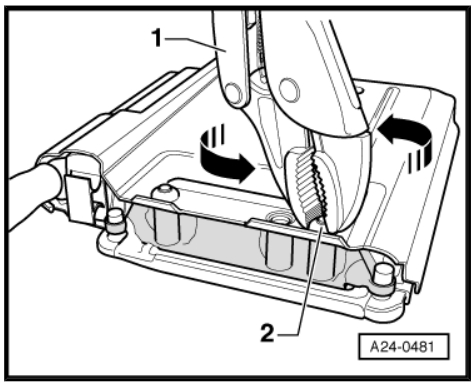


– Carry out the following operations first on the one and then on the other of the shear bolts -4-.

– Direct nozzle -1- of hot air blower at shear bolt -2- of protective housing. You can rest the nozzle on the top section of the protective housing.
– Switch on the hot air blower and heat the bolt for approximately 20 ... 25 seconds.



– Grasp head of bolt -2- with vice-grip pliers -1- and unscrew shear bolt -arrows-.
– Repeat the procedure for the 2nd shear bolt.



Note

Be particularly careful here, as this shear bolt is in the immediate vicinity of control unit connector.

– Release locking plate 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:

– Reinstall the engine control unit into the protective housing.
– 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.

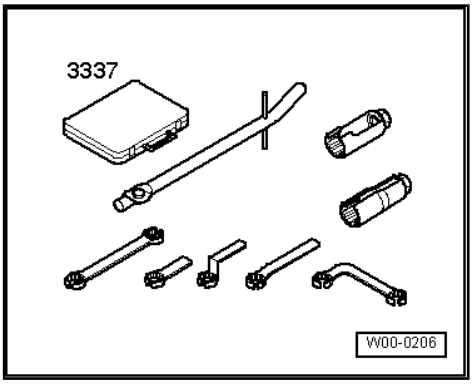
After installing a new engine control unit, the following operations must be performed:

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

1.18 Removing and installing Lambda probe before catalytic converter - bank 1 (right)

Special tools and workshop equipment required

- Lambda probe open ring spanner set -3337-

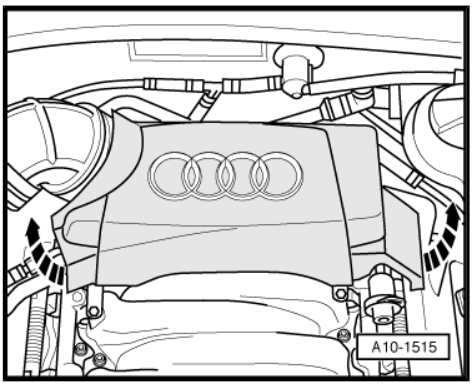


Removing

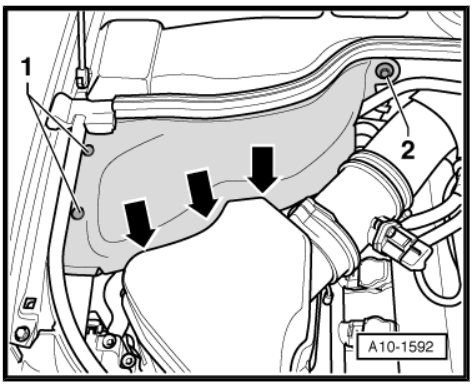
Note

All cable ties which are released or cut open when removing must be fitted in the same position when installing.

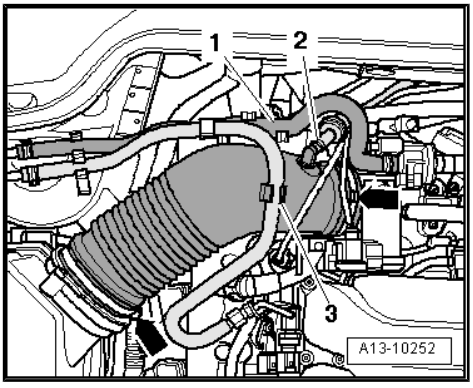
– Pull off engine cover (rear) -arrows-.



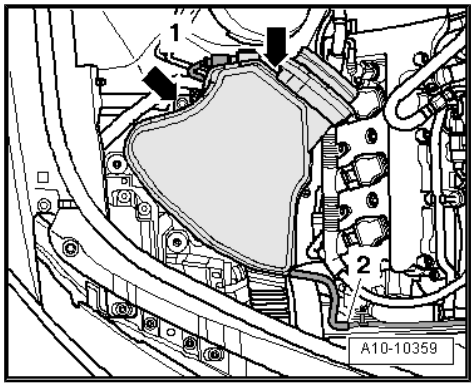
– If fitted, remove cover for suspension turret (right-side); to do so, detach spreader clips -1- and unscrew nut -2-.
– Pull cover out of retainers -arrows-.



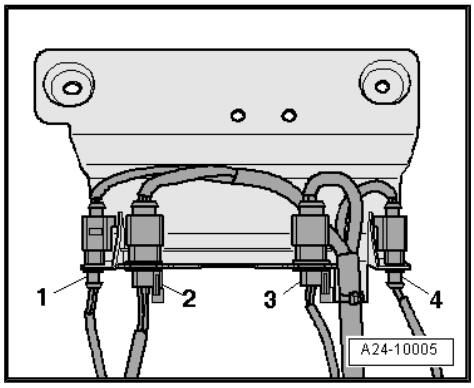
– Pull non-return valve -2- off connection at air intake hose.
– Unclip vacuum line -1- and fuel line -3- from retainer on air intake hose.
– Release hose clips -arrows- and remove air intake hose.



– Unplug electrical connector -1-.
– Detach vacuum hose -2-.
– Remove bolts -arrows-.
– Take out air cleaner housing.



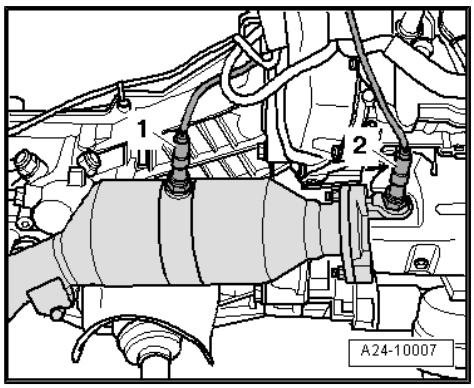
– Unplug electrical connector -2- for Lambda probe -G39- .



Note

Disregard -items 1, 3 and 4-.

– Unscrew Lambda probe -2- using Lambda probe open ring spanner set -3337/7- .



Note

Shown in illustration with engine removed.

Installing

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

Note

- *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- *If reinstalling the old Lambda probes, coat the threads with high-temperature paste ⇒ Parts catalogue . The paste must not get into the slots on the probe body.*
- *Fit all cable ties in the original positions when installing.*
- *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*

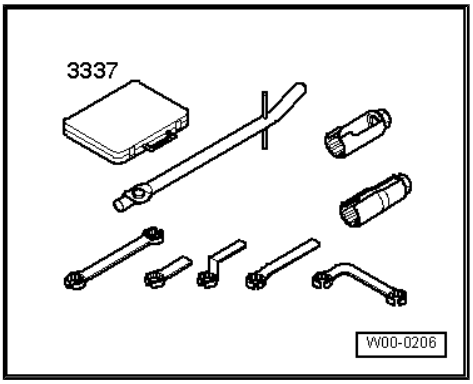
Tightening torques

Component	Nm
Lambda probe in front exhaust pipe	55
Air cleaner housing to body	5
Hose clips (9 mm wide)	3

1.19 Removing and installing Lambda probe before catalytic converter - bank 2 (left)

Special tools and workshop equipment required

- Lambda probe open ring spanner set -3337-

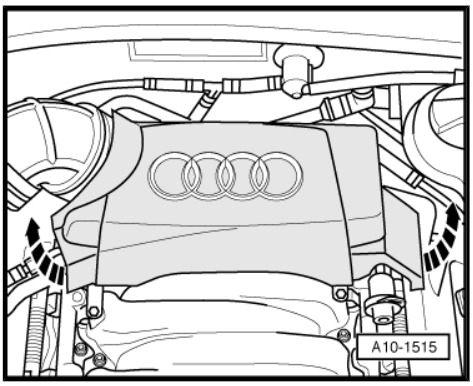


Removing

Note

All cable ties which are released or cut open when removing must be fitted in the same position when installing.

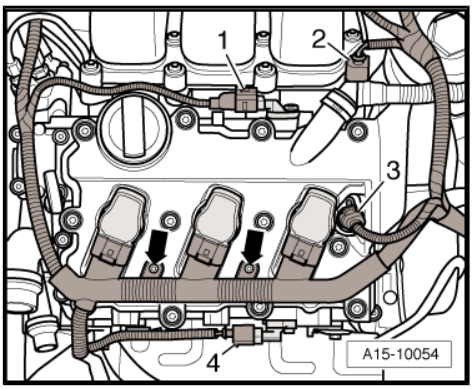
– Pull off engine cover (rear) -arrows-.



– Unscrew bolts -arrows- and unplug electrical connectors at ignition coils.

Note

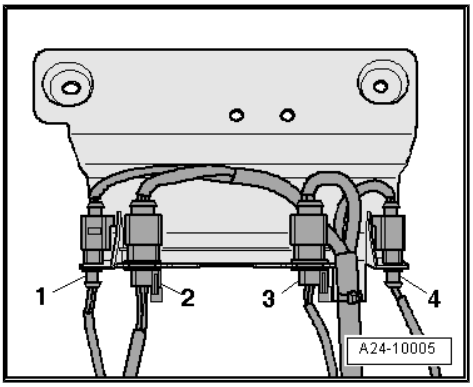
Disregard -items 1 ... 4-.



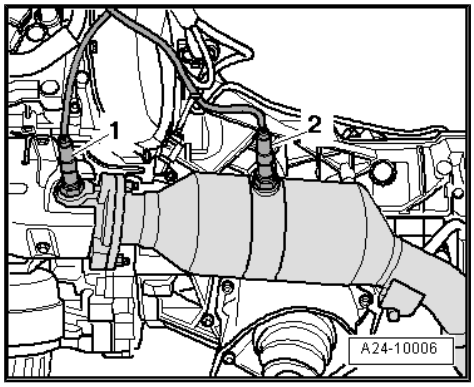
– Unplug electrical connector -3- for Lambda probe 2 -G108- and move wiring clear.

Note

Disregard -items 1, 2 and 4-.



– Unscrew Lambda probe -1- using Lambda probe open ring spanner set -3337/7- .



Note

Shown in illustration with engine removed.

Installing

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

Note

- *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- *If reinstalling the old Lambda probes, coat the threads with high-temperature paste ⇒ Parts catalogue . The paste must not get into the slots on the probe body.*
- *Fit all cable ties in the original positions when installing.*
- *When installing, the Lambda probe wires must always be reattached at the same locations to prevent them from coming into contact with the exhaust pipe.*

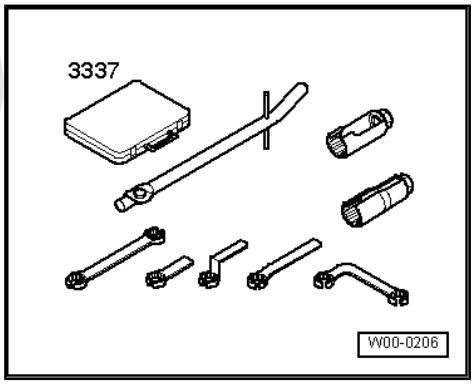
Tightening torque

Component	Nm
Lambda probe in front exhaust pipe	55

1.20 Removing and installing Lambda probe after catalytic converter - bank 1 (right)

Special tools and workshop equipment required

- Lambda probe open ring spanner set -3337-

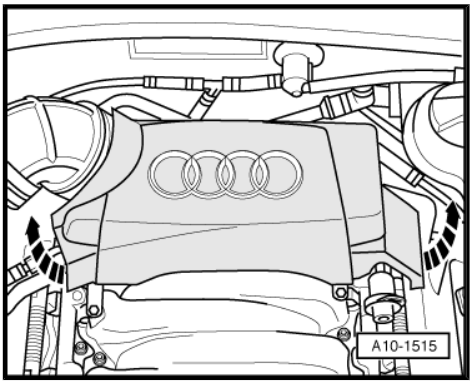


Removing

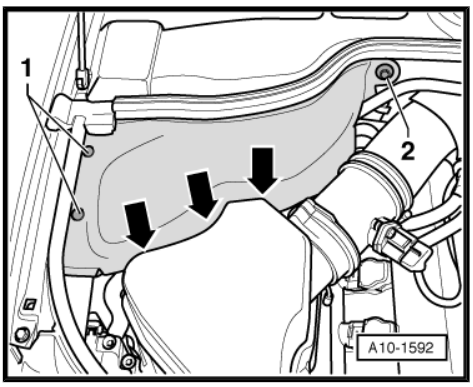
Note

All cable ties which are released or cut open when removing must be fitted in the same position when installing.

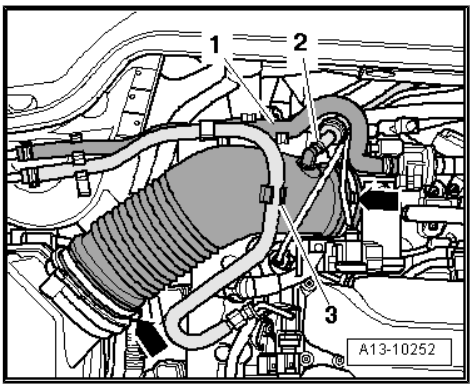
– Pull off engine cover (rear) -arrows-.



– If fitted, remove cover for suspension turret (right-side); to do so, detach spreader clips -1- and unscrew nut -2-.
– Pull cover out of retainers -arrows-.



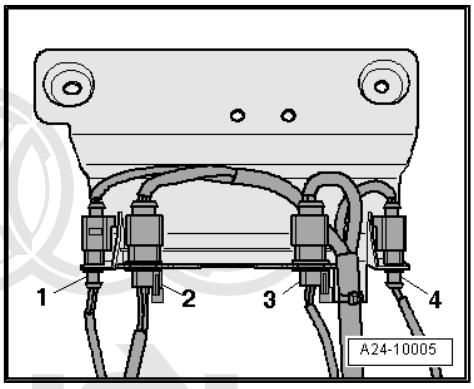
– Pull non-return valve -2- off connection at air intake hose.
– Unclip vacuum line -1- and fuel line -3- from retainer on air intake hose.
– Release hose clips -arrows- and remove air intake hose.



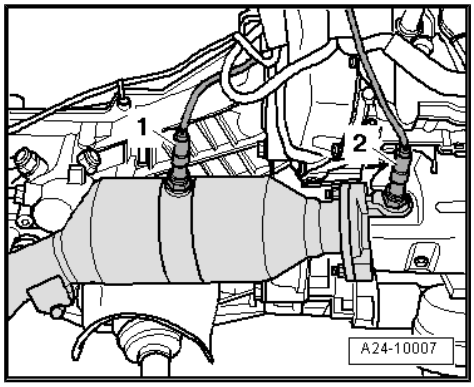
– Unplug electrical connector -1- for Lambda probe after catalytic converter -G130- and move wiring clear.

Note

Disregard -items 2, 3 and 4-.



– Unscrew Lambda probe -1- using Lambda probe open ring spanner set -3337/7- .



Note

Shown in illustration with engine removed.

Installing

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

Note

- *Renew O-ring.*
- *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- *If reinstalling the old Lambda probes, coat the threads with high-temperature paste ⇒ Parts catalogue . The paste must not get into the slots on the probe body.*
- *Fit all cable ties in the original positions when installing.*
- *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*

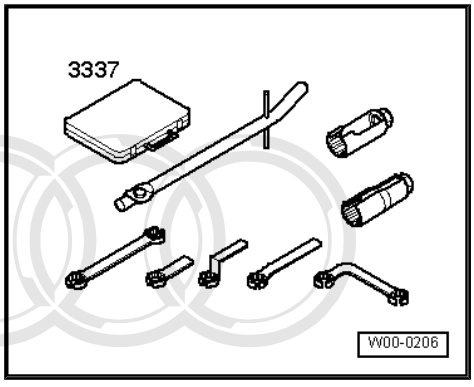
Tightening torques

Component	Nm
Lambda probe in front exhaust pipe	55
Hose clips (9 mm wide)	3

1.21 Removing and installing Lambda probe after catalytic converter - bank 2 (left)

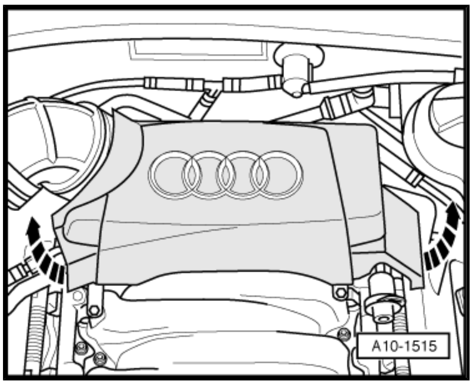
Special tools and workshop equipment required

- Lambda probe open ring spanner set -3337-

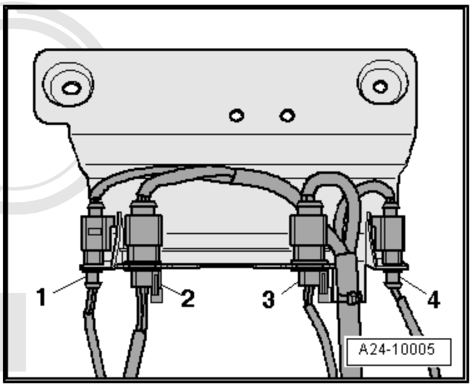


Removing

– Pull off engine cover (rear) -arrows-.



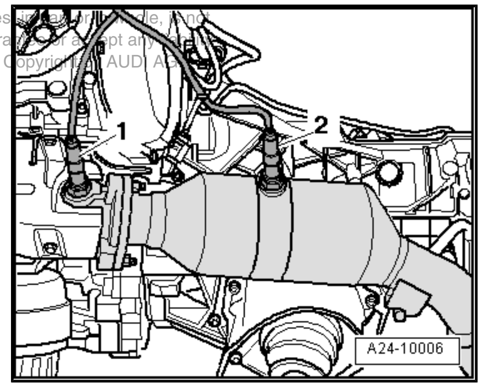
– Unplug electrical connector -4- for Lambda probe 2 after catalytic converter -G131- .



Note

Disregard -items 1, 2 and 3-.

– Unscrew Lambda probe -2- using Lambda probe open ring spanner set -3337/7- .



Note

Shown in illustration with engine removed.

Installing

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

Note

- *Renew O-ring.*
- *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- *If reinstalling the old Lambda probes, coat the threads with high-temperature paste ⇒ Parts catalogue . The paste must not get into the slots on the probe body.*
- *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*

Tightening torque

Component	Nm
Lambda probe in front exhaust pipe	55

28 – Ignition system

1 General notes and safety precautions

1.1 General notes on ignition system

- A voltage of at least 12.5 V is required for proper operation of 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

- *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.*

Observe the following to avoid injuries to persons and/or damage to the injection and ignition system:

- Do not touch or detach the ignition wires when the engine is running or while starting the engine.
- The ignition must be switched off before disconnecting or connecting ignition system wiring, high-voltage wires and test leads.
- If the engine is to be operated at starter motor speed without it starting (e.g. compression test), unplug the connectors at the ignition coils and injectors. After completing the work, interrogate and erase the fault memory.
- Always switch off the ignition before cleaning the engine.

Caution

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

2 Servicing ignition system

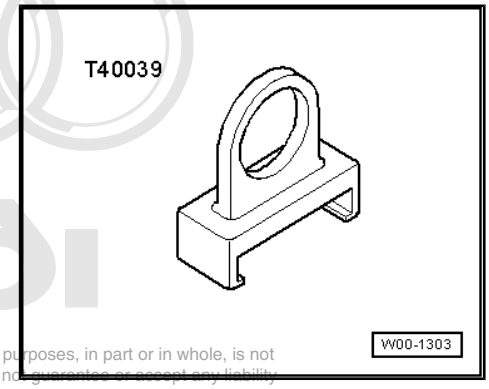
2.1 Technical data

Engine code letters		AUK (3.2 ltr. / 4V / 188 kW engine)	BPK (3.2 ltr. / 4V / 191 kW engine)
Idling speed		650 … 750 rpm (not adjustable)	
Ignition timing		Not adjustable (determined by control unit)	
Ignition system		Multi-coil system with 6 ignition coils (output stages integrated) connected directly to spark plugs	
Spark plugs	Designations	⇒ Data sheets for exhaust emission test	
	Tightening torque	⇒ Maintenance ; Booklet 404	
Firing order		1-5-3-6-2-4	

2.2 Removing and installing ignition coils

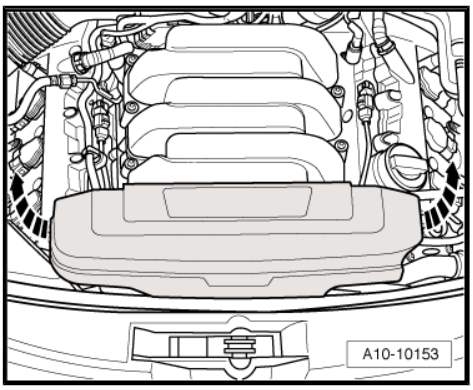
Special tools and workshop equipment required

- Puller -T40039-



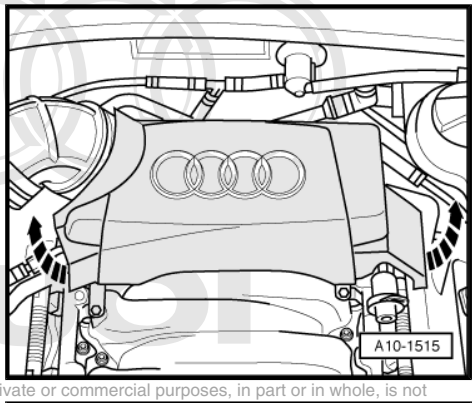
Removing

– Pull off engine cover (front) -arrows-.



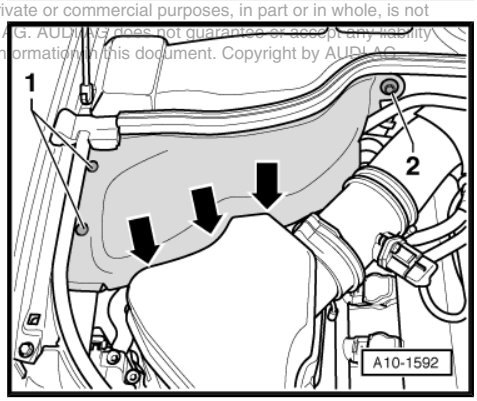
Cylinder bank 1 (right-side):

– Pull off engine cover (rear) -arrows-.



– If fitted, remove cover for suspension turret (right-side); to do so, detach spreader clips -1- and unscrew nut -2-.

– Pull cover out of retainers -arrows-.



– Release hose clip -arrow- and disconnect air intake hose at air cleaner housing.

– Detach electrical connector -1- at non-return valve

– Detach vacuum pipe -2-.

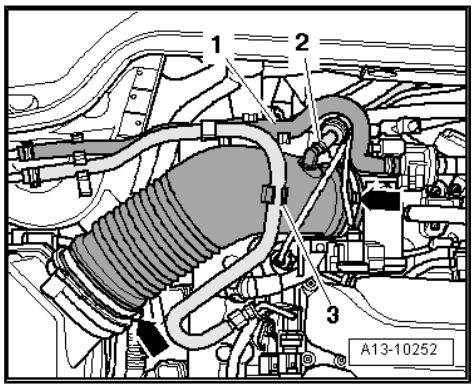
– Release hose clips -arrows- and remove air intake hose.

– Unplug electrical connector -1-.

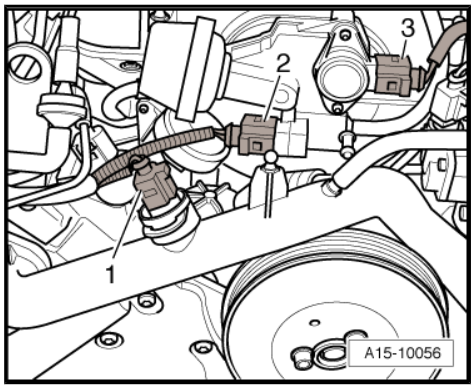
– Detach vacuum hose -2-.

– Remove bolts -arrows-.

– Take out air cleaner housing.



– Unplug electrical connectors at coolant temperature sender -G62- -item 1- and variable intake manifold flap change-over valve -N239- -item 2-.



– Unplug electrical connectors:

1 - Exhaust camshaft control valve 1 -N318-

2 - Inlet camshaft control valve 1 -N205-

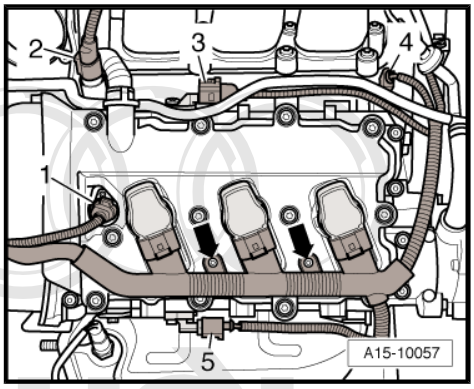
3 - Hall sender -G40-

4 - Intake manifold flap potentiometer -G336-

5 - Hall sender 3 -G300-

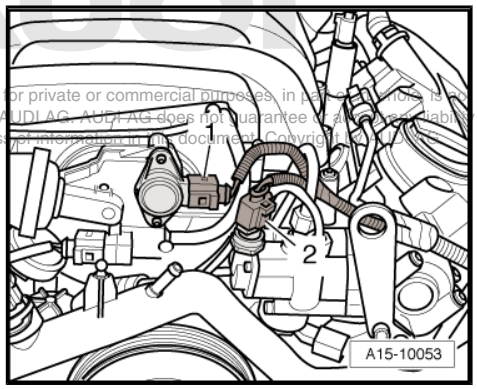
– Unscrew bolts -arrows- and unplug electrical connectors at ignition coils.

– Move wiring harness clear.



Cylinder bank 2 (left-side):

– Unplug electrical connectors at variable intake manifold position sender -G513- -item 1- and at high-pressure pump -item 2-.



– Unplug electrical connectors:

1 - Hall sender 2 -G163-

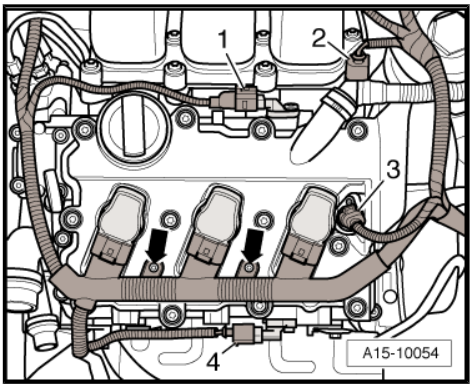
2 - Inlet camshaft control valve 2 -N208-

3 - Exhaust camshaft control valve 2 -N319-

4 - Hall sender 4 -G301-

– Unscrew bolts -arrows- and unplug electrical connectors at ignition coils.

– Move wiring harness clear.



Continuation for both sides:

– Pull ignition coils out with puller -T40039- .

Installing

Install in reverse order.

Tightening torque

Component	Nm
Hose clips (9 mm wide)	3