

Workshop Manual Audi A3 2004 ➤

**Direct petrol injection and ignition system (4-cyl. 2.0 ltr.
4-valve)**

Engine ID	AXW	BHD	BMB	BLX	BLY	BLR	BVY	BVZ	
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Edition 09.2009

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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24 – Mixture preparation - injection

1 Safety precautions and rules for cleanliness

1.1 General notes on self-diagnosis

- ◆ The engine control unit has a self-diagnosis capability. Before carrying out repairs and fault finding the fault memory must be interrogated. The vacuum hoses and connections must also be checked (unmetered air).
- ◆ Fuel hoses in engine compartment must only be secured with spring-type clips. O-type clips or screw-type clips must not be used.
- ◆ A voltage of at least 11.5 V is required for proper operation of the electrical components.
- ◆ Do not use sealants containing silicone. Particles of silicone drawn into the engine will not be burnt in the engine and will damage the Lambda 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:

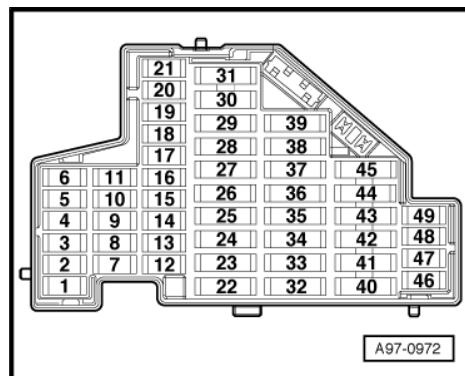


WARNING

- ◆ *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.
- ◆ 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 -T40039- ⇒ [page 55](#) . 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. Do not use fluffy cloths.
- ◆ Carefully cover or seal open components if repairs cannot be carried out immediately.
- ◆ Only install clean components; replacement parts should only be unpacked immediately prior to installation. Do not use parts that have been previously unpacked and stored away loose (e.g. in toolboxes, etc.).
- ◆ When the system is open: Do not work with compressed air if this can be avoided. Do not move the vehicle unless absolutely necessary.
- ◆ 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

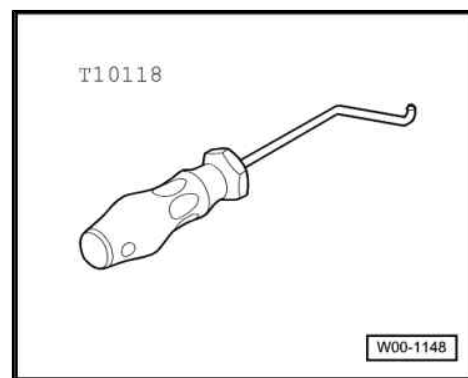
The injection system consists of a high-pressure section (maximum approx. 120 bar) and a low-pressure section (approx. 6 bar).

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

Special tools and workshop equipment required

- ◆ Assembly tool -T10118-



- Using assembly tool -T10118-, detach electrical connector from fuel pressure regulating valve -N276- -5-.
- 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.
- ◆ You can watch the fuel pressure dropping by connecting a vehicle diagnosis and service information system -VAS 5052- 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.

- 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.

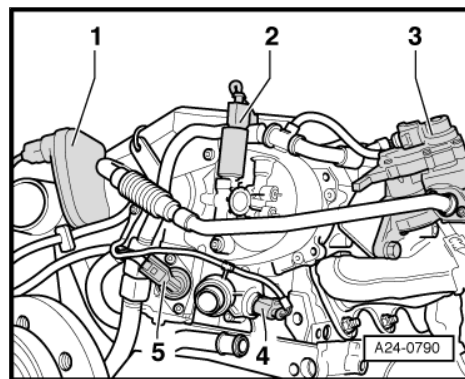
Before opening the high-pressure section, wrap a cloth around the connection.

- 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.


Note

The pressure may increase again slightly if a high-pressure line is not opened immediately.

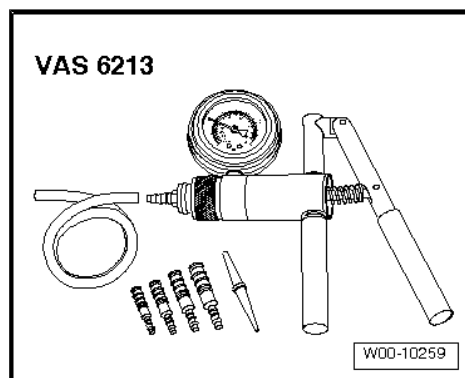
- Connect vehicle diagnosis and service information system -VAS 5052- and generate readiness code in engine control unit using "Guided Fault Finding" mode.



1.5 Checking vacuum system

Special tools and workshop equipment required

- ◆ Hand vacuum pump -VAS 6213-



Procedure

- Check all vacuum lines in the complete vacuum system for:
 - ◆ Cracks
 - ◆ Traces of animal bites
 - ◆ Kinked or crushed lines
 - ◆ Lines porous or leaking
- Check vacuum line to solenoid valve and from solenoid valve to corresponding component.
- If a fault is stored in the fault memory, check the vacuum lines leading to the corresponding component and also check the remaining vacuum lines leading to other components.
- If it is not possible to build up pressure with hand vacuum pump -VAS 6213- or if the pressure drops again immediately, check hand vacuum pump and connecting hoses for leaks.

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2 Injection system

2.1 Technical data

Engine data		2.0 ltr. / 110 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		6500 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)
	Fuel high-pressure (generated by mechanical single-plunger pump)	approx. 50 bar at idling speed up to 110...120 bar in certain parts of operating range.

2.2 Overview of fitting locations

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



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1 - Activated charcoal filter solenoid valve 1 -N80-

2 - Motronic control unit -J220-

- ☐ Removing and installing
⇒ [page 47](#)

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

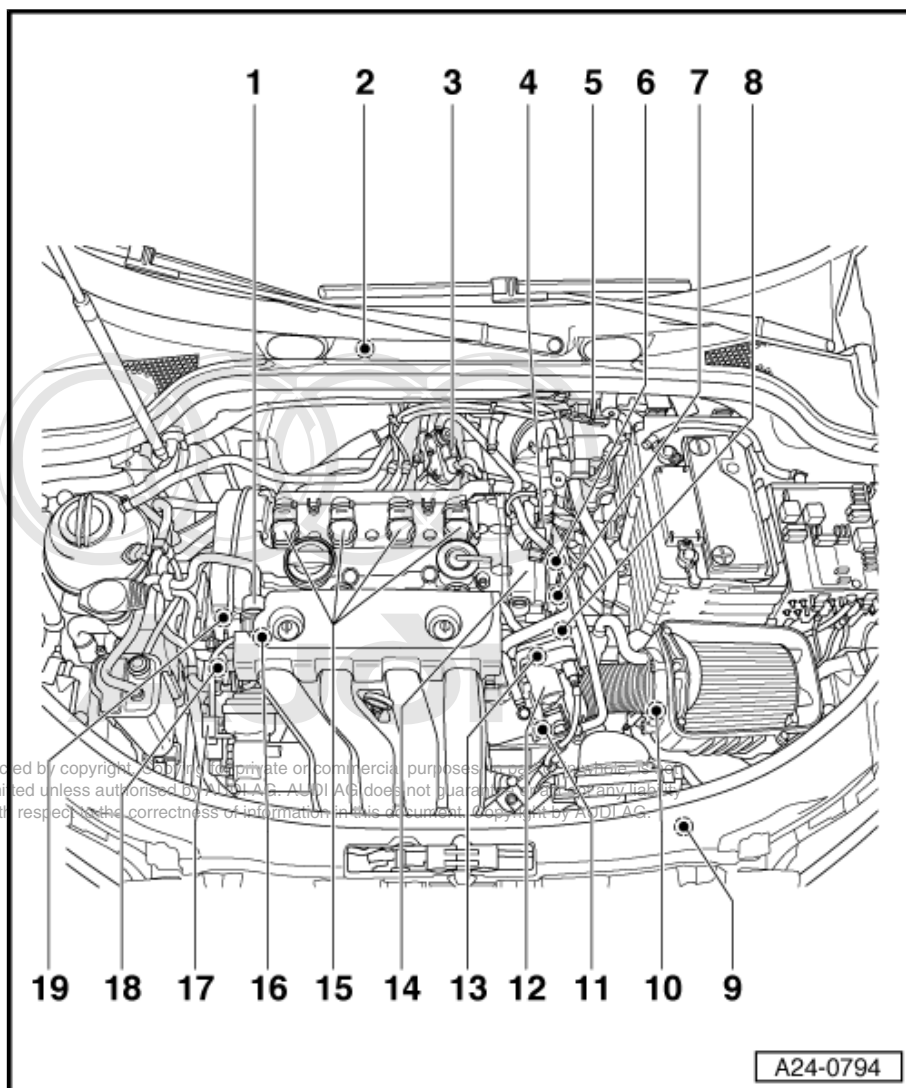
- ☐ Not fitted on engines with code letters BHD, BMB, BLY and BVZ
- ☐ ⇒ [page 12](#)

4 - Camshaft control valve 1 - N205-

- ☐ ⇒ [page 12](#)
- ☐ Removing and installing
⇒ Rep. Gr. 15

5 - 6-pin connector

- ☐ For Lambda probe - G39- and Lambda probe heater -Z19- (black)
- ☐ For Lambda probe 2 - G108- and Lambda probe heater 2 -Z28- (brown); "not fitted on engines with code letters BHD, BLY, BMB,





BVY and BVZ”

- ☐ ⇒ [page 10](#)

6 - Coolant temperature sender -G62- (4-pin)

- ☐ ⇒ [page 12](#)

7 - Fuel pressure regulating valve -N276-

- ☐ ⇒ [page 12](#)

8 - Single-plunger high-pressure pump

9 - Radiator outlet coolant temperature sender -G83-

- ☐ ⇒ [page 13](#)

10 - Intake air temperature sender 2 -G299-

- ☐ ⇒ [page 12](#)

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

- ☐ ⇒ [page 13](#)

12 - Throttle valve module -J338- , throttle valve drive for electric throttle -G186-

- ☐ Throttle valve drive angle sender 1 for electric throttle -G187- and throttle valve drive angle sender 2 for electric throttle -G188-
- ☐ Perform adaption after renewing throttle valve module -J338-

13 - 8-pin connector for injectors

14 - Vacuum pump

15 - 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-

16 - Fuel pressure sender -G247-

- ☐ ⇒ [page 13](#)
- ☐ 15 Nm

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

- ☐ ⇒ [page 12](#)

18 - Right-side of engine (in direction of travel)

- ☐ ⇒ [page 12](#)
- ☐ Fuel pressure sender for low pressure -G410- (not fitted on engines with code letters BVZ and BVY)
- ☐ Activated charcoal filter solenoid valve -N80-
- ☐ Variable intake manifold change-over valve -N156-
- ☐ 3-pin electrical connector for engine speed sender -G28-
- ☐ Map-controlled engine cooling system thermostat -F265-
- ☐ 3-pin connector for knock sensor 1 -G61-
- ☐ Hall sender -G40- (camshaft position sensor)

19 - Hall sender -G40- (camshaft position sensor)

- ☐ ⇒ [page 12](#)

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 243, refer to ⇒ Rep. Gr. 20
- ☐ Beneath rear seat bench ⇒ [page 10](#)

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C - "EPC" warning lamp

- ☐ In instrument cluster

D - "MIL" exhaust emissions warning lamp

- ☐ In instrument cluster

E - Lambda probe -G39- and Lambda probe heater -Z19-

- ☐ ➔ [page 10](#)
- ☐ Removing and installing ➔ [page 39](#)

F - Lambda probe 2 -G108- and Lambda probe heater 2 - Z28 -

- ☐ Not fitted on engines with code letter BVZ
- ☐ ➔ [page 10](#)
- ☐ Removing and installing ➔ [page 39](#)

G - Lambda probe, after catalytic converter -G130- and Lambda probe heater 1, after catalytic converter -Z29-

- ☐ ➔ [page 11](#)
- ☐ Removing and installing ➔ [page 40](#)

H - Lambda probe 2, after catalytic converter -G131- and Lambda probe heater 2, after catalytic converter - Z30-

- ☐ Not fitted on engines with code letters BLY, BHD, BMB and BVZ
- ☐ ➔ [page 11](#)
- ☐ Removing and installing ➔ [page 40](#)

I - NOx sender -G295- and NOx sender heater -Z44-

- ☐ ➔ [page 11](#)
- ☐ Not fitted on engines with code letters BHD, BMB, BLY, BLR, BVZ and BVY
- ☐ Removing and installing ➔ [page 41](#)

J - Lambda probe 3 after catalytic converter -G287- and Lambda probe heater 3 after catalytic converter -Z64-

- ☐ On engines with code letters BLR and BVY a Lambda probe 3 after catalytic converter -G287- is fitted in place of the NOx sender -G295- .
- ☐ Removing and installing ➔ [page 44](#)

K - Exhaust gas temperature sender 1 -G235-

- ☐ ➔ [page 11](#)
- ☐ Not fitted on engines with code letters BHD, BMB, BLY, BLR, BVZ and BVY
- ☐ Removing and installing ➔ [page 43](#)

L - NOx sensor control unit -J583-

- ☐ ➔ [page 10](#)
- ☐ Not fitted on engines with code letters BHD, BMB, BLY, BLR, BVZ and BVY
- ☐ Removing and installing ➔ [page 41](#)

M - Brake light switch -F- and brake pedal switch -F63-

- ☐ In footwell on brake pedal
- ☐ ➔ [page 14](#)

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

- ☐ In footwell on accelerator pedal (both senders are accommodated in one housing)
- ☐ ➔ [page 14](#)

O - Clutch position sender -G476-

- ☐ ➔ [page 14](#)

P - Motronic current supply relay -J271-

- ☐ ➔ [page 14](#)

Q - Radiator fan control unit -J293-

- ☐ Installed in left-side radiator fan (in direction of travel)

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R - 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.

S - 3-pin connector for knock sensor 2 -G66-

- ☐ ⇒ [page 14](#)

T - Oil pressure switch -F1-

- ☐ ⇒ [page 14](#)

V - Engine speed sender -G28-

- ☐ ⇒ [page 14](#)

W - Knock sensor 1 -G61-

- ☐ ⇒ [page 15](#)
- ☐ Tightening torque: 20 Nm

X - Knock sensor 2 -G66-

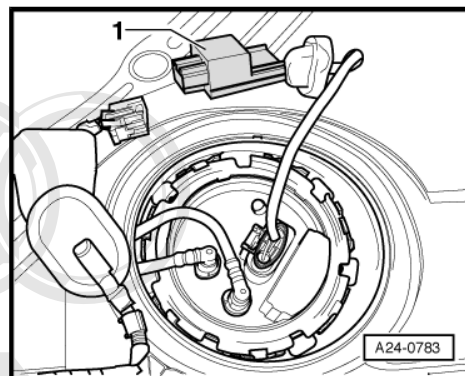
- ☐ ⇒ [page 15](#)
- ☐ Tightening torque: 20 Nm

Y - Intake manifold flap motor -V157- and intake manifold flap potentiometer -G336-

- ☐ ⇒ [page 15](#)
- ☐ After the intake manifold has been renewed, intake manifold flap potentiometer -G336- must be adapted to engine control unit -J623-. For this purpose, use vehicle diagnosis and service information system - VAS 5052- , "Guided Functions".

Fuel pump control unit -J538-

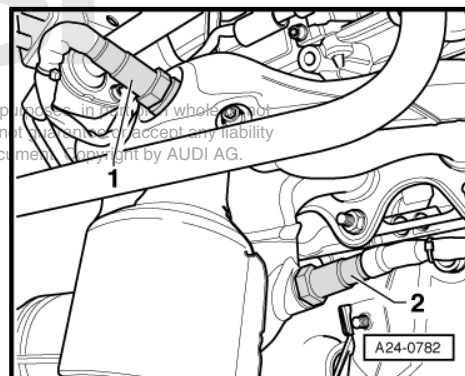
- Adaption must be performed after renewing fuel pump control unit -J538-. Basic setting, measured value block 243, refer to ⇒ Rep. Gr. 20



Lambda probes before catalytic converter

1 - Lambda probe -G39- and Lambda probe heater -Z19- "engines with code letters BLY and BVZ, see next illustration"

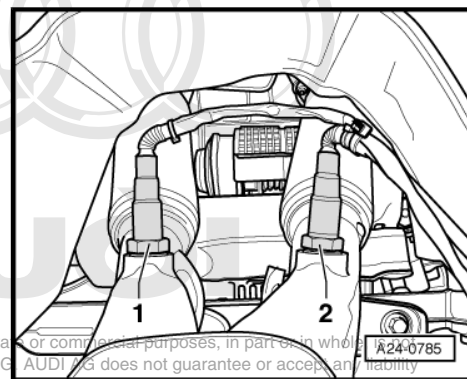
2 - Lambda probe 2 -G108- and Lambda probe heater 2 -Z28- (not fitted on vehicles with engine codes BVY, BLY, BHD, BMB and BVZ)



Lambda probes after catalytic converter

1 - Lambda probe 2, after catalytic converter -G131- and Lambda probe heater 2, after catalytic converter -Z30- "not fitted on engines with code letters BLY, BHD, BMB and BVZ"

2 - Lambda probe, after catalytic converter -G130- and Lambda probe heater 1, after catalytic converter -Z29-

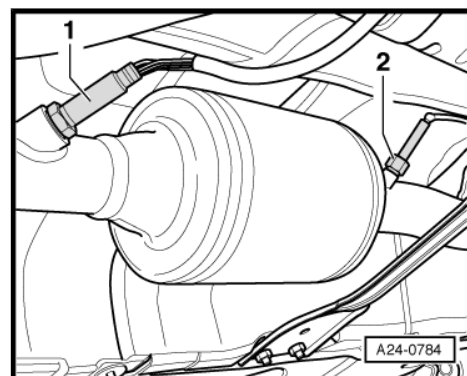


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NOx sender -G295- and exhaust gas temperature sender 1 -G235-

1 - NOx sender -G295- and NOx sender heater -Z44- ("NOx" stands for oxides of nitrogen) "not fitted on engines with code letters BHD, BMB, BLY, BLR, BVY and BVZ"; tightening torque 63 Nm.

2 - Exhaust gas temperature sender 1 -G235- (tightening torque for union nut: 45 Nm) not fitted on engines with code letters "BHD, BMB, BLY, BLR, BVZ and BVY"



Note

On engines with code letters BLR and BVY a Lambda probe 3 after catalytic converter -G287- is fitted in place of the NOx sender -G295-.

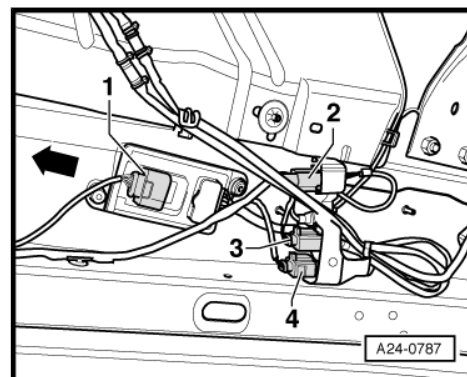
Connectors located on right-side underbody beneath the underbody cover (arrow faces direction of travel)

1 - NOx sensor control unit -J583- (cable for control unit cannot be disconnected from NOx sender -G295-) not fitted on engines with code letters "BHD, BMB, BLY, BLR, BVZ and BVY"

2 - Connector for exhaust gas temperature sender 1 -G235- not fitted on engines with code letters "BHD, BMB, BLY, BLR, BVZ and BVY"

3 - Connector (black) for Lambda probe after catalytic converter -G130- (right-side) and Lambda probe 1 heater after catalytic converter -Z29-

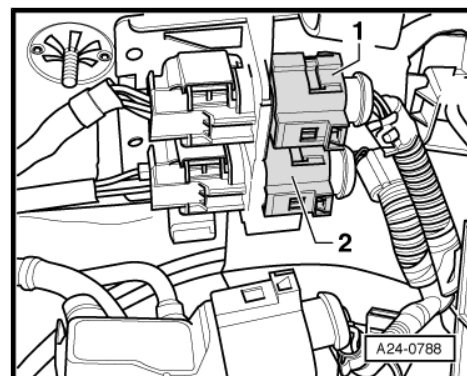
4 - Connector (brown) for Lambda probe 2 after catalytic converter -G131- (left-side) and Lambda probe heater 2 after catalytic converter -Z30- "not fitted on engines with code letters BLY, BHD, BMB and BVZ"



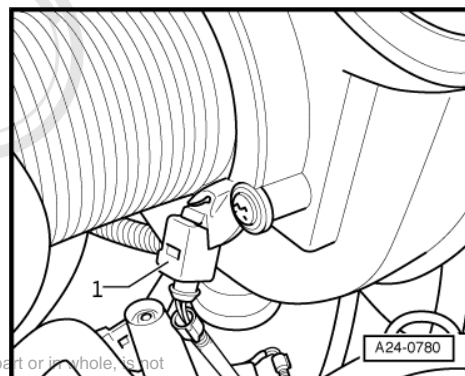
Connectors for Lambda probes before catalytic converter

1 - Connector for Lambda probe 2 -G108- and Lambda probe 2 heater -Z28- (for cylinders 2 and 3) "not fitted on engines with code letters BHD, BLY, BMB, BVZ and BVY"

2 - Connector for Lambda probe -G39- and Lambda probe heater -Z19- (for cylinders 1 and 4)



Intake air temperature sender 2 -G299-



Left-side of engine (in direction of travel)

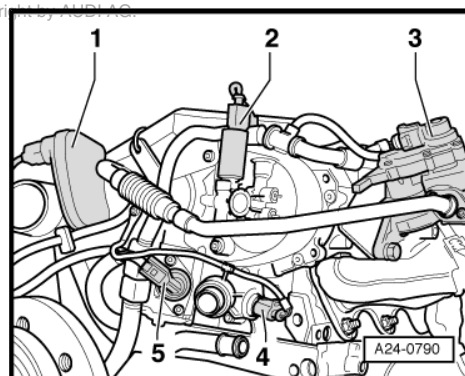
1 - Throttle valve module -J338- , including throttle valve drive for electric throttle -G186- , throttle valve drive angle sender 1 for electric throttle -G187- and throttle valve drive angle sender 2 for electric throttle -G188-

2 - Camshaft control valve 1 -N205-

3 - Exhaust gas recirculation valve -N18- with exhaust gas recirculation potentiometer -G212- "not fitted on engines with code letters BHD, BMB, BLY and BVZ"

4 - Coolant temperature sender -G62-

5 - Fuel pressure regulating valve -N276-

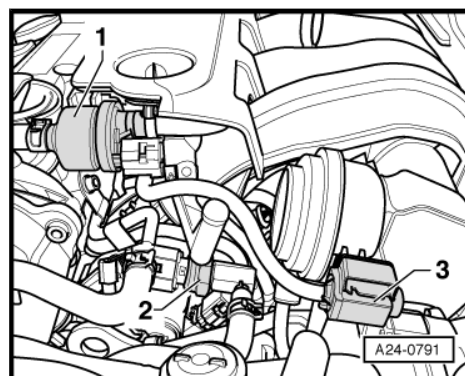


Right-side of engine (in direction of travel)

1 - Activated charcoal filter solenoid valve -N80-

2 - Fuel pressure sender for low pressure -G410- "not fitted on engines with code letters BVZ and BVY"

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



Right-side of engine (in direction of travel)

1 - Fuel pressure sender for low pressure -G410- "not fitted on engines with code letters BVZ and BVY"

2 - Activated charcoal filter solenoid valve -N80-

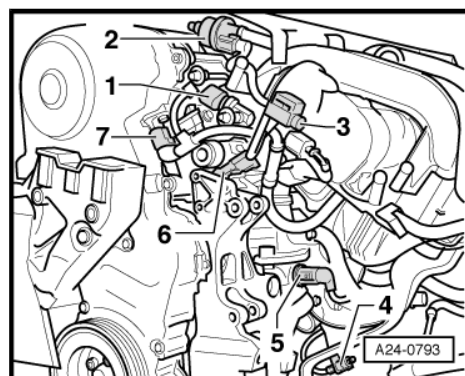
3 - Variable intake manifold change-over valve -N156-

4 - 3-pin electrical connector for engine speed sender -G28-

5 - Map-controlled engine cooling system thermostat -F265-

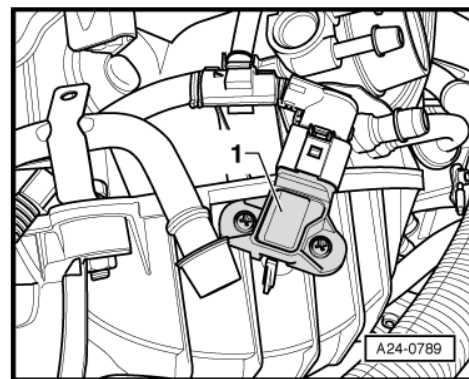
6 - 3-pin connector for knock sensor 1 -G61-

7 - Hall sender -G40- (camshaft position sensor)



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

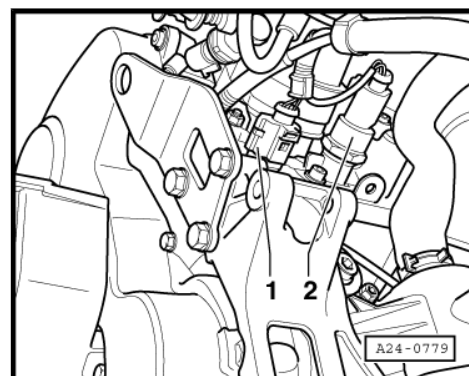
1 - Intake manifold pressure sender -G71- with intake air temperature sender -G42-



Knock sensor 1 -G61- and fuel pressure sender -G247-

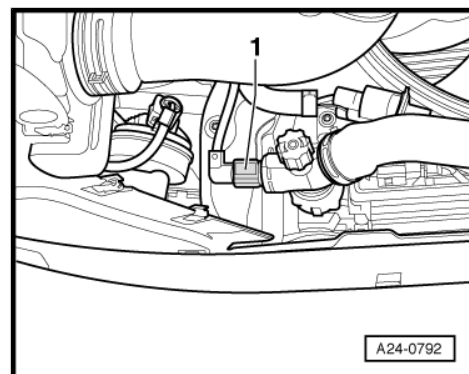
1 - 3-pin connector for knock sensor 1 -G61-

2 - Fuel pressure sender -G247-



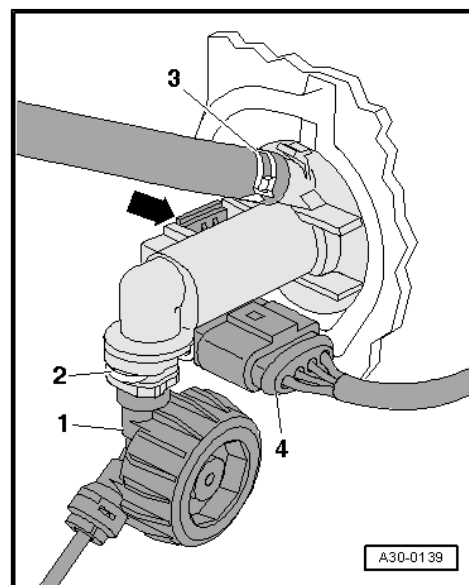
Radiator outlet coolant temperature sender -G83-

1 - Radiator outlet coolant temperature sender -G83-



Clutch position sender -G476-

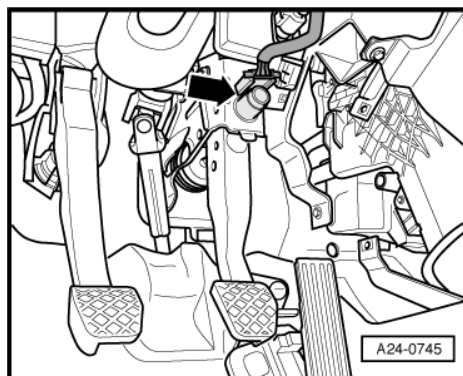
4 - Connector



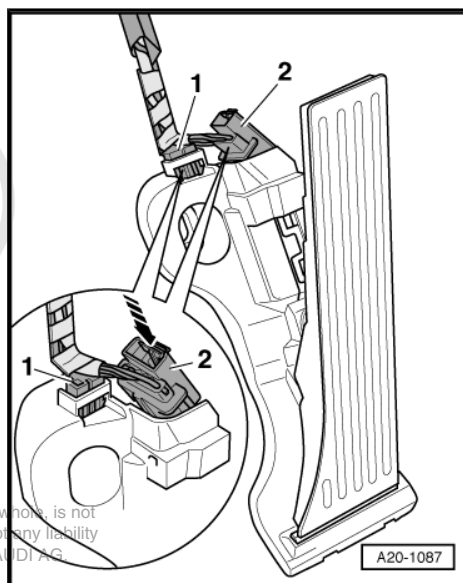
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Fitting location of brake light switch -F- and brake pedal switch -F63- (in driver's footwell)

1 - Brake light switch -F- and cruise control system brake pedal switch (diesel direct injection system) -F47-



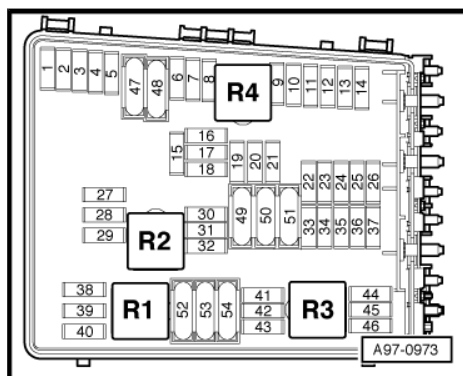
Fitting location of accelerator pedal position sender -G79- and accelerator pedal position sender 2 -G185- (in driver's footwell)



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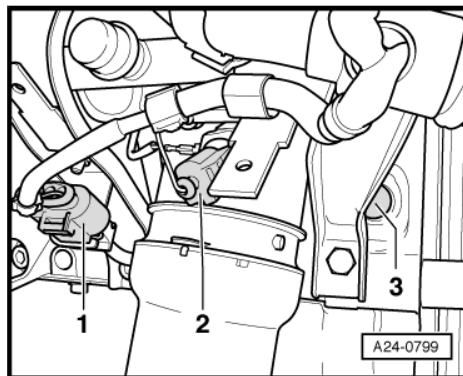
Motronic current supply relay -J271-

- R1 - Terminal 15 voltage supply relay -J329-
- R2 - Terminal 50 voltage supply relay -J682-
- R3 - Fuel pump relay -J17-
- R4 - Motronic current supply relay -J271-



Fitting locations

- 1 - 3-pin connector for knock sensor 2 -G66-
- 2 - Oil pressure switch -F1-
- 3 - Engine speed sender -G28-

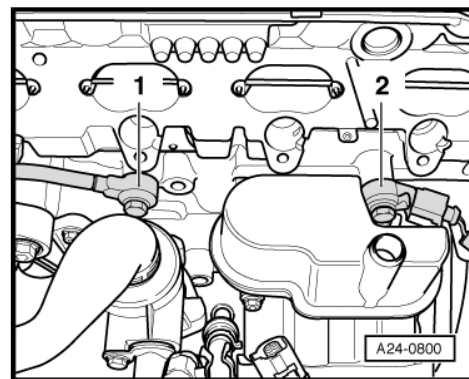


Knock sensors (beneath fuel rail)

1 - Knock sensor 1 -G61-

2 - Knock sensor 2 -G66-

Tightening torque for knock sensors: 20 Nm



Intake manifold flap for air distribution

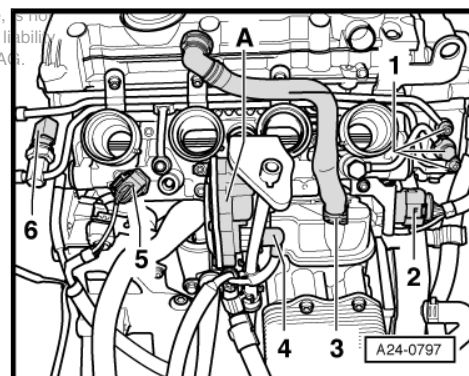
4 - Connector for intake manifold flap motor -V157

A - Intake manifold flap motor -V157- with intake manifold flap potentiometer -G336-



Note

Intake manifold flaps are the same as air flow control flaps.



2.3 Air cleaner - exploded view

1 - Panel bolt

- ☐ 5 Nm

2 - Air channel

- ☐ Clean any leaves and dirt out of air channel

3 - Air funnel
4 - Intake air temperature sender 2 -G299-

- ☐ Tighten to 2 Nm
- ☐ Renew O-ring if damaged

5 - Spring clamp
6 - Intake air duct
7 - Vacuum connection for vacuum booster
8 - Panel bolt

- ☐ 8 Nm

9 - Panel bolt

- ☐ 3 Nm

10 - Air cleaner housing

- ☐ Clean any salt deposits or leaves and dirt out of air cleaner housing

11 - 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).
- ☐ Removing and installing ⇒ [page 16](#)

12 - Hexagon flange nut

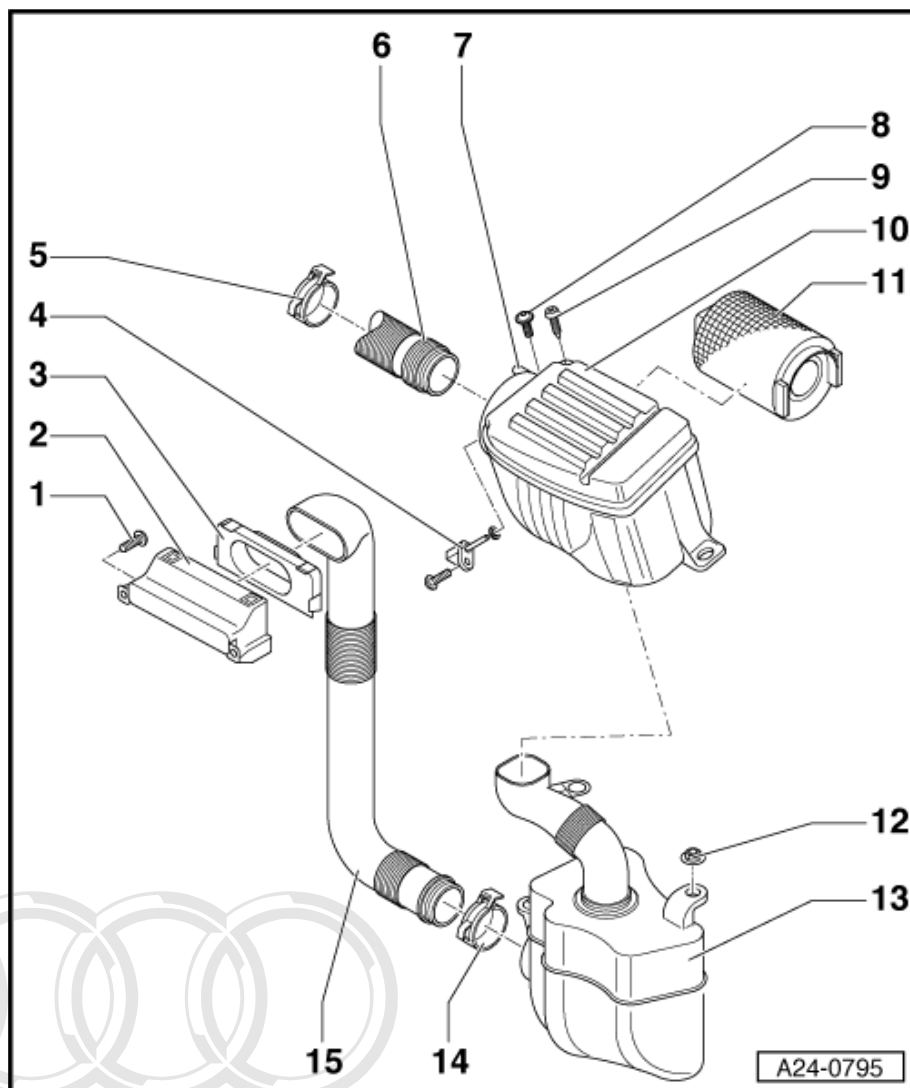
- ☐ 20 Nm

13 - Intake air duct

- ☐ Damping chamber
- ☐ Check intake air duct for dirt and leaves

14 - Spring clamp
15 - Intake air duct

- ☐ Check intake air duct for dirt and leaves



2.4 Removing and installing air filter element

Removing air filter element

- Slacken bolts and detach top section of air cleaner.

- Pull out air filter element.

Installing air filter element



Note

- ◆ *Always use genuine part for air filter element.*
- ◆ *Hose connections and hoses for charge air system must be free of oil and grease before assembly. Do not use any lubricants containing silicone when assembling.*
- ◆ *The air cleaner housing must be clean.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue*
- ◆ *To prevent malfunctions, cover all critical parts of the engine air intake tract (air mass meter, intake pipes, etc.) with a clean cloth when blowing out the air cleaner housing with compressed air.*
- ◆ *Please observe requirements for disposal.*
- Check for salt residue, dirt and leaves in air intake hose (engine intake side).
- Check for dirt in air intake hose from air duct.
- 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).

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

2.5 Throttle valve module, exhaust gas recirculation valve and intake manifold - exploded view

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**1 - Activated charcoal filter sol-
enoid valve 1 -N80-**

2 - Bracket for activated charcoal filter solenoid valve 1 - N80-

3 - Connecting hose

- Between activated charcoal filter solenoid valve 1 -N80- and activated charcoal filter

4 - Hexagon socket head flange bolt

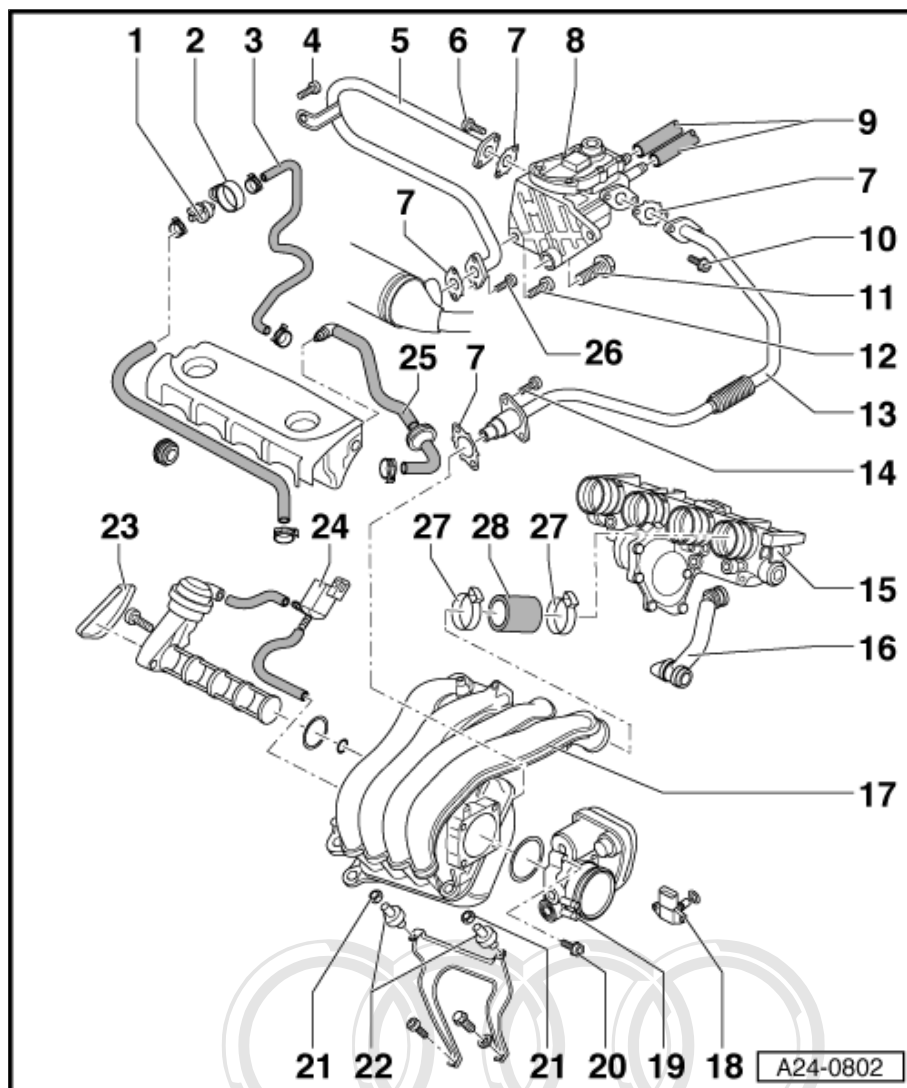
5 - Connecting pipe for exhaust gas recirculation

**6 - Hexagon socket head
flange bolt**

7 - Gasket

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

- ❑ Not fitted on engines with code letters BHD, BMB and BLY
- ❑ Adaption to engine control unit is required after replacement (Basic setting, Display group 74, with ignition switched on); see “Guided Fault



21 22 21 20 19 18 A24-0802

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Finding”.

9 - Coolant hoses

10 - Hexagon socket head
flange bolt

11 - Hexagon bolt

12 - Hexagon socket head flange bolt

13 - Connecting pipe for exhaust gas recirculation

14 - Hexagon socket head flange bolt

□ 5 Nm

15 - Fuel rail

16 - Vent hose

17 - Intake manifold

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

□ ⇒ [page 13](#)

□ Tighten to 3 Nm

19 - Throttle valve module

□ Adaption to engine control unit required after replacement (Basic setting, Display group 60; see “Guided fault finding”).

20 - Hexagon socket head flange bolt

21 - Securing nut for intake manifold (2x), 10 Nm

22 - Rubber bush (2x)

23 - Change-over barrel for intake manifold change-over

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

25 - Connecting hose

□ Between vacuum unit and air cleaner (top section)

26 - Hexagon socket head flange bolt

27 - Spring clamp (8x)

28 - Connection piece (4x)

2.6 Fuel rail with intake manifold flap motor -V157- - exploded view (for engine code letters AXW and BHD)



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](#).

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1 - Fuel pressure sender for low pressure -G410-

2 - Fuel pipes

- ☐ Install so that parts are free of tension

3 - Bolts

- ☐ 15 Nm
- ☐ With tapered sealing seat
- ☐ Ensure parts are kept clean

4 - Hexagon socket head bolt, 10 Nm

5 - Clip

6 - Connection piece

7 - 25 Nm

- ☐ With tapered sealing seat
- ☐ Ensure parts are kept clean

8 - Fuel pipe (high-pressure)

- ☐ Install so that parts are free of tension

9 - Fuel pressure sender - G247-

- ☐ 15 Nm

10 - Bolt

- ☐ 10 Nm

11 - Cable retainer

12 - Connector

- ☐ For injectors

13 - Bracket

14 - Nut and washer assembly (2x)

- ☐ 10 Nm

15 - Fuel rail with intake manifold flap motor -V157- and intake manifold flap potentiometer -G336-

16 - Gasket

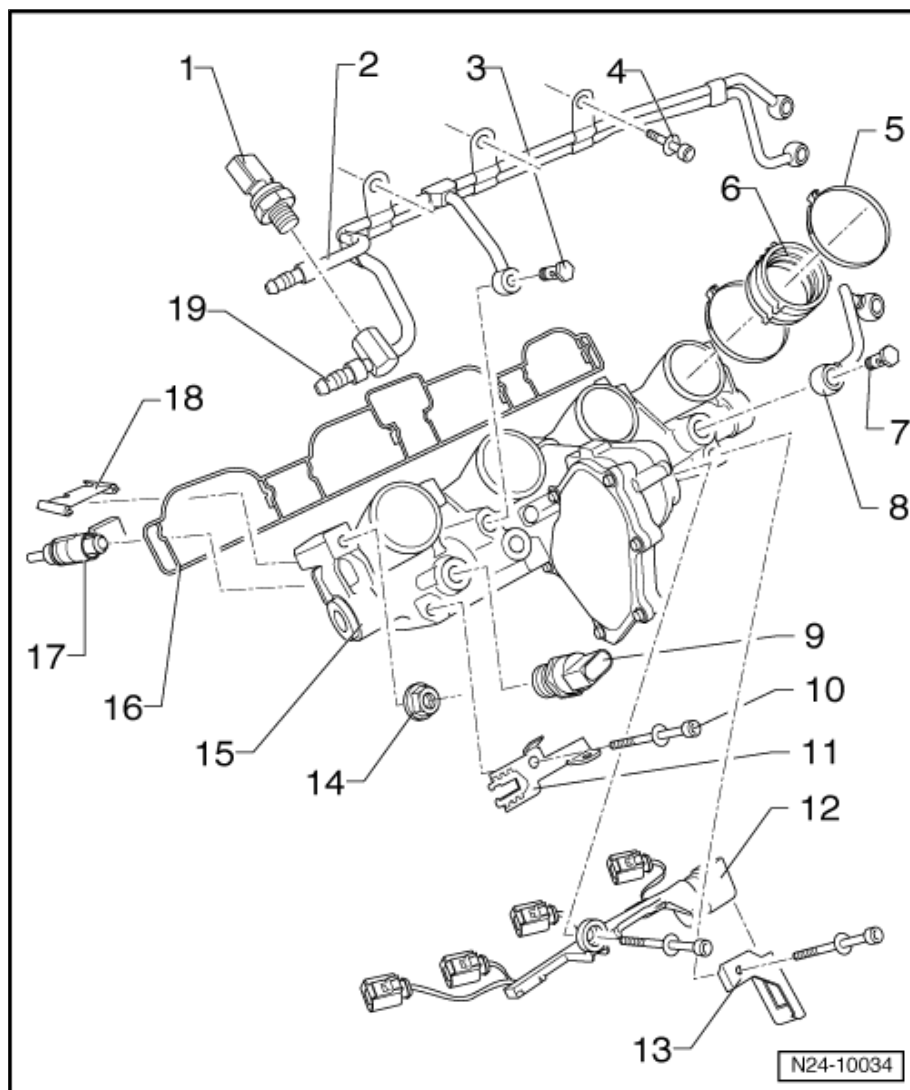
- ☐ Renew

17 - Injector, cylinder 1 -N30- ... injector, cylinder 4 -N33-

- ☐ Removing and installing ⇒ [page 34](#)

18 - Air guide plates

- ☐ Removable
- ☐ Check for damage and correct fitting



2.7 Fuel rail with intake manifold flap motor -V157- - exploded view (for engine code letters BMB, BLX, BLY, BLR, BVZ and BVY)



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](#).

1 - Fuel pressure sender for low pressure -G410-

- ☐ Not fitted on engines with code letters BVZ and BVY

2 - Fuel pipes

- ☐ Install so that parts are free of tension

3 - Hexagon socket head bolt, 10 Nm

4 - Gasket

- ☐ Renew

5 - Fuel rail with intake manifold flap motor -V157- and intake manifold flap potentiometer -G336-

6 - Clip

7 - Connection piece

8 - Fuel pipe

- ☐ Install so that parts are free of tension

9 - 17 Nm

- ☐ With tapered sealing seat
- ☐ Ensure parts are kept clean

10 - 10 Nm

11 - Connector

- ☐ For injectors

12 - Pressure limiting valve

- ☐ 30 Nm

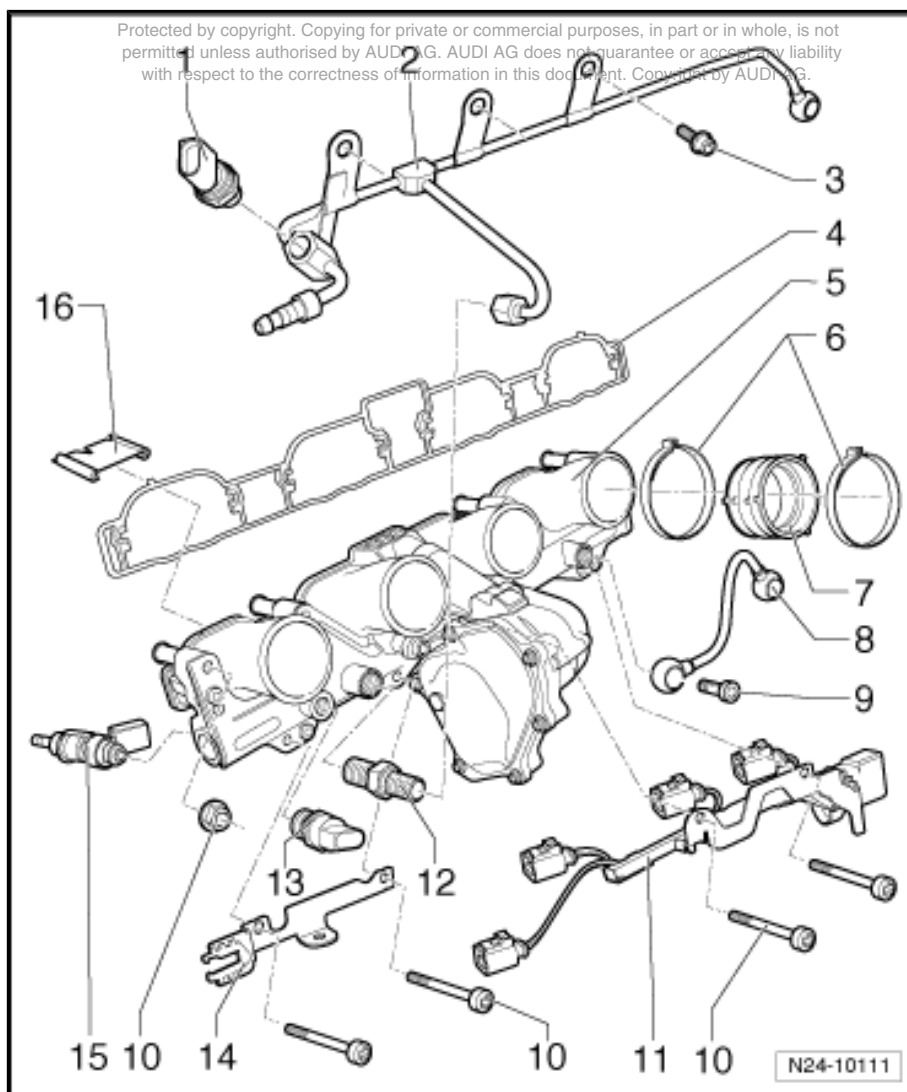
13 - Fuel pressure sender -G247-

- ☐ 15 Nm

14 - Cable retainer

15 - Injector, cylinder 1 -N30- ... injector, cylinder 4 -N33-

- ☐ Removing and installing [⇒ page 34](#)



16 - Air guide plate

- ☐ Removable
- ☐ Check for damage and correct fitting

2.8 Intake manifold - exploded view



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.

1 - Vacuum hose

2 - Vacuum reservoir

3 - 5 Nm

4 - Pipe for exhaust gas recirculation

5 - Vacuum hose

- ☐ With non-return valve

6 - Crankcase breather hose

7 - Seal

- ☐ Renew if damaged

8 - Cable retainer

9 - 8 Nm

10 - Throttle valve module - J338-, throttle valve drive for electric throttle -G186-

- ☐ Throttle valve drive angle sender 1 for electric throttle -G187- and throttle valve drive angle sender 2 for electric throttle -G188-
- ☐ Perform adaption after renewing throttle valve module -J338-.

11 - Connection for vacuum booster

12 - Seal

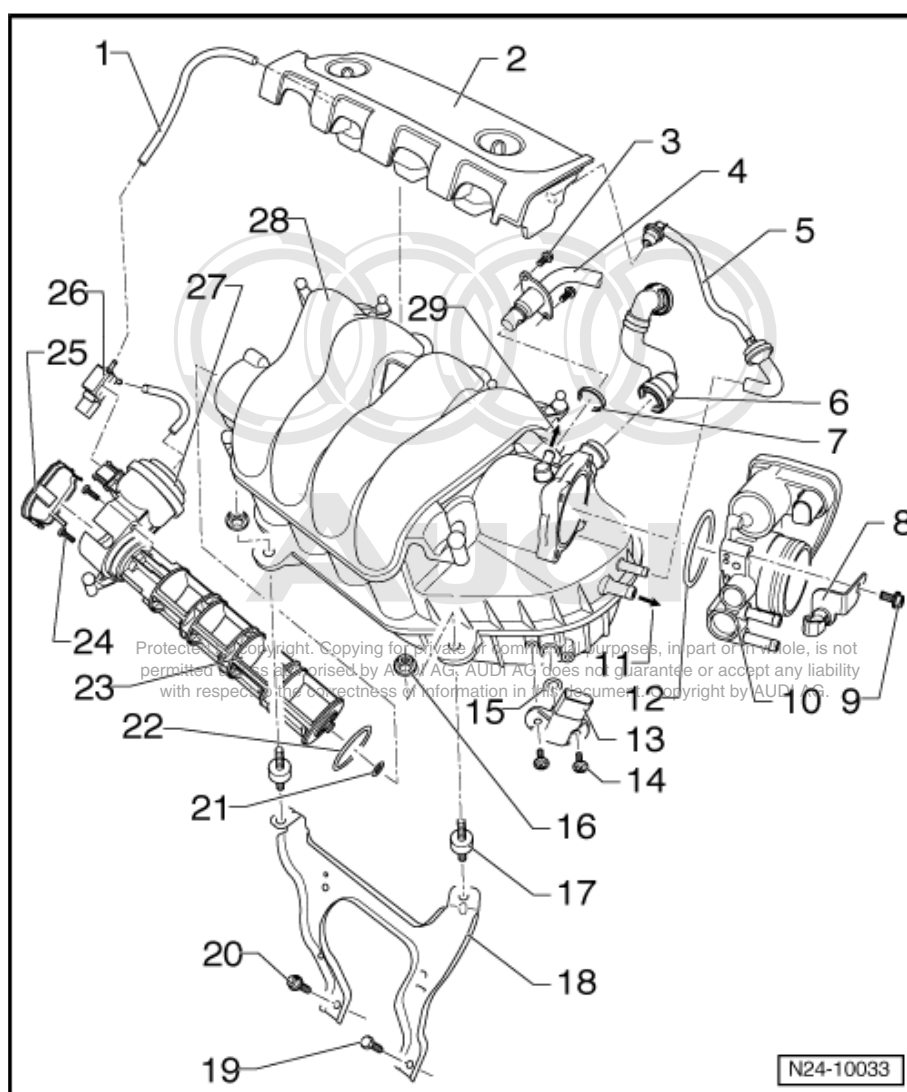
- ☐ Renew if damaged

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

14 - 3 Nm

15 - O-ring

- ☐ Renew if damaged



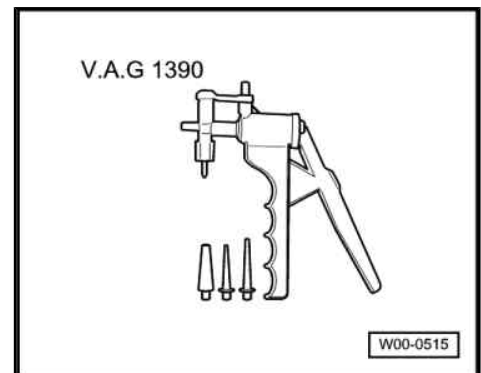
- 16 - 10 Nm
- 17 - Bonded rubber mounting
- 18 - Intake manifold support
- 19 - 15 Nm
- 20 - 25 Nm
- 21 - Seal
 - ☐ Renew if damaged
- 22 - Seal
 - ☐ Renew if damaged
- 23 - Change-over barrel
- 24 - 7 Nm
- 25 - Cover
- 26 - Variable intake manifold change-over valve -N156-
- 27 - Vacuum unit
 - ☐ Checking ⇒ [page 23](#)
- 28 - Intake manifold
- 29 - Connection for activated charcoal filter solenoid valve 1 -N80-

2.9 Checking intake manifold change-over function

Only perform this test if there is a loss of engine torque (poor flexibility or lack of pulling power).

Special tools and workshop equipment required

- ◆ Hand vacuum pump with attachments -V.A.G 1390- or hand vacuum pump -VAS 6213-



- Variable intake manifold change-over valve -N156- has been tested via "Guided Fault Finding" using vehicle diagnosis, testing and information system -VAS 5051B-.

Perform the following tests if the variable intake manifold change-over valve -N156- is OK.

- Remove cover from vacuum unit.

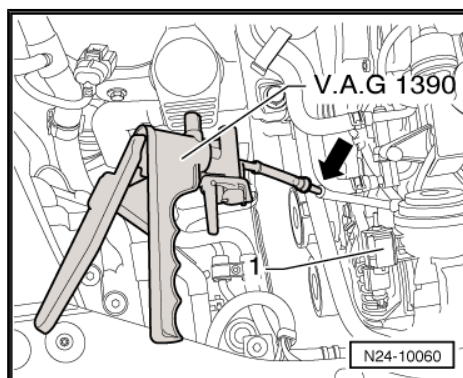
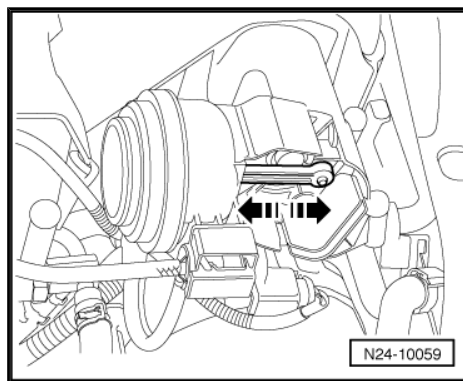
– **Start engine and run at idling speed.**

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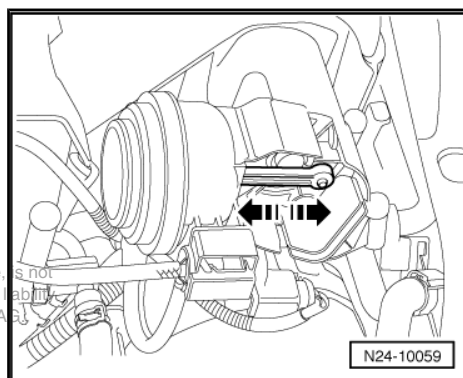
- Have a second mechanic rev up engine quickly (short burst of throttle) and observe vacuum unit for intake manifold change-over. Vacuum unit should pick up.

If the change-over does not operate as described:

- Check vacuum system for leaks (including vacuum reservoir on intake manifold).
- Check that change-over mechanism moves freely by operating linkage manually.
- Check proper connection of vacuum lines.
- Check vacuum hoses for damage and leaks.
- Detach vacuum hose going to vacuum unit for intake manifold change-over -arrow- at variable intake manifold change-over valve -1-.
- Connect hand vacuum pump -V.A.G 1390- to vacuum unit for intake manifold change-over.



- Operate the hand vacuum pump -V.A.G 1390- several times. The vacuum unit should move.
- Renew vacuum unit if the intake manifold change-over does not move.



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2.10 Removing and installing intake manifold

Removing intake manifold

Perform adaption after renewing throttle valve module -J338- .



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 .



Note

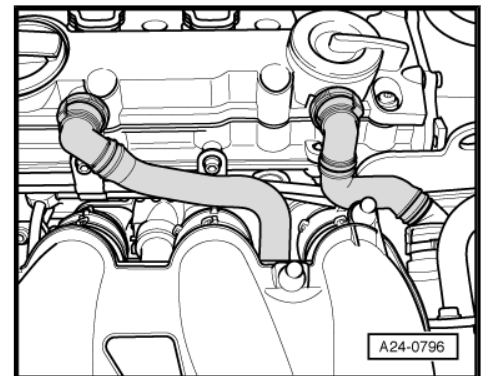
- ◆ *Use the exploded views on the previous pages.*
- ◆ *The combustion chamber (teflon) ring seal and the injector O-ring must always be renewed.*
- ◆ *The injectors can only be accessed after removal of the intake manifold and fuel rail with air flow control flap. (Additional or fewer steps may be required depending on the model.)*
- Pull off vacuum hose for intake manifold change-over from vacuum unit.



Note

The vacuum unit is integrated in the intake manifold cover.

- Pull off both vacuum hoses between vacuum unit and throttle valve module.
- Pull off vacuum unit upwards from intake manifold.
- Disconnect the two hoses from cylinder head cover.
- Unplug all connectors.
- Detach connecting pipe for exhaust gas recirculation at the connection.
- Disconnect fuel supply pipe and fuel return pipe (collect escaping fuel).
- Disconnect coolant hose from throttle valve (collect any discharged water).
- Pull out oil dipstick.
- Release the four hose clips on intake manifold.
- Unscrew nuts securing intake manifold (2x).
- Remove intake manifold.



Installing intake manifold

Install in reverse order.

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2.11 Removing and installing fuel rail

Removing fuel rail

Intake manifold must be removed. Removing intake manifold

⇒ [page 24](#)

- Disconnect fuel pipes from high-pressure pump -1- (pipes have "ridge" at the connection point to ensure proper sealing and correct attachment of pipe).
- Unscrew the four securing bolts for fuel pipes.
- Unplug connector -2-.
- Remove hose -3- from oil separator for crankcase breather.
- Unplug connector at intake manifold flap motor -V157- .
- Unplug connector -5- at fuel pressure sender -G247- .
- Unplug connector -6- from fuel pressure sender for low pressure -G410- (not fitted on engines with code letters BVZ and BVY).
- Loosen securing screws for fuel rail: 6 Allen screws and 2 nuts with washers.
- Pull fuel rail with air flow control flaps off injectors.
- Detach connectors from injectors.

Installing fuel rail



Note

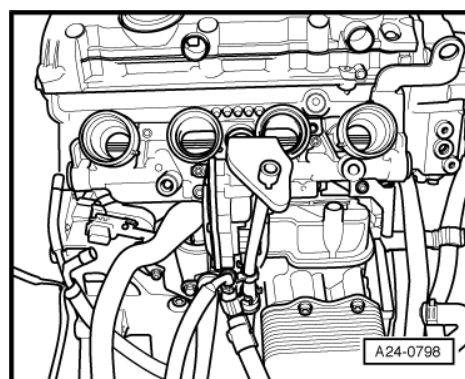
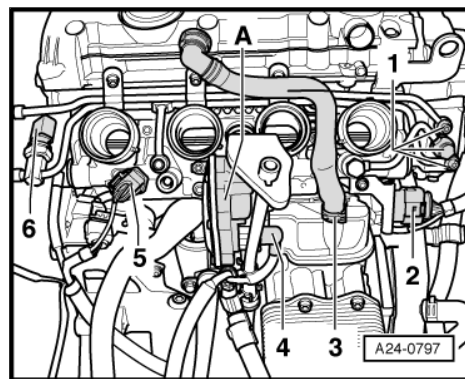
- ◆ *Renew seals and O-ring.*
- ◆ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Parts catalogue.*
- Lift air flow control flaps slightly when fitting fuel rail (lower section of intake manifold) on cylinder head.



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.

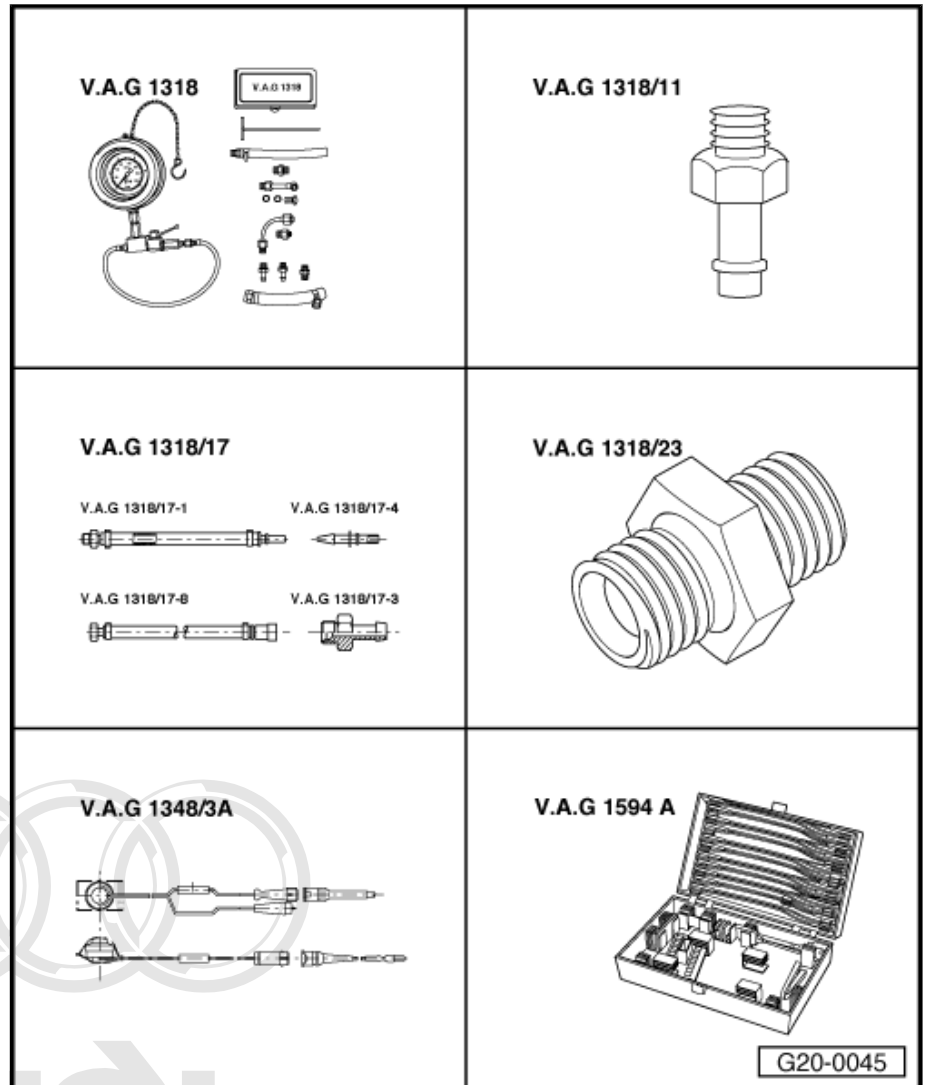
The remaining installation steps are carried out in the reverse sequence.



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

Special tools and workshop equipment required

- ◆ Pressure tester - V.A.G 1318-
- ◆ Adapter -V.A.G 1318/11-
- ◆ Adapter -V.A.G 1318/17-1- from adapter set -V.A.G 1318/17-
- ◆ Connector -V.A.G 1318/23-
- ◆ Remote control -V.A.G 1348/3 A- with adapter cable -V.A.G 1348/3-3-
- ◆ Auxiliary measuring set - V.A.G 1594 C- or -V.A.G 1594 A-
- ◆ Fuel-resistant measuring container

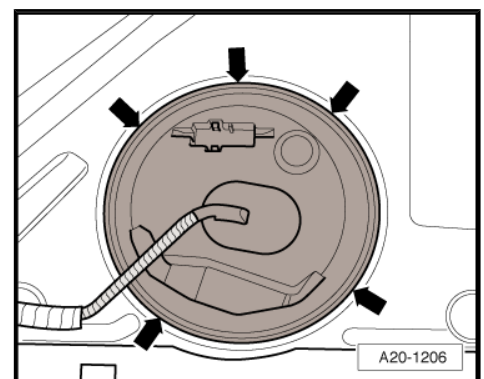


Test conditions

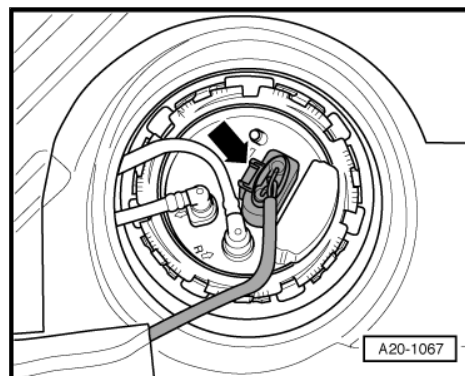
- Battery voltage at least 12.5 V
- Fuel filter OK
- Fuel tank at least $\frac{1}{4}$ full.
- Fuel pump control unit -J538- OK (check)
- Ignition off.

Test sequence

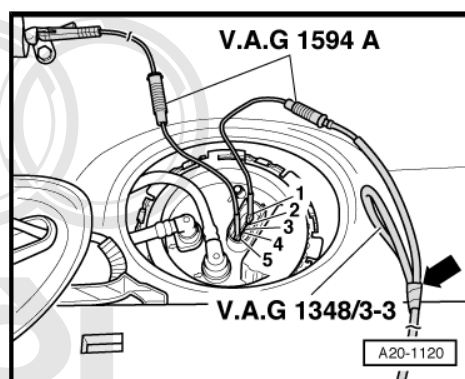
- Remove rear seat ⇒ General body repairs, interior; Rep. Gr. 72 .
- Unclip retaining tabs -arrows- for flange cover.



- Unplug electrical connector -arrow- at flange.



- Connect remote control -V.A.G 1348/3 A- with adapter cable -V.A.G 1348/3-3- to contact -1- using a test lead from auxiliary measuring set -V.A.G 1594 C- .
- Tape off 2nd connector contact of the adapter cable -V.A.G 1348/3-3- with insulating tape -arrow- to prevent short circuits.
- Connect contact -5- to the body (earth) using a test lead from auxiliary measuring set -V.A.G 1594 C- .
- Connect crocodile clip to positive (+) terminal of battery.
- Remove filler cap from fuel filler neck.


WARNING

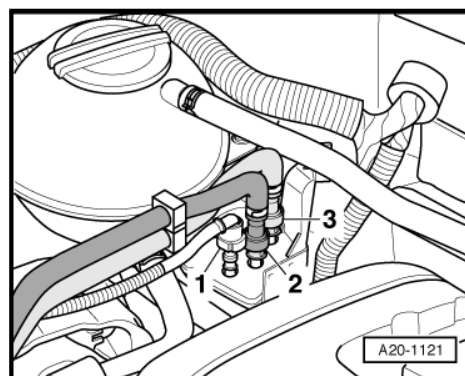
Fuel system is pressurised (low pressure). Wear safety goggles and protective clothing to avoid possible injury and skin contact. Before opening the fuel system, wrap a cloth around the connection. Then dissipate pressure by carefully detaching the connection.

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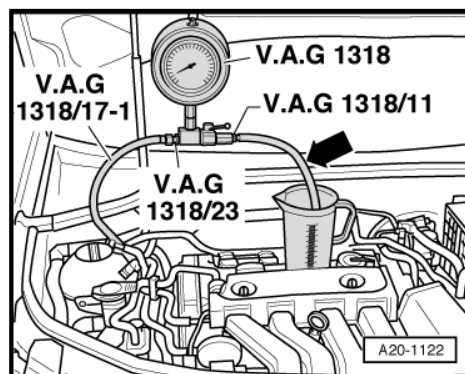
- Disconnect fuel supply pipe -3- by pulling release tab.


Note

The fuel return pipe -2- and vacuum pipe -1- remain connected (if fitted).



- Screw connector -V.A.G 1318/23- and adapter -V.A.G 1318/17-1- onto pressure gauge -V.A.G 1318- .
- Fit adapter -V.A.G 1318/17-1- onto the disconnected fuel supply pipe.
- Screw the adapter -V.A.G 1318/11- onto the pressure gauge -V.A.G 1318- . Attach test hose -arrow- and hold end of hose in measuring container.
- Open cut-off tap on pressure tester -V.A.G 1318- . Lever must point in direction of flow.
- Bleed fuel system by pressing remote control switch briefly.



- Close cut-off tap on pressure tester -V.A.G 1318- . Lever is at right angle to direction of flow -arrow-.
- Press and hold remote control switch until pressure tester - V.A.G 1318- shows no further increase in pressure.
- Specification: approx. 6 bar (5 ... 7 bar).

If specification is not obtained:

- Check delivery rate of fuel pump ⇒ Fuel supply system, petrol engines; Rep. Gr. 20 .

Checking residual pressure

- Check for leaks and check residual pressure by watching drop in pressure on pressure tester -V.A.G 1318- .
- After 10 minutes pressure should still be at least 3.75 bar.

If the residual pressure drops below 3.75 bar:

- ◆ Check union between pressure tester -V.A.G 1318- and fuel supply line for leaks.
- ◆ Check pressure tester -V.A.G 1318- for leaks.
- ◆ Check fuel lines and their connections for leaks.
- ◆ Renew fuel filter with integrated fuel pressure regulator ⇒ Fuel supply system, petrol engines; Rep. Gr. 20 . Then repeat the test.
- ◆ If fuel filter is OK, renew fuel pump ⇒ Fuel supply system, petrol engines; Rep. Gr. 20 .

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

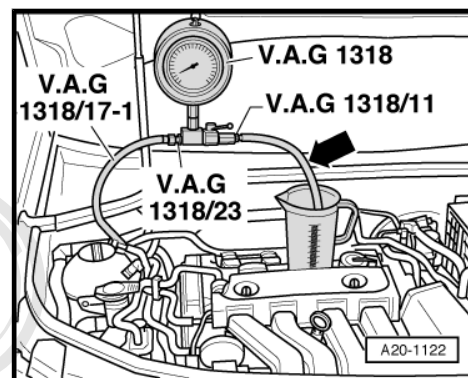
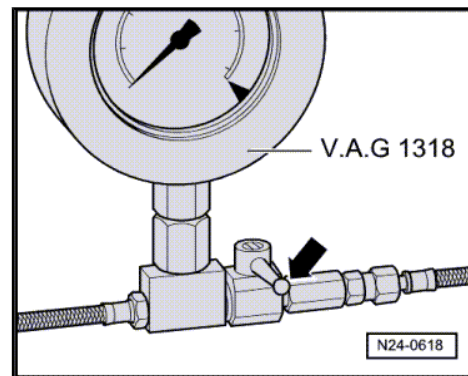
- Switch off ignition.



Note

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

- Re-install fuel supply line (make sure that all parts are clean).



2.13 High-pressure pump - exploded view (for engine code letters AXW and BHD)

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1 - Roller tappet

- ☐ Can possibly stick inside cylinder head after removal of high-pressure pump

2 - O-ring

- ☐ Renew
- ☐ Before installing, lubricate lightly with clean engine oil

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

4 - Bolts

- ☐ 10 Nm

5 - Banjo bolt with tapered sealing seat

- ☐ Connection for fuel return pipe to fuel tank
- ☐ Counterhold connection on high-pressure pump when loosening
- ☐ Renew banjo bolt
- ☐ 17 Nm
- ☐ Install fuel pipe so it is free of tension (all parts must be clean)

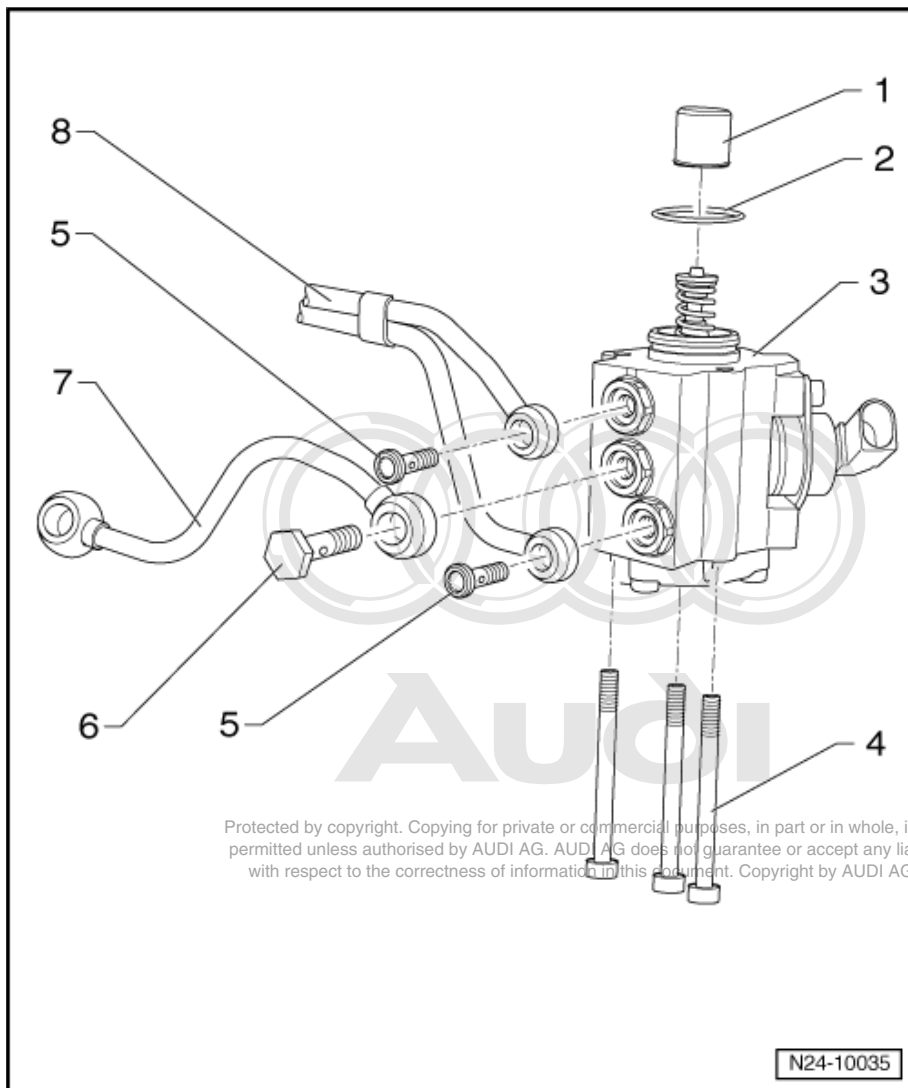
6 - Banjo bolt with tapered sealing seat

- ☐ Connection for high-pressure fuel pipe leading to fuel rail
- ☐ Counterhold connection on high-pressure pump when loosening
- ☐ Renew banjo bolt
- ☐ 25 Nm
- ☐ Install fuel pipe so it is free of tension (all parts must be clean)

7 - High-pressure fuel pipe

- ☐ Fuel pressure in high-pressure pipe can be up to 120 bar! Wear safety goggles and protective clothing to avoid possible injury and skin contact. Wrap a cloth around the connection before loosening the fuel pipes. Then dissipate pressure by carefully slackening banjo bolts

8 - Fuel pipes



2.14 High-pressure pump - exploded view (for engine code letters BMB, BLX, BLY, BLR, BVZ and BVY)

1 - Roller tappet

- ☐ Can possibly stick inside cylinder head after removal of high-pressure pump

2 - O-ring

- ☐ Renew
- ☐ Before installing, lubricate lightly with clean engine oil

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

4 - Dust cap for bleeder valve

5 - Bolts

- ☐ 10 Nm

6 - Banjo bolt with tapered sealing seat

- ☐ 17 Nm
- ☐ Counterhold connection on high-pressure pump when loosening

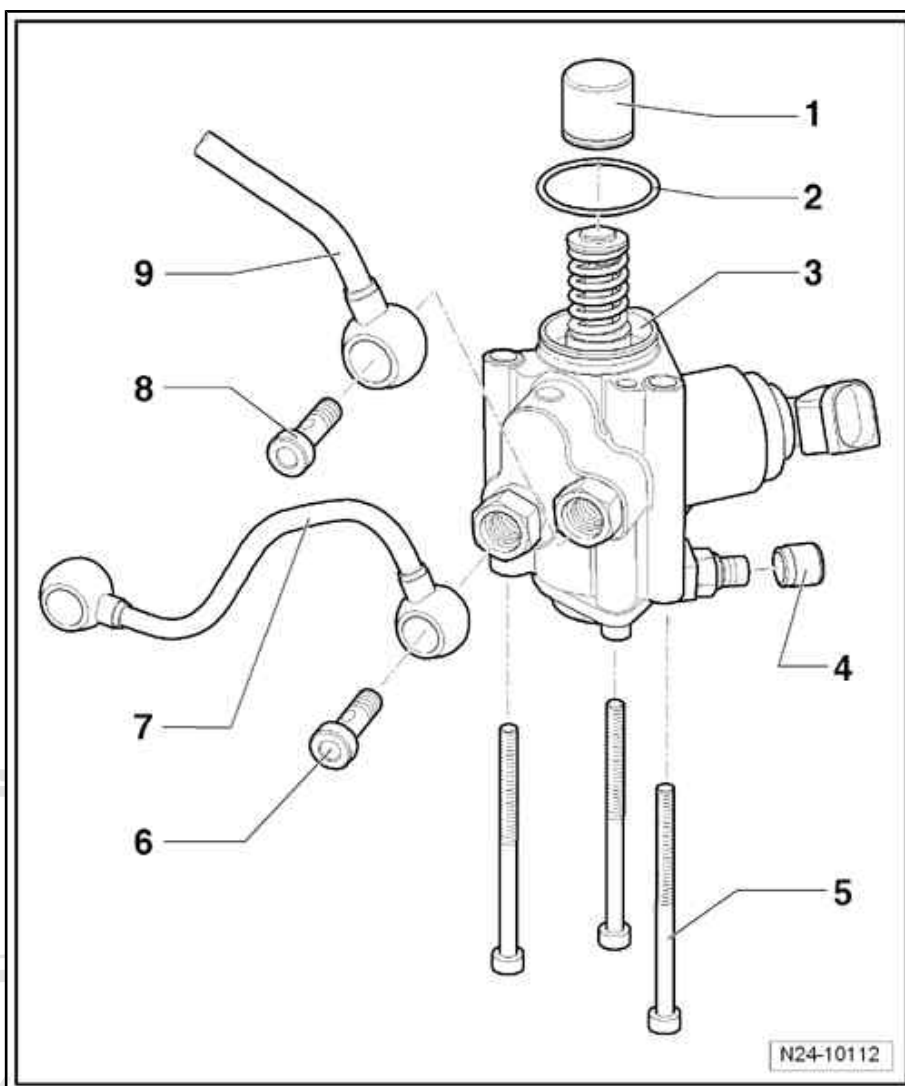
7 - High-pressure fuel pipe

- ☐ Connection for high-pressure fuel pipe leading to fuel rail
- ☐ Fuel pressure in high-pressure pipe can be up to 120 bar! Wear safety goggles and protective clothing to avoid possible injury and skin contact. Wrap a cloth around the connection before loosening the fuel pipes. Then dissipate pressure by carefully slackening banjo bolts

8 - Banjo bolt with tapered sealing seat

- ☐ 17 Nm
- ☐ Counterhold connection on high-pressure pump when loosening
- ☐ Renew banjo bolt

9 - Fuel line from tank



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2.15 Removing and installing high-pressure pump



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.*
- ◆ *Use a cloth to catch escaping fuel.*
- ◆ *The high-pressure pump must not be dismantled.*

Removing



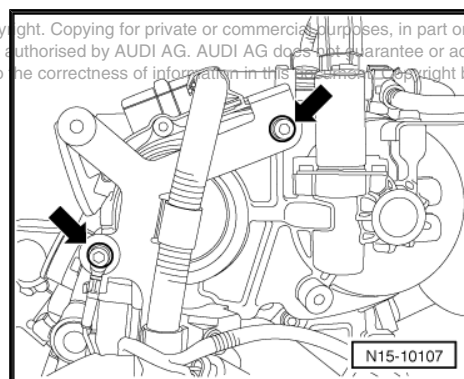
WARNING

Fuel system operates under high pressure. Always dissipate fuel pressure prior to opening fuel system. For procedure, refer to ⇒ [page 3](#)

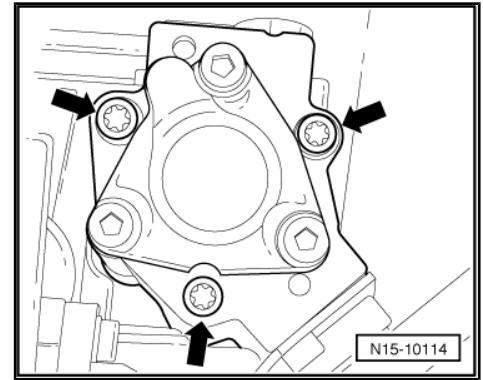


Note

- ◆ *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.*
 - ◆ *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.*
 - ◆ *Use a cloth to catch escaping fuel.*
 - ◆ *The O-ring must always be renewed.*
 - ◆ *Banjo bolt for fuel return line must always be renewed.*
 - ◆ *Always ensure that the high-pressure fuel pipes are free of tension when tightening the connections.*
- Remove intake manifold ⇒ [page 24](#) .
 - Remove fuel pipes. Counterhold connections on high-pressure pump when loosening
 - Remove retaining bracket for wiring harness -arrows-
 - Remove high-pressure pump -arrows- (depending on version).



Engine code letters AXW and BHD



Engine code letters BMB, BLX, BLY, BLR, BVZ and BVY

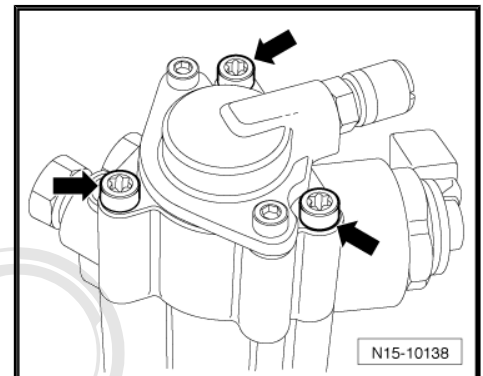
- Remove roller tappet ⇒ [Item 1 \(page 30\)](#) from camshaft housing.

Installing

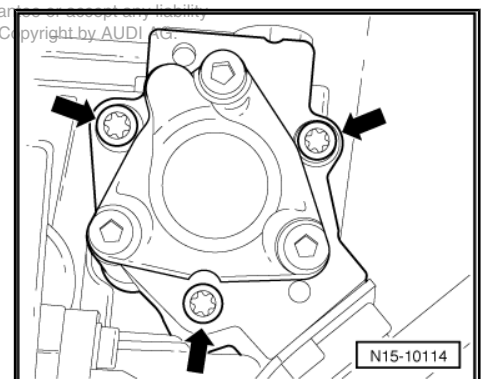


Note

- ◆ *The securing bolts must be inserted before fitting the high-pressure pump.*
- ◆ *Ensure stress-free installation of fuel pipes.*
- ◆ *Always renew banjo bolts.*
- Renew O-ring for high-pressure pump (lubricate lightly with clean engine oil before fitting)
- Check roller tappet ⇒ [Item 1 \(page 30\)](#) for damage and insert in cylinder head
- Carefully locate high-pressure pump on cylinder head and screw in bolts -arrows- hand-tight.

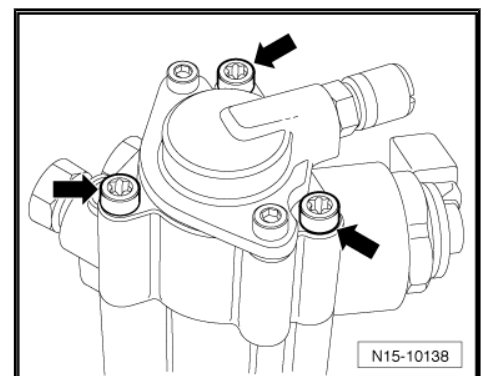


Engine code letters AXW and BHD



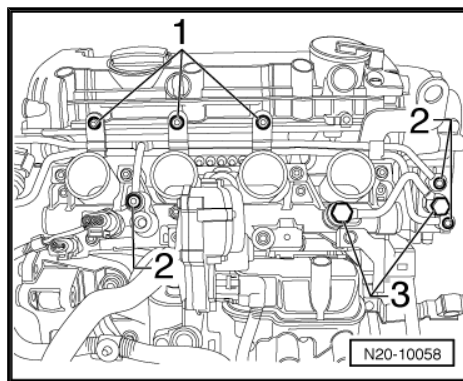
Engine code letters BMB, BLX, BLY, BLR, BVZ and BVY

- Install fuel pipes. Only tighten bolts hand-tight.
- Now tighten bolts as follows: (fit new banjo bolts)



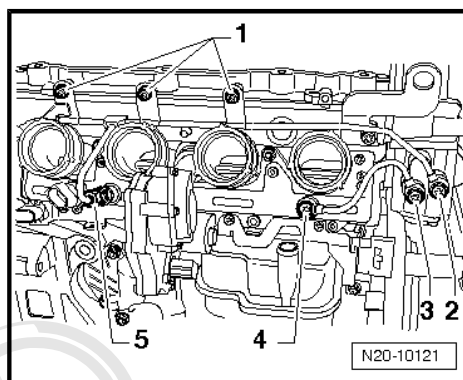
Engine code letters AXW and BHD

1. - Tighten securing bolts for high-pressure pump to 10 Nm.
2. - Tighten banjo bolts -2- to 17 Nm
3. - Tighten banjo bolts -3- to 25 Nm
4. - Tighten securing bolts -1- to 10 Nm.



Engine code letters BMB, BLX, BLY, BLR, BVZ and BVY

1. - Tighten securing bolts for high-pressure pump to 10 Nm.
 2. - Tighten banjo bolt -2- to 17 Nm
 3. - Tighten banjo bolt -3- to 17 Nm
 4. - Tighten banjo bolt -4- to 17 Nm
 5. - Tighten union nut -5- to 27 Nm.
 6. - Tighten securing bolts -1- to 10 Nm.
- Install intake manifold ⇒ [page 24](#) .

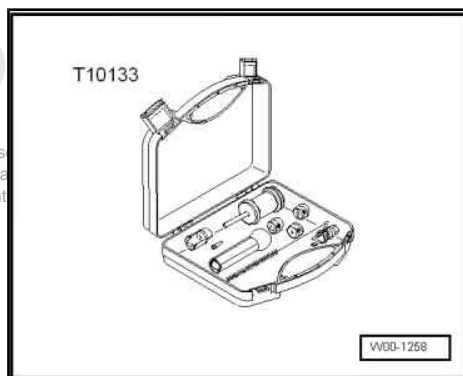


2.16 Removing and installing injectors, renewing combustion chamber (teflon) ring seal

Special tools and workshop equipment required

- ◆ Puller -T10133-

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Note

Special tool T10133/2 (puller) has been modified and now has the designation puller T10133/2 A . If you have not yet received the new tool you can make the modification yourself.

Modifying special tool T10133/2 (puller) to make it equivalent to puller T10133/2 A

Special tools and workshop equipment required

- ◆ Round file, approx. 6 mm
- File out a semi-circular recess as shown in the illustration. The recess allows the tool to be pushed further onto the injector so the contact surface is increased.

- For identification purposes, mark the modified tool with the letter "A" after the tool number.

Removing injectors

- Illustration shows injector when removed.

- Radial compensation element, renew if damaged
- Combustion chamber ring seal (teflon ring seal) - renew; when fitting, do not grease ring or use any other lubricant
- Groove on injector
- Spacer ring (renew if damaged)
- O-ring (renew; apply thin coating of clean engine oil prior to installation)
- Support ring (via this support ring, fuel rail exerts force which secures injector in cylinder head)

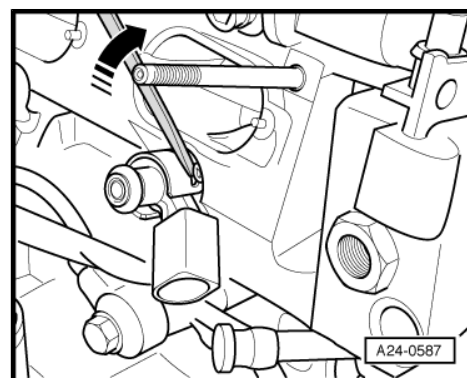
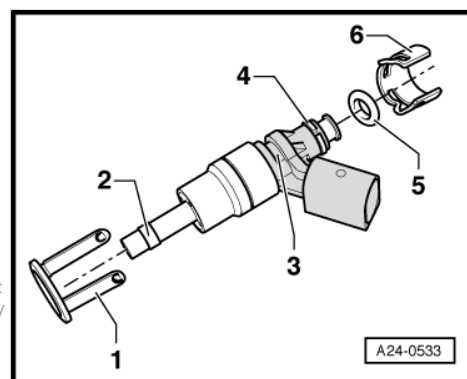
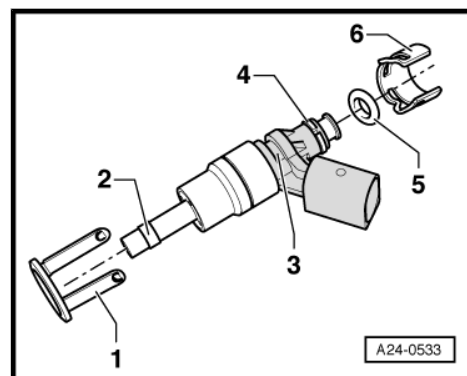
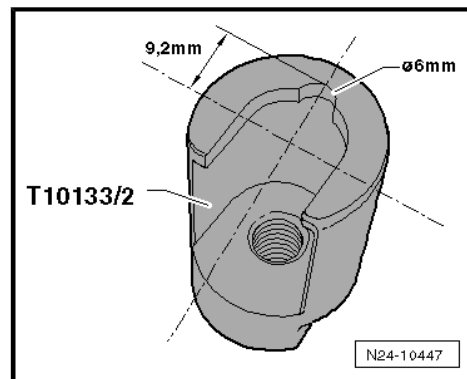


Note

The radial compensation element -Item 1- is clipped into the support ring -Item 6- with the injector fitted. To remove the injector, the support ring must be removed from the injector so that the puller -T10133/2- can be inserted into the groove on the injector -Item 3-.

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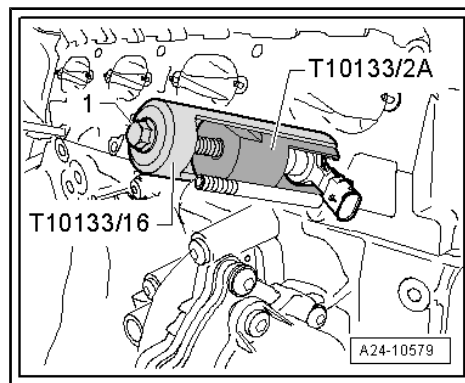
- Use a screwdriver to bend retainer tabs of radial compensation element to side, and pull support ring off injector.



- Guide puller -T10133/2A- into groove on injector.
- Then attach removal tool -T10133/16- and pull out injector by turning bolt -1-.


Note

The combustion chamber ring seal must always be renewed prior to reinstalling the injector ⇒ [page 36](#).



2.16.1 Renewing combustion chamber ring seal (teflon ring seal)

Special tools and workshop equipment required

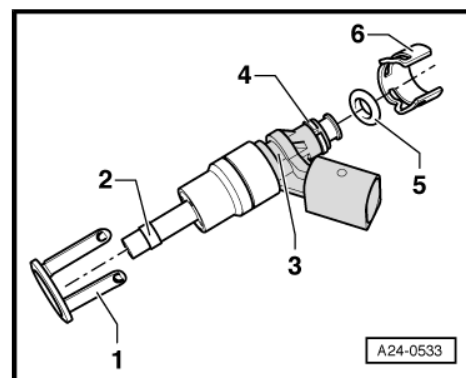
- ◆ Puller -T10133-



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– Illustration shows injector when removed.

- 1 - Radial compensation element, renew if damaged
- 2 - Combustion chamber ring seal (teflon ring seal) - renew; when fitting, do not grease ring or use any other lubricant
- 3 - Groove on injector
- 4 - Spacer ring (renew if damaged)
- 5 - O-ring (renew; apply thin coating of clean engine oil prior to installation)
- 6 - Support ring (via this support ring, fuel rail exerts force which secures injector in cylinder head)



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

- Carefully remove old teflon ring using suitable tools (e.g. cut open ring using 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.

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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.



Note

The illustration shows an injector with "offset connector". This can be ignored since it is not relevant when replacing the combustion chamber ring seal.

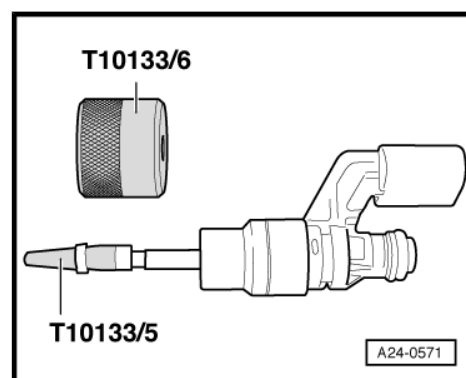
- Use assembly cone -T10133/5- and assembly sleeve -T10133/6- to fit new teflon ring.
- Slide teflon ring onto assembly cone. Then use assembly sleeve to push teflon ring evenly off assembly cone into injector groove. Do not use any lubricants during this procedure.



Note

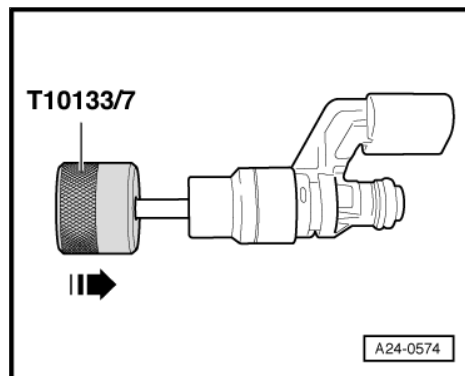
The teflon ring is widened as it is pushed onto the injector. The teflon ring must therefore be compressed again after it has been fitted. This is done in two steps. The procedure is described below.

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

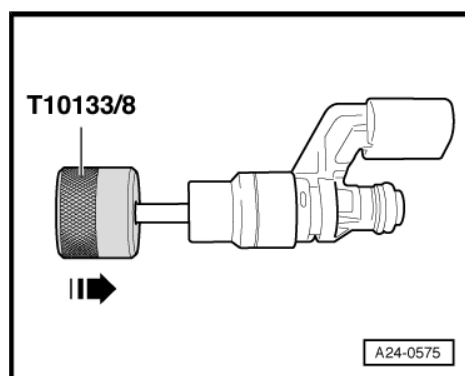


- Turn special tool (approx. 180°) while simultaneously sliding it over injector as far as it will go, applying moderate force. Then pull back to the original position, once again turning it 180°.

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



- Turn special tool (approx. 180°) while simultaneously sliding it over injector as far as it will go, applying moderate force. Then pull back to the original position, once again turning it 180°.

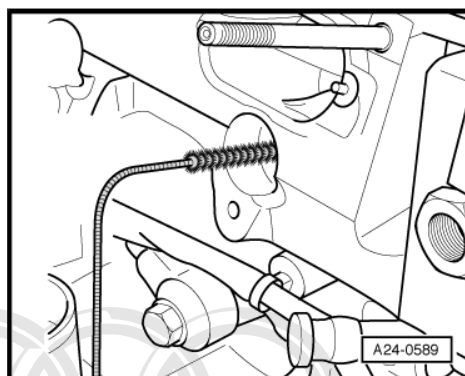


- Use supplied nylon brush (special tool -T10133/4-) to thoroughly clean holes for high-pressure injectors in cylinder head prior to installing injector.



Note

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

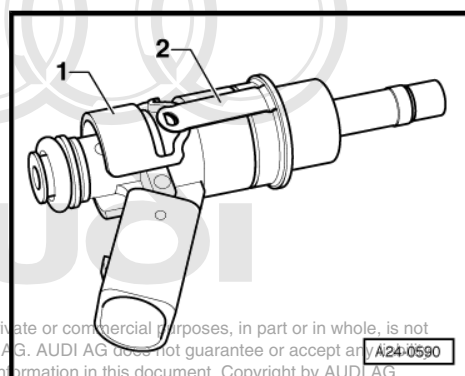


- Refit support ring -1- on injector and clip radial compensation element -2- onto support ring.



Note

- ◆ *The teflon seal on the injector must not be oiled or greased.*
- ◆ *Make sure there is no cleaning fluid or oil in the cylinder head bores when installing the injectors.*



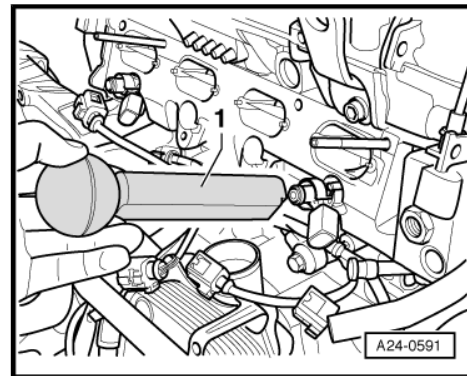
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- Use assembly tool -T10133/9- to push injector as far as it will go into hole in cylinder head (free of oil and grease). Ensure that the injector is properly seated in the cylinder head.

Installation is performed in the reverse sequence.

Important: the following points must always be observed:

- The teflon seal on the injector must not be oiled or greased.
- Make sure there is no cleaning fluid or oil in the cylinder head bores when installing the injectors.
- Coat O-rings of high-pressure injectors with clean engine oil to facilitate insertion into fuel rail.
- Renew all seals.
- Fuel rail must be positioned on injectors and pressed in evenly.
- Installing fuel rail ⇒ [page 25](#)
- Installing intake manifold ⇒ [page 24](#)

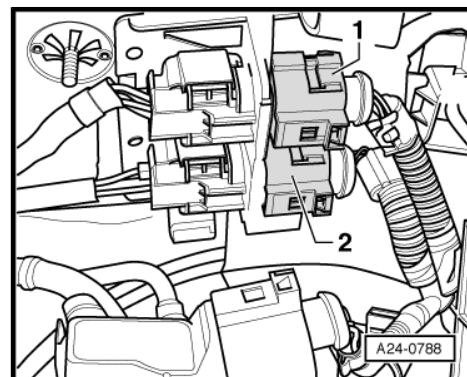
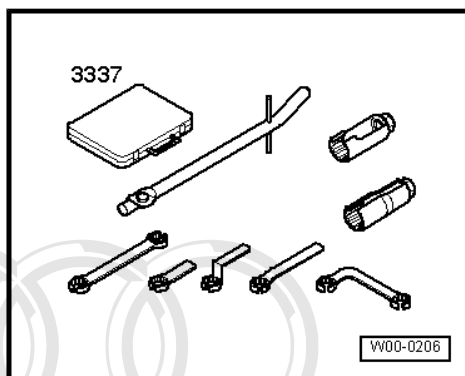


2.17 Removing and installing Lambda probes (before catalytic converter)

The components Lambda probe 2 -G108- and Lambda probe 2 heater -Z28- are not fitted on engines with code letter BVZ.

Special tools and workshop equipment required

- ◆ Lambda probe opening spanner set -3337-



Fitting location of connectors for Lambda probes before catalytic converter

1 - Connector for Lambda probe 2 -G108- and Lambda probe 2 heater -Z28- (for cylinders 2 and 3) **not fitted on engines with code letter BVZ**

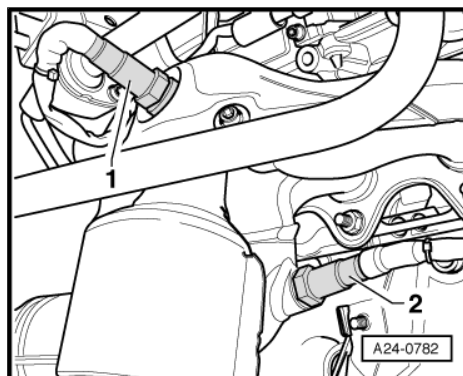
2 - Connector for Lambda probe -G39- and Lambda probe heater -Z19- (for cylinders 1 and 4)

- Unplug connector for corresponding Lambda probe.

Fitting location of Lambda probes before catalytic converter

1 - Lambda probe -G39- and Lambda probe heater -Z19- before catalytic converter "engines with code letters BLY and BVZ, see next illustration"

2 - Lambda probe 2 -G108- and Lambda probe heater 2 -Z28- before catalytic converter "not fitted on engines with code letter BVZ"



Lambda probe -G39- -2- "engine code letters BLY and BVZ"

Removing

- Unplug electrical connector for Lambda probe -G39- and Lambda probe heater -Z19- .
- Unscrew relevant Lambda probe using tool from Lambda probe open ring spanner set -3337- .

Installing

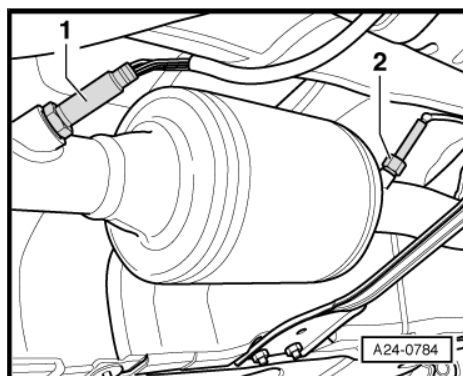
When installing, note the following:



Note

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- ◆ *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.*

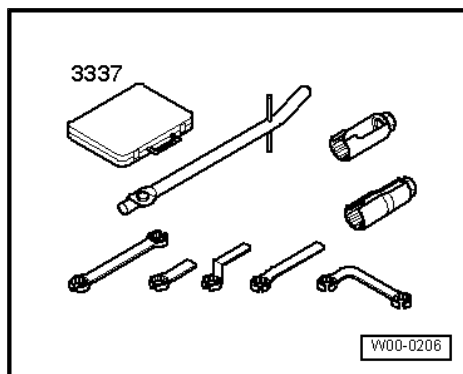


2.18 Removing and installing Lambda probes (after catalytic converter)

The components Lambda probe 2 after catalytic converter -G131- and Lambda probe 2 heater after catalytic converter -Z30- are not fitted on engines with code letters BHD, BMB, BLY and BVZ.

Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set -3337-



Removing

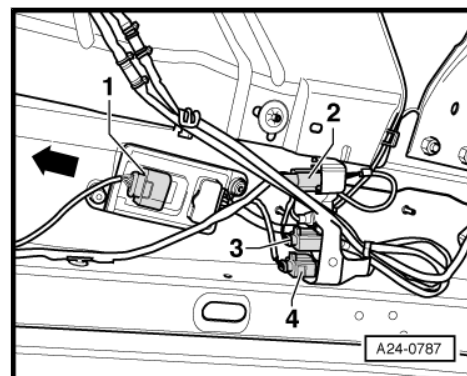
- Remove right-side cover from underbody.

Fitting location of connectors for Lambda probes after catalytic converter (arrow faces direction of travel).

3 - Electrical connector (black) for right-side Lambda probe after catalytic converter -G130- and Lambda probe 1 heater, after catalytic converter -Z29- (bank 1, probe 2)

4 - Electrical connector (brown) for left-side Lambda probe 2 after catalytic converter -G131- and Lambda probe 2 heater after catalytic converter -Z30- (bank 2, probe 2)

- Unplug connector for corresponding Lambda probe.

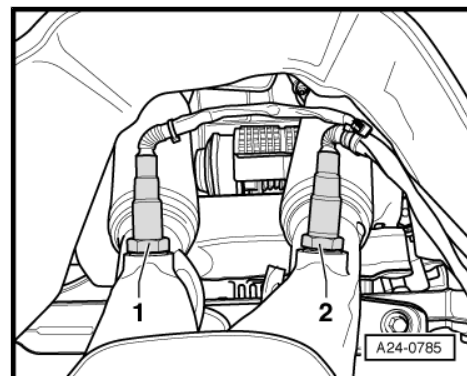


Lambda probes after catalytic converter

1 - Lambda probe 2, after catalytic converter -G131- and Lambda probe heater 2, after catalytic converter -Z30- (bank 2, probe 2)

2 - Lambda probe after catalytic converter -G130- and Lambda probe 1 heater after catalytic converter -Z29- (bank 1, probe 2)

- Unscrew relevant Lambda probe using tool from Lambda probe open ring spanner set -3337-.



Installing

When installing, note the following:



Note

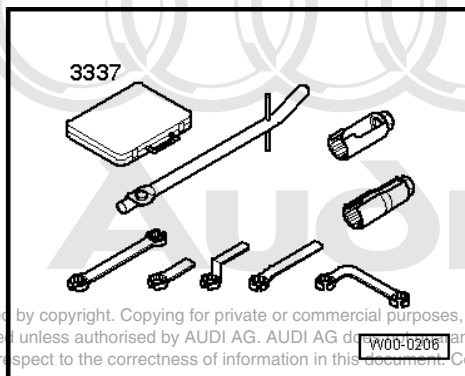
- ◆ *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- ◆ *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the probe body. High-temperature paste ⇒ 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.*

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

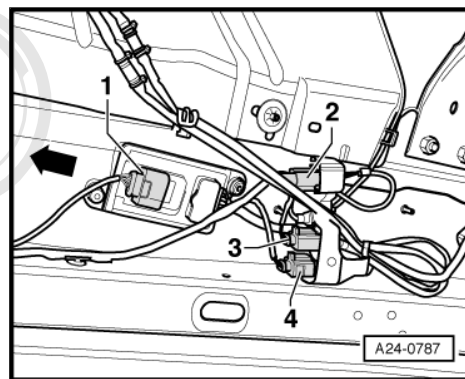
The NOx sensor control unit -J583- and the NOx sender -G295- are not fitted on vehicles with engine code letters BLY, BMB, BHD, BLR, BVZ and BVY.

Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set -3337-



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Fitting location of connectors (arrow faces direction of travel)

1 - NOx sensor control unit -J583- (cable for control unit cannot be disconnected from NOx sender -G295-)

2 - Connector for exhaust gas temperature sender 1 -G235-

Fitting location of NOx sender -G295- and exhaust gas temperature sender 1 -G235-

1 - NOx sender -G295- and NOx sender heater -Z44- ("NOx" stands for oxides of nitrogen)

2 - Exhaust gas temperature sender 1 -G235-

Removing

- Remove right-side cover from underbody.
- 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- .

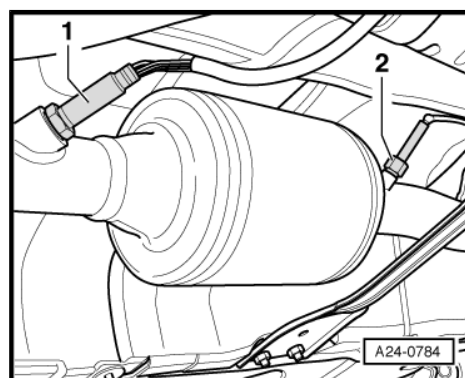
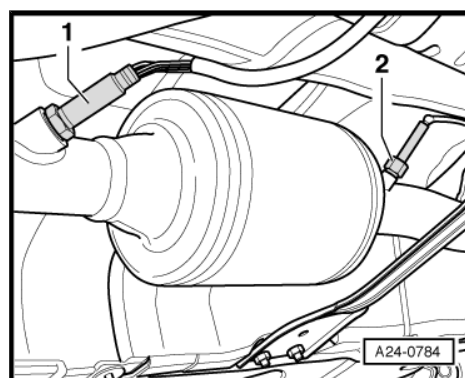
Installing

When installing, note the following:



Note

- ◆ When installing, the cables must always be reattached at the same locations to prevent them from coming into contact with the exhaust pipe.
- ◆ Tightening torque for NOx sender -G295- is 63 Nm.

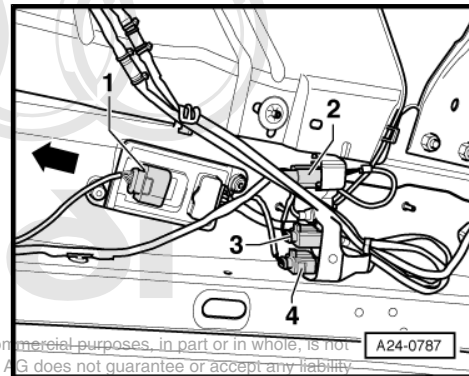
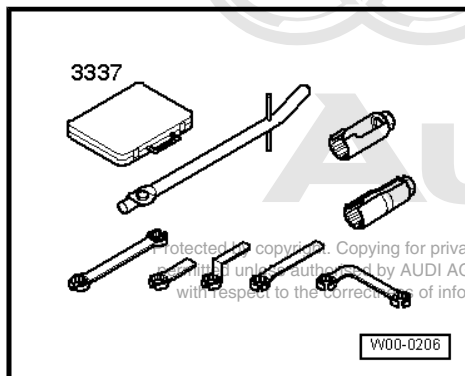


2.20 Removing and installing exhaust gas temperature sender 1 -G235-

Exhaust gas temperature sender 1 -G235- is not fitted on engines with code letters BLY, BMB, BHD, BLR, BVZ and BVY.

Special tools and workshop equipment required

- ◆ Lambda probe opening spanner set -3337-



Fitting location of connectors (arrow faces direction of travel)

1 - NOx sensor control unit -J583- (cable for control unit cannot be disconnected from NOx sender -G295-)

2 - Connector for exhaust gas temperature sender 1 -G235-

- Unplug electrical connector for exhaust gas temperature sender 1 -G235- .

Fitting location of NOx sender and exhaust gas temperature sender

1 - NOx sender -G295- and NOx sender heater - Z44 - ("NOx" stands for oxides of nitrogen)

2 - Exhaust gas temperature sender 1 -G235-

Removing

- Remove right-side cover from underbody.
- Unscrew exhaust gas temperature sender 1 -G235- -item 2- using tool from Lambda probe open ring spanner set -3337- .

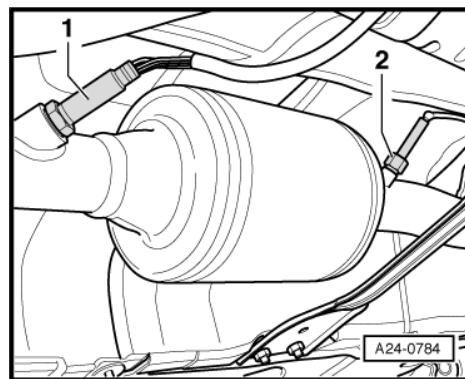
Installing

When installing, note the following:



Note

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

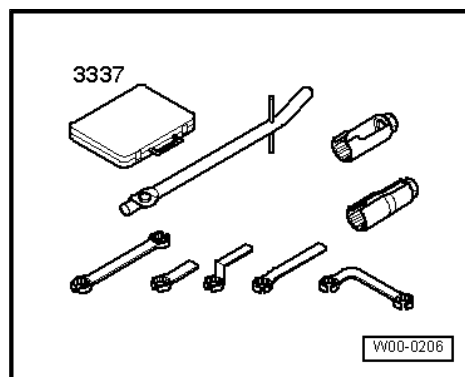


2.21 Lambda probe 3 after catalytic converter -G287- and Lambda probe heater 3 after catalytic converter -Z64-

On engines with code letters BLR and BVY a Lambda probe 3 after catalytic converter -G287- is fitted in place of the NOx sender -G295- .

Special tools and workshop equipment required

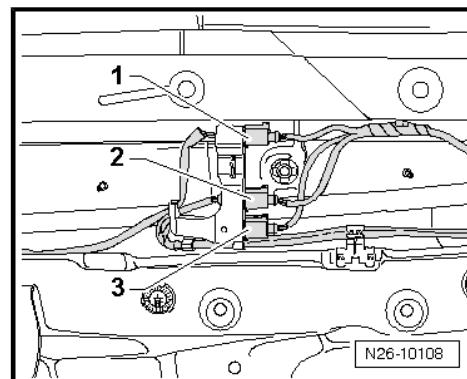
- ◆ Lambda probe open ring spanner set -3337-



Removing

- Remove right-side cover from underbody.

- Unplug electrical connector -2- for Lambda probe 3 after catalytic converter -G287- .



- Unscrew Lambda probe 3 after catalytic converter -G287- -1- using tool from Lambda probe open ring spanner set -3337- .

Installing

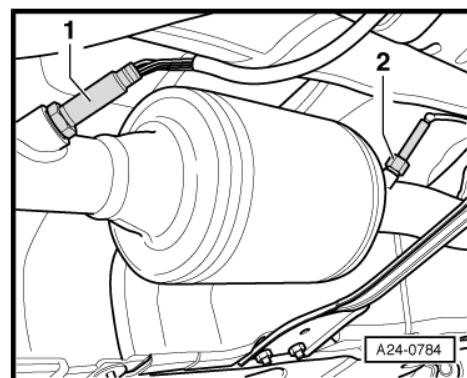
When installing, note the following:



Note

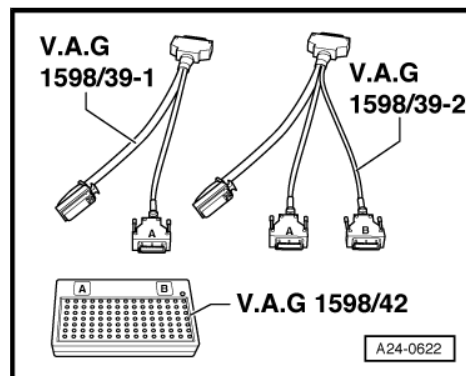
- ◆ *Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the probe body.*
- ◆ *In the case of a used Lambda probe grease only the thread with high-temperature paste. The paste must not get into the slots on the probe body. High-temperature paste → 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.*

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3 Engine control unit

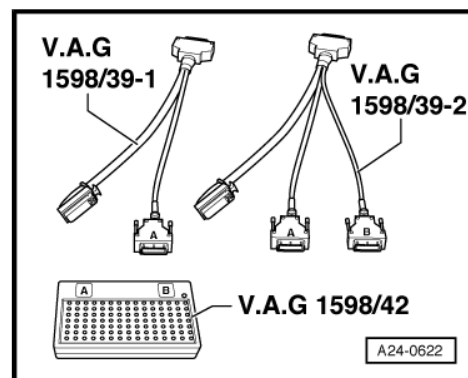
3.1 Wiring and component check with test box -V.A.G 1598/42-



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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.

**WARNING**

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

- 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.
- Remove engine control unit ➔ [page 47](#)
- Carry out test as described in appropriate repair procedures.

Installing engine control unit

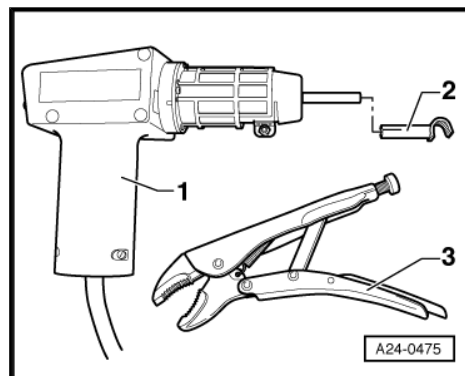
Installation is performed in the reverse sequence; the engine control unit must be installed with the protective housing. New shear bolts must be used.

Perform the following after reconnecting engine control unit:

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

3.2 Renewing Motronic control unit -J220-**Special tools and workshop equipment required**

- ◆ Hot air blower -VAS 1978/14A- -item 1- with nozzle attachment
-2- from wiring harness repair set -VAS 1978 B-



- ◆ Mole grips (commercially available type)

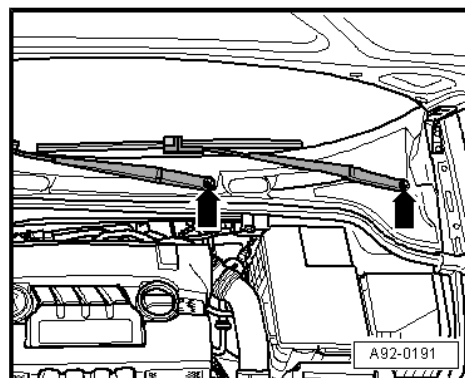
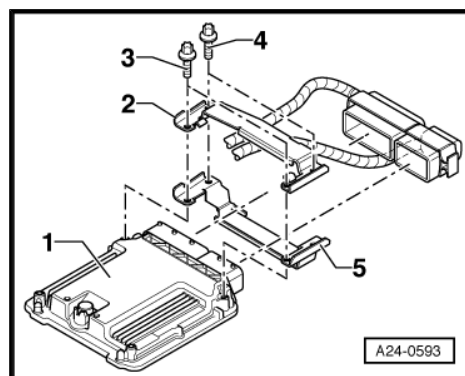
The engine control unit -1- is bolted to the locking plates -2 and 5-. To make it more difficult to unscrew the shear bolts -4- for locking plate -2-, their threads have been coated with locking fluid.

The protective housing has to be removed before the connectors can be unplugged from the engine control unit (e.g. to connect the test box or renew the engine control unit).

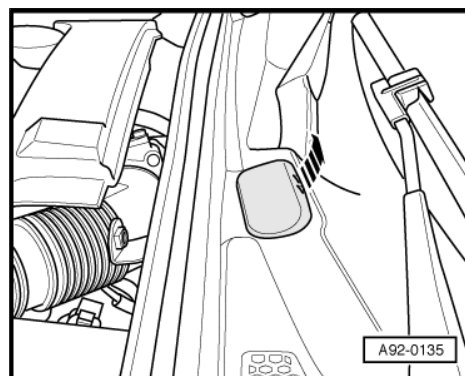
To make it more difficult to unscrew the shear bolts, their threads have been coated with locking fluid.

Removing engine control unit

- When renewing engine control unit, select diagnosis object "Replace engine control unit" in "Guided Functions" ⇒ Vehicle diagnosis, testing and information system VAS 5051.
- Switch off ignition.
- Lever off caps on windscreen wiper arms with a screwdriver.
- Loosen hexagon nuts -arrows- several turns.
- Loosen wiper arms from wiper shafts by tilting slightly.
- Completely remove hexagon nuts and detach wiper arms from wiper shafts.



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

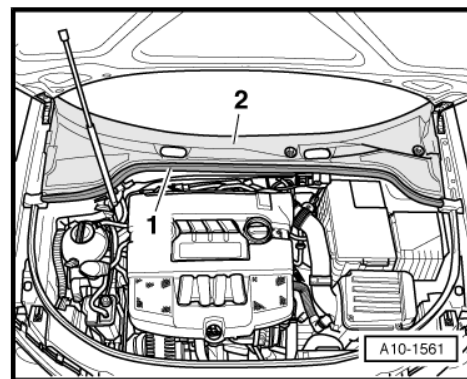


- Pull off rubber seal -1- from plenum chamber cover.
- Detach plenum chamber cover -2-.

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

Set wiper shafts to service position (so that electrical connector can 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.

Procedure for all vehicles:

- Remove ignition key.



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.

- 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.



WARNING

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

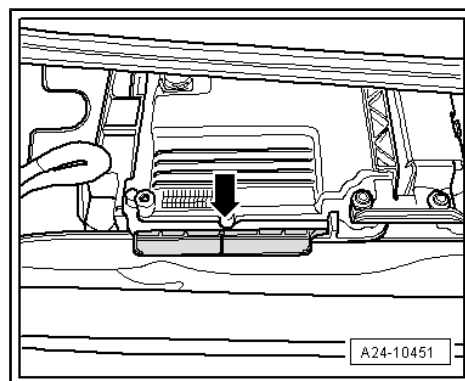
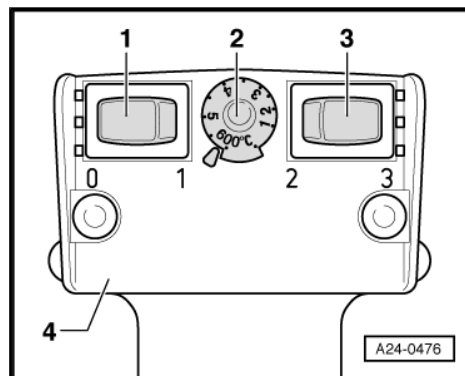
- Place the hot air blower nozzle close to the shear bolt on the protective housing.
- Switch on the hot air blower and heat the bolt for approximately 20 to 25 seconds.
- Then grasp the bolt head with the vice-grip pliers and unscrew the shear bolt.

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

Engine control unit can now be separated from protective housing.

Bracket for engine control unit: version 1

- Release clip “arrow” and remove engine control unit.



Bracket for engine control unit: version 2

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

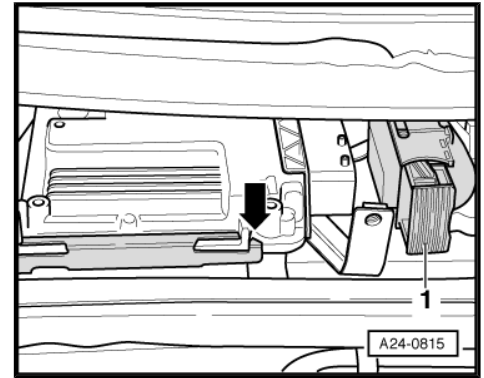
Installing engine control unit

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".



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28 – Ignition system

1 General notes and safety precautions

1.1 General notes on ignition system

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- ◆ A voltage of at least 11.5 V is required for proper operation of the electrical components.
- ◆ Certain tests may lead to a fault being detected by the control unit and stored. The fault memory should therefore be interrogated and (if necessary) erased after completing the tests and any repair work that may be required.
- ◆ If the engine starts, runs for a short period and then cuts out after completing fault finding, repairs or component tests, this may be due to the immobiliser disabling the engine control unit. The fault memory must then be interrogated and, if necessary, the control unit must be adapted.

1.2 Safety precautions

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



WARNING

- ◆ *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 -T40039- ⇒ [page 55](#) . 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- .



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2 Servicing ignition system

2.1 Test data

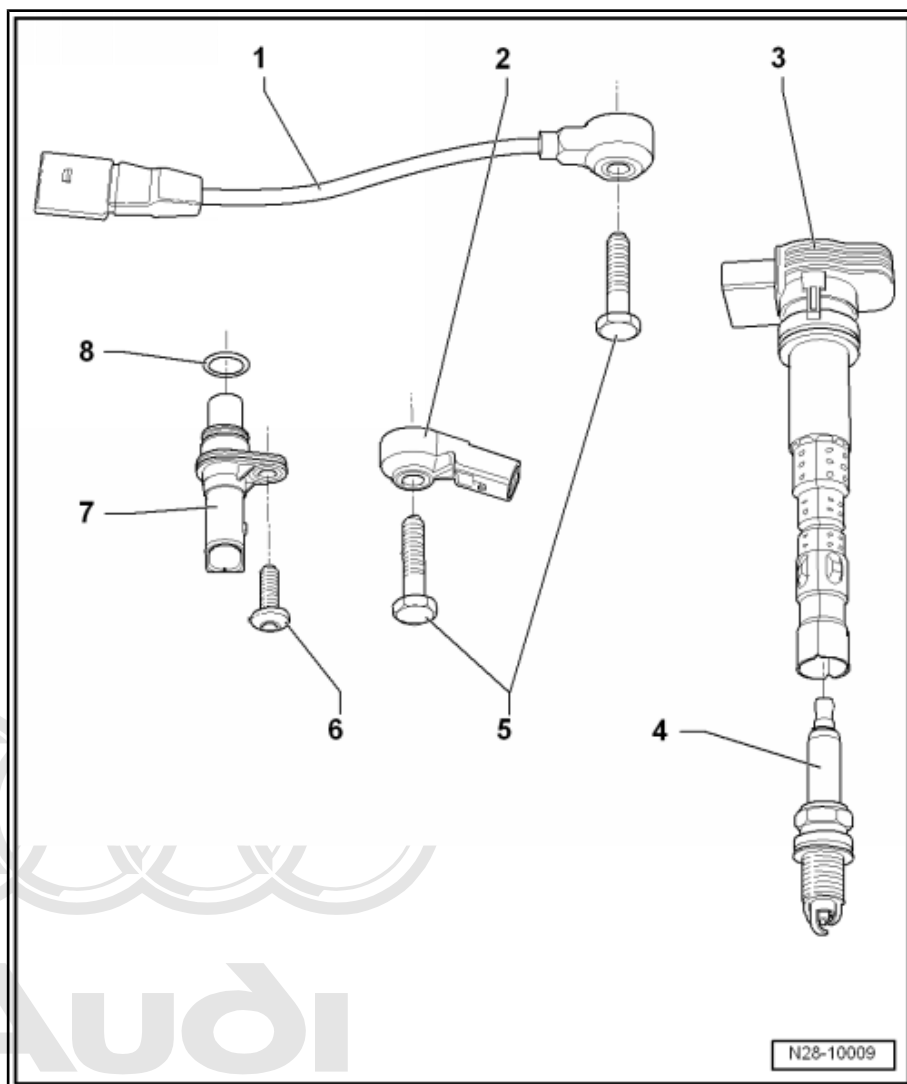
Engine data	2.0 ltr / 110 kW FSI engine
Idling speed: Cannot be adjusted; controlled by the idling speed stabilisation	640...800 rpm
Speed governing: By deactivating injec- tors or closing throttle valve	approx. 6,500 rpm
Ignition timing is deter- mined by the control unit. Ignition timing cannot be 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 - T40039 -
Firing order	1-3-4-2

2.2 Ignition system - exploded view



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- 1 - Knock sensor 1 -G61-**
 - ☐ Contacts gold-plated
- 2 - Knock sensor 2 -G66-**
 - ☐ Contacts gold-plated
- 3 - Ignition coil with output stage -(N70, N127, N291, N292)-**
 - ☐ Removing and installing
⇒ [page 55](#)
 - ☐ Use puller -T40039- for removal
- 4 - Spark plug**
 - ☐ 30 Nm
 - ☐ Removing and installing
⇒ Maintenance ; Book-let 808
- 5 - Bolt**
 - ☐ 20 Nm
 - ☐ Tightening torque influences the function of the knock sensor
- 6 - Bolt**
 - ☐ 10 Nm
- 7 - Hall sender -G40-**
 - ☐ Contacts gold-plated
- 8 - O-ring**

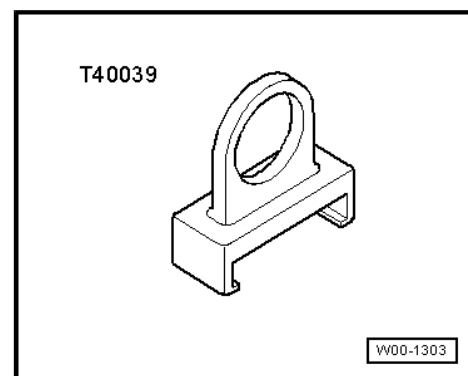


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2.3 Removing and installing ignition coils with output stages

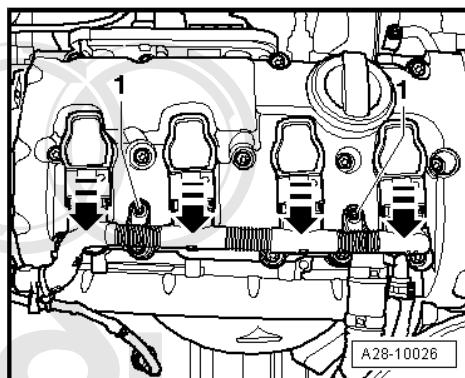
Special tools and workshop equipment required

- ◆ Puller -T40039-



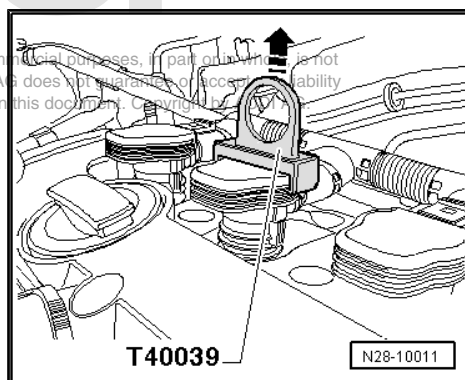
Removing:

- Unscrew two bolts -1- on connector rail.



- Pull all ignition coils approx. 30 mm out of spark plug holes using puller -T40039- .

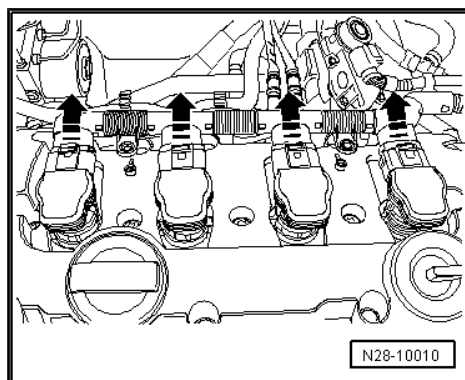
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- Release connectors and pull all connectors off ignition coils.

Installing:

- Fit all ignition coils loosely into spark plug holes.



- Align ignition coils with connectors and attach all connectors to ignition coils so they engage audibly.
- Press ignition coils onto spark plugs by hand with uniform pressure (do not use tool).

