

Workshop Manual Audi A6 2005 ➤

Injection and ignition system (8-cyl. 5-valve injection engine)

Engine ID	BAT	BNK							
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Edition 01.2007

Audi

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List of Workshop Manual Repair Groups

Repair Group

24 - Mixture preparation - injection

28 - Ignition system



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

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Audi A6 2005 ►

Injection and ignition system (8-cyl. 5-valve injection engine) - Edition 01.2007



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24 – Mixture preparation - injection

1 Servicing Motronic injection system

1.1 Safety precautions

1.1.1 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.*

To avoid any risk of injuries to persons and/or damage to the fuel injection and ignition system, always observe the following safety precautions.

- ◆ Always switch off the ignition before connecting or disconnecting injection or ignition system wiring or tester cables.
- ◆ To operate the engine at cranking speed without actually starting it (e.g. compression test), first unplug the connectors from the injectors and from the output stages of the ignition coils.
- ◆ 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.
- ◆ Always switch off the ignition before cleaning the engine.
- ◆ Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.



WARNING

The fuel system is pressurised. Before loosening hose connections or opening the test connection (to measure fuel pressure), place a cloth around the connection. Then release pressure by carefully unscrewing the connection.

1.2 Rules for cleanliness

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

- ◆ Thoroughly clean all unions and surrounding areas before disconnecting.

- ◆ Place parts that have been removed on a clean surface and cover them over. 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 stored loose (e.g. in tool boxes 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.
- ◆ Unplugged electrical connectors must be kept clean and dry. Make sure connections are dry when attaching.

1.3.1 Overview of fitting locations

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

1 - Engine control unit -J623-

- ❑ Fitting location: in electronics box in plenum chamber (right-side)

2 - Air mass meter -G70- with intake air temperature sender -G42-

- ❑ Removing and installing
⇒ [page 24](#)

3 - Inlet camshaft control valve 1 -N205-

- ❑ ⇒ [page 6](#)

4 - Connector console

- ❑ Connector assignment
⇒ [page 5](#)

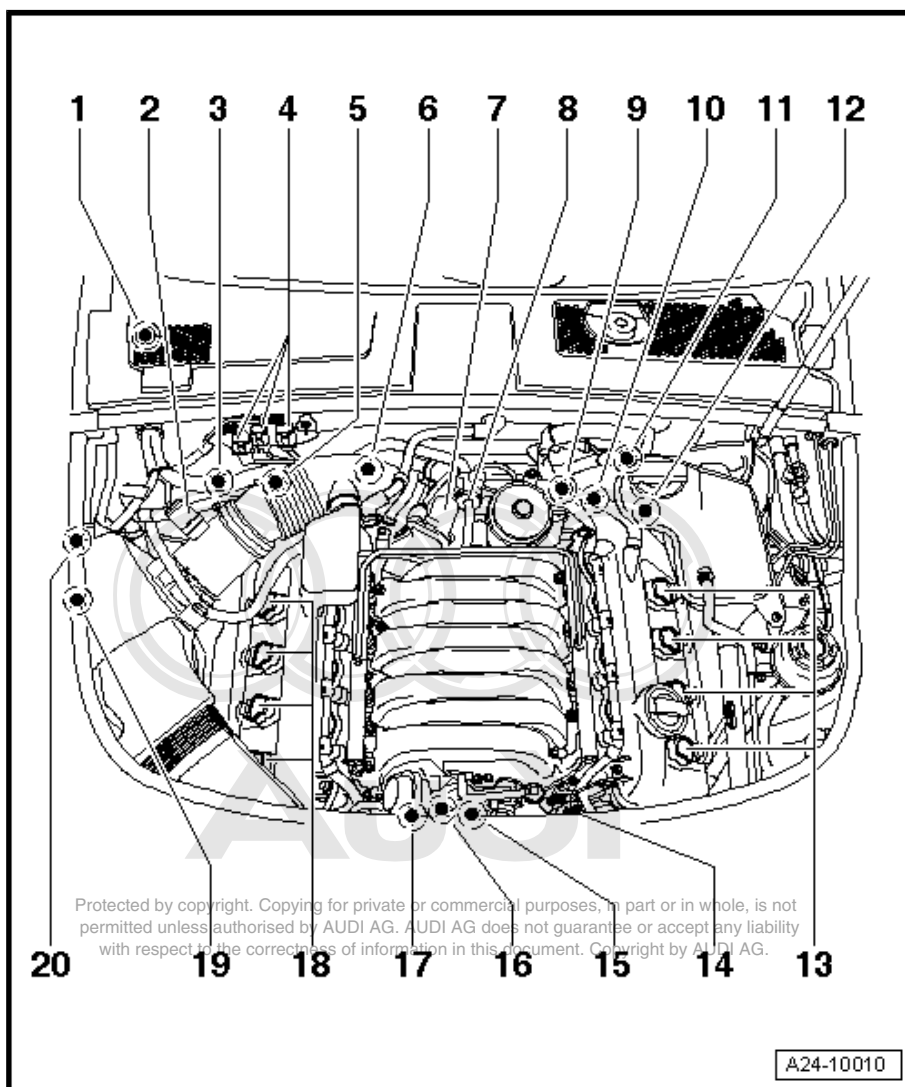
5 - Hall sender -G40-

- ❑ Cylinder bank 1
- ❑ ⇒ [page 6](#)

6 - Coolant temperature sender -G62-

7 - Throttle valve module - J338-

- ❑ Including throttle valve drive (electric power control) -G186-, throttle valve drive angle sender -1- (electric power control) -G187- and throttle valve drive angle sender -2- (electric power control) -G188-



trol) -G188-

- ☐ ⇒ [page 6](#)

8 - Activated charcoal filter solenoid valve 1 -N80-

- ☐

9 - Oil pressure switch -F1-

- ☐ ⇒ [page 6](#)

10 - Hall sender 2 -G163-

- ☐ Cylinder bank 2
- ☐ ⇒ [page 6](#)

11 - Connector console

- ☐ Connector assignment
- ☐ ⇒ [page 6](#)

12 - Inlet camshaft control valve 2 -N208-

- ☐ ⇒ [page 6](#)

13 - Ignition coils with output stages

- ☐ Cylinder bank 2
- ☐ Use puller -T10094- to remove.

14 - 3-pin connector

- ☐ For knock sensor 3 -G198-
- ☐ For knock sensor 4 -G199-

15 - Secondary air inlet valve -N112-

- ☐ ⇒ [page 6](#)

16 - Variable intake manifold change-over valve -N156-

- ☐ ⇒ [page 6](#)

17 - 3-pin connector

- ☐ For knock sensor 1 -G61-
- ☐ For knock sensor 2 -G66-
- ☐ ⇒ [page 6](#)

18 - Ignition coils with output stages

- ☐ Cylinder bank 1
- ☐ Can be removed using puller -T10094-

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

- ☐ To control a flap in air cleaner housing
- ☐ Variable intake manifold change-over valve -N335- is located behind air cleaner housing. To carry out test you must remove air cleaner housing completely.

20 - Secondary air pump motor -V101-

- ☐ At bottom front (as seen in direction of travel)
- ☐ ⇒ [page 6](#)

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

- ☐ In footwell on accelerator pedal (both senders are accommodated in one housing)

B - Brake light switch -F-

- ☐ In footwell on pedal bracket near brake pedal

C - Clutch pedal switch -F36-

- ☐ In footwell on pedal bracket near clutch pedal

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D - Fuel pump relay -J17-

- ☐ In 3-position relay carrier in plenum chamber (left-side), relay position 2
- ☐ ⇒ [page 5](#)

E - Motronic current supply relay -J271-

- ☐ In 3-position relay carrier in plenum chamber (left-side), relay position 3
- ☐ ⇒ [page 5](#)

F - Secondary air pump relay -J299-

- ☐ In 4-position relay carrier in electronics box in plenum chamber (right-side), relay position 3
- ☐ ⇒ [page 5](#)

G - Diagnostic connector

- ☐ In driver's knee restraint

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H - Engine speed sender -G28-

- ☐ In gearbox housing above starter ring gear

MIL exhaust emissions warning lamp

- ◆ Exhaust emissions warning lamp will come on if engine control unit detects faults which are relevant for exhaust emissions.
- ◆ Fitting location of exhaust emissions warning lamp (CHECK): in dash panel insert



Note

The exhaust emissions warning lamp will either flash or light up constantly. Fault memory has to be interrogated in any case.

Emissions warning lamp is flashing:

- ◆ A fault has occurred which, under the current driving conditions, will cause damage to the catalytic converter. In this case the vehicle may only be driven with reduced power (until MIL goes out or lights up constantly). The fault must be rectified as soon as possible.

Emissions warning lamp lights up constantly:

- ◆ A fault has occurred causing deterioration of emission levels. Interrogate fault memory for engine control unit / automatic gearbox.
- ◆ Fault memory must be interrogated and emissions warning lamp must be checked in the event of engine running problems or a customer complaint, even if exhaust emissions warning lamp does not light up. There could be faults stored in the memory which do not activate the emissions warning lamp immediately.

EPC warning lamp

- ◆ "EPC" stands for Electronic Power Control and refers to the electronic throttle control system.
- ◆ Fitting location of EPC warning lamp: in dash panel insert

The engine control unit switches the EPC warning lamp on when the ignition is switched on.

After the engine has been started, the engine control unit checks all components for faults relevant to the electronic throttle control system.

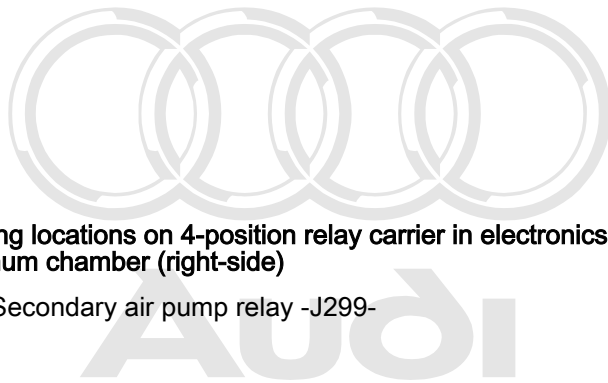
During the test sequence the EPC warning lamp lights up for about 3 seconds. If a fault is detected during this check the warning lamp will remain lit.

If a fault is detected in the electronic power control system while the engine is running, the engine control unit switches on the EPC lamp. At the same time an entry is stored in the fault memory of the engine control unit.

Fitting locations on 3-position relay carrier in plenum chamber (left-side)

2 - Fuel pump relay -J17-

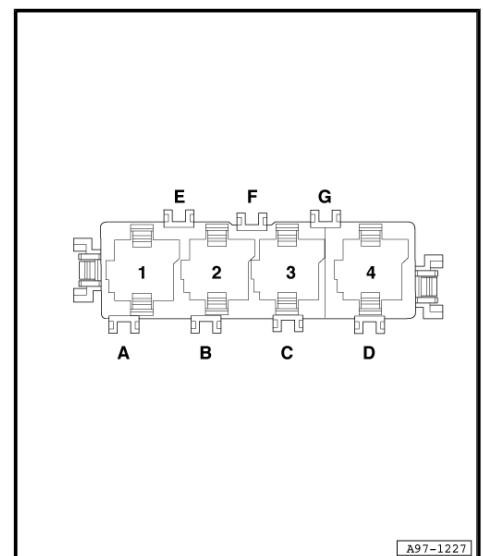
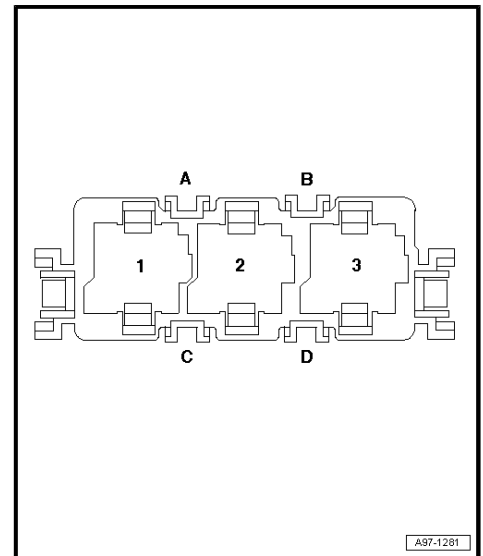
3 - Motronic current supply relay -J271-



Fitting locations on 4-position relay carrier in electronics box in plenum chamber (right-side)

3 - Secondary air pump relay -J299-

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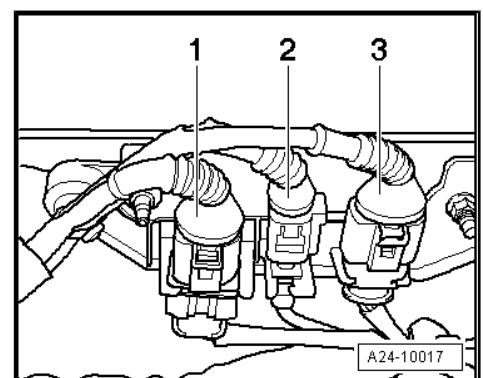


Connector console on bulkhead (right-side)

1 - 6-pin electrical connector for Lambda probe -G39- and Lambda probe heater -Z19- before catalytic converter (bank 1)

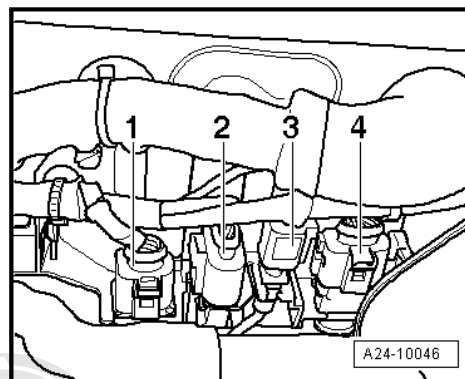
2 - 2-pin connector for bank 1, inlet camshaft control valve 1 - N205-

3 - 4-pin electrical connector for Lambda probe after catalytic converter -G130- and Lambda probe 1 heater after catalytic converter -Z29- (after catalytic converter, bank 1)



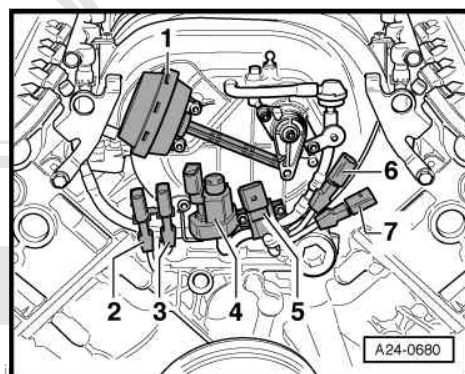
Connector console below coolant expansion tank

- 1 - 6-pin electrical connector for Lambda probe 2 -G108- and Lambda probe heater 2 -Z28- before catalytic converter (bank 2)
- 2 - 3-pin connector (grey) for engine speed sender -G28-
- 3 - 2-pin connector for bank 2, inlet camshaft control valve 2 - N208-
- 4 - 4-pin electrical connector for Lambda probe 2 after catalytic converter -G131- and Lambda probe 2 heater after catalytic converter -Z30- (after catalytic converter, bank 2)



Engine viewed from front

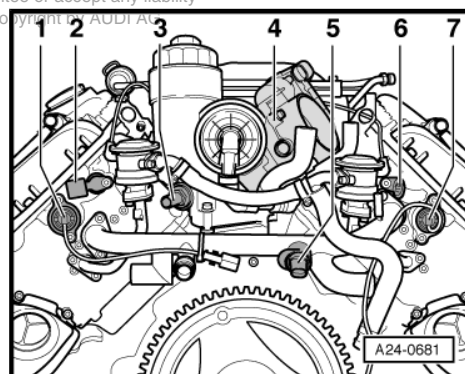
- 1 - Vacuum unit for intake manifold change-over
- 2 - Knock sensor 1 -G61-
- 3 - Knock sensor 2 -G66-
- 4 - Variable intake manifold change-over valve -N156-
- 5 - Secondary air inlet valve -N112-
- 6 - Knock sensor 3 -G198-
- 7 - Knock sensor 4 -G199-



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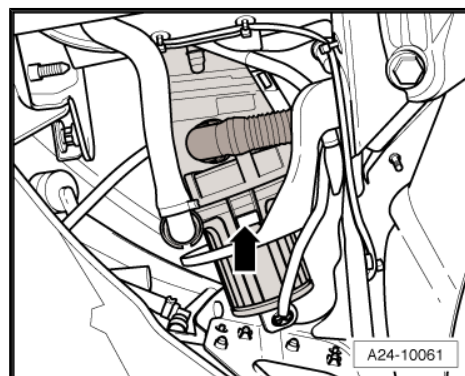
Engine viewed from rear

- 1 - Inlet camshaft control valve 2 -N208-
- 2 - Hall sender 2 -G163- , cylinder bank 2
- 3 - Oil pressure switch -F1-
- 4 - Throttle valve module -J338-
- 5 - Coolant temperature sender -G62-
- 6 - Hall sender -G40- , cylinder bank 1
- 7 - Inlet camshaft control valve 1 -N205-



Secondary air pump motor -V101-

- ◆ At bottom right (as seen in direction of travel)



1.3.2 Air cleaner - exploded view

1 - Breather hose

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

3 - Air cleaner housing (bottom section)

- ☐ Clean any salt residue, leaves and dirt out of air cleaner housing

4 - Rubber grommet

5 - Air duct

- ☐ Check air duct for dirt and leaves

6 - 1.5 Nm

7 - Air duct

- ☐ Check air duct for dirt and leaves

8 - Connection

9 - Air intake hose leading to throttle valve module -J338-

- ☐ With resonator

10 - Cable guide

11 - O-ring

- ☐ Renew

12 - 1.5 Nm

- ☐ Secures air filter element

13 - Air cleaner housing (top section)

- ☐ Clean any salt residue, leaves and dirt out of air cleaner housing

14 - Air duct

- ☐ Clipped into air cleaner housing (top section)

15 - Air filter element

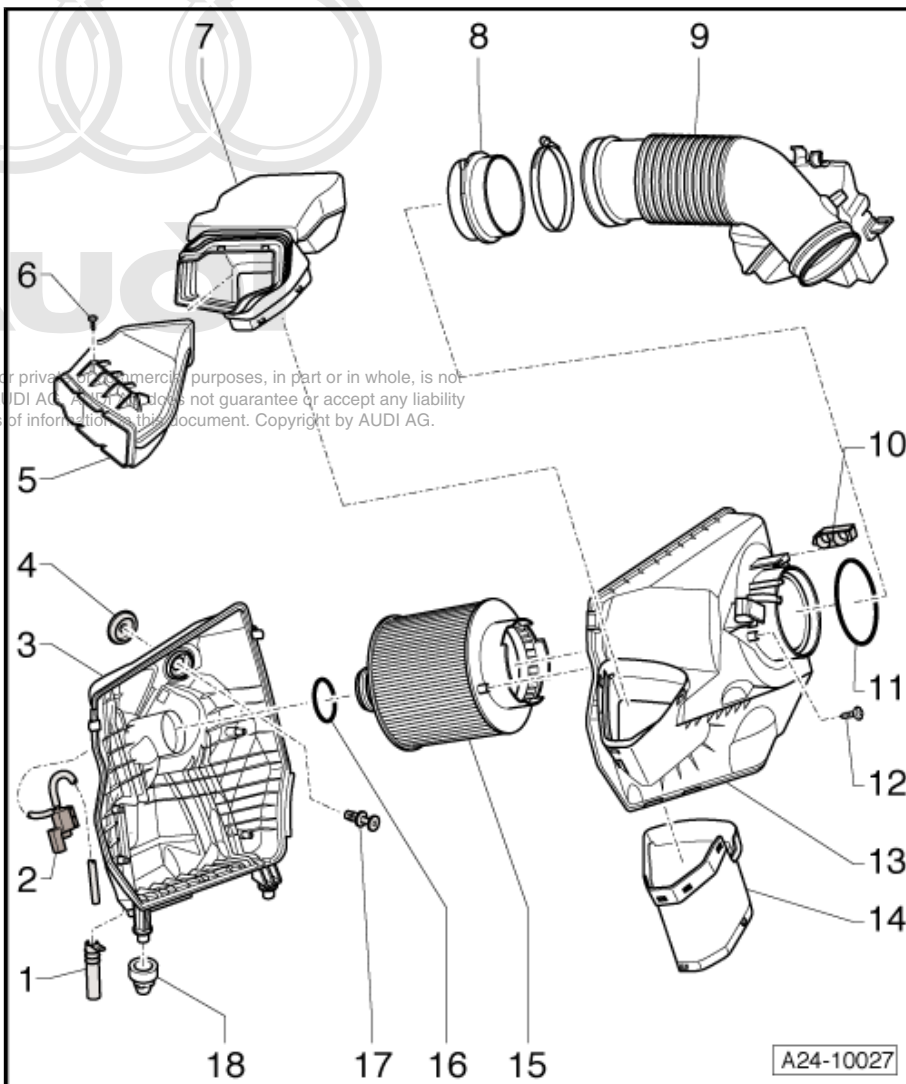
- ☐ Always use genuine part for air filter element

16 - O-ring

- ☐ Renew

17 - Spreader clip

18 - Grommet



1.4 Removing and installing air cleaner

Removing

- Remove bolts -arrow-.



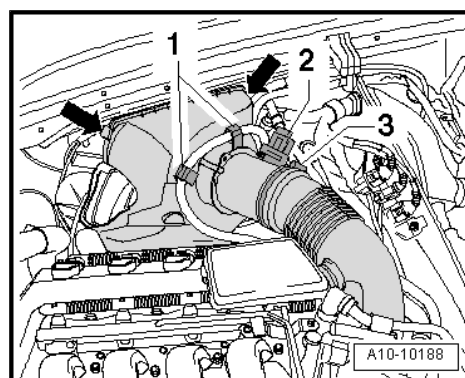
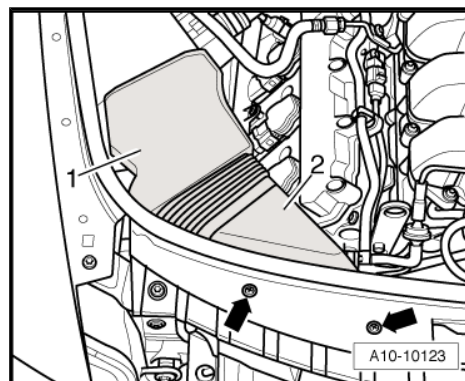
- Remove air ducts -1- and -2-.
- Unclip fuel hose -1-.



Note

On USA vehicles the fuel hose is routed behind air intake hose -3-.

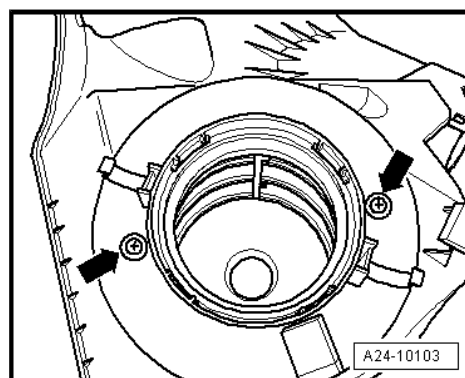
- Unplug electrical connector -2- at air mass meter -G70- .
- Detach air mass meter -G70- from air intake hose -3-.
- Release clamps -arrows- and detach top section of air cleaner housing with air mass meter -G70- .



- Remove 2 securing bolts -arrows- from air filter element.

Removing air cleaner housing (bottom section)

- Detach hose connections on air cleaner housing (bottom section).



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- Pull pin out of fastener -3-.
- Remove air cleaner housing (bottom section) and unplug electrical connector -2- on reverse side from variable intake manifold change-over valve -N335-.

Installing

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



Note

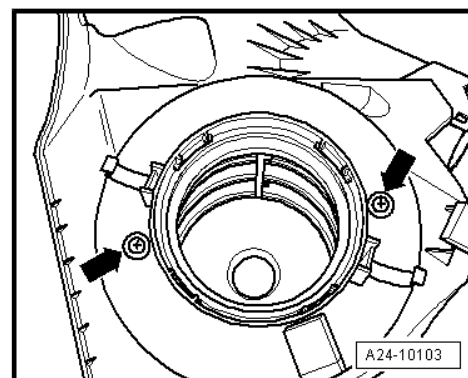
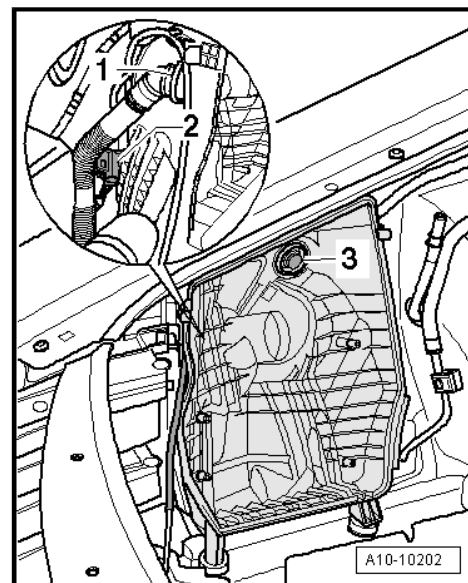
- ◆ *If the air filter element is very dirty or wet, dirt or water could reach the air mass meter -G70- and affect the air mass value. This would lead to loss of power, since a smaller injection quantity is calculated.*

- ◆ *Always use genuine part for air filter element.*

- ◆ *Use a silicone-free lubricant when installing the intake hose.*

- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment): ⇒ Parts catalogue*

- Blow out water drain hose in bottom section of air cleaner 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 in air duct leading to air filter element.
- When installing the air filter element, check that it is properly centred in the retainer in the air cleaner (bottom section).
- Secure air filter element again with two bolts -arrows-.
- Fit the top section of the air cleaner carefully on the bottom section, without using force. Make sure the top section of the air cleaner is fitted straight on the air filter element. Note position of sealing lip on air filter element (to prevent air leaks).
- Then secure top section of air cleaner on bottom section.
- The remaining installation steps are carried out in the reverse sequence.



1.5 Intake manifold - exploded view

1 - Intake manifold

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

2 - O-rings

- ☐ For injectors
- ☐ Renew

3 - 10 Nm

4 - Fuel supply pipe

- ☐ Tighten union nut to 25 Nm

5 - Fuel rail

6 - Pressure control valve

- ☐ For crankcase breather

7 - 10 Nm

- ☐ Tighten in stages and in diagonal sequence

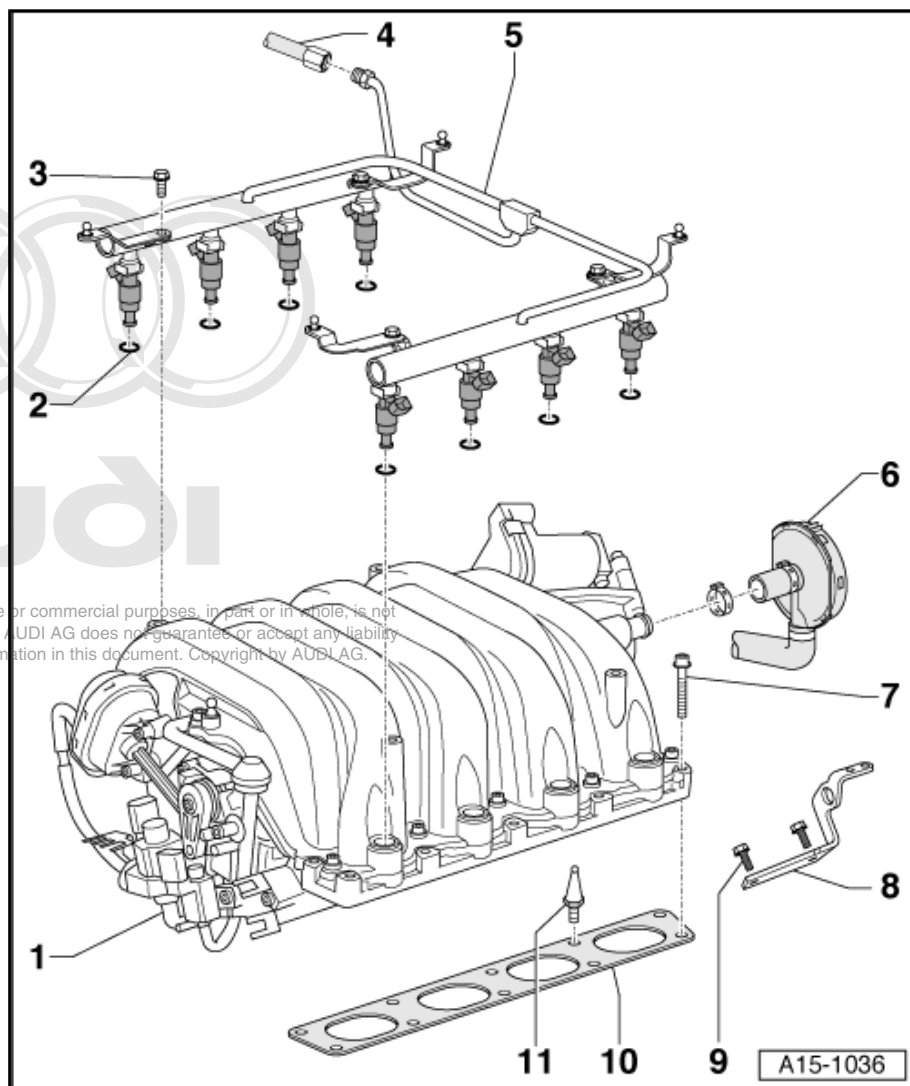
8 - Lifting eye

9 - 23 Nm

10 - Gasket

- ☐ For intake manifold
- ☐ Renew

11 - Locking pin, 0.6 Nm



1.6 Removing and installing intake manifold

Removing

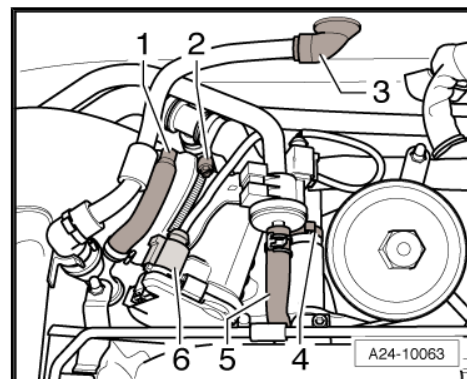


Note

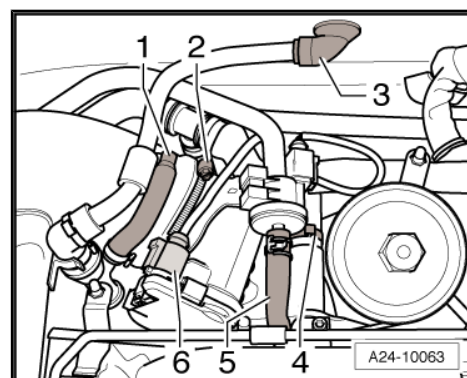
All cable ties which are released or cut open when removing must be refitted in the same position when installing.

- Pull off engine cover panels (front and rear).
- Disconnect vacuum hose -3- leading to brake servo at bulk-head.

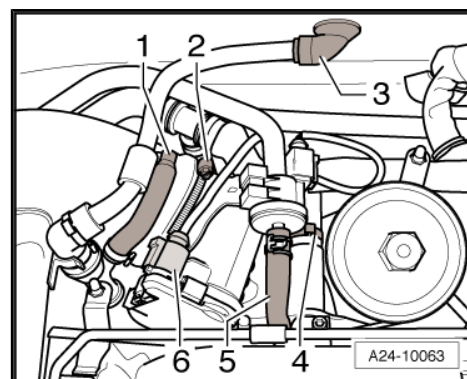
- Detach vacuum hose -1-.
- Unplug electrical connector -6- at throttle valve module - J338- .



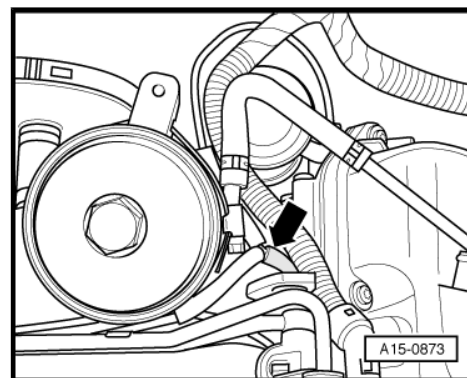
- Open hose clip -2- and pull out air intake hose.
- Disconnect vacuum hose -4- for crankcase breather system at intake manifold.



- Detach vacuum hose -5- at intake manifold.



- Detach vacuum hose -arrow- from T-piece.



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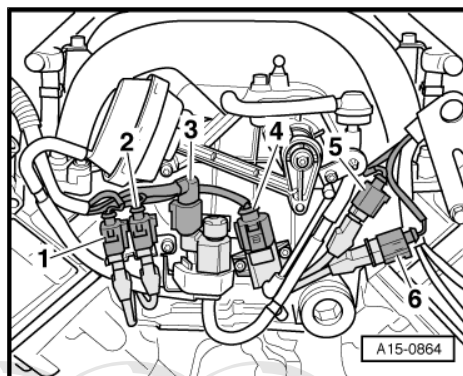
- Pull electrical connectors -1 to 4- forwards out of brackets on intake manifold.



Note

Do not unplug electrical connectors.

- Unplug connector rails -2- and -3- at 8 injectors.
- Remove resonance chamber -1-.

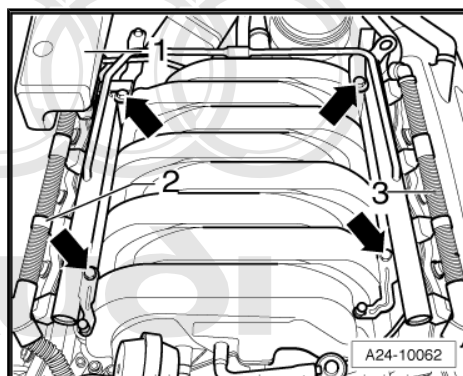


- Unscrew securing bolts -arrows- for fuel rail.
- Pull fuel rail together with injectors off intake manifold (pull off evenly from the top) and place it on a clean cloth in the engine compartment.

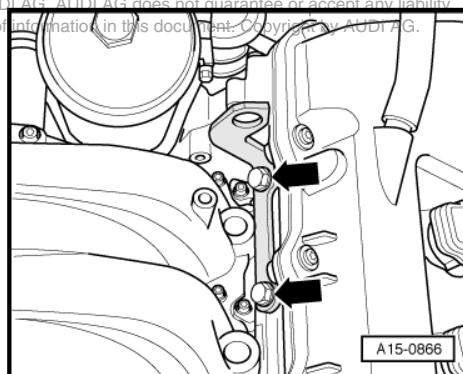


Note

Make sure the removed injectors do not become soiled.



- Unscrew engine lifting eye (rear left) -arrows-



- Unscrew and remove intake manifold -arrows-.



Note

Seal intake ports on cylinder heads with clean cloths.

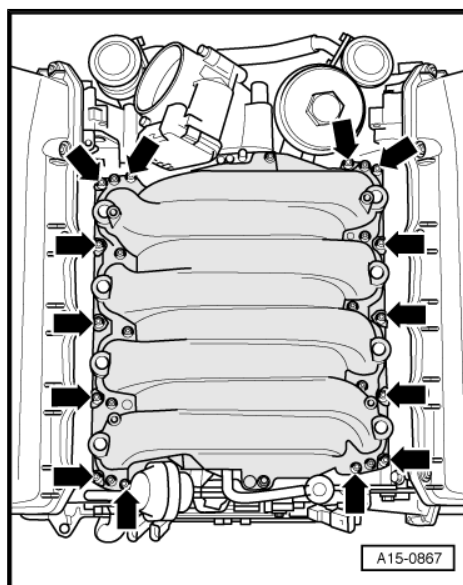
Installing

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

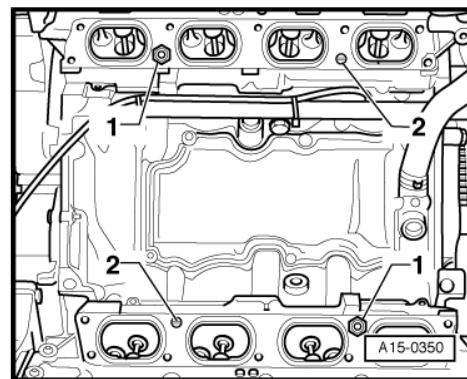


Note

- ◆ Renew gaskets, seals and O-rings.
- ◆ Reinstall all cable ties in the same locations when assembling.
- ◆ Secure all hose connections with the correct type of hose clips (same as original equipment): ⇒ Parts catalogue



- Remove securing bolts -1- to renew gaskets for intake manifold.
- Observe locating pins -2- when fitting intake manifold.

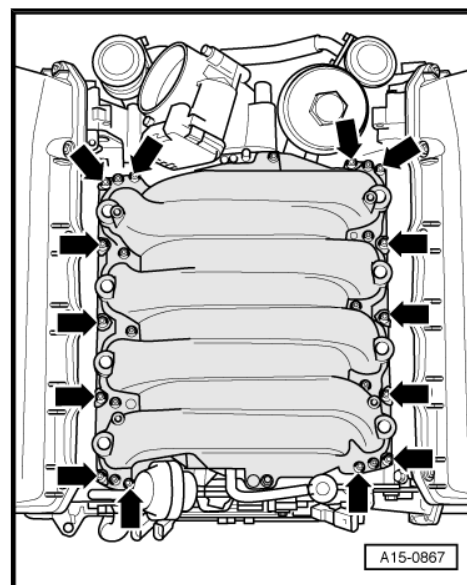


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- Tighten bolts on intake manifold in stages and in diagonal sequence -arrows-.
- Reconnect all vacuum hoses.
- Ensure secure fit of electrical connections.
- Bleed the fuel system ⇒ [page 13](#) .

Tightening torque

Component	Nm
Securing bolt to cylinder head	0.6
Intake manifold to cylinder head	10
Engine lifting eye to cylinder head	22
Fuel rail to intake manifold	10



1.7 Bleeding fuel system

- 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.

- Start engine and let it run at moderate speed for several minutes and then switch off.
- Check fuel system for leaks.
- Interrogate fault memory and erase, if necessary.



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.

- After completing the repair, road-test the vehicle. Accelerate with full throttle at least once. Then inspect fuel system for leaks again.
- After road test interrogate the fault memory again.

1.8 Checking fuel pressure regulator and residual pressure



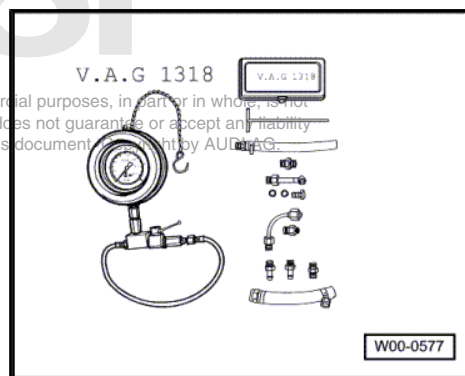
Note

The fuel pressure regulator is located in the fuel filter below the fuel tank.

Special tools and workshop equipment required

- ♦ K-Jetronic tester -V.A.G 1318- with -V.A.G 1318/6- and -V.A.G 1318/7-

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Test conditions

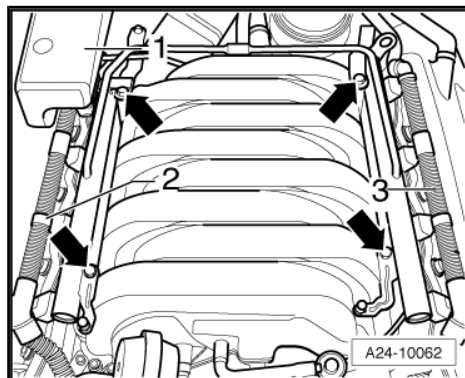
- Fuel pump relay OK
- Fuel pump OK
- Fuel filter OK
- Battery voltage at least 11 V
- Vehicles with automatic gearbox: selector lever in position P or N
- Briefly open the fuel tank filler cap (to release pressure).
- Remove engine cover panel.
- Remove resonance chamber -1-.



WARNING

The fuel system is pressurised. Before loosening hose connections or opening the test connection (to measure fuel pressure), place a cloth around the connection. Then release pressure by carefully unscrewing the connection.

- Cover pressurised union (fuel supply) with a cloth.



- Open the union -arrow- and catch escaping fuel with a cloth.

 Note

The routing of the fuel line is different on USA vehicles.

- Connect K-Jetronic tester -V.A.G 1318- with adapters - V.A.G 1318/6- and 1318/7 between supply pipe and fuel rail.

 Note

Cut-off valve on K-Jetronic tester -V.A.G 1318- must be installed on the side leading to fuel tank (fuel supply line).

- Open cut-off valve on pressure tester. Lever must point in direction of flow.
- Start the engine and run at idling speed.

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Measure the fuel pressure.
Specification: approx. 4 bar

- Switch off ignition.
- Check for leaks and check residual pressure by watching the drop in pressure on the pressure gauge.

After 10 minutes pressure should still be at least 2.5 bar.

If the residual pressure drops below 2.5 bar:

- Start the engine and run at idling speed.
- Allow pressure to build up, then switch off ignition. Simultaneously close the cut-off valve of the K-Jetronic pressure gauge -V.A.G 1318- (lever perpendicular to direction of flow).
- Observe pressure drop on pressure gauge.

If the pressure drops again:

- ◆ Union between pressure gauge and fuel supply pipe leaking
- ◆ Test pressure gauge for leaks.
- ◆ Check pipe connections, O-rings on fuel rail and injectors for leaks.

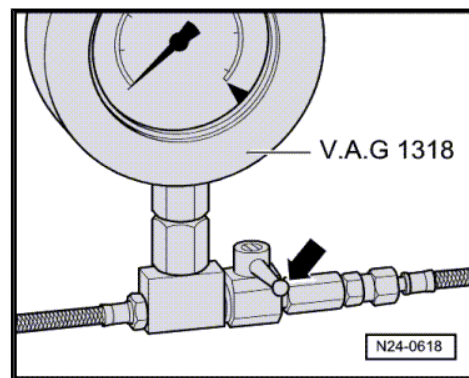
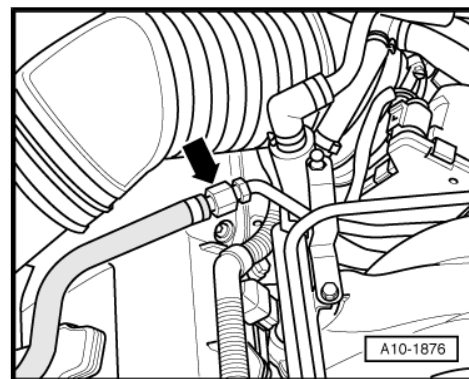
If the pressure does not drop:

- ◆ Replace fuel filter ⇒ Fuel supply system, petrol engines; Repair group 20
- ◆ Check non-return valve of fuel pump ⇒ Fuel supply system, petrol engine; Repair group 20 .

1.9 Checking injection quantity and spray pattern of injectors; checking for leaks

Test conditions

- Fuel pressure OK



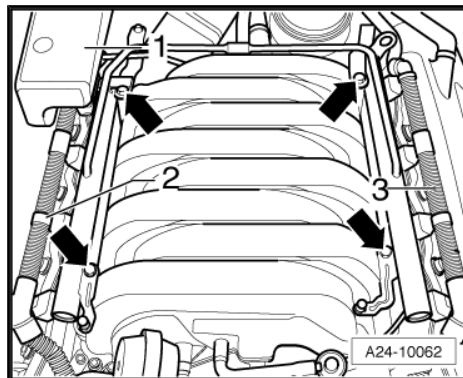
Removing and installing fuel rail



WARNING

The fuel system is pressurised. Before loosening hose connections or opening the test connection (to measure fuel pressure), place a cloth around the connection. Then release pressure by carefully unscrewing the connection.

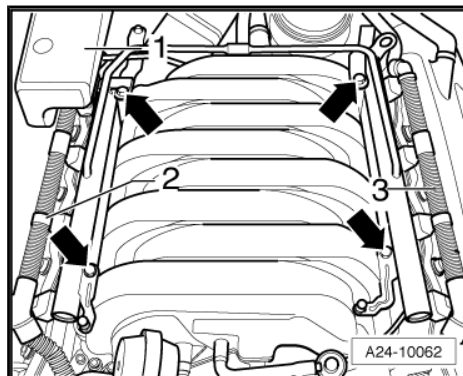
- Remove engine cover.
- Unplug electrical connectors from injectors.
- Remove resonance chamber -1-.
- Cover pressurised union (fuel supply) with a cloth.
- Open the union -arrow- and catch escaping fuel with a cloth.



- Unbolt fuel rail from intake manifold -arrows- and lift it off intake manifold together with injectors.

Installation of the fuel rail together with injectors is performed in the reverse sequence. The following points should be noted when installing:

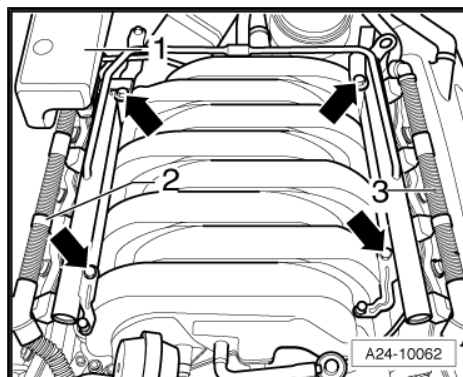
- Renew the O-rings at all opened connections. (When renewing the front O-ring, ensure that the plastic cap is never removed from the injector head. The O-ring must be pulled off over the plastic cap).
- Lubricate the O-rings with clean engine oil.
- Make sure retaining clips are properly connected.
- Bolt fuel rail to intake manifold (tightening torque: 10 Nm).



1.9.1 Checking injectors for leaks

- Remove engine cover.
- Unplug electrical connectors from injectors.
- Remove resonance chamber -1-.
- Unbolt fuel rail from intake manifold -arrows- and lift it off intake manifold together with injectors.

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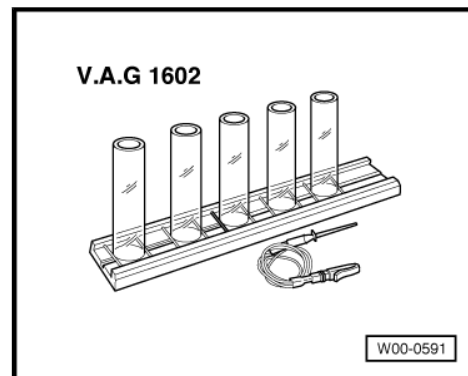
- Place the injector which is to be tested into measuring glass of injection rate tester -V.A.G 1602- .
- Connect test box -V.A.G 1598/31- to wiring harness for engine control unit. Do not connect engine control unit ⇒ [page 19](#) .
- Bridge contacts 1 and 65 on the test box using test leads from auxiliary measuring set -V.A.G 1594 C- . (This creates an earth connection to one side of the fuel pump relay coil.)
- Switch on ignition.



Note

Once the ignition has been switched on the fuel pump runs continuously, even if the engine is not running. This is because the fuel pump relay receives a positive voltage supply via the central electrics when the ignition is switched on. The earth connection for the fuel pump relay is set up via the test lead bridge connection in the test box.

- Visually check the fuel injectors for leaks. When the fuel pump is running, no more than 1 to 2 drops a minute should escape from any one of the injectors.
- If the fuel loss is greater, switch off the fuel pump (turn off ignition) and renew the faulty injector.



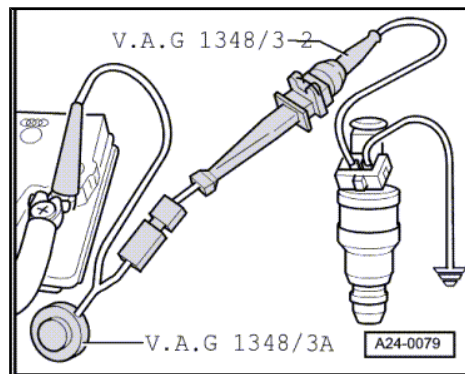
1.9.2 Checking injection quantity

- Place the injector which is to be tested into measuring glass of injection rate tester -V.A.G 1602- .



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- Connect one of the injector contacts to engine earth using test lead and crocodile clamp from auxiliary measuring set -V.A.G 1594 C- .
- Connect second injector contact to positive using remote control -V.A.G 1348/3 A- , adapter lead -V.A.G 1348/3 - 2- and auxiliary lead.
- Use leads from adapter set -V.A.G 1594 C- to bridge contacts 1 and 65 at test box.
- Switch on ignition.
- ◆ The fuel pump should run.
- Activate remote control -V.A.G 1348/3 A- for 30 seconds.
- Perform measurements on all injectors.
- Once all four injectors have been actuated, place measuring glasses on a level surface.



Specification: 105..125 ml for each injector

If none of the injectors delivers the specified quantity:

- Check fuel pressure ⇒ [page 14](#) .

If only one injector fails to deliver the specified quantity:

- Renew the defective injector.



Note

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When checking the injection quantity, also check the spray pattern. The spray pattern should be the same for all injectors.

Installation of the fuel rail together with injectors is performed in the reverse sequence. The following points should be noted when installing:

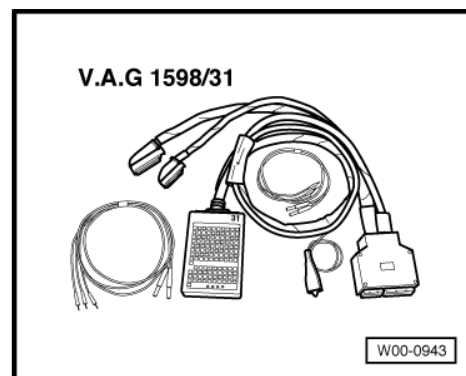
- Renew the O-rings at all opened connections. (When renewing the front O-ring, ensure that the plastic cap is never removed from the injector head. The O-ring must be pulled off over the plastic cap).
- Lubricate the O-rings with clean engine oil.
- Make sure retaining clips are properly connected.
- Bolt fuel rail to intake manifold (tightening torque: 10 Nm).

1.10 Wiring and component check with adapter lead, 121-pin -V.A.G 1598/31- (test box)



Note

- ◆ The test box -V.A.G 1598/31- is designed so that it can be connected both to the wiring harness for the engine control unit and to the engine control unit itself at the same time.
- ◆ The advantage of this is that the electronic engine control system remains fully functional when the test box is connected (for example, for measuring signals when the engine is running).
- ◆ The relevant test procedure will state whether it is necessary to also connect the engine control unit to the test box.
- ◆ To connect the testers to test box -V.A.G 1598/31-, always use the adapter leads from adapter set -V.A.G 1594 C-.

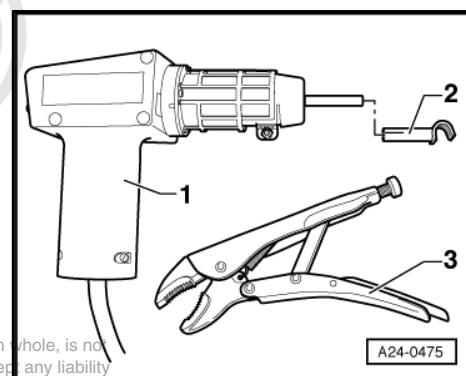


WARNING

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

Special tools and workshop equipment required

- ◆ Hot air blower -1- from the wiring harness repair set -VAS 1978-
- ◆ Nozzle attachment -2- from the wiring harness repair set -VAS 1978-
- ◆ Small, commercially available vice grip pliers (mole grip)



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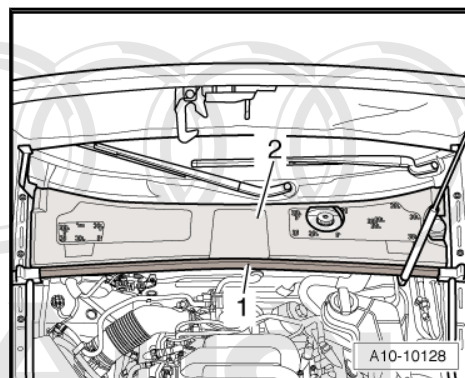
WARNING

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

Procedure

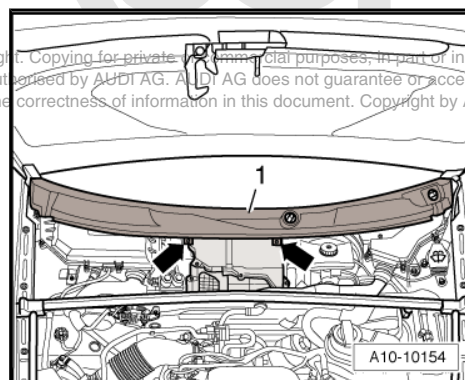
- Switch off ignition.

- Pull off rubber seal -1- on plenum chamber cover.
- Detach plenum chamber cover -2-.
- Use screwdriver to pry off cover caps on wiper arms and unscrew hexagon nuts.
- Pull wiper arms off wiper shafts.



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

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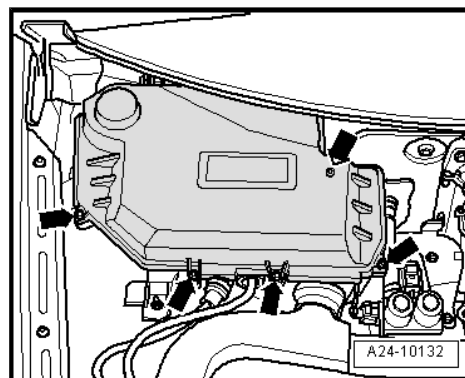


- Unscrew bolts -arrows- and take off cover for electronics box.



WARNING

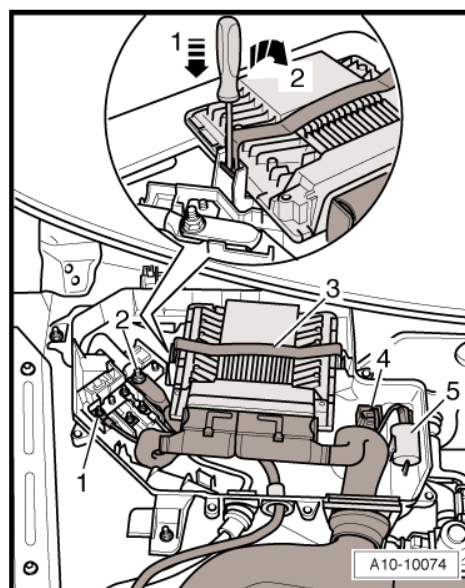
The pump valve unit for heating system (left in front of electronics box) gets very hot - risk of burns!



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

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

The threads of the two shear bolts -1- which are not screwed into the engine control unit are secured with locking fluid. To unscrew these bolts, the threads must therefore be heated with the hot-air blower.



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

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



WARNING

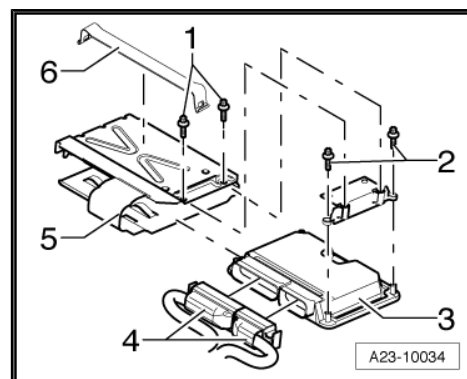
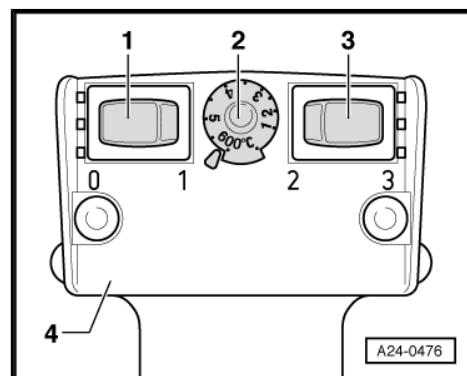
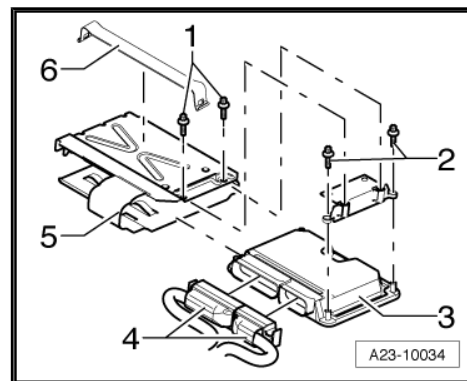
Heating the thread of the locking plate also heats up the shear bolts and parts of the metal housing. Take care to avoid burns. It is also important to ensure that only the thread is heated and none of the surrounding components if at all possible. These should be covered if necessary.

- Apply heat to the threads of the shear bolts -1- for approx. 25 to 30 seconds.
- Unscrew shear bolts using vice-grip pliers.
- The two shear bolts screwed into the control unit do not need to be heated. They can be removed without heating.
- Detach metal locking plate from control unit connectors.
- Release connectors on engine control unit and unplug connectors.
- Connect adapter cable, 121-pin -V.A.G 1598/31- to wiring harness connector. The earth clip on the test box must be connected to the negative battery terminal. The instructions for performing the individual tests indicate whether or not the engine control unit itself also needs to be connected to the test box.
- Carry out test as described in appropriate repair procedures.

Installing engine control unit -J623-

Installation is performed in the reverse sequence.

- Make sure you fit metal casing back on engine control unit.
- Always use new shear bolts.
- Clean threaded holes for new shear bolts to remove any residue from locking fluid. This can be done using a thread tap.
- Interrogate and, if necessary, erase fault memory. ⇒ Vehicle diagnostic, testing and information system VAS 5051



1.11 Renewing engine control unit -J623-

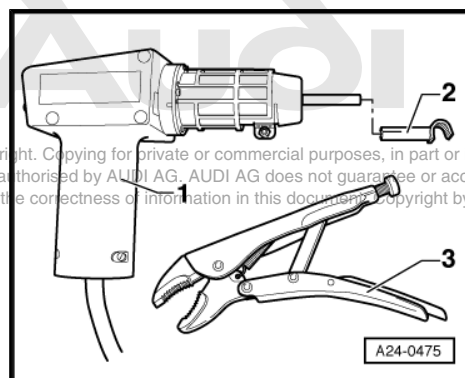


Note

When the engine control unit is disconnected, the learnt values are erased but the contents of the fault memory remain intact.

Special tools and workshop equipment required

- ◆ Hot air blower -1- from the wiring harness repair set -VAS 1978-
- ◆ Nozzle attachment -2- from the wiring harness repair set -VAS 1978-
- ◆ Small, commercially available vice grip pliers (mole grip)



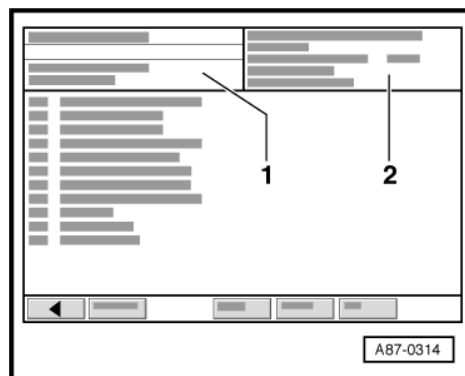
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Removing

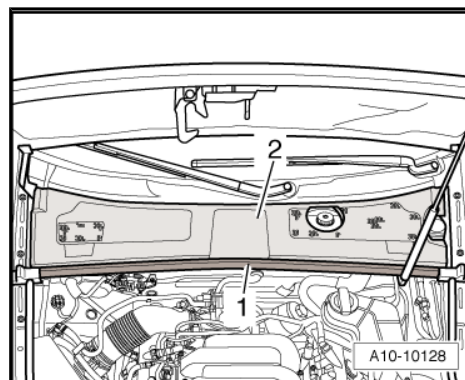
- Connect vehicle diagnostic, testing and information system -VAS 5051 A- and select vehicle system "01 - Engine electronics" from list. When doing this, the ignition must be switched on.

The display on vehicle diagnostic, testing and information system -VAS 5051 A- will show the control unit identification and the coding -2-.

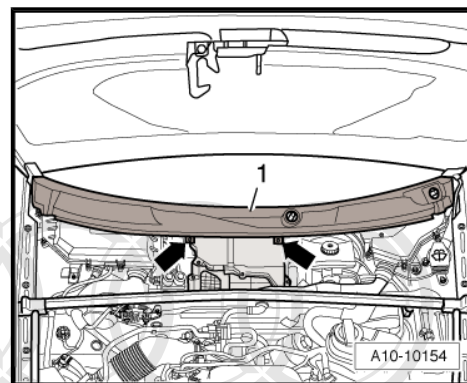
- Always start by displaying the control unit identification and printing it out.
- Switch off ignition.
- Pull off rubber seal -1- on plenum chamber cover.



- Detach plenum chamber cover -2-.
- Use screwdriver to pry off cover caps on wiper arms and unscrew hexagon nuts.
- Pull wiper arms off wiper shafts.



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



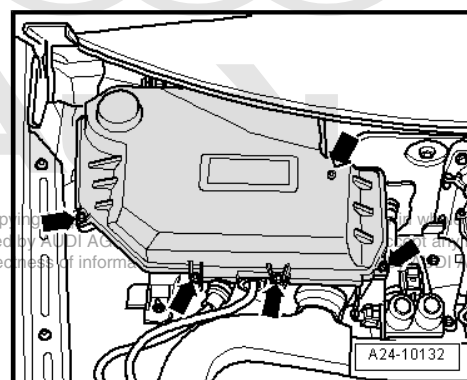
- Unscrew bolts -arrows- and take off cover for electronics box.



WARNING

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

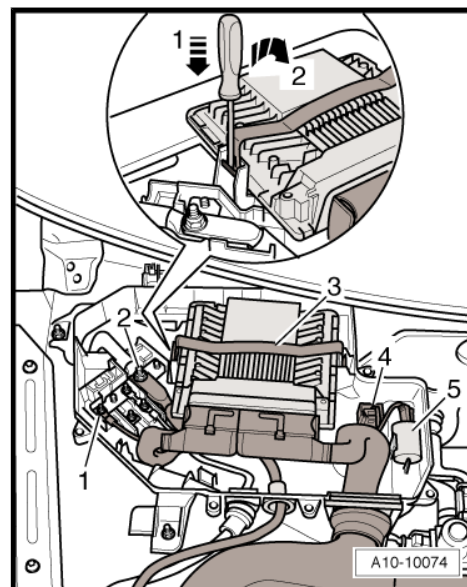
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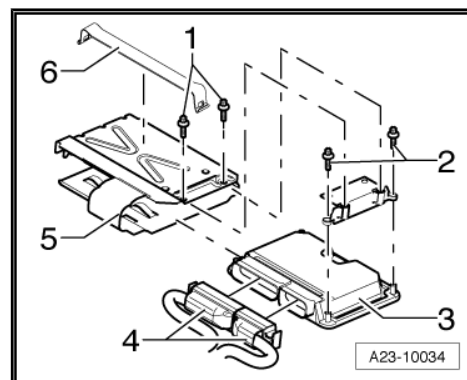
- Carefully lever out the retaining strap -3- using a screwdriver -arrows 1 and 2- and remove the engine control unit from the electronics box.

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

The threads of the two shear bolts -1- which are not screwed into the engine control unit are secured with locking fluid. To unscrew these bolts, the threads must therefore be heated with the hot-air blower.



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



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



WARNING

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

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

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

Installing

Installation is performed in the reverse sequence.

- Make sure you fit metal casing back on engine control unit.
- Always use new shear bolts.
- Clean threaded holes for new shear bolts to remove any residue from locking fluid. This can be done using a thread tap.

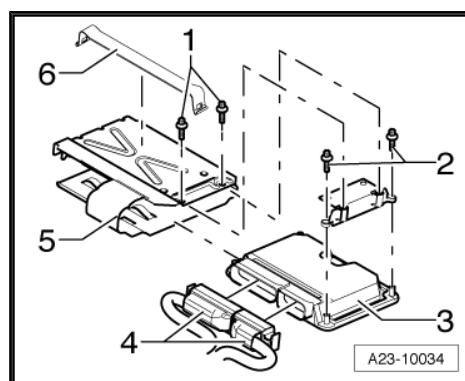
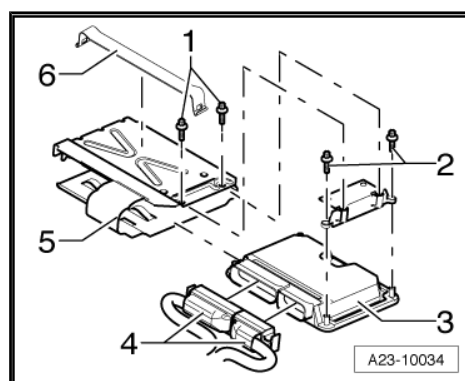
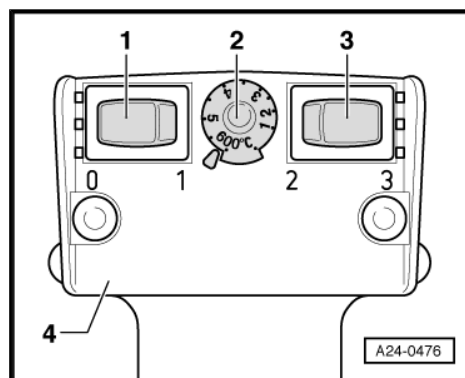
The procedure required after connecting the new engine control unit is described in the Guided fault-finding or Guided functions.

- Enter correct vehicle identification in Guided Fault-Finding.
- Press “Go to” button.
- Press “Function/component selection”.
- Select “Drive train”.
- Select “Engine code letters”.
- 01 - Self-diagnosis compatible systems
- “Motronic injection and ignition system”
- Select “Functions, engine”.
- Select “Renewing engine control unit”.

1.12 Removing and installing air mass meter

Removing

- Unplug electrical connector from air mass meter -G70- -2-.



- Release hose clip -3- and clamps on air mass meter -G70- and pull out air mass meter -G70- .

Installing

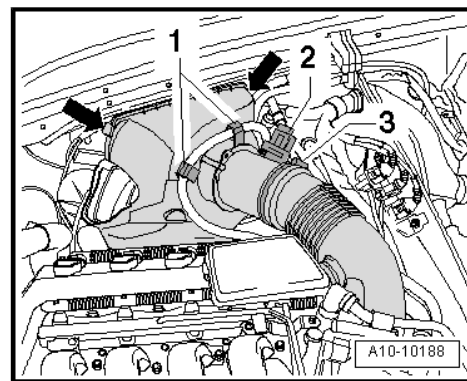
To ensure the proper function of the air mass meter -G70- it is important to observe the following notes and instructions.



Note

- ◆ *If the air filter element is very dirty or wet, dirt or water could reach the air mass meter -G70- and affect the air mass value. This would lead to loss of power, since a smaller injection quantity is calculated.*
- ◆ *Always use genuine part for air filter element.*
- ◆ *Use a silicone-free lubricant when installing the 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. If necessary, clean salt residue, dirt and leaves out of air cleaner housing (top and bottom sections); wash out or use a vacuum cleaner as required. Removing and installing air cleaner ⇒ [page 7](#)
- If air cleaner element has been removed, blow out water drain in bottom section of air cleaner with compressed air.

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

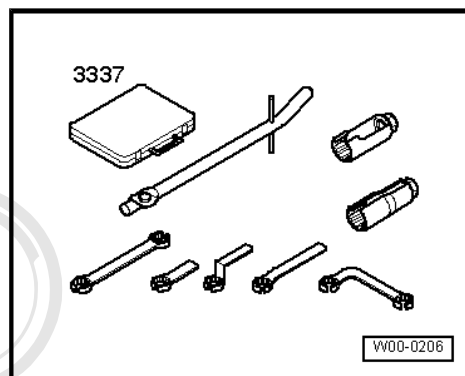


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2 Removing and installing Lambda probes

Special tools and workshop equipment required

- ♦ Lambda probe open ring spanner set -3337-



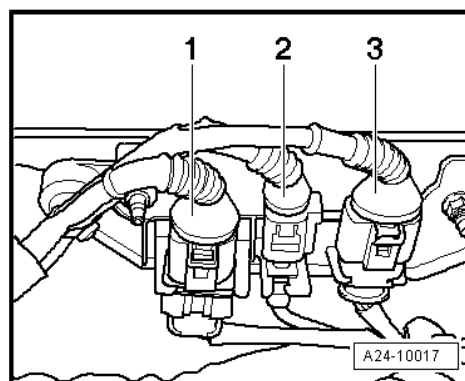
Removing and installing Lambda probe -G39- before catalytic converter - bank 1 (right-side)



Note

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

- Pull off engine cover panel.
- Remove air mass meter with air intake hose between air cleaner and throttle valve module -J338- .
- Unplug electrical connector -1-.
- Move Lambda probe wiring clear up to Lambda probe.
- Unscrew Lambda probe between engine and bulkhead using tool from Lambda probe open ring spanner set -3337- .



 Note

Illustration shows engine removed.

Installing

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

 Note

- ◆ *The thread on the Lambda probe is coated with assembly paste. This paste must not be allowed to penetrate the openings on the probe.*
- ◆ *In the case of a used Lambda probe only grease the thread with high-temperature paste. This paste must not be allowed to penetrate the openings on the probe; high-temperature paste ⇒ Parts catalogue .*
- ◆ *When installing, all cable ties must always be reattached at the same location to prevent them from coming into contact with the exhaust pipe.*

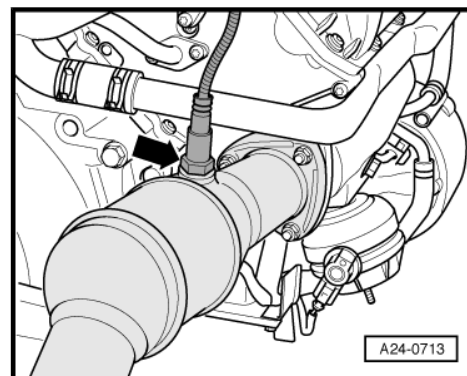
Tightening torque

Component	Nm
Lambda probe	55

Removing and installing Lambda probe 2 -G108- before catalytic converter - bank 2 (left-side)

Special tools and workshop equipment required

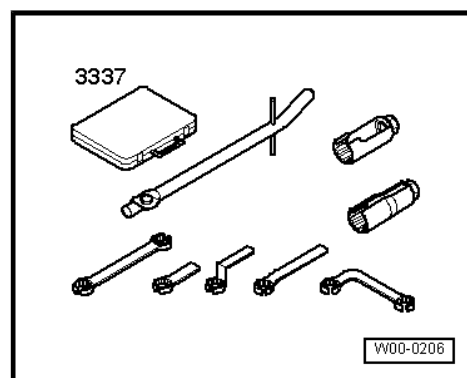
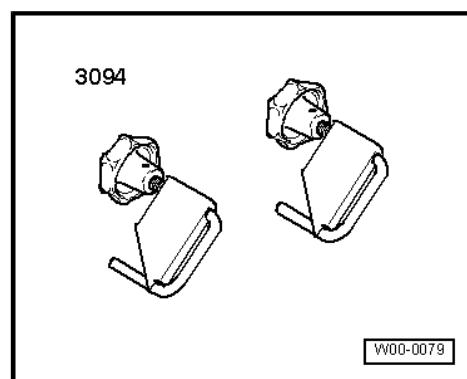
- ◆ Hose clamps for hoses up to 25 mm Ø -3094-



Audi

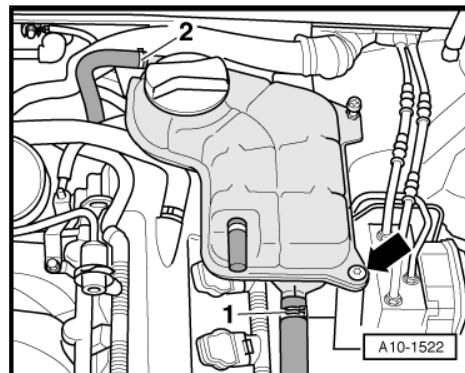
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- ◆ Lambda probe open ring spanner set -3337-

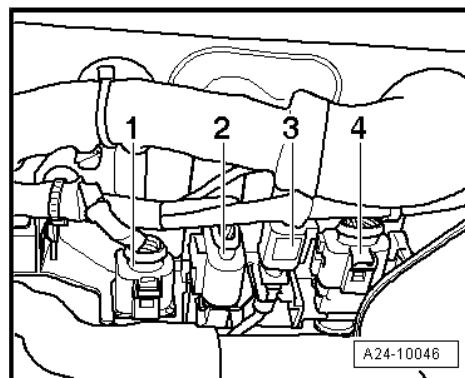


Removing

- Pull off engine cover panel.
- Clamp off coolant hose -2- using hose clamp (up to Ø 25 mm) -3094- and disconnect coolant hose.
- Seal off connection with a suitable plug if necessary.
- Unbolt coolant expansion tank -arrow-.
- Unplug electrical wire for coolant shortage indicator switch - F66- at expansion tank (bottom) and move expansion tank to one side (coolant hose -1- remains attached).



- Unplug electrical connector -1-.
- Remove bracket for 4 electrical connectors on bulkhead (to facilitate removal and installation of Lambda probe).
- Move Lambda probe wiring clear up to Lambda probe.
- Unscrew Lambda probe between engine and bulkhead using tool from Lambda probe open ring spanner set -3337- .



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 Note

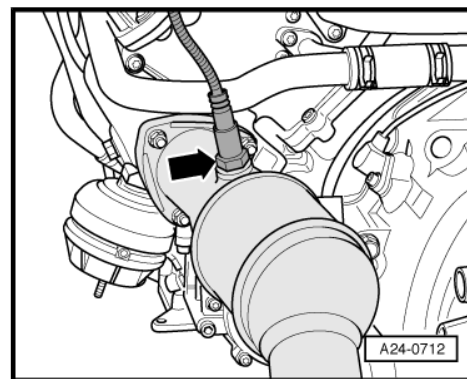
Illustration shows engine removed.

Installing

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

 Note

- ◆ *The thread on the Lambda probe is coated with assembly paste. This paste must not be allowed to penetrate the openings on the probe.*
- ◆ *In the case of a used Lambda probe only grease the thread with high-temperature paste. This paste must not be allowed to penetrate the openings on the probe; high-temperature paste ⇒ Parts catalogue .*
- ◆ *When installing, all cable ties must always be reattached at the same location to prevent them from coming into contact with the exhaust pipe.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment): ⇒ Parts catalogue*



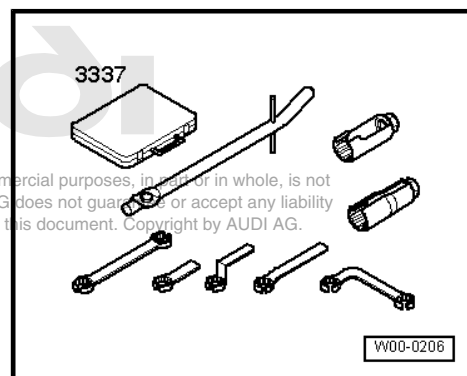
Tightening torque

Component	Nm
Lambda probe	55

2.1 Removing and installing Lambda probe after catalytic converter -G130- - bank 1 (right-side)

Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set -3337-



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Removing

 Note

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

- Pull off engine cover panel.
- Remove air intake hose with air mass meter and move to one side.

- Unplug electrical connector -3-.
- Move Lambda probe wiring clear up to Lambda probe.
- Remove noise insulation.
- Remove front right exhaust pipe ⇒ Rep. Gr. 26 .
- Unscrew Lambda probe using tool from Lambda probe open ring spanner set -3337- .

Installing

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



Note

- ◆ *The thread on the Lambda probe is coated with assembly paste. This paste must not be allowed to penetrate the openings on the probe.*
- ◆ *In the case of a used Lambda probe only grease the thread with high-temperature paste. This paste must not be allowed to penetrate the openings on the probe; high-temperature paste ⇒ Parts catalogue .*
- ◆ *When installing, all cable ties and the clip at gearbox must always be reattached at the same locations to prevent probe wire from coming into contact with exhaust pipe.*

- Align exhaust system so it is free of stress ⇒ Rep. Gr. 26

Tightening torques

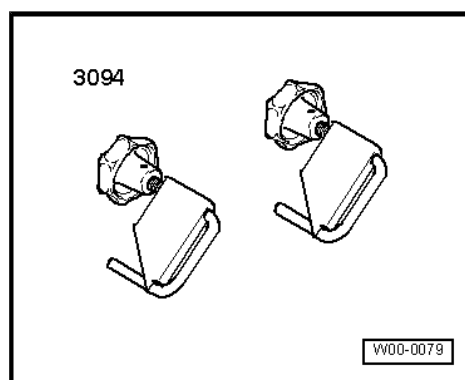
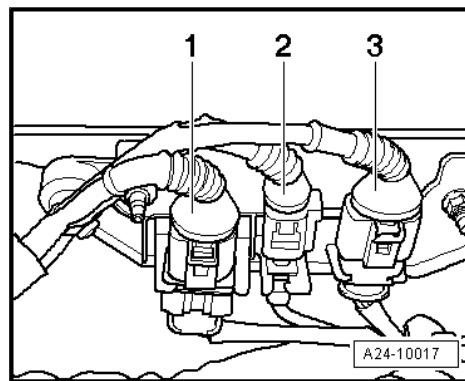
Component	Nm
Lambda probe to catalytic converter	55

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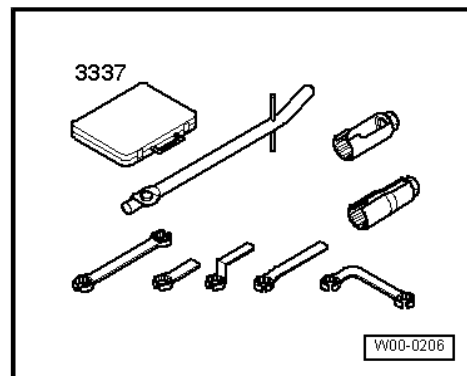
2.2 Removing and installing Lambda probe 2 after catalytic converter -G131- - bank 2 (left-side)

Special tools and workshop equipment required

- ◆ Hose clamps for hoses up to 25 mm Ø -3094-



◆ Lambda probe open ring spanner set -3337-



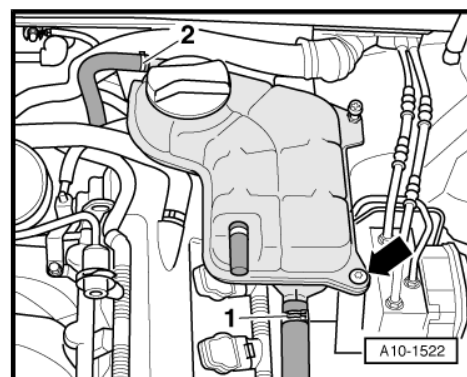
Removing



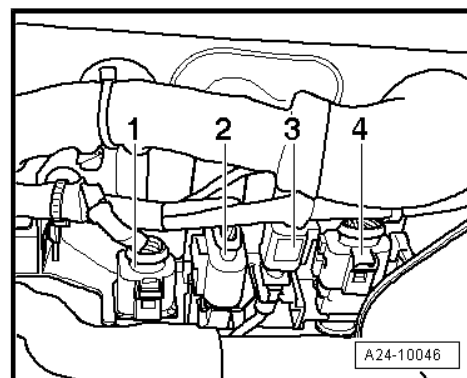
Note

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

- Pull off engine cover panel.
- Clamp off coolant hose -2- using hose clamps (up to Ø 25 mm) -3094- and disconnect coolant hose.
- Plug connection with a suitable plug if necessary.
- Unbolt coolant expansion tank -arrow-.
- Unplug electrical wire for coolant shortage indicator switch - F66- at expansion tank (bottom) and move expansion tank to one side (coolant hose -1- remains attached).



- **Unplug electrical connector -4-**
- **Remove bracket for 4 electrical connectors at bulkhead (to facilitate removal and installation of Lambda probe).**
- Move Lambda probe wiring clear up to Lambda probe.
- Remove rear noise insulation.



- Unscrew Lambda probe using tool -3337/5- and extension -3337/6- from Lambda probe open ring spanner set -3337- .

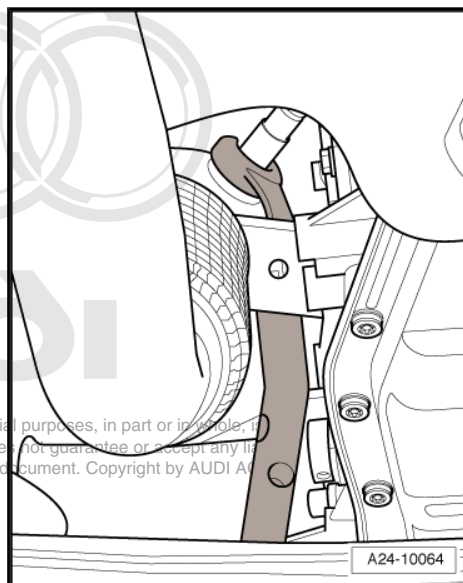
Installing

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



Note

- ◆ *The thread on the Lambda probe is coated with assembly paste. This paste must not be allowed to penetrate the openings on the probe.*
- ◆ *In the case of a used Lambda probe only grease the thread with high-temperature paste. This paste must not be allowed to penetrate the openings on the probe; high-temperature paste ⇒ Parts catalogue .*
- ◆ *When installing, all cable ties and the clip at gearbox must always be reattached at the same locations to prevent probe wire from coming into contact with exhaust pipe.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment): ⇒ Parts catalogue*



Tightening torques

Component	Nm
Lambda probe	55

28 – Ignition system

1 Checking ignition system

1.1 General notes on ignition system

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

To avoid any risk of injuries to persons and/or damage to the fuel injection and ignition system, always observe the following safety precautions.

- ◆ Do not touch or disconnect ignition wiring when the engine is running or being turned at starter speed.
- ◆ Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.
- ◆ The ignition must be switched off before connecting or disconnecting injection or ignition system wiring or tester cables.
- ◆ To operate the engine at starting speed without actually starting it (for example, in order to test compression), unplug the connectors from the output stages for the ignition coils and also the connectors on the injectors. After completing the work, interrogate and erase the fault memory.
- ◆ Always switch off the ignition before cleaning the engine.

1.3 Technical data

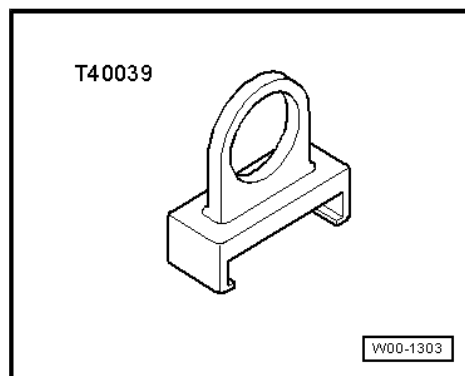
Engine data	4.2 ltr. / 235 kW engine)
Idling speed	650 ... 750 rpm ¹⁾
Ignition timing Not adjustable (determined by control unit)	
Ignition system	Multi-coil system with 6 ignition coils (output stages integrated) connected directly to spark plugs via spark plug connectors
Removing and installing spark plugs ⇒ Maintenance ; Booklet 405	Tightening torque 30 Nm
Firing order	1-5-3-6-2-4

1) Not adjustable

2 Removing and installing ignition coils

Special tools and workshop equipment required

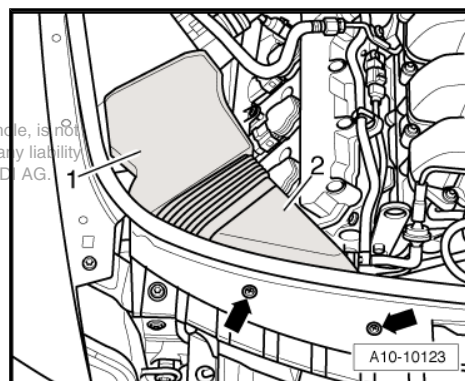
- ◆ Puller -T40039-



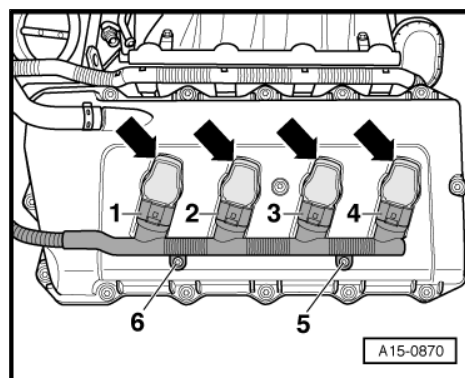
Removing (cylinder 1):

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

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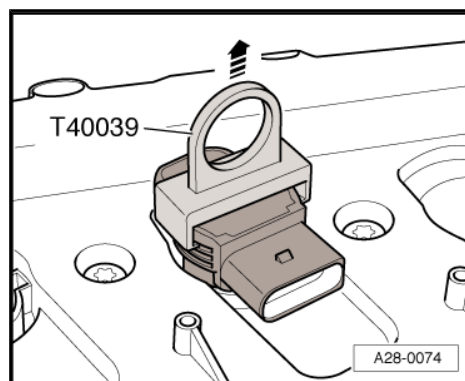


- Unscrew bolts -5 and 6- and unplug electrical connectors at ignition coils.

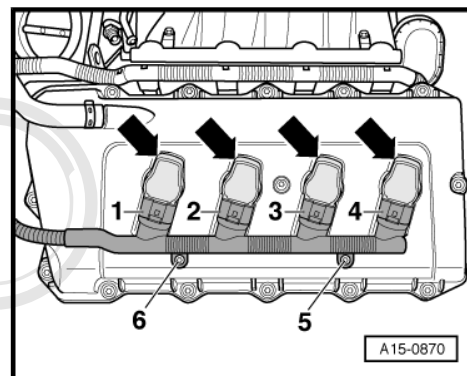


- Pull ignition coil (cylinder 1) out with puller -T40039- .

Removing (cylinders 2 and 3):



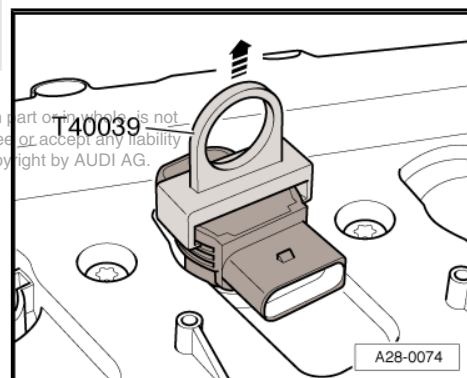
- Unscrew bolts -5 and 6- and unplug electrical connectors at ignition coils.



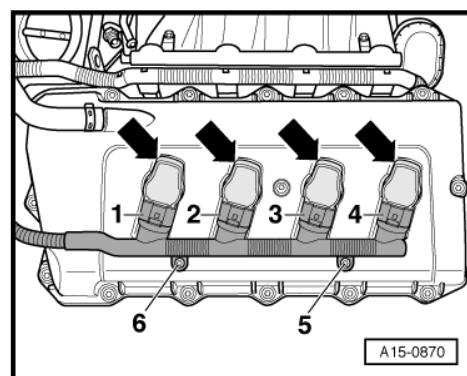
- Pull ignition coils (cylinders 2 and 3) out with puller -T40039- .

Removing (cylinder 4):

- Remove air intake hose from between air cleaner and throttle valve module -J338-.

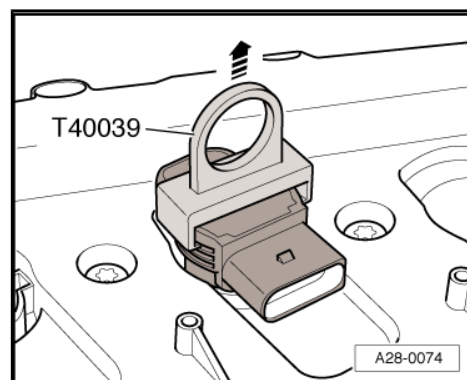


- Unscrew bolts -5 and 6- and unplug electrical connectors at ignition coils.

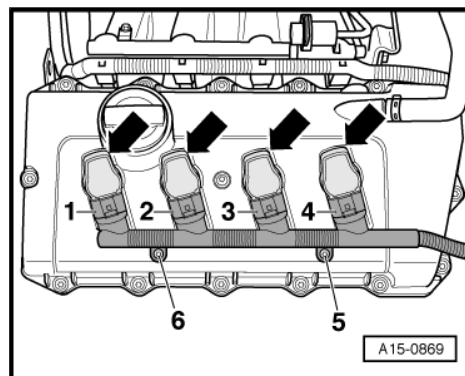


- Pull ignition coil (cylinder 4) out with puller -T40039- .

Removing (cylinders 5 and 6):

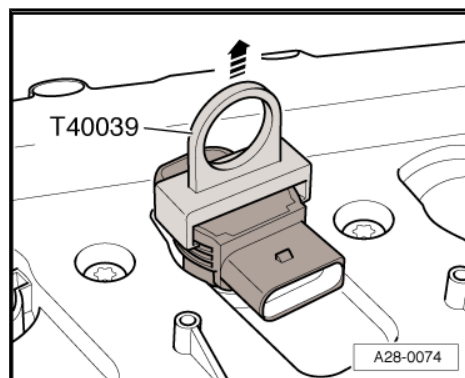


- Unscrew bolts -5 and 6- and unplug electrical connectors at ignition coils.

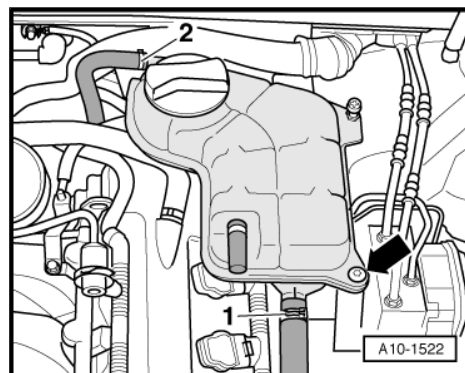


- Pull ignition coils (cylinders 5 and 6) out with puller -T40039- .

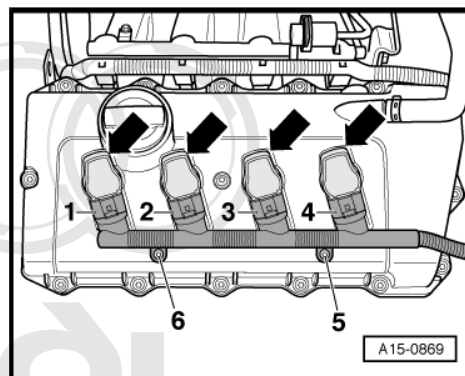
Removing (cylinders 7 and 8):



- Unbolt coolant expansion tank -arrow- and lay it aside with coolant hoses -1- and -2- connected.



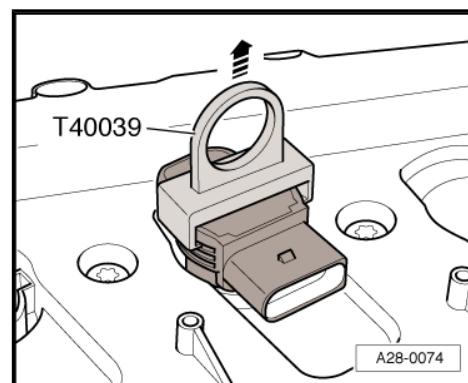
- Unscrew bolts -5 and 6- and unplug electrical connectors at ignition coils.



- Pull ignition coils (cylinders 7 and 8) out with puller -T40039- .

Installing ignition coils

Install in reverse order.



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