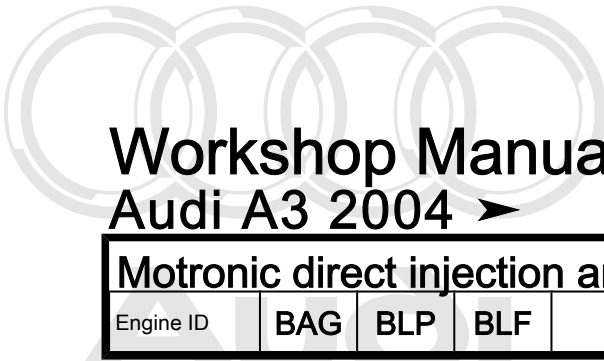




Workshop Manual Audi A3 2004 ➤

Motronic direct injection and ignition system (4-cyl.)

Engine ID	BAG	BLP	BLF						
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Edition 12.2006

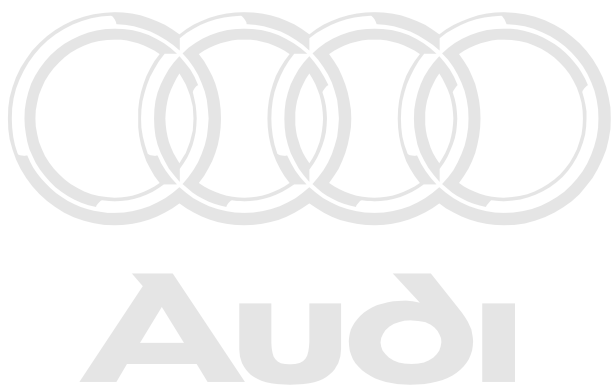
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List of Workshop Manual Repair Groups

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 A3 2004 ►

Motronic direct injection and ignition system (4-cyl.) - Edition 12.2006



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24 – Mixture preparation - injection

1 Servicing injection system

1.1 General notes on injection

- ◆ The engine control unit has a self-diagnosis capability. Before carrying out repairs and fault finding the fault memory must be interrogated. The vacuum hoses and connections must also be checked (unmetered air).
- ◆ Fuel hoses in engine compartment must only be secured with spring-type clips. Clamping-type or screw-type clips must not be used.
- ◆ A voltage of at least 11.5 V is required for proper operation of the electrical components.
- ◆ Do not use sealants containing silicone. Particles of silicone drawn into the engine will not be burnt in the engine and will damage the Lambda probe.
- ◆ The vehicles are fitted with a crash/fuel shut-off system. This system is designed to reduce the risk of a vehicle fire after a crash by deactivating the fuel pump via the fuel pump relay.
- ◆ At the same time, this system also improves the engine's starting performance. When the door is opened, the fuel pump is activated for 2 seconds in order to build up pressure in the fuel system. Observe safety precautions ⇒ [page 1](#).

1.2 Safety precautions



WARNING

The fuel system is pressurised. The fuel pressure in the high-pressure part of the injection system must be reduced to a residual pressure prior to opening; for procedure see ⇒ [page 3](#).

The connection must be opened immediately after reducing the pressure; wrap a cloth around the connection and allow the residual pressure (approx. 6 bar) to dissipate.

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

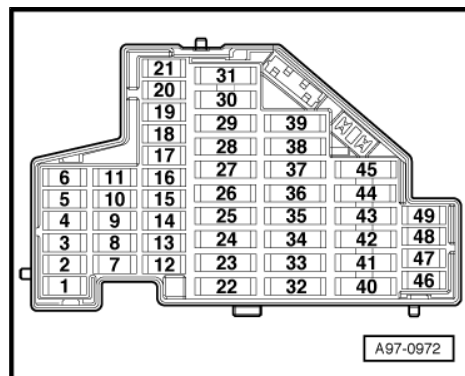


WARNING

- ◆ *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.

- ◆ If the battery is not disconnected, fuse No. 27 for fuel pump control unit -J538- must be removed as a precautionary measure before opening the fuel system, because the fuel pump will otherwise be activated by the contact switch on the driver's door.
- ◆ Persons wearing a cardiac pacemaker must at all times maintain a safe distance from high-voltage components such as the ignition system and gas-discharge headlights.
- ◆ Do not open any fuel line connections while the engine is running.
- ◆ Always switch off the ignition before connecting or disconnecting injection or ignition system wiring or tester cables.
- ◆ If engine is to be operated at cranking speed without it starting (e.g. compression test), unplug connectors from ignition coils and remove fuse for electric fuel pump.
- ◆ Certain tests may lead to a fault being detected by the control unit and stored. The fault memory should therefore be interrogated and (if necessary) erased after completing the tests and any repair work that may be required.
- ◆ If the fault memory has been erased, you must generate the readiness code again.
- ◆ Always switch off the ignition before cleaning the engine.
- ◆ Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.
- ◆ If the engine has to be operated at starting speed without actually starting (e.g. to test compression pressure), detach the four connectors from the ignition coils using assembly tool - T10118- and puller -T10094-. Also remove fuse 27 from fuel pump control unit -J538-.



Note

Removing fuse 27 will interrupt the voltage supply for the fuel pump control unit -J538-

1.3 Rules for cleanliness

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 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 vehicle.

- ◆ Unplugged electrical connectors must be kept clean and dry. Make sure connections are dry when attaching.

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



Caution

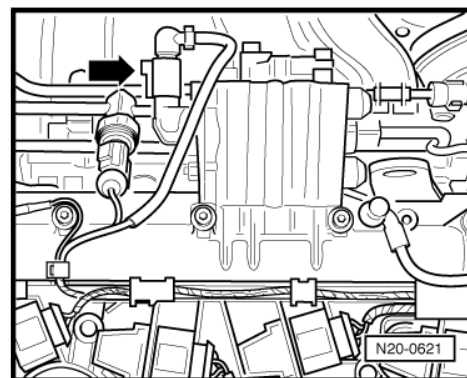
The injection system consists of a high-pressure section (maximum approx. 120 bar) and a low-pressure section (approx. 6 bar).

Prior to opening the high-pressure section (e.g. when removing the high-pressure pump, fuel rail, injectors, fuel pipes or fuel pressure sender -G247-, the fuel pressure in the high-pressure section must be reduced to a residual pressure of approx. 6 bar. The procedure is described below.

Reducing fuel pressure in high-pressure section

- Detach electrical connector at fuel pressure regulating valve - N276- -2-.

Engine code BAG -arrow-



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Engine codes BLP and BLF -1-

- Allow engine to idle for about 10 seconds.



Note

Fuel pressure will be reduced from approx. 50 bar to approx. 6 bar when electrical connector is detached from fuel pressure regulating valve -N276- while engine is idling.

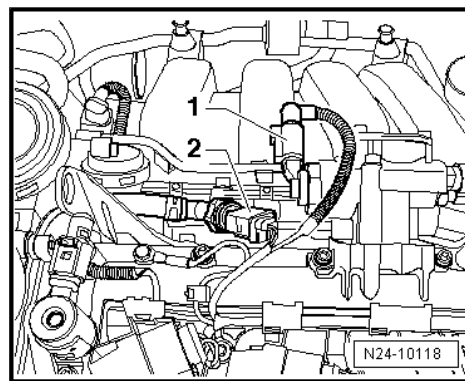
- Switch off ignition.



WARNING

The fuel lines are still filled with fuel, however the fuel is no longer under high pressure. Wear safety goggles and protective clothing when opening the fuel system to avoid possible injury and skin contact.

Before opening the high-pressure section, wrap a cloth around the connection.



- The high-pressure system must be opened IMMEDIATELY after reducing the pressure by wrapping a clean cloth around the connection and allowing the residual pressure (approx. 6 bar) to dissipate. Catch the escaping fuel.
- Generate readiness code in engine control unit in “Guided Functions” mode.



Note

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- ◆ *You can watch the fuel pressure dropping by connecting a fault reader and selecting the engine control unit. Select function “Read measured value block” and display group 140.*
- ◆ *The fuel pressure (actual value) is displayed in zone 3.*

1.5 Technical data

Engine data		1.6 ltr. / 85 kW FSI engine Bosch Motronic
Idling speed is not adjustable; controlled by the idling speed stabilisation		640 ... 800 rpm
Maximum rpm governed by deactivation of fuel injectors		approx. 5800 rpm
Fuel pressure	Initial fuel pressure up to high-pressure pump (generated by electric fuel pump in fuel tank)	approx. 6.0 bar (identical for all operating conditions)

Engine data	1.6 ltr. / 85 kW FSI engine Bosch Motronic
Pressure in high-pressure fuel circuit (generated by mechanical single-plunger pump) at a coolant temperature of approx. 85°C.	approx. 50 bar at idling speed approx. 120 bar in certain parts of operating range.

1.6 Overview of fitting locations

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

1 - Vacuum unit for intake manifold flap

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

☐ ⇒ [page 12](#)

◆ Intake manifold flap potentiometer -G336-

⇒ [page 12](#)

◆ Intake manifold flap air flow control valve -N316-

⇒ [page 12](#)

3 - Fuel pressure sender for low pressure -G410-

☐ Not fitted on models with engine code BLF

☐ Engine code BAG
⇒ [page 11](#)

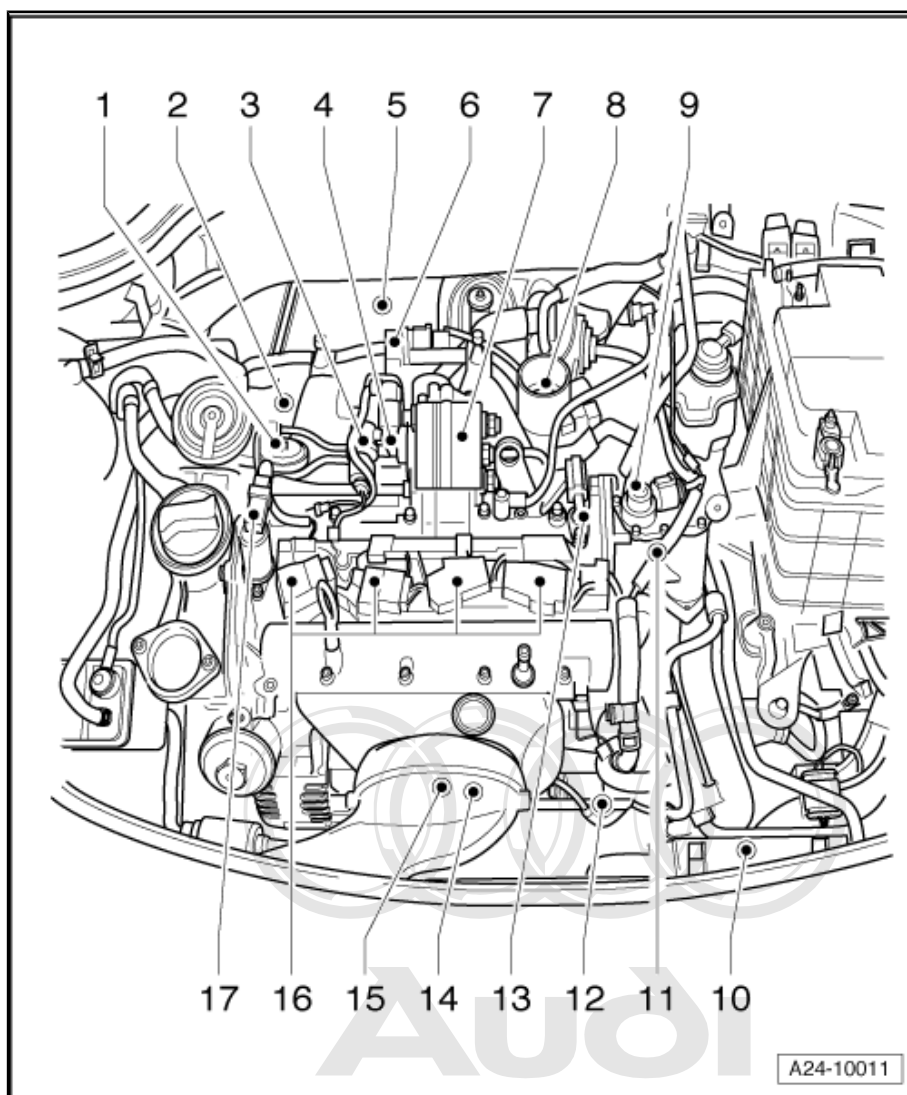
☐ Engine code BLP
⇒ [page 11](#)

4 - Fuel pressure regulating valve -N276-

☐ ⇒ [page 10](#)

5 - Motronic control unit -J220- with ambient pressure sender

☐ Removing and installing



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⇒ [page 42](#)

6 - Activated charcoal filter solenoid valve 1 -N80-

- ☐ ⇒ [page 10](#)

7 - Single-plunger high-pressure fuel pump

- ☐ The high-pressure fuel pump should only be removed and installed when the engine is cold.
- ☐ The fuel system must not be under pressure. For procedure, refer to ⇒ [page 3](#)
- ☐ When installing the high-pressure fuel pump, it is essential to ensure that no dirt enters the fuel system.
- ☐ Install pipes free of tension.

8 - Throttle valve module -J338- , throttle valve drive for electric throttle operation -G186-

- ☐ Throttle valve drive angle sender 1 for electric throttle -G187- and throttle valve drive angle sender 2 for electric throttle -G188-
- ☐ ⇒ [page 9](#)

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

- ☐ ⇒ [page 10](#)
- ☐ After replacing the engine control unit or the exhaust gas recirculation valve -N18- , the engine control unit and the exhaust gas recirculation valve must be adapted -N18- to one another ⇒ Rep. Gr. 26 .

10 - Radiator outlet coolant temperature sender -G83-

- ☐ ⇒ [page 13](#)

11 - Coolant temperature sender -G62-

- ☐ ⇒ [page 10](#)

12 - Electrical connectors for Lambda probe -G39- and exhaust gas temperature sender 1 -G235-

- ☐ Engine code BLP ⇒ [page 8](#)
- ☐ Engine code BAG ⇒ [page 9](#)

13 - Hall sender -G40-

- ☐ ⇒ [page 13](#)

14 - Exhaust gas temperature sender 1 -G235-

- ☐ Only fitted on models with engine codes BAG and BLP
- ☐ Engine code BAG ⇒ [page 8](#)
- ☐ Fitted before main catalytic converter on models with engine code BLP
- ☐ Removing and installing ⇒ [page 47](#)

15 - Lambda probe -G39-

- ☐ ⇒ [page 8](#)
- ☐ Removing and installing ⇒ [page 46](#)

16 - Ignition coils with output stages

- ☐ Ignition coil 1 with output stage -N70-
- ☐ Ignition coil 2 with output stage -N127-
- ☐ Ignition coil 3 with output stage -N291-
- ☐ Ignition coil 4 with output stage -N292-

17 - Inlet camshaft control valve 1 -N205-

A - Diagnostic connector

- ☐ In driver's knee restraint

B - Fuel pump control unit -J538-

- ☐ Adaption must be performed after renewing fuel pump control unit -J538- . Basic setting, measured value block 238, refer to ⇒ Rep. Gr. 20
- ☐ ⇒ [page 8](#)

C - "EPC" warning lamp

- ☐ In dash panel insert

D - "MIL" exhaust emissions warning lamp

- ☐ In dash panel insert

E - NOx sender -G295-

- ☐ Only fitted on models with engine codes BAG and BLP
- ☐ [⇒ page 8](#)
- ☐ Removing and installing [⇒ page 48](#)

F - Lambda probe after catalytic converter -G130-

- ☐ On engines with code letters BLF a Lambda probe after catalytic converter -G130- is fitted in place of the NOx sender -G295-. A 4-pin electrical connector is used.
- ☐ Removing and installing [⇒ page 48](#)

G - NOx sensor control unit -J583-

- ☐ Only fitted on models with engine codes BAG and BLP
- ☐ [⇒ page 8](#)

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

- ☐ In footwell on accelerator pedal (both senders are accommodated in one housing)
- ☐ [⇒ page 9](#)

I - Motronic relay

- ☐ Motronic current supply relay -J271- [⇒ page 14](#)
- ☐ Terminal 15 voltage supply relay -J329- [⇒ page 14](#)
- ☐ Voltage supply relay - terminal 50 -J682- [⇒ page 14](#)

J - Injectors

- ☐ In fuel rail
- ☐ Injector, cylinder 1 -N30-
- ☐ Injector, cylinder 2 -N31-
- ☐ Injector, cylinder 3 -N32-
- ☐ Injector, cylinder 4 -N33-

The fuel injectors are high-pressure injectors. They inject fuel at high pressure (maximum approx. 110 bar) directly into the cylinder.

K - Engine speed sender -G28-

- ☐ [⇒ page 13](#)

L - Knock sensor 1 -G61-

- ☐ [⇒ page 13](#)

M - Fuel pressure sender -G247-

- ☐ [⇒ page 11](#)

N - Intake air temperature sender 2 -G299-

- ☐ [⇒ page 12](#)
- ☐ Integrated in engine compartment cover

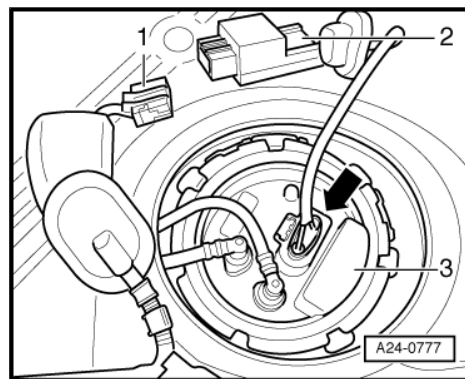
Fuel pump with fuel pump control unit -J538-

1 - Connector for fuel pump control unit -J538-

2 - Fuel pump control unit -J538-

3 - Fuel system pressurisation pump -G6-

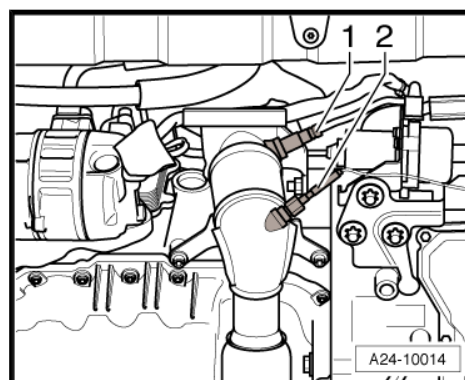
- Adaption must be performed after renewing fuel pump control unit -J538-. Basic setting, measured value block 238, refer to ⇒ Rep. Gr. 20



Components on catalytic converter

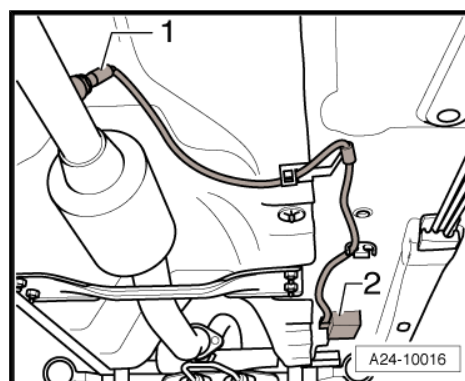
1 - Lambda probe -G39-

2 - Exhaust gas temperature sender 1 -G235- (only fitted on engines with code letters BAG)



NOx sender -G295- with NOx sender heater -Z44- -1- and NOx sensor control unit -J583- -2- (only fitted on engines with code letters BAG and BLP)

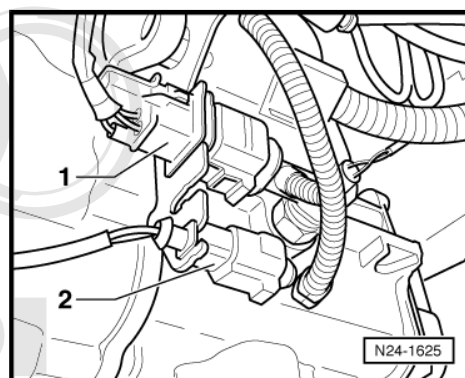
On engines with code letters BLF a Lambda probe after catalytic converter -G130- is fitted in place of the NOx sender -G295-. A 4-pin electrical connector is used.



Electrical connectors on engines with code letters BAG

1 - Lambda probe -G39-

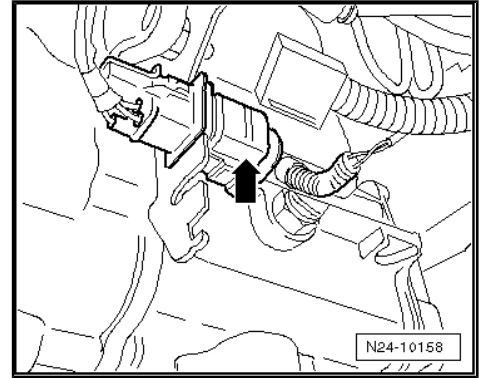
2 - Exhaust gas temperature sender 1 -G235- (only fitted on engines with code letters BAG)



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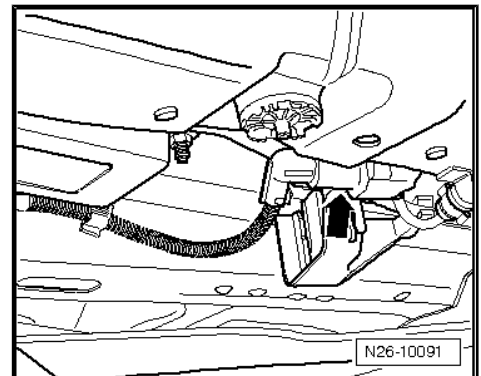
Electrical connector on engines with code letters BLP and BLF

1 - Lambda probe -G39-

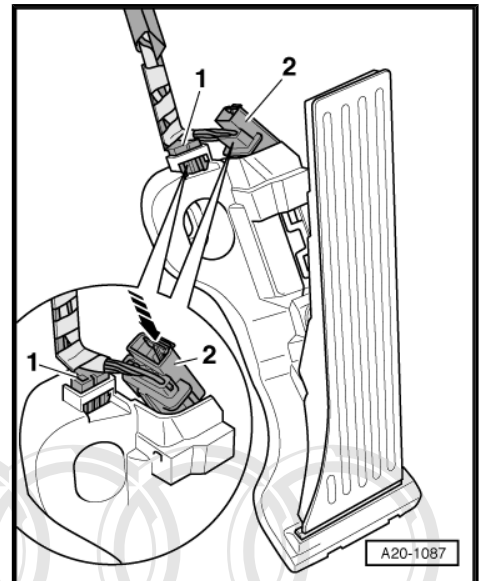


Electrical connector for exhaust gas temperature sender 1 -G235- (engine code BLP)

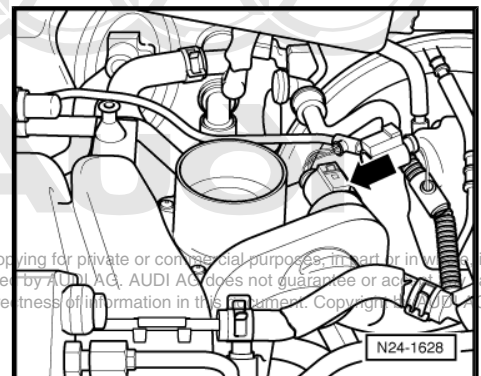
Pfeil - Electrical connector for exhaust gas temperature sender 1 -G235- is located behind underbody trim (right-side), near control unit for NOx sender -J583- .



Accelerator pedal position sender -G79- and accelerator pedal position sender 2 -G185- are integrated in the accelerator pedal module and transmit the driver's wishes to the Motronic control unit -J220- quite independently of one another. Both senders are accommodated in a single housing.



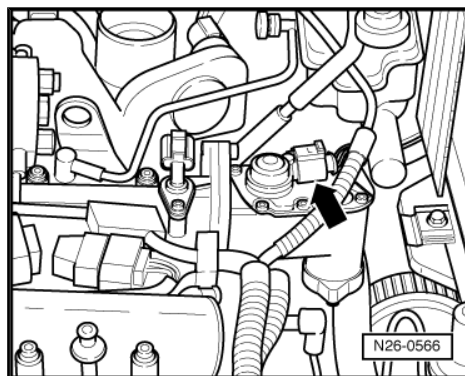
Throttle valve module -J338-



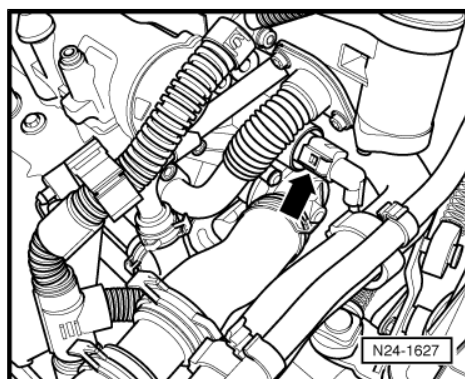
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Exhaust gas recirculation valve -N18- with exhaust gas recirculation potentiometer -G212- -arrow-

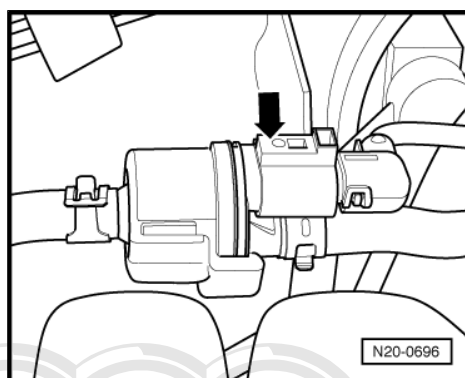
After replacing the engine control unit or the exhaust gas recirculation valve -N18- , the engine control unit and the exhaust gas recirculation valve must be adapted -N18- to one another ⇒ Rep. Gr. 26 .



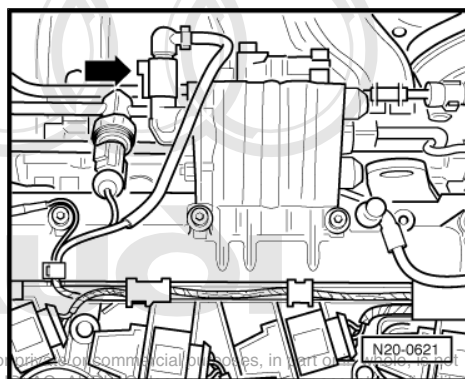
Coolant temperature sender -G62- -arrow-



Activated charcoal filter solenoid valve 1 -N80- -arrow-

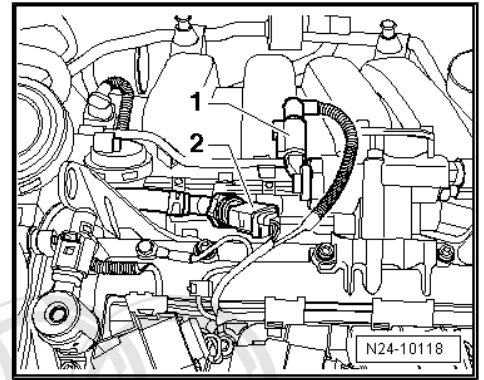


Fuel pressure regulating valve -N276- -arrow- (engine code letters BAG)

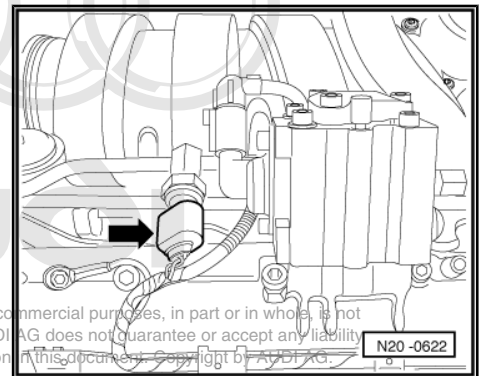


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Fuel pressure regulating valve -N276- -1- (engine code letters BLP and BLF)

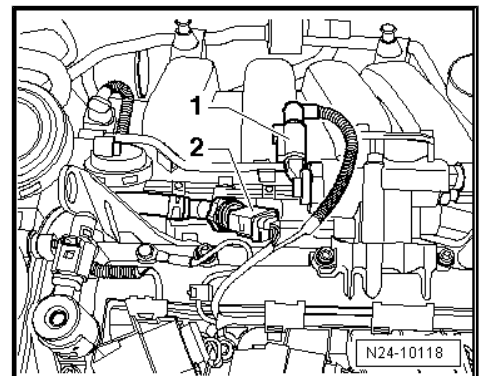


Fuel pressure sender for low pressure -G410- -arrow- (engine code letters BAG)

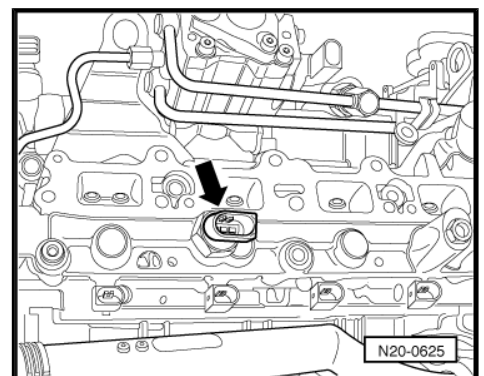


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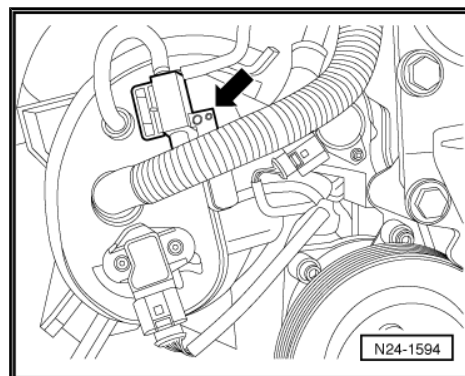
Fuel pressure sender for low pressure -G410- -2- (engine code letters BLP)



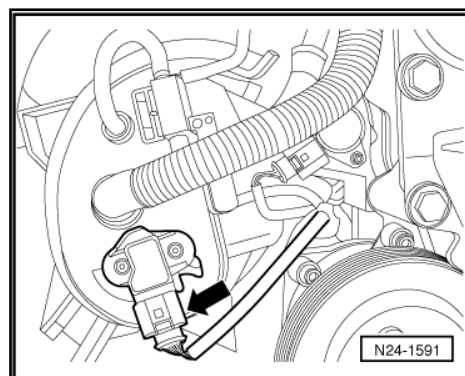
Fuel pressure regulator -G247- -arrow-



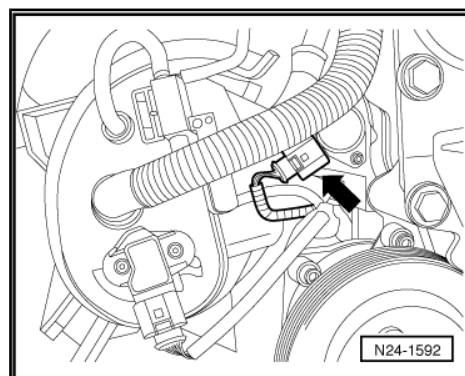
Intake manifold flap valve -N316- -arrow- (air flow control flaps)



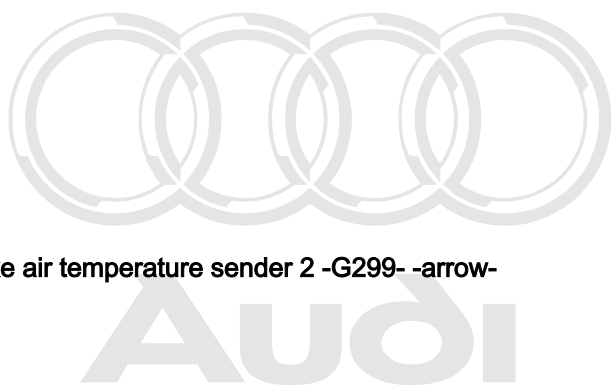
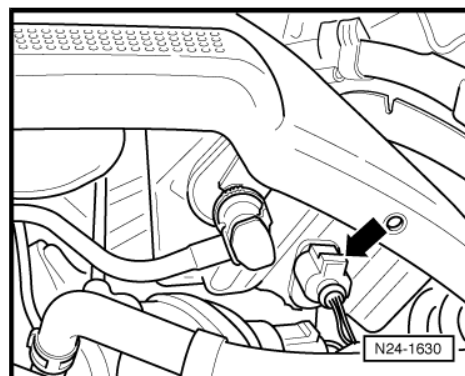
Intake air temperature sender -G42- with intake manifold pressure sender -G71- -arrow-



Intake manifold flap potentiometer -G336- -arrow- (air flow control flaps)

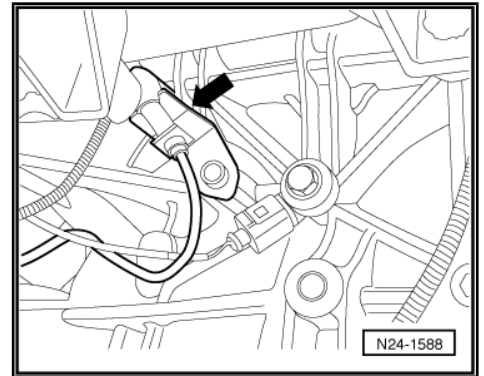


Intake air temperature sender 2 -G299- -arrow-

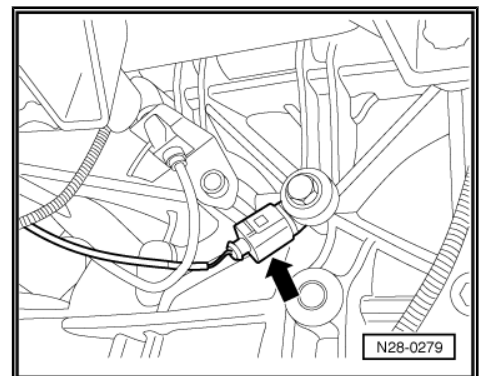


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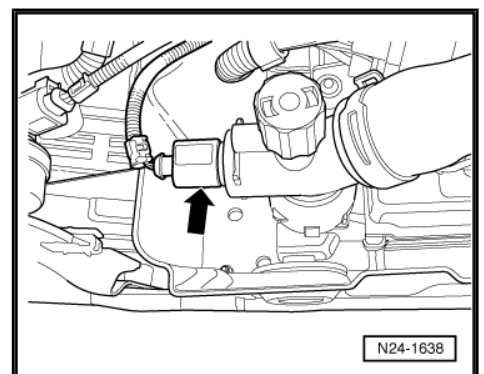
Engine speed sender -G28- -arrow-



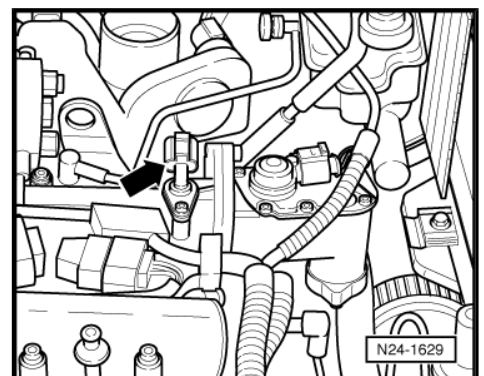
Knock sensor 1 -G61- -arrow-



Radiator outlet coolant temperature sender -G83- -arrow-



Hall sender -G40- -arrow-



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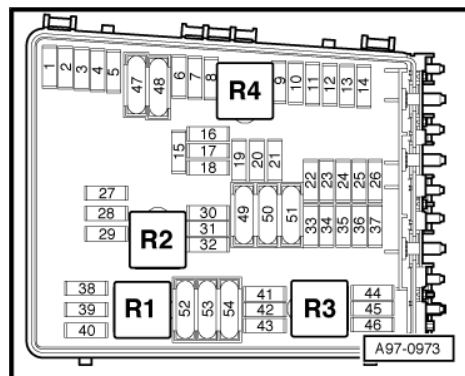
Relay and fuse holder in electronics box

R1 - Terminal 15 voltage supply relay -J329-

R2 - Voltage supply relay (terminal 50) -J682-

R3 - Fuel pump relay -J17-

R4 - Motronic current supply relay -J271-



1.7 Dismantling and assembling air cleaner



Note

♦ The air filter element is integrated in the engine cover panel.

♦ Checking function of intake air preheating (control flap)

⇒ [page 15](#)

1 - Air cleaner (bottom section)

- ☐ Clean any leaves and dirt out of bottom section of air cleaner

2 - Rubber bush

3 - Air filter element

- ☐ Always use genuine part for air filter element
- ☐ Observe change intervals ⇒ Maintenance ; Booklet 808
- ☐ When installing the air filter element, check that it is properly centred in the retainer in the air cleaner (bottom section).
- ☐ Fit the top section of the air cleaner carefully on the bottom section, without using force. 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).

4 - 3 Nm

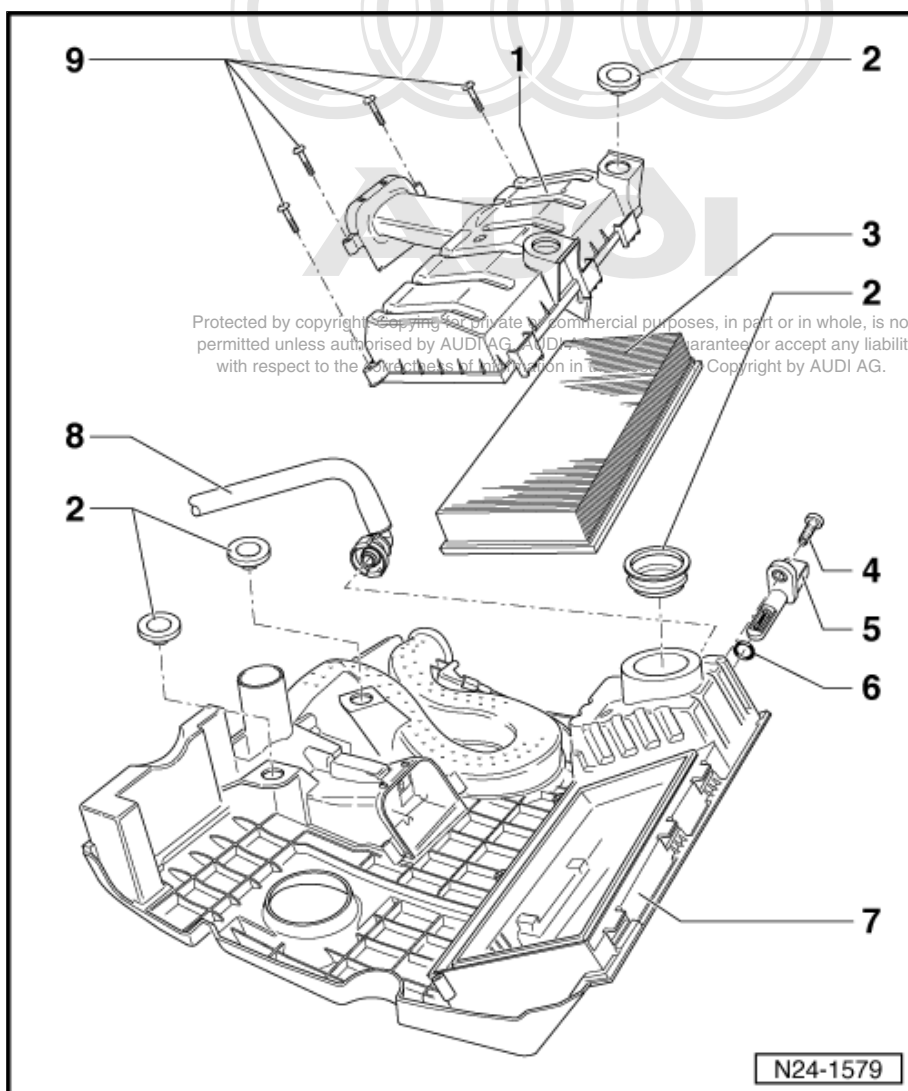
5 - Intake air temperature sender 2 -G299-

6 - O-ring

- ☐ Renew

7 - Air cleaner (top section)

- ☐ Clean any leaves and dirt out of top section of air cleaner



8 - Vacuum hose

- From camshaft housing

1.8 Checking function of intake air preheating (control flap)

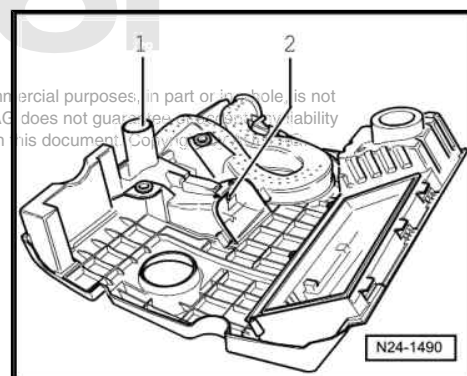
Special tools and workshop equipment required

- ◆ Chilling spray (commercially available)
- Remove engine cover panel ➔ [page 15](#).
- Remove air intake connecting piece on air cleaner.
- Check position of control flap -1-.
- Spray thermo element -2- with chilling spray.
- ◆ Above +23 °C flap must close warm air connection.
- ◆ Below +10 °C flap must open warm air connection.



Note

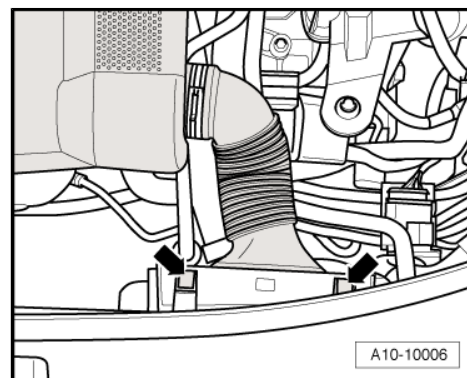
You can easily check whether the thermo element is functioning correctly if you spray it with chilling spray (commercially available). To carry out the test, you must first remove the bottom section of the air cleaner.



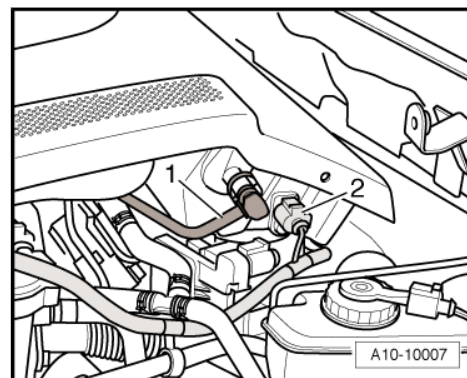
1.9 Removing engine cover panel

Removing

- Unclip air intake hose from air duct.



- Unplug electrical connector at intake air temperature sender 2 -G299- -2-.
- Detach vacuum hose from actuator for intake air preheater.
- Pull out dipstick -1-.



- Pull off cover at locations marked with -arrows-.

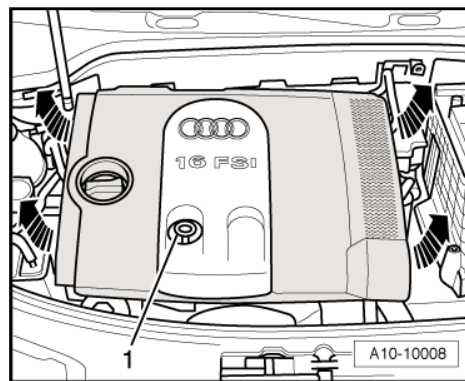

Note

Make sure no dirt gets into throttle valve module -J338-.

- Re-insert dipstick in guide tube.


Note

Removing and installing air filter element ⇒ Maintenance ; Booklet 808


Installing

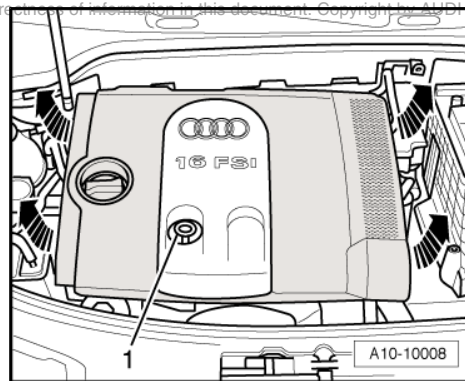
- Check intake hose (section after filter element) for salt residue, dirt and leaves; vacuum out if necessary.
- Check for dirt in air intake hose from air duct.

Installation is performed in the reverse sequence.


Note

Do not use silicone lubricants when installing the intake hose.

- Fit rubber mountings of cover onto pins affixed on engine
- Push cover downwards at locations marked with -arrows-.
- Push oil dipstick -1- into guide tube as far as it will go.



1.10 Dismantling and assembling intake manifold


WARNING

Fuel supply line is pressurised. Before loosening fuel connections always release fuel pressure prior to carrying out any work ⇒ page 3.

On engines with code letters BLP and BLF a fuel pressure limiting valve is incorporated in the fuel filter. In this system, only the supply pipe is routed to the front, to the engine compartment. The fuel pressure limiting valve opens when the pressure in the fuel supply line rises above 6 ... 6.8 bar. Excess fuel flows from the filter directly back to the fuel tank via a return line.

1 - Fuel return pipe

- ☐ Not fitted on engines with code letters BLP and BLF
- ☐ Blue or with blue marking
- ☐ Secure with spring clips
- ☐ Check that it is securely seated
- ☐ To fuel delivery unit in fuel tank

2 - Fuel supply pipe

- ☐ Secure with spring clips
- ☐ Check that it is securely seated
- ☐ From fuel filter

3 - Clip

4 - Connecting pipe

- ☐ The connecting pipe for fuel return line is not installed on engines with code letters BLP and BLF

5 - Fuel pressure sender for low pressure -G410-

- ☐ Not fitted on models with engine code BLF
- ☐ Fitting location: in fuel supply pipe
- ☐ 18 Nm

6 - O-ring

- ☐ Renew

7 - Bolt

- ☐ 10 Nm

8 - Banjo bolt

- ☐ Only one banjo bolt on engines with code letters BLP and BLF
- ☐ 18 Nm

9 - Throttle valve module -J338-

- ☐ After the throttle valve module -J338- has been renewed, it must be adapted to the Motronic control unit -J220- ⇒ Vehicle diagnosis, testing and information system VAS 5051

10 - Bolt

- ☐ 10 Nm

11 - Clip

12 - Hose from activated charcoal filter system solenoid valve 1 -N80- to intake manifold

13 - Intake manifold

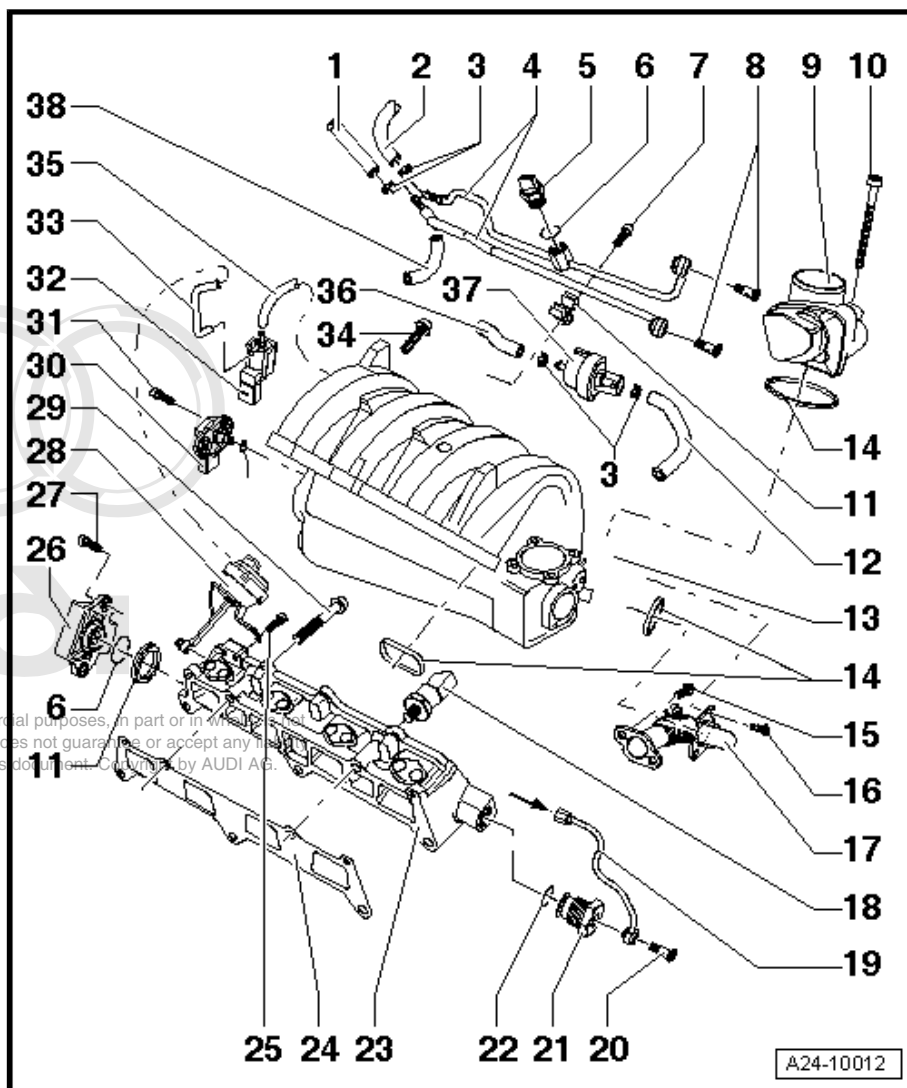
- ☐ Removing and installing ⇒ [page 19](#)

14 - Seals

- ☐ Renew

15 - Bolt

- ☐ 8 Nm



16 - Bolt

- ☐ 5 Nm

17 - Connecting pipe

- ☐ For exhaust gas recirculation system

18 - Fuel pressure sender -G247-**19 - High-pressure pipe****20 - Banjo bolt**

- ☐ 18 Nm

21 - Bolt

- ☐ 20 Nm

22 - O-ring

- ☐ Renew

23 - Fuel rail (bottom section of intake manifold)

- ☐ Before removing and installing, lock vacuum unit in position using a 2.5 mm drill [⇒ page 19](#) .
- ☐ Remove retaining clip (transport lock) on vacuum unit after installing new vacuum unit
- ☐ After installation, check function of intake manifold flap (air flow control flaps) using hand-operated vacuum pump -VAS 6213- [⇒ page 19](#)
- ☐ Renew seals and O-rings for injectors after removal

24 - Gasket

- ☐ Renew
- ☐ Note installation position

25 - Bolt

- ☐ 10 Nm

26 - Intake manifold flap potentiometer -G336-

- ☐ Intake manifold flap = air flow control flaps
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27 - Bolt

- ☐ 1.5 Nm

28 - Vacuum unit

- ☐ Remove retaining clip (transport lock) on vacuum unit after installing new vacuum unit
- ☐ After installation, check function of intake manifold flap (air flow control flaps) using hand-operated vacuum pump -VAS 6213- [⇒ page 19](#)

29 - Bolt

- ☐ 20 Nm

30 - Intake manifold pressure sender -G71-**31 - Bolt**

- ☐ 5 Nm

32 - Intake manifold flap valve -N316-

- ☐ Intake manifold flap = air flow control flaps

33 - Vacuum hose

- ☐ To vacuum unit

34 - Bolt

- ☐ 20 Nm

35 - Vacuum hose

- ☐ From intake manifold

36 - Hose to activated charcoal filter solenoid valve 1 -N80-

37 - Activated charcoal filter solenoid valve 1 -N80-

38 - Fuel return pipe

- ☐ Not fitted on engines with code letters BLP and BLF
- ☐ Blue or with blue marking
- ☐ Secure with spring clips
- ☐ Check that it is securely seated

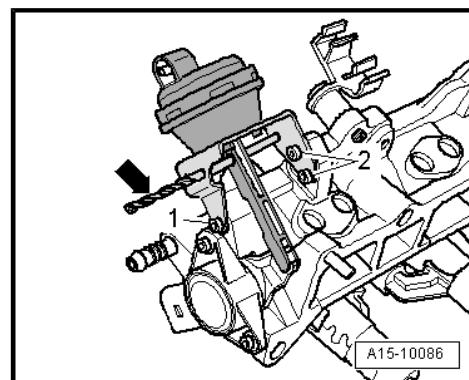
1.11 Locking vacuum unit for air flow control flaps

- Press operating rod of vacuum unit towards vacuum unit and lock with 2.5 mm drill -arrow-.



Note

Disregard items marked -1- and -2-.



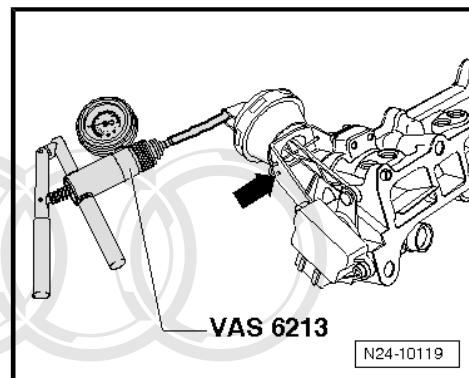
1.12 Checking operation of air flow control flaps

- After installing new bottom section of intake manifold remove clip -arrow- for vacuum unit.
- Connect hand-operated vacuum pump -VAS 6213- as illustrated.
- Create a vacuum and check function of vacuum unit at operating rod.



Note

You can also check the function of the air flow control flaps (visual inspection) with the intake manifold removed.

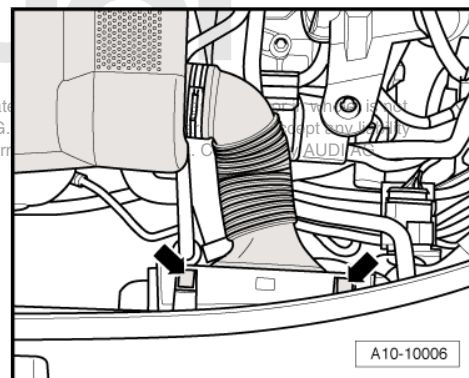


1.13 Removing and installing intake manifold

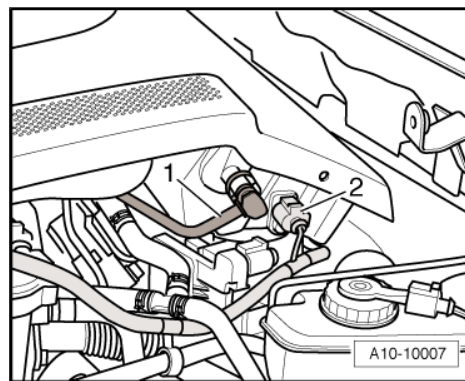
Removing

- Unclip air intake hose from air duct -arrows-.

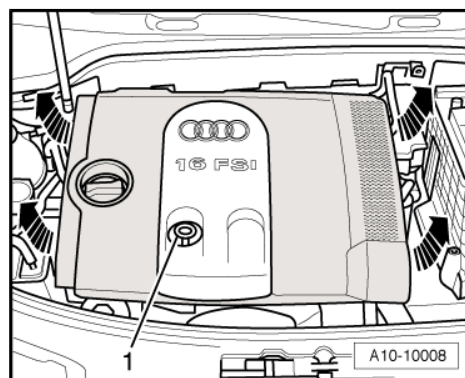
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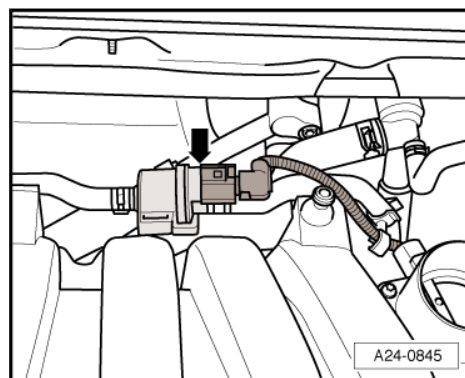
- Unplug electrical connector -2- at intake air temperature sender 2 -G299- .
- Detach vacuum hose -1- from actuator for intake air preheater.



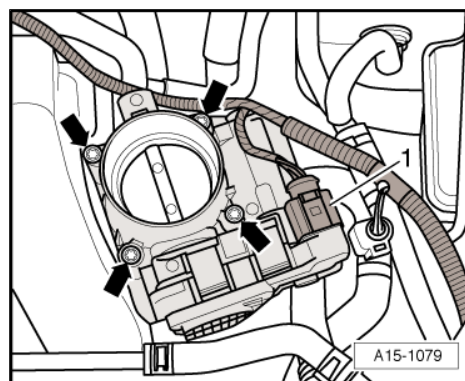
- Pull dipstick -1- out of guide tube.
- Remove the engine cover together with air cleaner housing -arrows-.
- Re-insert dipstick in guide tube.



- Unplug electrical connector at solenoid valve 1 for activated charcoal filter system -N80- .

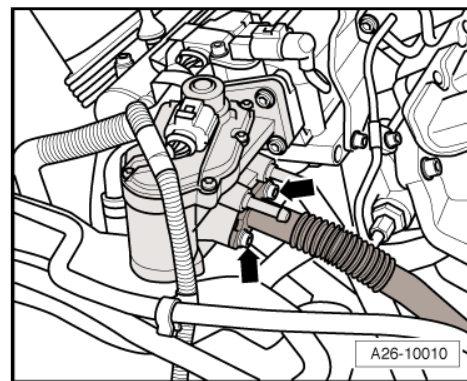


- Unplug electrical connector -1- at throttle valve module - J338- .
- Unscrew bolts -arrows- and remove throttle valve module - J338- .

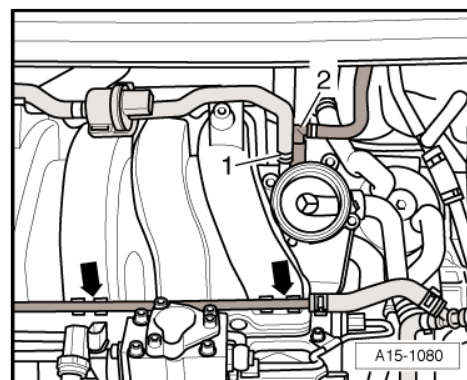


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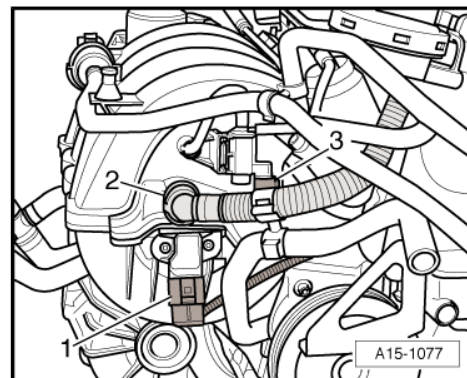
- Remove bolts -arrows- for connecting pipe for exhaust gas recirculation at exhaust gas recirculation valve -N18- and remove gasket.



- Detach vacuum hose -1- leading to solenoid valve 1 for activated charcoal filter system -N80- at intake manifold.
- Detach solenoid valve 1 for activated charcoal filter system -N80- from its retainers and move to side with vacuum hoses attached.
- Detach vacuum line -2- leading to brake servo at intake manifold.
- Unclip upper coolant pipe at intake manifold -arrows- and move forward.

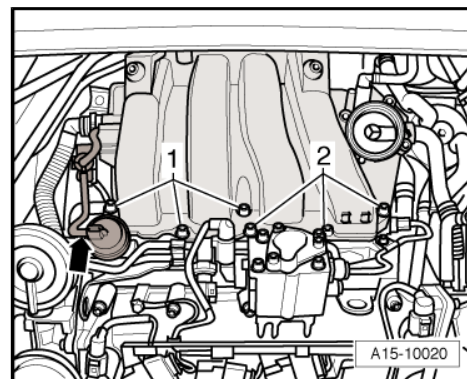


- Disconnect hose -2- for crankcase breather system at intake manifold by pressing release tabs.
- Unplug electrical connectors at intake manifold pressure sender -G71- -item 1- and intake manifold flap air flow control valve -N316- -item 3-.



- Disconnect vacuum hose -arrow- at actuator for intake manifold change-over.

- Unscrew securing bolts -1- and -2- for intake manifold and lay intake manifold to rear.



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- Unplug electrical connector -arrow- at bolt.
- Unscrew fuel pressure sender -G247- .
- Lift intake manifold up and towards left.

Installing



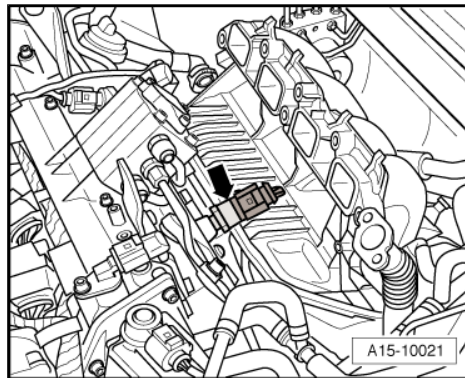
Note

- ◆ *Make sure that no dirt etc. gets into the opened intake manifold.*
- ◆ *Renew gaskets and seals.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue.*
- Place intake manifold rearwards in engine compartment for the meantime.
- Screw in fuel pressure sender -G247- .
- Secure intake manifold to cylinder head.

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

Tightening torques

Component	Nm
Intake manifold to fuel rail (bottom section of intake manifold)	20
Throttle valve connection to intake manifold	7
EGR connecting pipe to exhaust gas recirculation valve -N18-	8



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1.14 Dismantling and assembling fuel rail with injectors (engine code BAG)



WARNING

Fuel supply line is pressurised. Before loosening fuel connections always release fuel pressure prior to carrying out any work ⇒ page 3 .

- 10 Nm

2 - Mechanical single-plunger high-pressure pump with fuel pressure regulating valve - N276-

- ❑ The high-pressure fuel pump should only be removed and installed when the engine is cold.
- ❑ The fuel system must not be under pressure. For procedure, refer to ⇒ page 3.
- ❑ When installing the high-pressure fuel pump, it is essential to ensure that no dirt enters the fuel system.
- ❑ Install pipes free of ten-

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Removing and installing
⇒ page 33

3 - Fuel pressure sender for low pressure -G410-

- ❑ Fitting location: in fuel supply pipe
- ❑ 18 Nm

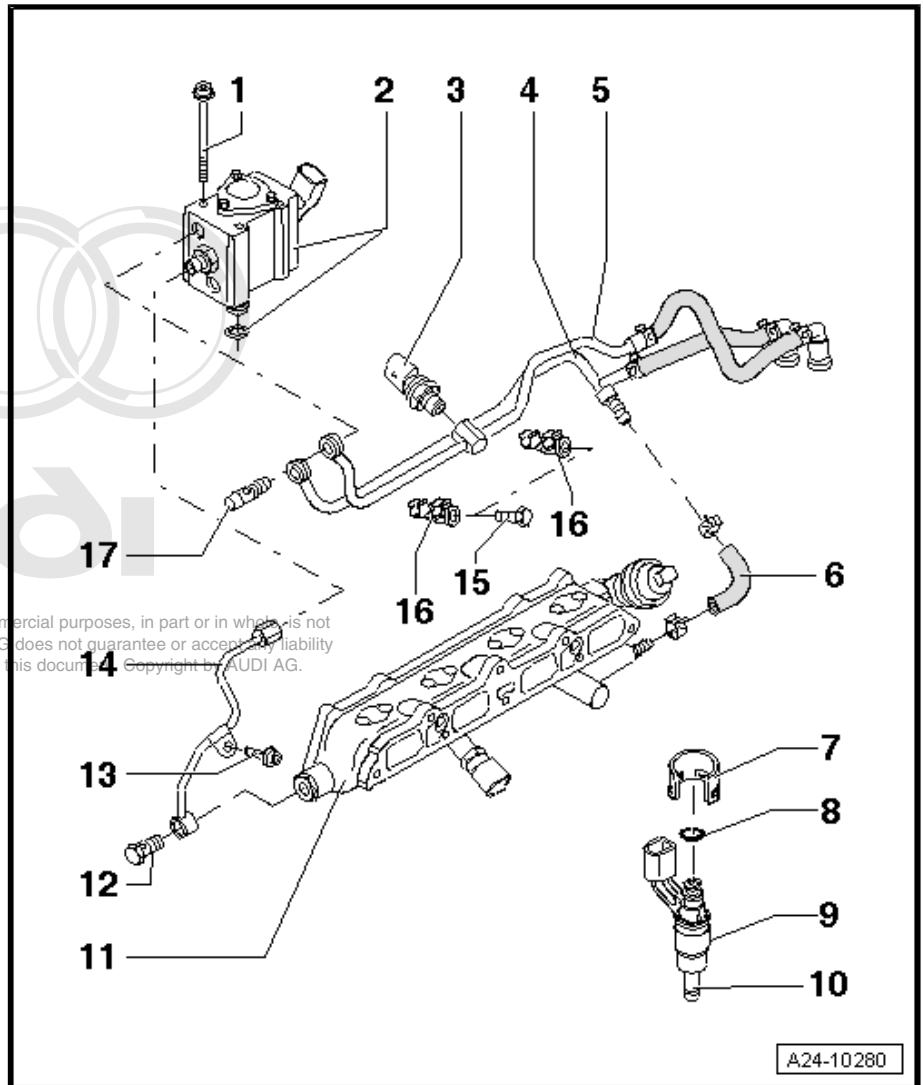
4 - Fuel return pipe

5 - Fuel supply pipe

6 - Fuel return pipe

7 - 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.

8 - O-ring

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

9 - Injector

- ☐ Removing and installing ⇒ [page 29](#)

10 - Combustion chamber ring seal (teflon ring seal)

- ☐ Renewing ⇒ [page 31](#)

11 - Fuel rail (bottom section of intake manifold)

- ☐ Before removing and installing, lock vacuum unit in position using a 2.5 mm drill ⇒ [page 19](#) .
- ☐ After installing new bottom section of intake manifold remove clip for vacuum unit.
- ☐ After installation, check function of intake manifold flap (air flow control flaps) using hand-operated vacuum pump -VAS 6213- ⇒ [page 19](#)
- ☐ Removing and installing ⇒ [page 26](#)

12 - Banjo bolt

- ☐ 18 Nm

13 - Bolt

14 - High-pressure fuel pipe

15 - Bolt

16 - Bracket

17 - Banjo bolt

- ☐ 15 Nm

1.15 Dismantling and assembling fuel rail with injectors (engine codes BLP and BLF)



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Fuel supply line is pressurised. Before loosening fuel connections always release fuel pressure prior to carrying out any work ⇒ [page 3](#) .

On engines with code letters BLP and BLF a fuel pressure limiting valve is incorporated in the fuel filter. In this system, only the supply pipe is routed to the front, to the engine compartment. The fuel pressure limiting valve opens when the pressure in the fuel supply line rises above 6 ... 6.8 bar. Excess fuel flows from the filter directly back to the fuel tank via a return line.

1 - Bolt

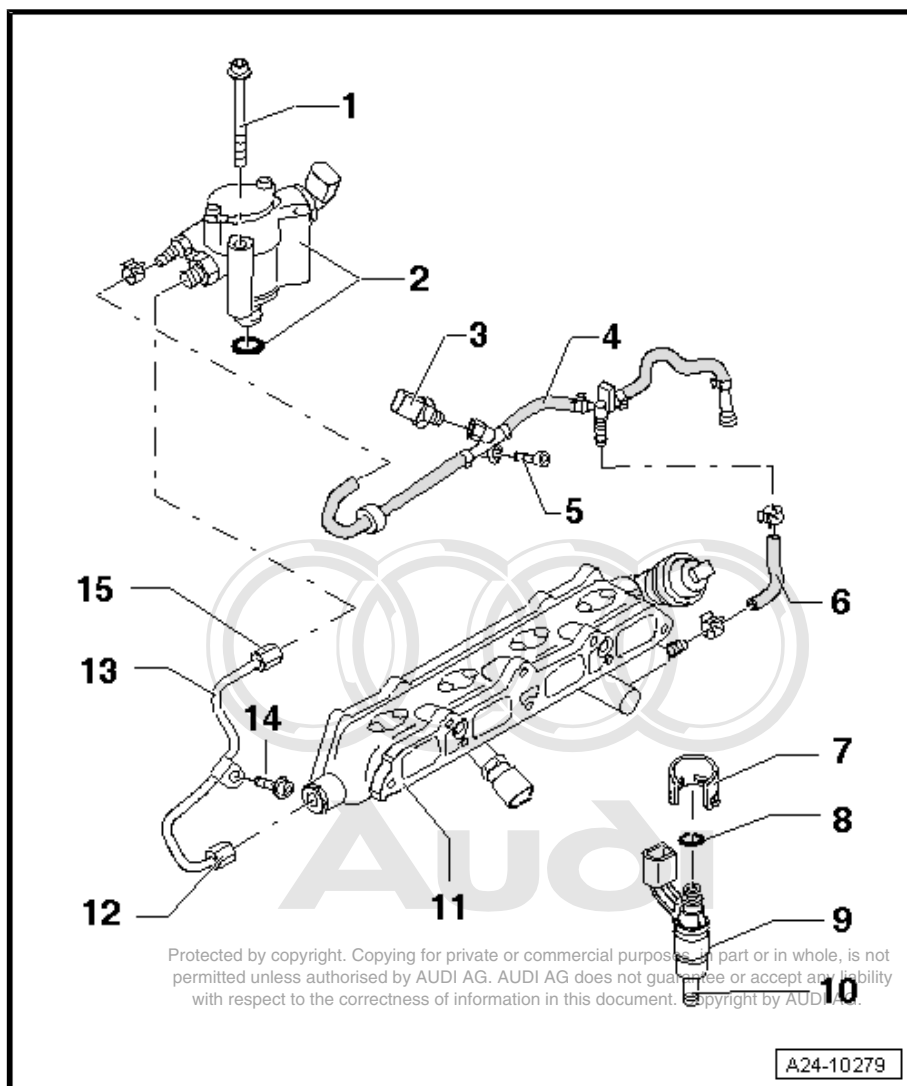
- ☐ 10 Nm

2 - Mechanical single-plunger high-pressure pump with fuel pressure regulating valve - N276-

- ☐ The high-pressure fuel pump should only be removed and installed when the engine is cold.
- ☐ The fuel system must not be under pressure. For procedure, refer to [⇒ page 3](#).
- ☐ When installing the high-pressure fuel pump, it is essential to ensure that no dirt enters the fuel system.
- ☐ Install pipes free of tension.
- ☐ Removing and installing [⇒ page 33](#)

3 - Fuel pressure sender for low pressure -G410-

- ☐ Not fitted on models with engine code BLF
- ☐ Fitting location: in fuel



supply pipe

- 18 Nm

4 - Fuel supply pipe

5 - Bolt

6 - Fuel return pipe

7 - 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.

8 - O-ring

- Renew
- When installing lubricate lightly with clean engine oil

9 - Injector

- Removing and installing ⇒ [page 29](#)

10 - Combustion chamber ring seal (teflon ring seal)

- Renewing ⇒ [page 31](#)

11 - Fuel rail (bottom section of intake manifold)

- Before removing and installing, lock vacuum unit in position using a 2.5 mm drill ⇒ [page 19](#) .
- After installing new bottom section of intake manifold remove clip for vacuum unit.
- After installation, check function of intake manifold flap (air flow control flaps) using hand-operated vacuum pump -VAS 6213- ⇒ [page 19](#)
- Removing and installing ⇒ [page 26](#)

12 - Union nut

- 18 Nm

13 - High-pressure fuel pipe

14 - Bolt

15 - Union nut

- 18 Nm

1.16 Removing and installing fuel rail (bottom section of intake manifold)

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 3](#) . A clean cloth must then be wrapped around the connection and the residual pressure dissipated by carefully loosening the connection.

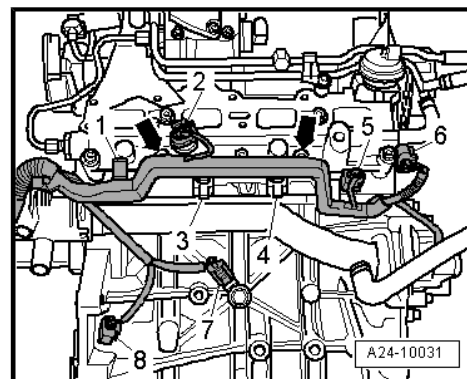
- Remove intake manifold ⇒ [page 19](#) .
- Unplug electrical connectors -1, 3, 4 and 5- at injectors and at fuel pressure sender -G247- -2-.
- Unplug electrical connector -6- at intake manifold flap potentiometer -G336- .

- Unscrew bolts -arrows- and remove wiring guide.



Note

Disregard items marked -7- and -8-.



- Remove high pressure pipe by unscrewing securing bolt -5- and union nuts -1- and -2-.

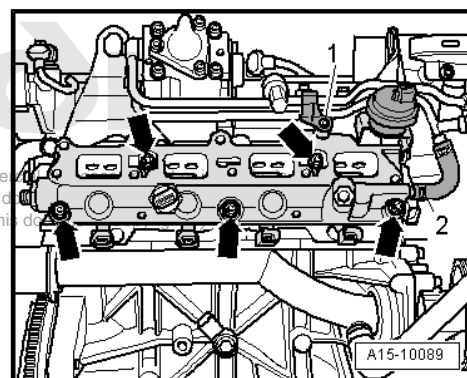
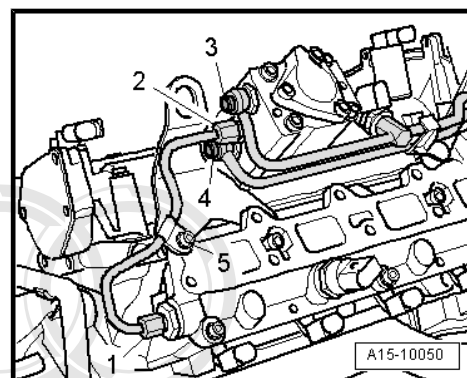


Note

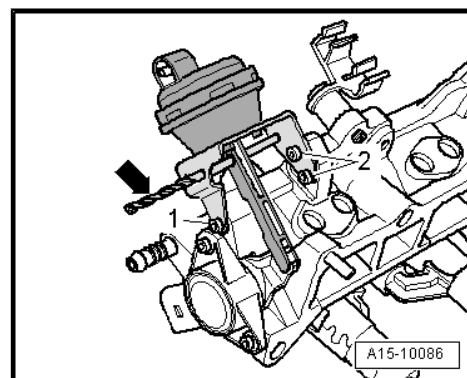
Disregard items marked -3- and -4- (only installed on engines with code letters BAG).

Step for fuel return line only necessary on engines with code letters BAG.

- Detach fuel return line -2- at fuel rail (bottom section of intake manifold).
- Unscrew bolt -1- for fuel line bracket and unclip bracket.



- Press operating rod of vacuum unit towards vacuum unit and lock in position with 2.5 mm drill -arrow-.



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- Unscrew bolts -arrows- and detach fuel rail (bottom section of intake manifold).
- Removing and installing injectors ⇒ [page 29](#)

Installing



Note

- ◆ *Renew seals and O-ring.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue.*

- Operating rod for vacuum unit must be locked with a 2.5 mm drill bit -arrow-.



Note

Disregard items marked -1- and -2-.

- Lift air flow control flaps slightly when fitting fuel rail (lower section of intake manifold) on cylinder head.



Note

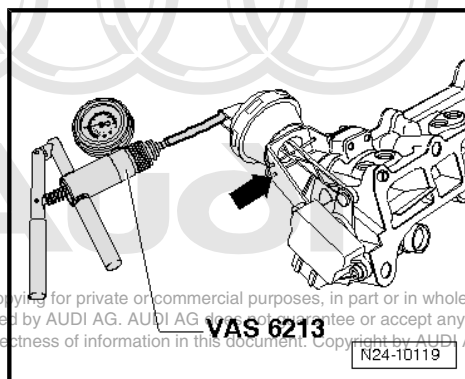
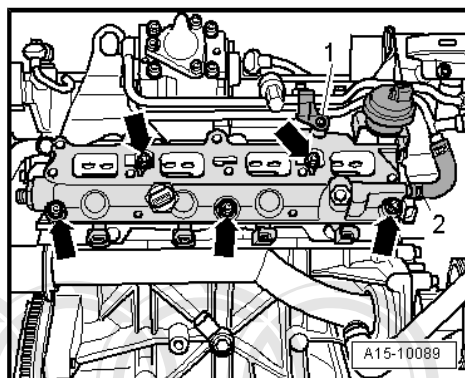
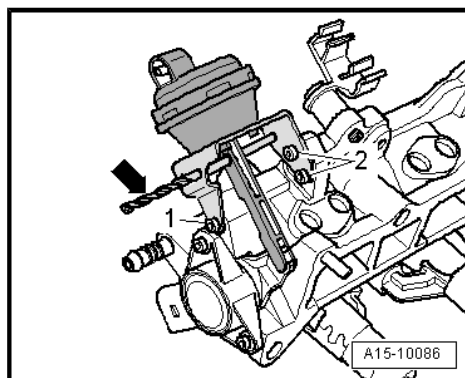
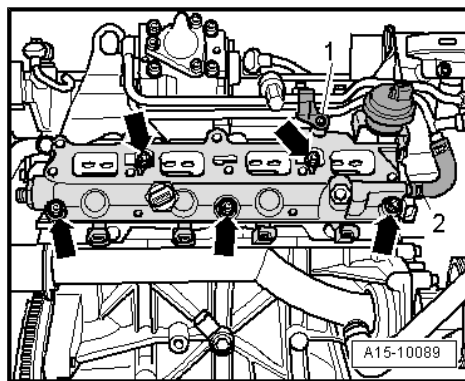
If this is neglected, the air flow control flaps can become stuck between the fuel rail and cylinder head so they will not function when assembly has been completed.

- Then secure fuel rail (bottom section of intake manifold) -arrows-.
- Check function of air flow control flaps using hand-operated vacuum pump -VAS 6213- .

- Connect hand-operated vacuum pump -VAS 6213- as illustrated.
- Create a vacuum and check function of vacuum unit at operating rod.

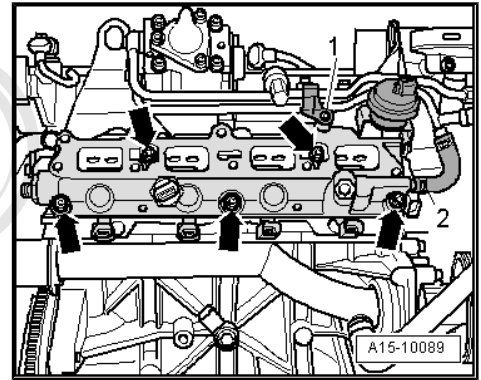
Steps for fuel return line are only necessary on engines with code letters BAG.

- Screw down pipe bracket -1-.



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- Attach fuel return line -2-.



- Pull out drill -arrow-.



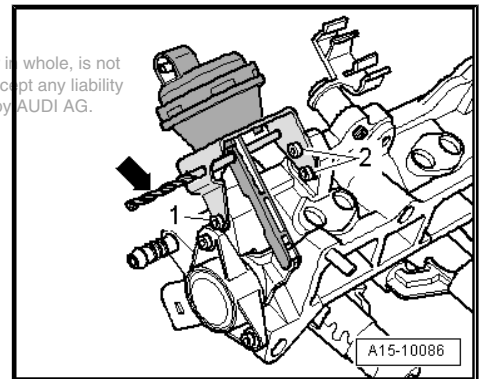
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Disregard items marked -1- and -2-.

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

- Install intake manifold ⇒ [page 19](#).



Tightening torques

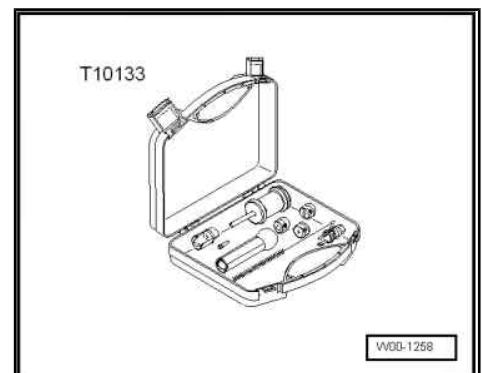
Component	Nm
Fuel rail (bottom section of intake manifold) to cylinder head	20
High-pressure pipes	High-pressure pump
to:	Fuel rail
High-pressure pump bracket	7

1.17 Removing and installing injectors

Removing

Special tools and workshop equipment required

- ◆ Tool kit with puller -T10133-



WARNING

Fuel supply line is pressurised. Before loosening fuel connections always release fuel pressure prior to carrying out any work ⇒ [page 3](#).

- Remove top section of intake manifold ⇒ [page 19](#) and fuel rail (bottom section of intake manifold) ⇒ [page 26](#) .

- Illustration shows injector when removed.

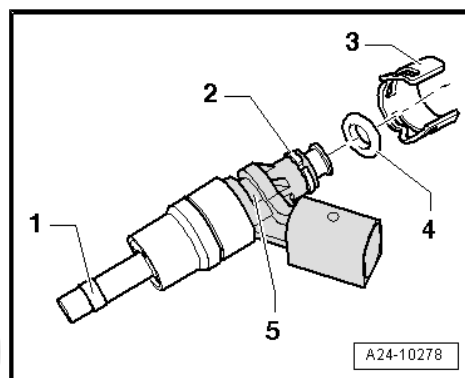
1 - Combustion chamber ring seal (teflon ring seal) - renew ⇒ [page 31](#) ; when fitting, do not grease ring or use any other lubricant.

2 - Spacer ring (renew if damaged)

3 - Support ring (via this support ring, fuel rail exerts force which secures injector in cylinder head)

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

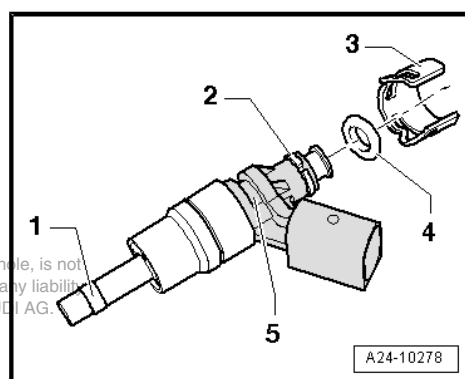
5 - Groove on injector



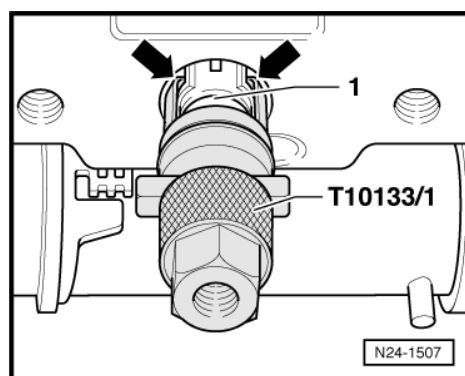
Note

To remove the injector, the support ring -3- must be removed from the injector so that the puller -T10133/2- can be inserted into the groove on the injector -5-.

- Cover open inlet ports with a clean cloth.
- Unplug electrical connector at injector that is to be removed.
- Pull retaining clip and support ring off injector.



- Place puller -T10133/1- on injector -1-. Make sure that hooks of puller engage in recesses on injector -arrows-.
- Tighten knurled nut of puller (hand-tight).

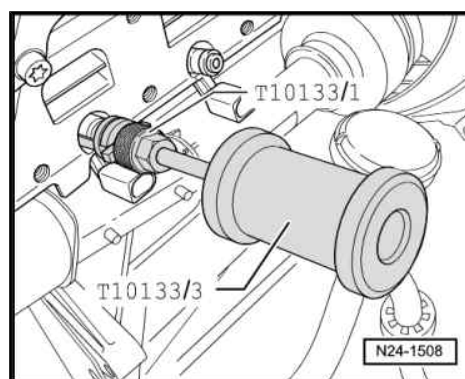


- Screw striker -T10133/3- onto puller -T10133/1- .
- Lift injector upwards out of cylinder head by tapping gently. The radial compensation element might thereby become damaged (retainer tabs break off). It must be renewed when injector is refitted.



Note

The combustion chamber ring seal must always be renewed prior to reinstalling the high-pressure injector ⇒ [page 31](#) .



1.18 Renewing combustion chamber ring seal (teflon ring seal)



Note

The combustion chamber ring seal must always be renewed prior to reinstalling the high-pressure injector.

- Illustration shows injector when removed.

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

2 - Spacer ring (renew if damaged)

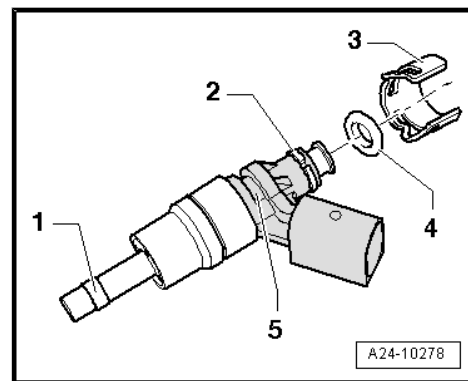
3 - Support ring (via this support ring, fuel rail exerts force which secures injector in cylinder head)

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

5 - Groove on injector

The combustion chamber ring seal (teflon ring seal) must always be renewed prior to reinstalling the high-pressure injector.

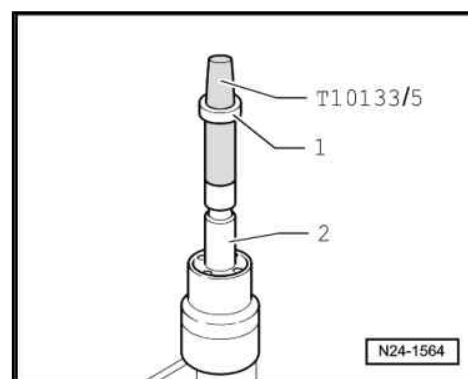
- Carefully remove old teflon ring using a suitable tool (e.g. cut open ring with razor blade, or prise open ring with small screwdriver and then pull off forwards). It is important to ensure that the groove and the continuous ridge in the bottom of the groove are not damaged.



Note

The injector must be renewed if the groove is damaged.

- Before new teflon ring is fitted, any combustion residue must be removed from ring groove and injector stem using a clean cloth.
- Fit the assembly cone -T10133/5- with new teflon seal -1- onto the injector -2-.



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


Note

The teflon ring is widened as it is pushed onto the injector. The teflon ring must therefore be compressed again after it has been fitted. This is done in two steps. The procedure is described below.

Step 1 of teflon ring seal calibration (adaption) is done with calibration sleeve -T10133/7- .

- Slide calibration sleeve -T10133/7- onto injector as far as the stop by pressing lightly and turning approx. 180°. Pull calibration sleeve -T10133/7- off again by turning it in the opposite direction.

Step 2 of teflon ring seal calibration (adaption) is done with calibration sleeve -T10133/8- .

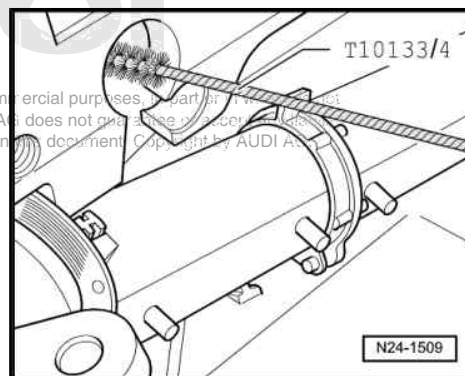
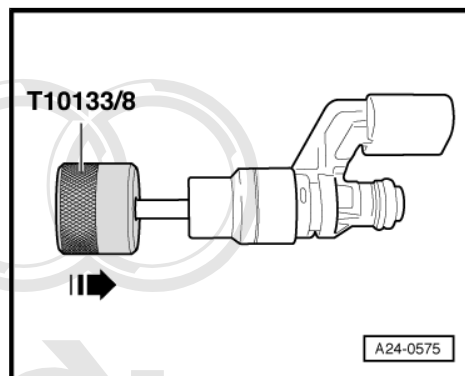
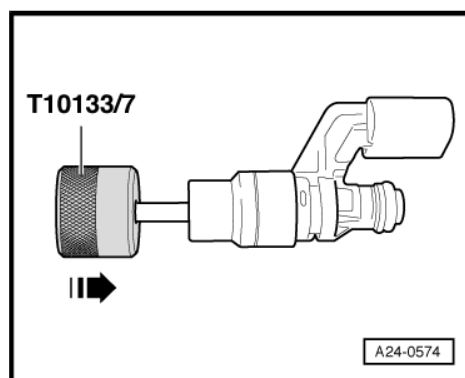
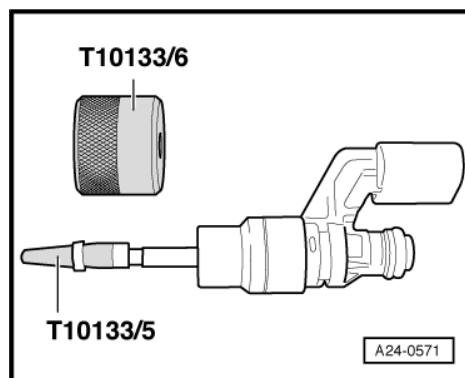
- Slide calibration sleeve -T10133/8- onto injector as far as the stop by pressing lightly and turning approx. 180°. Pull calibration sleeve -T10133/8- off again by turning it in the opposite direction.
- Renew O-rings on injector and spacer sleeve. Lubricate O-rings lightly with clean engine oil before installing.

- Use supplied nylon brush -T10133/4- to thoroughly clean holes for high-pressure injectors in cylinder head prior to installing injector.


Note

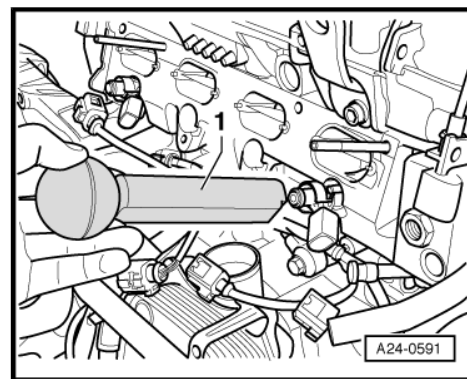
An open inlet valve may prevent cleaning. If so, the engine must be cranked by hand by rotating the crankshaft with a spanner.

- Reinstall the injector with the support ring.



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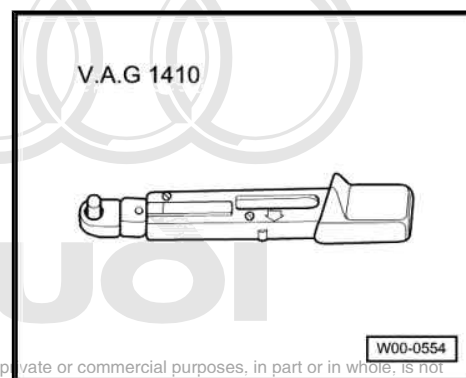
- Use assembly tool -T10133/9- to push injector as far as it will go into hole in cylinder head. Ensure that the injector is properly seated in the cylinder head.
- The remaining installation steps are carried out in the reverse sequence.
- Install fuel rail (bottom section of intake manifold) ⇒ [page 26](#) and then top section of intake manifold ⇒ [page 19](#) .



1.19 Removing and installing high-pressure pump (engine code letters BAG)

Special tools and workshop equipment required

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



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Removing



Note

- ◆ *The high-pressure fuel pump should only be removed and installed when the engine is cold.*
- ◆ *When installing the high-pressure fuel pump, it is essential to ensure that no dirt enters the fuel system.*
- ◆ *The high-pressure pump must not be dismantled.*



WARNING

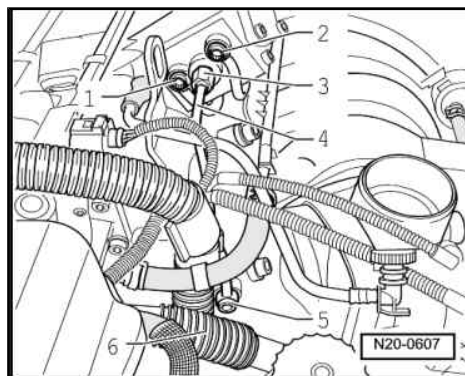
Fuel supply line is pressurised. Before loosening fuel connections always release fuel pressure prior to carrying out any work ⇒ [page 3](#) .

- Remove engine cover panel ⇒ [page 15](#) .

- Remove connecting pipe -6-.
- Loosen union nut -3-.
- Unscrew banjo bolts -1-, -2- and -5-.


Note

Use a cloth to catch escaping fuel.



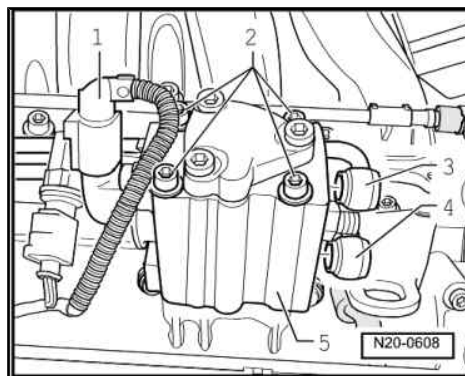
- Detach connector -1-.
- Detach fuel line connections -3- and -4- from high-pressure pump -5-.
- Remove securing bolts -2-.
- Detach high-pressure pump -5- from camshaft housing.

Installing

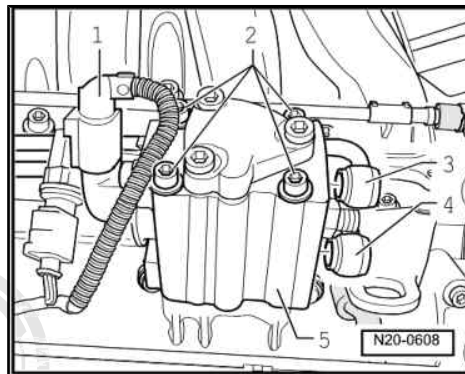
Installation is carried out in the reverse order; note the following:


Note

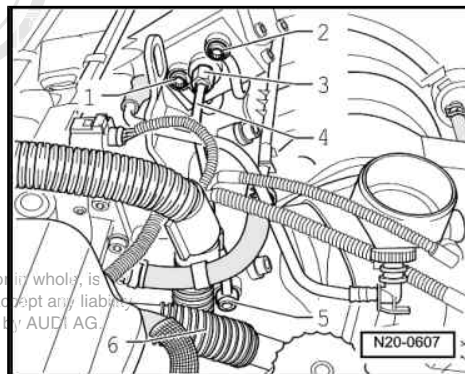
- ◆ *Lubricate sleeve of high-pressure pump with clean engine oil.*
- ◆ *Always renew O-ring for high-pressure pump.*



- Fit high-pressure pump -5- with new, oiled O-ring in camshaft housing.
- Tighten securing bolts -2- on high-pressure pump -5- to 10 Nm.
- Refit connector -1-.
- Fit fuel lines -3- and -4- onto high-pressure pump.



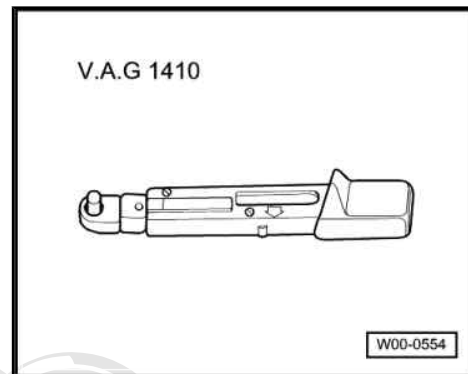
- Tighten banjo bolts -1- and -2- to 15 Nm
- Install high pressure pipe -4- as follows:
 - 1 - Screw in banjo bolt -5- 2 turns by hand.
 - 2 - Screw in union nut -3- onto stop by hand.
 - 3 - Screw in banjo bolt -5- onto stop by hand.
 - 4 - Tighten banjo bolt -5- to 15 Nm
 - 5 - Tighten union nut -3- to 15 Nm
- Install connecting pipe -6-.



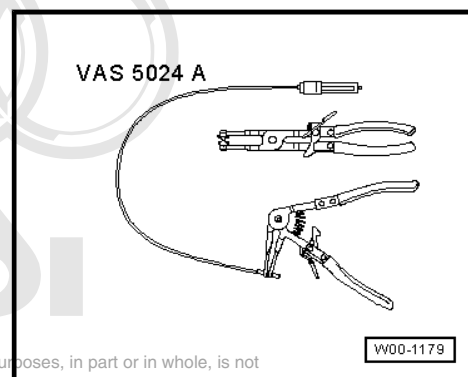
1.20 Removing and installing high-pressure pump (engine code letters BLP and BLF)

Special tools and workshop equipment required

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



- ◆ Spring-type clip pliers -VAS 5024A- or hose clip pliers -VAS 6340-



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Removing



Note

- ◆ *The high-pressure fuel pump should only be removed and installed when the engine is cold.*
- ◆ *When installing the high-pressure fuel pump, it is essential to ensure that no dirt enters the fuel system.*
- ◆ *The high-pressure pump must not be dismantled.*

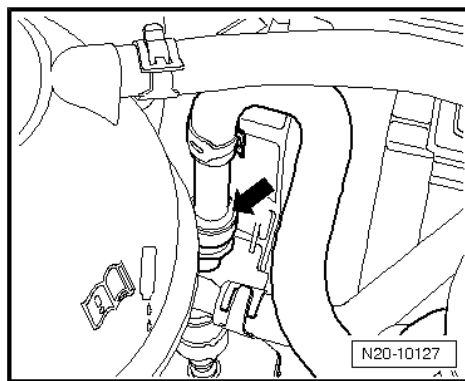
- Remove engine cover panel ⇒ [page 15](#) .



WARNING

Fuel supply line is pressurised. Before loosening fuel connections always release fuel pressure prior to carrying out any work ⇒ [page 3](#) .

- Disconnect fuel supply line -arrow-.

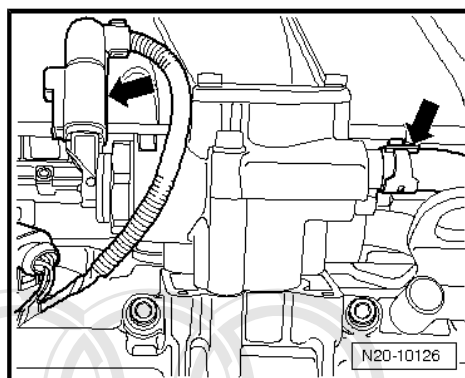


- Detach connector and fuel supply line -arrows- from high-pressure pump.



Note

Use a cloth to catch escaping fuel.



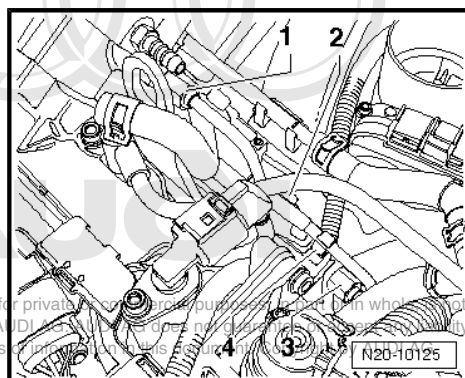
- Remove duct -2- and detach clip -4- from high-pressure pipe.



Note

Counterhold connections on high-pressure pump and lower section of intake manifold with a spanner when loosening union nuts.

- Loosen union nuts -3- and -1- on high-pressure pipe.



- Unscrew securing bolts -1-, -2- and -3- evenly.
- Detach high-pressure pump from camshaft housing.

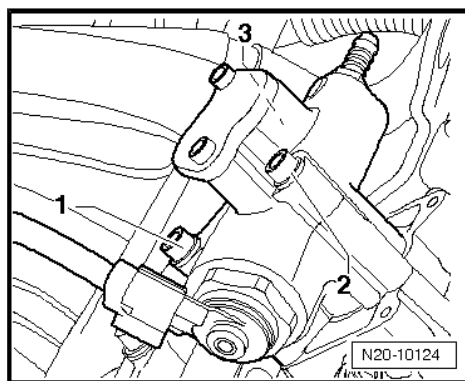
Installing

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

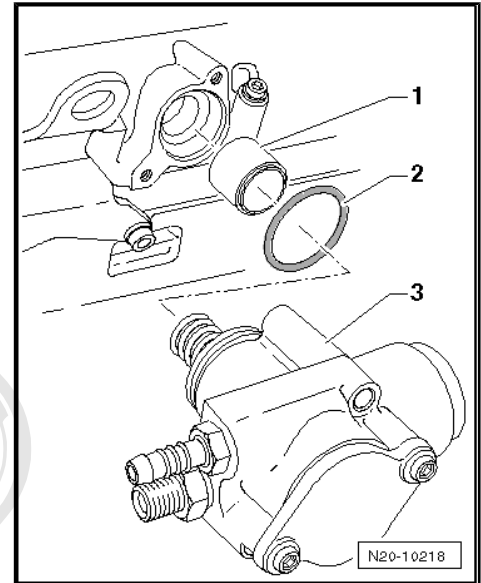


Note

- ◆ Lubricate tappets of high-pressure pump with clean engine oil.
- ◆ Always renew O-ring for high-pressure pump.
- Insert a new, oiled O-ring -2- into groove on high-pressure pump.

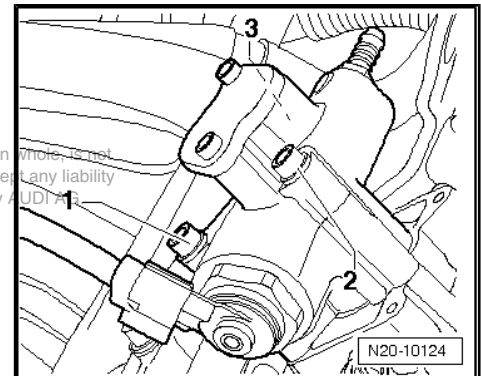


- Fit high-pressure pump -3- on camshaft housing.



- Tighten securing bolts -1-, -2- and -3- evenly.
- ◆ Tightening torque: 10 Nm

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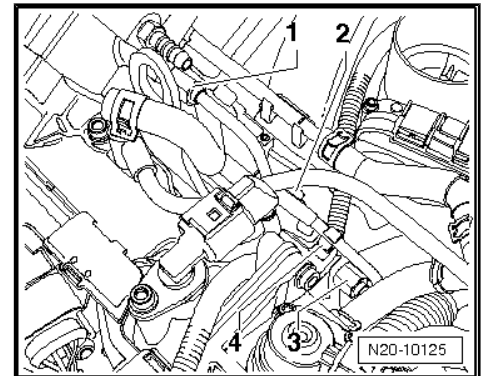


- Hand-tighten union nuts -1- and -3- on high-pressure pipe.
 - Install duct -2- and press clip -4- onto high-pressure pipe.
- Tightening torque of securing bolt for duct: 10 Nm

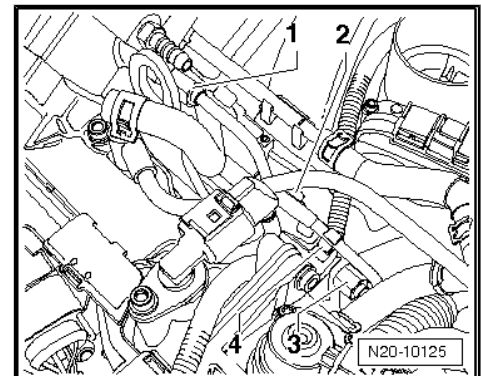


Note

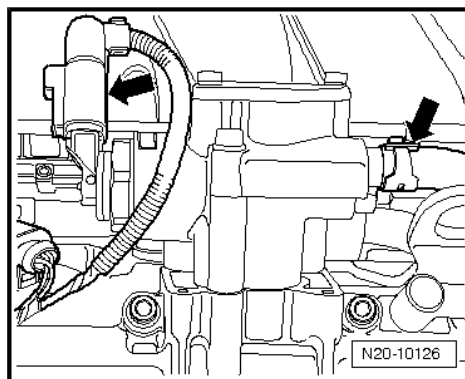
Counterhold connections on high-pressure pump and lower section of intake manifold with a spanner when tightening union nuts.



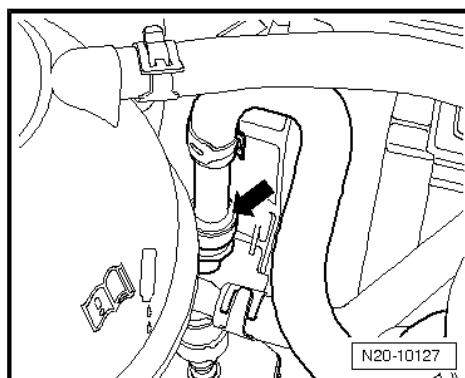
- Tighten union nuts -1- and -3-.
- ◆ Tightening torque for high-pressure pipe connections: 18 Nm



- Attach fuel supply line and connector -arrows- on high-pressure pump.



- Connect fuel supply line -arrow-.



1.21 Checking initial fuel pressure up to mechanical high-pressure pump



Note

- ◆ Control unit for electric fuel pump OK.
- ◆ Fuel pump OK.
- ◆ Fuel filter OK
- ◆ Battery voltage at least 11 Volt

- Switch on ignition.

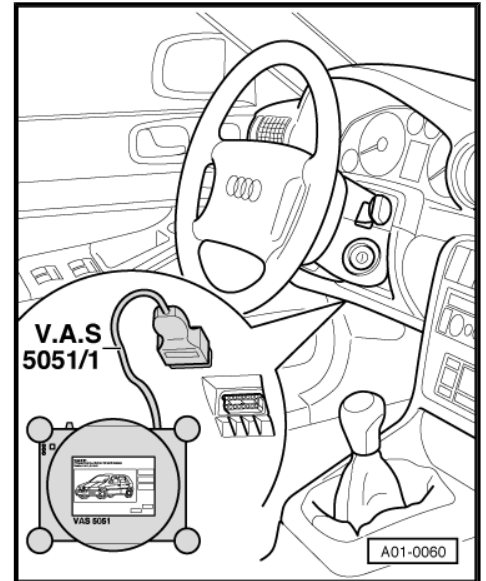


Note

The engine control unit is selected below using the VAS 5051 under the function "Read data block" and the display group 140.

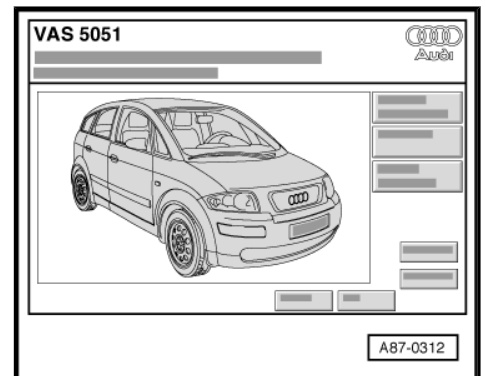
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- Connect vehicle diagnostic, testing and information system - VAS 5051B- with diagnostic cable -VAS 5051/1- .



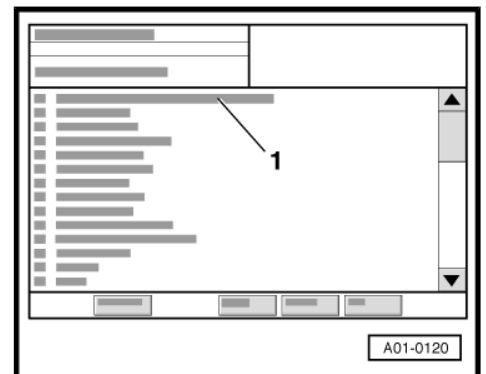
Display on tester:

- Press the “Vehicle self-diagnosis” key.



Display on tester:

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

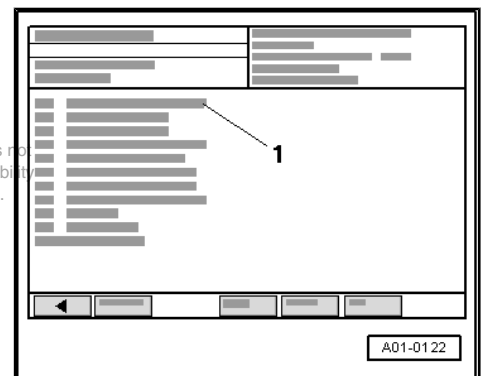


Display on tester:

1 - Selection of diagnostic functions:

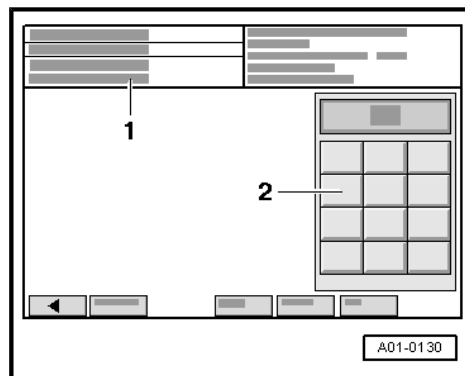
- From list -1- select diagnostic function “08 - Read measured value block”

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Display on tester:

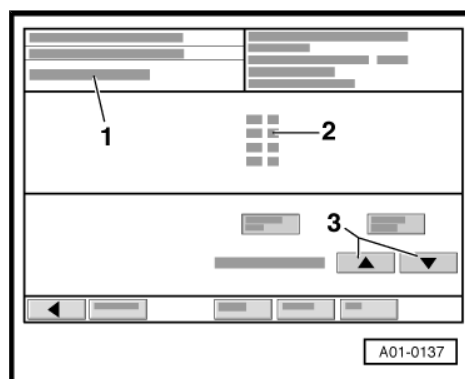
- Use keypad -2- to enter display group number 140 and confirm entry by pressing the **Q** key.



Display on tester:

- 1 - Display group X
- 2 - Display zone 1
- Display zone 2
- Display zone 3
- Display zone 4

Observe the reading in display zone 3. The display shows the current (actual) pressure in the fuel rail. Display zone 2 shows the specified pressure (required pressure). The values for specified pressure and actual pressure should be equal.

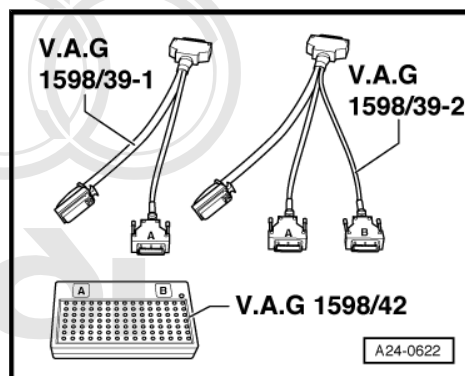


Note

When the ignition is switched off and on, the fuel pump control unit -J538- will activate the electric fuel pump for several seconds. The initial fuel pressure can only be measured during this time.

- Switch the ignition off and back on again (when a message appears, press repeat.)
- Measure the fuel pressure.
- ♦ Specification: approx. 6 bar (5 ... 7 bar)
- If reading does not match specification, check electric fuel pump ⇒ Rep. Gr. 20 .

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

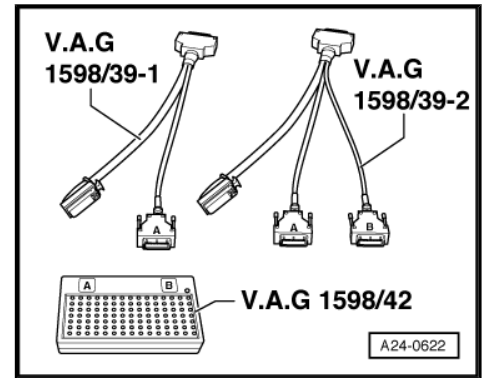


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Note

- ◆ The test box has 105 contacts. The connecting cable can be disconnected from the test box. This means that only the cable (and not the test box) has to be purchased for future engine control units with different types of connectors.
- ◆ The smaller of the two connectors on the engine control unit has the contacts 1 to 60. The larger of the two connectors has the contacts 1 to 94.
- ◆ If you want to check a wiring connection to the engine control unit, first refer to the current flow diagram to find out which connector on the engine control unit the wiring connection leads to. If this is a wire which leads to the 60-pin connector (e.g. the activation wire for the intake manifold change-over valve, T60/27), then attach the smaller of the two connectors to connection "A" of the test box -V.A.G 1598/42- (using adapter cable -V.A.G 1598/39-1-) and measure to pin 27.
- ◆ If a wiring connection leads to the 94-pin connector (according to current flow diagram), then connect the larger of the two connectors using adapter cable -V.A.G 1598/39-2- as follows: The connector marked "A" must be attached to connection "A" on the test box -V.A.G 1598/42- and the connector marked "B" must be attached to connection "B" on the test box -V.A.G 1598/42-.
- ◆ 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 relevant test procedure will state whether it is necessary to also connect the engine control unit to the test box.



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

- Remove Motronic control unit -J220- ⇒ [page 42](#) .
- Connect test box -V.A.G 1598/42- 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

Installation is performed in the reverse sequence; the engine control unit must be installed with the protective housing. New shear bolts must be used.

Perform the following after reconnecting engine control unit:

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

1.23 Renewing Motronic control unit -J220-

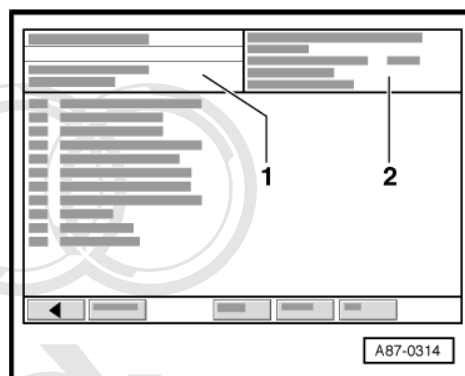
Removing

If the motronic control unit -J220- is to be renewed, you must first print out the control unit identification and coding before removing it.

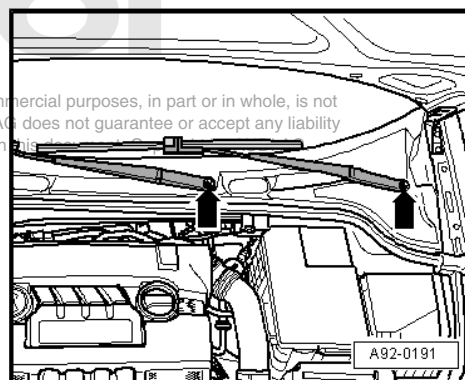
- Connect vehicle diagnostic, testing and information system - VAS 5051B- and select vehicle system "01 - Engine electronics" from list. When doing this, the ignition must be switched on.

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

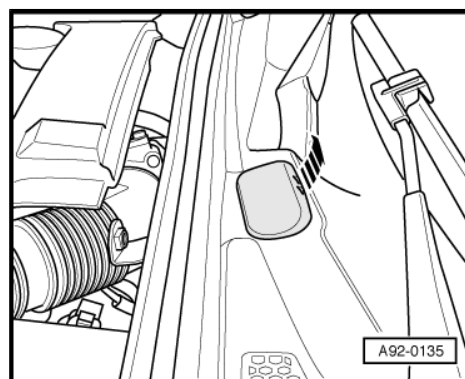
- Always start by displaying the control unit identification and coding and printing it out.
- Switch off ignition.
- Lever off caps on windscreen wiper arms with a screwdriver.



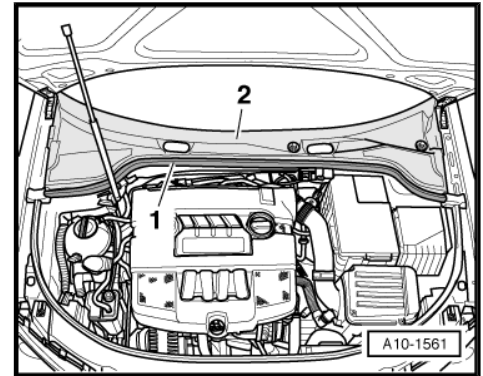
- Loosen hexagon nuts -arrow- several turns.
- Loosen wiper arms from wiper shafts by tilting slightly.
- Completely remove hexagon nuts and detach wiper arms from wiper shafts.



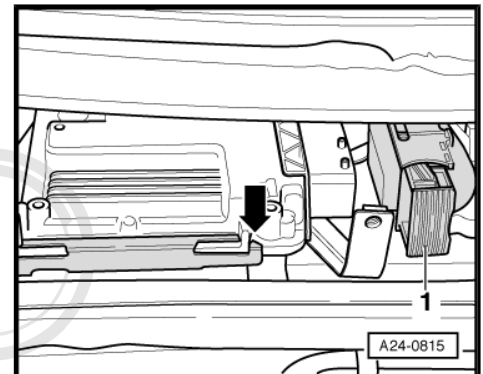
- Unclip washer jets -arrow-.
- Push washer jets through assembly opening back into plenum chamber, leaving hoses connected.



- Pull off rubber seal -1- from plenum chamber cover.
- Detach plenum chamber cover -2-.



Bracket for engine control unit: version 1



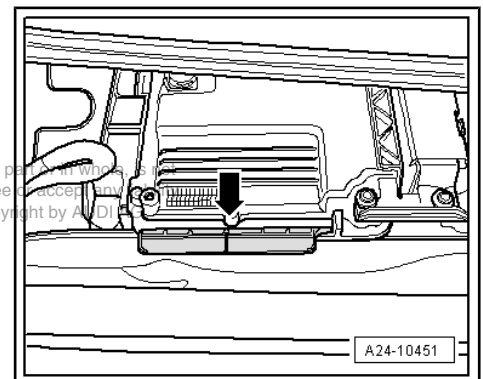
Bracket for engine control unit: version 2

- Release clip “arrow” and remove engine control unit. You can then unplug the connector from the engine control unit.

The following steps are only required if the engine control unit is installed as in version 1 in the illustration.

Set wiper shafts to service position (to enable electrical connector to be detached from engine control unit).

- First close bonnet.
- Switch ignition on and then off again. Within 10 seconds, press wiper switch down once to brief wipe position.



Note

The wiper shafts will now run to the service position.

- Then open bonnet again.

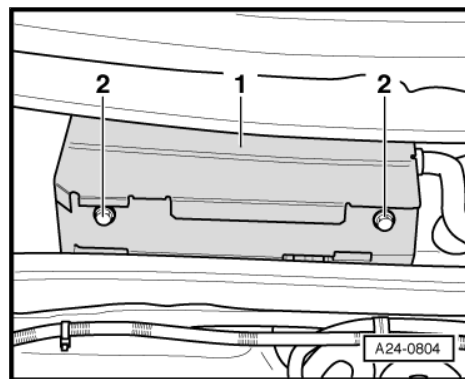
The following steps are only required up to and including model year 2006.

- Remove ignition key.

To make it more difficult to access connectors on engine control unit, the engine control unit is covered by a protective housing -1- and secured with shear bolts -2-.

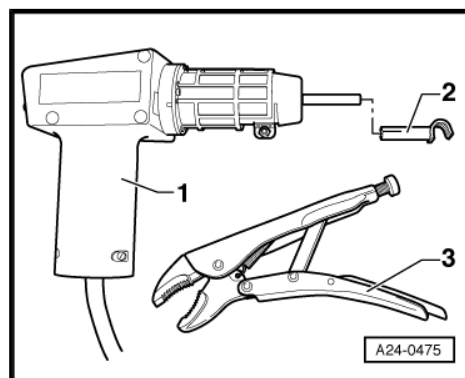
To make it more difficult to unscrew the shear bolts, their threads have been coated with locking fluid.

Engine control unit must be separated from protective housing before connectors can be unplugged from engine control unit (e.g. when connecting test box or replacing engine control unit). This procedure is described in the following.



Special tools and workshop equipment required

- ◆ Hot air blower -1- (from the wiring harness repair set -VAS 1978A-)
- ◆ Nozzle attachment -2- (also from wiring harness repair set -VAS 1978A-)
- ◆ Commercially available vice-grip pliers



Procedure:



WARNING

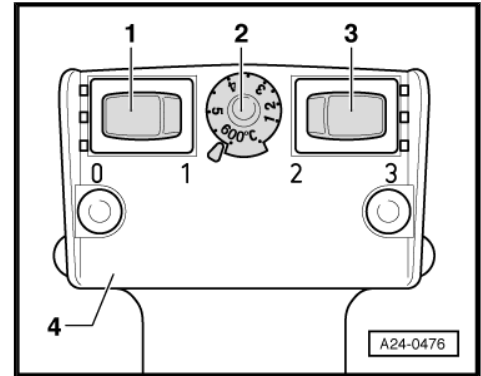
The following procedure must be followed exactly to prevent any damage (scorching) to wiring, connectors, insulation and control units. Observe operating instructions for hot air blower.

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

 Note

- ◆ Then use hot air blower to heat shear bolts. This step reduces inhibiting action of locking fluid on shear bolt threads and makes it easier to unscrew these bolts.
- ◆ Cover up all painted parts to avoid any damage caused by hot air blower or vice-grip pliers.



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

- Place the hot air blower nozzle close to the shear bolt on the protective housing.
- Switch on the hot air blower and heat the bolt for approximately 20 to 25 seconds.
- Then grasp the bolt head with the vice-grip pliers and unscrew the shear bolt.

The procedure for the second shear bolt is exactly the same.

Engine control unit can now be separated from protective housing.

- Release front connector -1- from engine control unit and unplug.
- Pull engine control unit out of retainer -arrow- (wiper shafts in service position).
- Release rear connector on engine control unit and unplug.

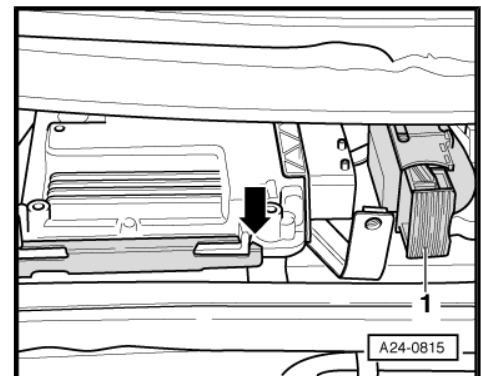
Installing engine control unit on vehicles with protective housing

Installation is performed in the reverse sequence.

- Make sure you fit protective housing back on engine control unit.
- Clean threaded holes for shear bolts to remove any residue from locking fluid. This can be done using a thread tap.
- Use new shear bolts.
- Return wiper arms to normal position.
- First close bonnet.
- Switch on ignition and press wiper switch down once to brief wipe position. The wipers will then return to the normal position.

The following step must be performed after installing the new engine control unit:

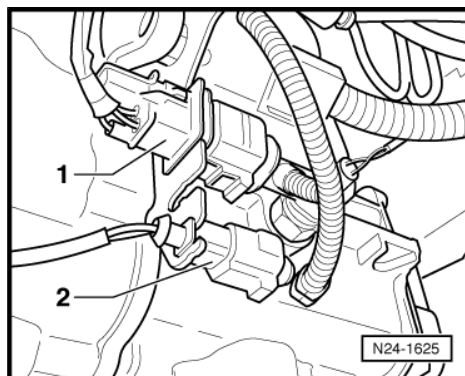
- Activate engine control unit in "Guided Fault Finding" under the test procedure / function "Replace engine control unit".



1.24 Removing and installing Lambda probe -G39- (before catalytic converter)

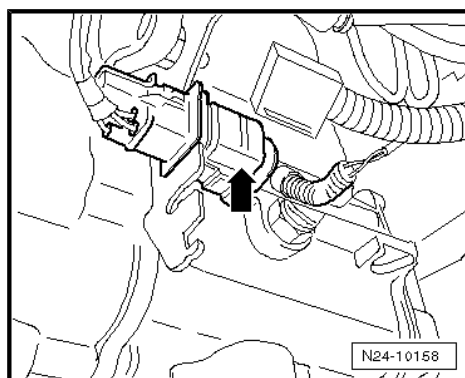
Removing

Electrical connector -item 1- (engine code BAG)



Electrical connector -arrow- (engine codes BLP, BLF)

- Unplug electrical connector for Lambda probe -G39- .



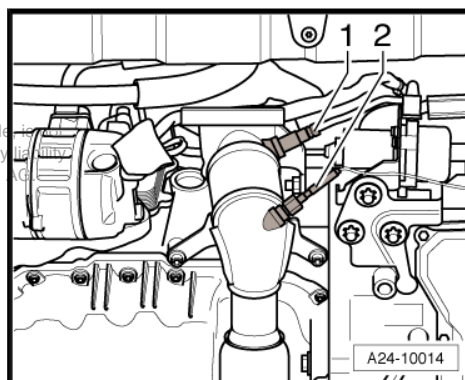
- Unscrew Lambda probe -G39- -item 1- using Lambda probe open ring spanner set -3337- .



Note

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- ◆ *Illustration shows exhaust of vehicle with engine code BAG.*
- ◆ *Item 2 can be disregarded.*



Installing

- When installing, note the following:



Note

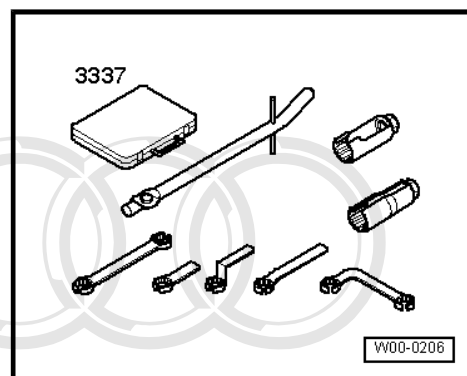
- ◆ *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- ◆ *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the probe body. High-temperature paste ⇒ Parts catalogue*
- ◆ *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*
- ◆ *Tightening torque: 55 Nm.*

1.25 Removing and installing exhaust gas temperature sender 1 -G235-

The exhaust gas temperature sender 1 -G235- is only fitted on engines with code letters BAG and BLP.

Special tools and workshop equipment required

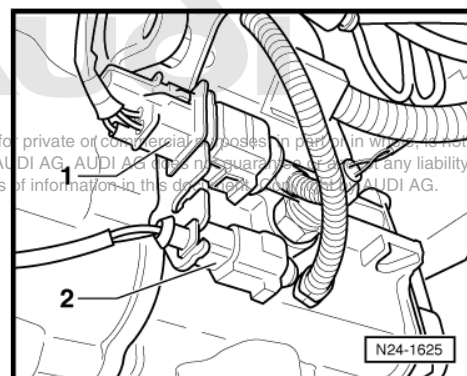
- ◆ Lambda probe open ring spanner set -3337-



Removing

Electrical connector -2- (engine code BAG)

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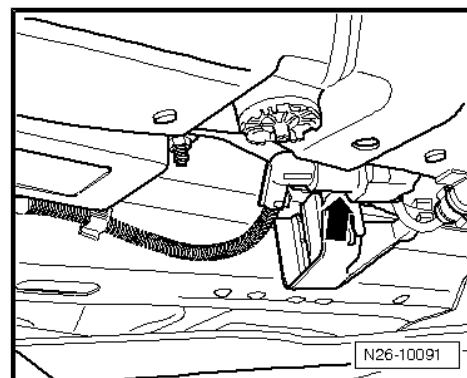


Electrical connector -arrow- (engine code BLP)



Electrical connector for exhaust gas temperature sender 1 -G235- is located behind underbody trim (right-side), near control unit for NOx sender -J583-.

- Unplug electrical connector for exhaust gas temperature sender 1 -G235-.
- Unscrew exhaust gas temperature sender 1 -G235- using Lambda probe open ring spanner set -3337-.



Installing

- When installing, note the following:



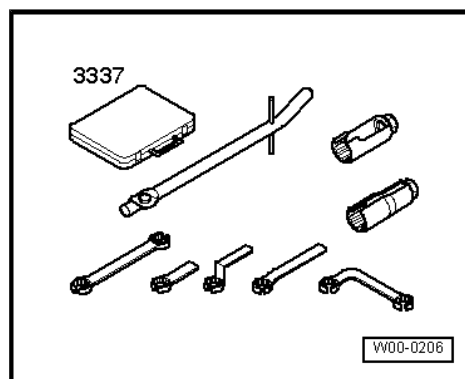
- ◆ *When installing, the electrical wire for exhaust gas temperature sender 1 -G235- must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*
- ◆ *Tightening torque: 45 Nm.*

1.26 Removing and installing NOx sensor control unit -J583- and NOx sender -G295-

The NOx sensor control unit -J583- and NOx sender -G295- are only fitted on engines with code letters BAG and BLP.

Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set -3337-

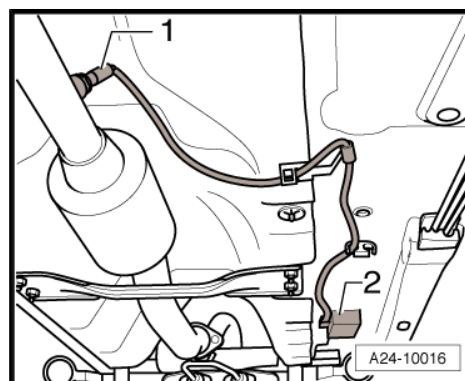


Removing

- Remove right-side cover from underbody.

The cable connecting the NOx sensor control unit -J583- -item 2- and the NOx sender -G295- -item 1- cannot be disconnected.

- Unplug engine wiring harness connector at NOx sensor control unit -J583- .
- Pull cable between NOx sensor control unit -J583- and NOx sender -G295- out of retainers and detach NOx sensor control unit -J583- .
- Unscrew NOx sender -G295- -item 1- using tool from Lambda probe open ring spanner set -3337- .



Installing

- When installing, note the following:



Note

- ◆ When installing, the cable for NOx sender -G295- must always be reattached at the same locations to prevent cable from coming into contact with exhaust pipe.
- ◆ Tightening torque: 55 Nm

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

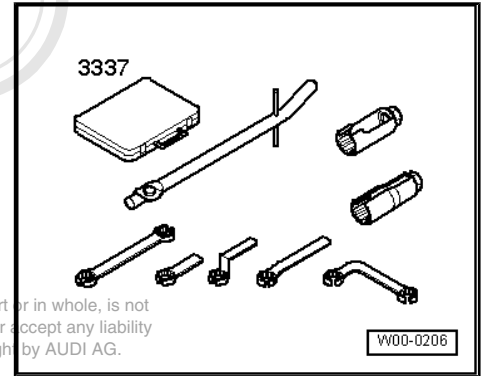
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Removing Lambda probe

Lambda probe after catalytic converter -G130- is only fitted on models with engine code BLF.

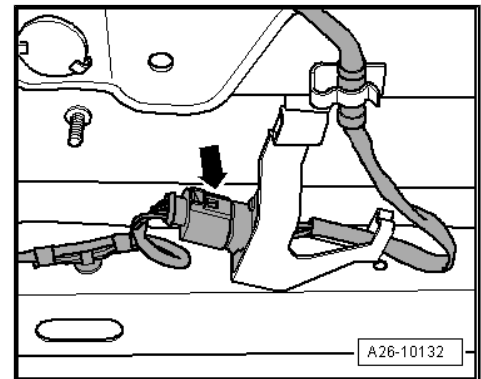
Special tools and workshop equipment required

◆ Lambda probe open ring spanner set -3337-



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- Remove right-side cover from underbody.
- Unplug electrical connector -arrow- for Lambda probe after catalytic converter -G130- and Lambda probe 1 heater, after catalytic converter -Z29- .



- Unscrew Lambda probe after catalytic converter -G130- and Lambda probe 1 heater, after catalytic converter -Z29- -1- using a tool from the Lambda probe open ring spanner set -3337- .

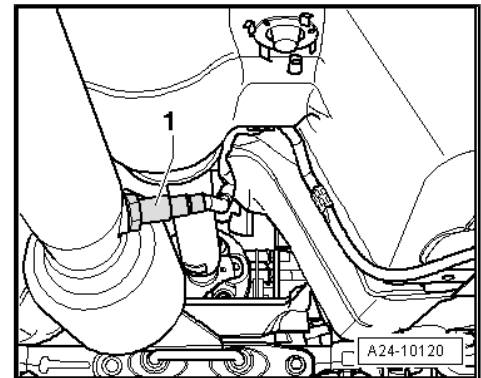
Installing Lambda probe

When installing, note the following:



Note

- ◆ *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- ◆ *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the probe body. High-temperature paste → Parts catalogue*
- ◆ *When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.*
- ◆ *Tightening torque: 55 Nm.*



28 – Ignition system

1 Servicing the 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.

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.*

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

- ◆ Persons wearing a cardiac pacemaker must at all times maintain a safe distance from high-voltage components such as the ignition system and gas-discharge headlights.
- ◆ Do not 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 injection or ignition system wiring or tester cables.
- ◆ Always switch off the ignition before cleaning the engine.
- ◆ Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.
- ◆ If the engine has to be operated at the starting speed without actually starting (e.g. to test compression pressure), detach the four connectors from the ignition coils using assembly tool -T10118- and puller -T10094- ⇒ [page 52](#) . Also remove fuse 27 from fuel pump control unit -J538- .



Note

Removing fuse 27 will interrupt the voltage supply for the fuel pump control unit -J538- .

1.3 Technical data for ignition system

Engine data	1.6 ltr. / 85 KW FSI engine
Firing order	1-3-4-2
Spark plug electrode gap	0.9...1.1 mm
Spark plug tightening torque	30 Nm
Ignition timing is determined by the control unit. Ignition timing cannot be adjusted.	
Ignition system	Multi-coil ignition system with 4 ignition coils (integrated output stages) connected directly to spark plugs via spark plug connectors; ignition coils can be pulled out of cylinder head using puller -T10094-

1.4 Removing and installing ignition system components

1 - Connector

- ☐ Black, 4-pin
- ☐ Release with assembly tool -T10118-

2 - Ignition coils with output stage -(N70, N127, N291, N292)-

- ☐ Removing and installing
⇒ [page 52](#)

3 - Connector

- ☐ Black, 2-pin
- ☐ For knock sensor 1 - G61-
- ☐ Connector contacts are gold-plated

4 - Knock sensor 1 -G61-

- ☐ Connector contacts are gold-plated

5 - 20 Nm

- ☐ Tightening torque influences the function of the knock sensor

6 - Connector

- ☐ Black, 3-pin
- ☐ For Hall sender -G40-

7 - Hall sender -G40-

8 - O-ring

- ☐ Renew if damaged

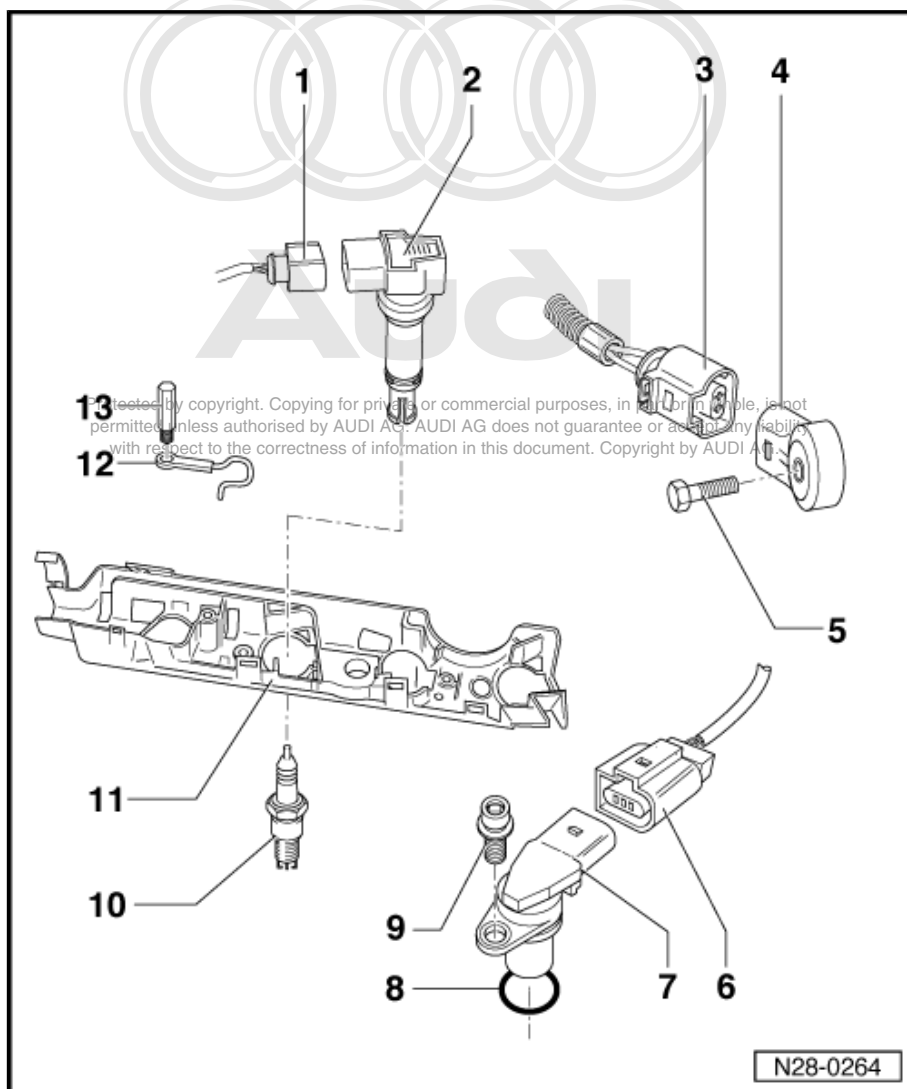
9 - 10 Nm

10 - Spark plug

- ☐ 30 Nm
- ☐ Removing and installing ⇒ Maintenance ; Booklet 808

11 - Cable guide

- ☐ Tighten to 5 Nm at camshaft housing



12 - Earth cable

- ☐ Only loosen or tighten with ignition switched off.

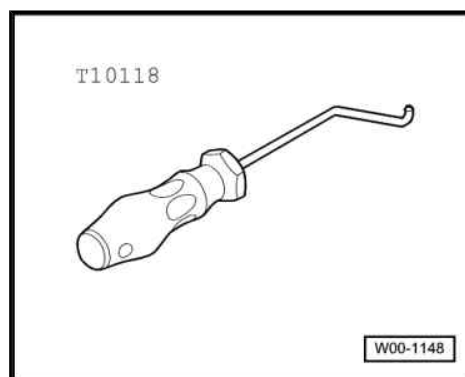
13 - 10 Nm

- ☐ Only loosen or tighten with ignition switched off.

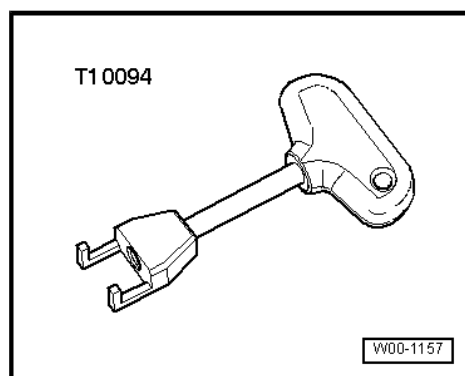
1.5 Removing and installing ignition coils with output stages

Special tools and workshop equipment required

- ◆ Assembly tool -T10118-



- ◆ Puller -T10094-

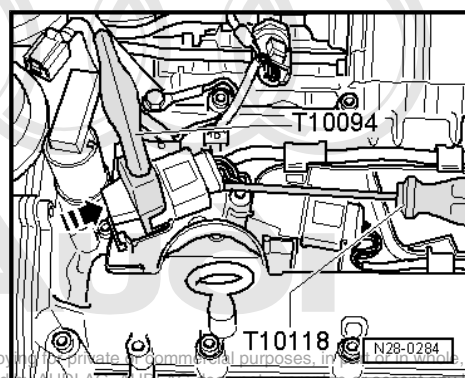


Removing

- Position puller -T10094- on ignition coil with output stage -arrow-.
- Pull ignition coil with output stage out slightly.
- Position assembly tool -T10118- as shown.
- Carefully release catch on connector and unplug connector.

Installing

- Position puller -T10094- on ignition coil with output stage.
- Fit ignition coils loosely into spark plug holes.
- Align ignition coils with connectors and attach all connectors to ignition coils so they engage audibly.



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- Press ignition coils with output stages evenly onto spark plugs in direction of -arrow- (DO NOT knock them into place with any kind of tool).



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