

Audi A3 1997 ➤

TDI® injection and glow plug system (4-cyl. unit injector)

Engine ID	ASZ	ATD	AXR						
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Edition 11.2001



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List of Workshop Manual Repair Groups List of Workshop Manual Repair Groups Audi A3 1997 ➤

TDI® injection and glow plug system (4-cyl. unit injector)

Repair Group

- 01 - Self-diagnosis, Electrical check
- 23 - Mixture preparation, Injection
- 28 - Glow plug system

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

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01 - Self-diagnosis, Electrical check

1 - Self-diagnosis

1.1 - Self-diagnosis

1.2 - Technical data of self-diagnosis

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Equipment

- ◆ The data transfer between the control unit and vehicle diagnostic, testing and information system VAS 5051 is carried out in the "Self-diagnosis" mode.
- ◆ Fault memory: Non-volatile memory and volatile memory¹⁾

1) Will be cancelled after 50th engine start if fault has not occurred again.

1.3 - Safety precautions

Note the following points if test equipment has to be used during a road test:

Warning

- ◆ Test equipment must always be secured on the rear seat and operated from the rear seat by a second person.
- ◆ If test equipment is operated from the front passenger seat, the occupant could be injured by the passenger's airbag in an accident.

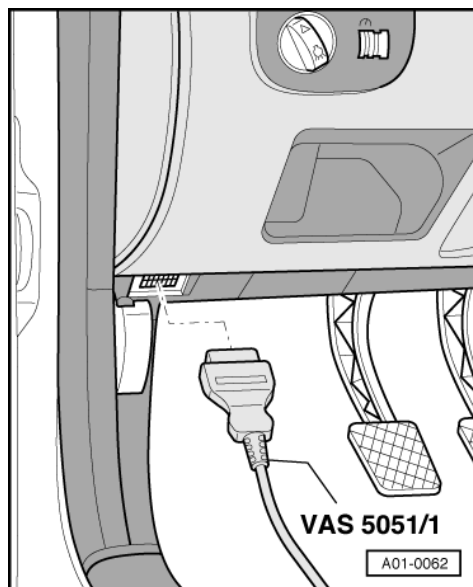
1.4 - Connecting vehicle diagnostic, testing and information system VAS 5051 and selecting functions

Requirements for test:

- Battery voltage not less than 12.7 V
- Fuses for engine electronics OK.

=> Current flow diagrams, Electrical fault finding and Fitting locations binder

- Earth connections on engine and gearbox OK



Work sequence

- Switch off ignition.
- -> Connect up vehicle diagnostic, testing and information system VAS 5051 with diagnostic cable VAS 5051/1.

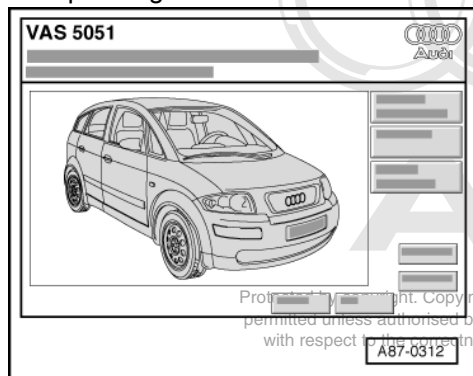
Warning

Observe safety precautions => Page 01-1.

Note:

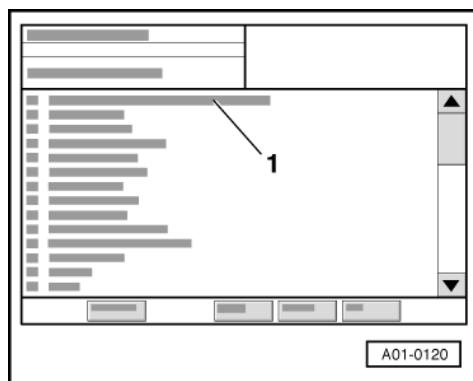
If an error message appears in the display:

=> Operating instructions for vehicle diagnostic, testing and information system VAS 5051



-> Display on VAS 5051:

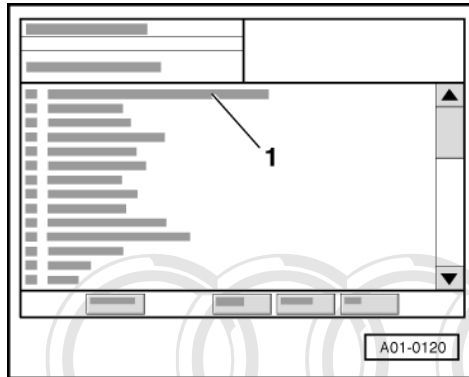
- Select "Vehicle self-diagnosis".



-> Display on VAS 5051:

Note:

Select "00 - Interrogate all fault memories" in the menu -1- to start the automatic test sequence (interrogation of fault memories of all vehicle systems with self-diagnosis capability).



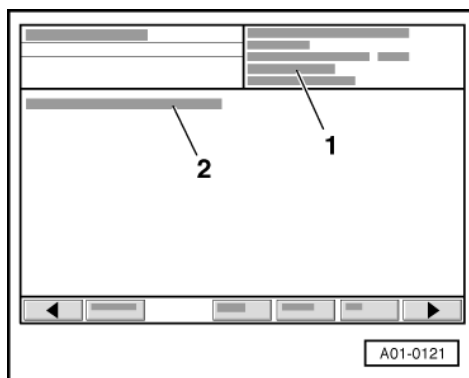
-> Display on VAS 5051:

Depending on the function required (see table of diagnosis functions => Page 01-6):

- Switch on ignition.

or

- Start the engine.
- Select vehicle system "01 - Engine electronics" in the menu -1-.
- Wait until the next display appears



-> Display on VAS 5051:

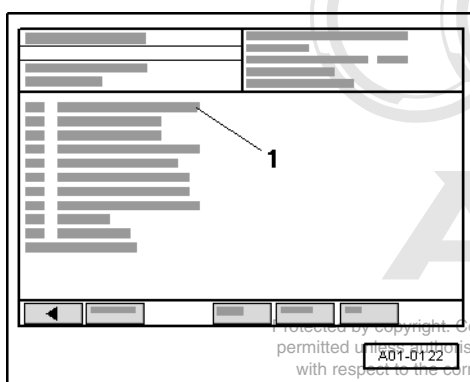
- 1 - Control unit identification of engine control unit => Page 01-5
- 2 - Control unit identification of immobiliser => Page 01-5

Control unit identification of engine control unit (example)	
01 - Engine electronics	Vehicle system
038906019..	Part No.; for allocation refer to => Parts Catalogue



Control unit identification of engine control unit (example)	
1.9l 1) R4 2) EDC 3) G 4) 000 5) SG 6)	1) Capacity of engine 2) In-line, 4-cylinder 3) Electronic Diesel Control 4) - G = Cruise control system activated 5) - No display = Cruise control system not fitted or not activated 6) Data status (software level) of control unit Manual gearbox
Coding 2	Coding of control unit (checking coding => Page 01-83)
Dealership No. 12345	Dealership No. of VAS 5051 which was used to perform the last coding

Control unit identification of immobiliser (example)	
WAUZZZ8L42A1064321 1) AUZ7Z0X1137197 2)	1) 17-digit vehicle identification No. (chassis No.) of vehicle 2) 14-digit identification No. of immobiliser



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- Press the ► button.

-> Display on VAS 5051:

1 - Menu of diagnosis functions:

Diagnosis functions	Ignition on, engine not running	Engine idling	Vehicle being driven	Page
02 Interrogate fault memory	No	Yes	Yes	01-7
03 Final control diagnosis	Yes	Yes	No	01-52
04 Basic setting	No	Yes	No	01-77
05 Erase fault memory	Yes	Yes	Yes	01-7
06 End output	Yes	Yes	Yes	01-12
07 Code control unit	Yes	No	No	01-83
08 Read data block (measured value block)	Yes	Yes	Yes	01-86
09 Read individual measuring value	No	No	No	-
10 Adaption	No	No	No	-
11 Login procedure	Yes	No	No	23-128

2 - Interrogating and erasing fault memory

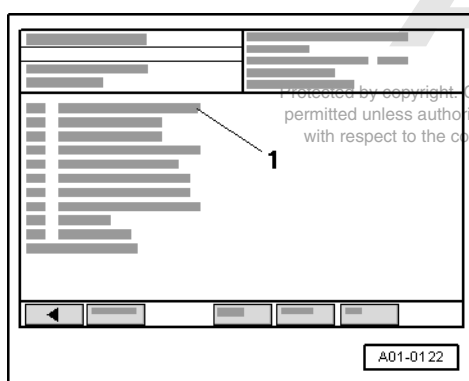
2.1 - Interrogating and erasing fault memory

2.2 - Interrogating fault memory

- Connect the vehicle diagnostic, testing and information system VAS 5051 => Page 01-2, and select the vehicle system "01 - Engine electronics" from the menu. When doing this the engine should be idling.

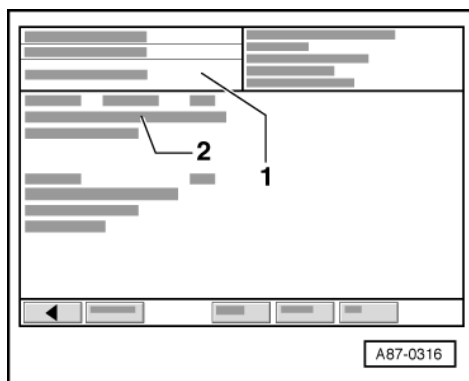
Note:

If the engine does not start, turn the engine over for at least 5 seconds using the starter. After doing this, do not switch off the ignition.



-> Display on VAS 5051:

- Select diagnosis function "02 - Interrogate fault memory" from the menu -1-.



-> Display on VAS 5051:

- 1 - Content of fault memory:
 - 0 faults detected
 - or
 - X faults detected
- 2 - Identification of fault
 - Fault code
 - Location/cause of fault
 - Type of fault



A - If one or more faults have been detected:

- Print out screen display or self-diagnosis log.
- Press the ◀ button to exit from function "02 - Interrogate fault memory".

-> Display on VAS 5051:

- Rectify fault(s) according to instructions in fault table => Page 01-13.
- Again select diagnosis function "02 - Interrogate fault memory" from the menu and then erase fault memory => Page 01-10.
- Select diagnosis function "06 - End output" Page 01-12.

B - If no faults have been detected:

- Select diagnosis function "06 - End output" Page 01-12.

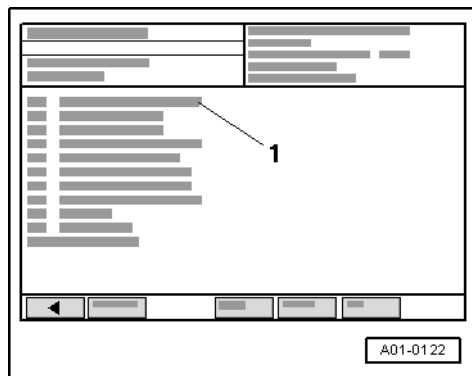
2.3 - Erasing fault memory

Note:

If it is not possible to erase the fault memory, interrogate the fault memory once again and repair faults.

Requirements:

- Fault memory has been interrogated => Page 01-7.
- All faults rectified.

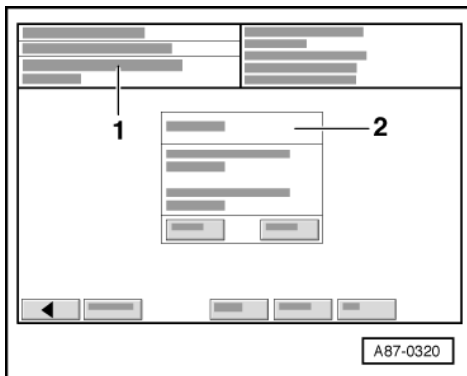


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After fault memory has been successfully interrogated:

-> Display on VAS 5051:

- Select diagnosis function "05 - Erase fault memory" from the menu -1-.



-> Display on VAS 5051:

- 1 - - No display (before erasing memory)
- or
- Fault memory is erased

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Note:

If display zone -1- shows the message "Fault memory is not interrogated", this means you have not kept exactly to the required sequence of steps. The fault memory must first be interrogated before it can be erased.

2 - Note:

Do you now want to implement this function?
(Existing data will be erased.)

- Press "OK" in display -2-.
- Press the ◀ button to exit from the function "05 - Erase fault memory".
- After completing repair work, interrogate the fault memory again.

Note:

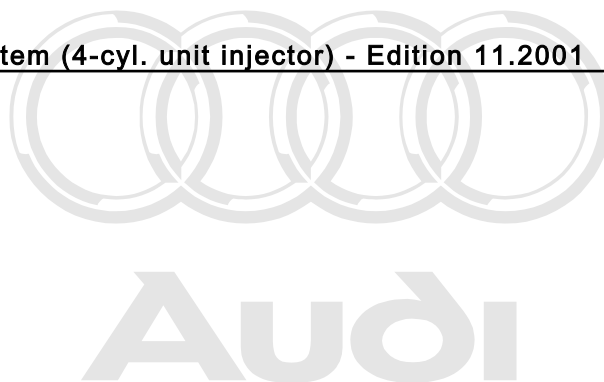
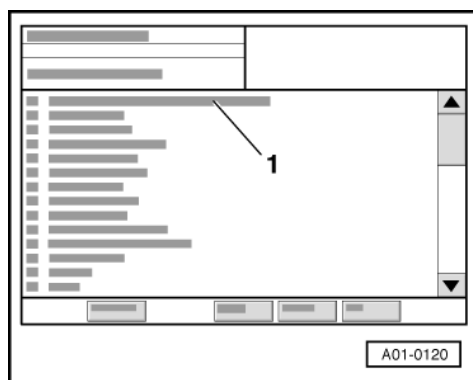
This has the effect of erasing any faults that may have been stored while carrying out repairs (e.g. as a result of unplugging connectors).



End output

-> Display on VAS 5051:

- Select diagnosis function "06 - End output" from the menu -1-.



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-> Display on VAS 5051:

- When this display appears, switch off ignition and unplug diagnostic connector.

2.4 - Fault table

Notes:

- ♦ If faults occur in the sensors and components being monitored, they will be stored in the fault memory together with an indication of the type of fault.
- ♦ The fault table is arranged according to the 5-digit fault codes in the left-hand column.
- ♦ If a fault is stored in the fault memory and then does not occur again during the next 50 times the engine is started, the fault code will be automatically erased.
- ♦ Sporadically occurring faults (temporary or intermittent faults) will be indicated on the display with the word "sporadic".
- ♦ Components that are indicated as being faulty by VAS 5051 should not be renewed immediately. Always start by checking the wiring, connectors and earth connections for the component using the current flow diagram. This is particularly important in the case of faults which are shown as "sporadic".

2.5 - Fault codes 16485 - 17948

Note:

SAE-codes (e.g. P 0101) are listed in addition to the familiar V.A.G. fault codes with five digits. These P-codes do not have to be considered for the time being, they will be relevant for future generations of self-diagnosis systems.

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
16485P0101 Air mass meter -G70 Implausible signal	- -G70 defective - Open circuit in wiring or short circuit to earth	- Reduced engine power - Black smoke	- Test -G70 => Page 23-107
16685P0301 Cylinder 1			

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
Misfiring recognised	- No combustion in cylinder - No compression pressure	- Reduced engine power - Engine runs rough - Increased emission figures	- Test compression pressure => 4-Cylinder TDI engine, Mechanics; Repair group 15; Removing and installing cylinder head; Testing compression pressure Removing and installing cylinder head; Testing compression pressure

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
16686P0302 Cylinder 2 Misfiring recognised	- No combustion in cylinder - No compression pressure	- Reduced engine power - Engine runs rough - Increased emission figures	- Test compression pressure => 4-Cylinder TDI engine, Mechanics; Repair group 15; Removing and installing cylinder head; Testing compression pressure Removing and installing cylinder head; Testing compression pressure
16687P0303 Cylinder 3 Misfiring recognised	- No combustion in cylinder - No compression pressure	- Reduced engine power - Engine runs rough - Increased emission figures	- Test compression pressure => 4-Cylinder TDI engine, Mechanics; Repair group 15; Removing and installing cylinder head; Testing compression pressure Removing and installing cylinder head; Testing compression pressure
16688P0304 Cylinder 4 Misfiring recognised	- No combustion in cylinder - No compression pressure	- Reduced engine power - Engine runs rough - Increased emission figures	- Test compression pressure => 4-Cylinder TDI engine, Mechanics; Repair group 15; Removing and installing cylinder head; Testing compression pressure Removing and installing cylinder head; Testing compression pressure

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
16705P0321 Engine speed sender -G28 Implausible signal	- G28 defective - Open circuit/short circuit in wiring - Sender wheel on crankshaft loose - Metal swarf on -G28 - G28 loose	- Engine stalls - Engine runs rough - Glow period warning lamp -K29 flashes - Increased emission figures - No display on rev. counter	- Test -G28 =>Page 23-77



Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
16706P0322 Engine speed sender -G28 No signal	- G28 defective - Open circuit/short circuit in wiring	- Engine will not start - Engine stops - Glow period warning lamp -K29 flashes - No display on rev. counter	- Test -G28 =>Page 23-77

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
16725P0341 Camshaft position sensor => Sender -G40 Implausible signal	- G40 defective - Sender incorrect or incorrectly secured - Gap between sender and sender wheel on camshaft not OK - Open circuit in wiring or short to earth	- Time to start engine is increased	- Test -G40 => Page 23-112
	- Sender wheel on camshaft damaged, turned out of position or loose	- Engine will not start - Engine stops	- Check camshaft position and sender wheel position => 4-Cylinder TDI engine, Mechanics; Repair group 15; Removing and installing cylinder head Removing and installing cylinder head

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
16885P0501 Road speed signal Implausible signal	- No signal from speedometer sender -G22	- Speedometer not OK - No cruise control function - No air conditioner function - Vehicle jolts when changing gears	- Test vehicle speed signal =>Page 23-122

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Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
16944P0560 Voltage supply Implausible signal	- Relay for diesel direct injection system defective - Relay sticks (sporadically)	- Engine will not start - Various running problems including engine cuts out	- Test voltage supply for diesel direct injection system control unit =>Page 23-69
16946P0562 Voltage supply Voltage too low	- Supply voltage below 4 V		
16947P0563 Voltage supply Voltage too high	- Supply voltage above 20 V		

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
16955P0571 Brake light switch -F Implausible signal	- Brake light switch -F or brake pedal switch -F47 defective	- Glow period warning lamp -K29 flashes - No brake light function	- Test -F and -F47 => Page 23-89 Test brake lights

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
16989P0605 Control unit defective	- Internal fault in control unit	- Engine running problems - Engine cuts out	- Renew control unit => Page 23-57
17552P1144 Air mass meter -G70 Open circuit/short to earth	- Open circuit in wiring or short circuit to earth - -G70 defective	- Reduced engine power - Black smoke	- Test -G70 => Page 23-107
17553P1145 Air mass meter -G70 Short to positive	Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability for the correctness of information in this document. Copyright by AUDI AG. - Short to positive - -G70 defective		
17554P1146 Air mass meter -G70 Voltage supply	- Operating voltage too high or too low - Open circuit in wiring		

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
17563P1155 Intake manifold pressure sender - G71 Short to positive	- Short circuit to positive - G71 defective	- Reduced engine power	- Test -G71 =>Page 23-80
17564P1156 Intake manifold pressure sender - G71 Open circuit/short to earth	- Open circuit in wiring or short circuit to earth - -G71 defective	- Reduced engine power - Increased emission figures	
17565P1157 Intake manifold pressure sender - G71 Voltage supply	- Open circuit/short circuit in wiring - -G71 defective		

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
17568P1160 Intake manifold temperature sender - G72 Short to earth	- Wiring short to earth - -G72 defective	- Goes to preset value of 135.9 °C	- Test -G72 =>Page 23-100
17569P1161 Intake manifold temperature sender - G72			



Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
Open circuit/short to positive	- Open circuit in wiring or short circuit to positive - G72 defective		

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
17570P1162 Fuel temperature sender -G81 Short to earth	- Short circuit to earth - G81 defective	- Increased emission figures	- Test -G81 => Page 23-104
17571P1163 Fuel temperature sender -G81 Open circuit/short to positive	- Open circuit in wiring or short circuit to positive - G81 defective		

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
17663P1255 Coolant temperature sender -G62 Short to earth	- Short circuit to earth - G62 defective	- Black smoke when starting - Glow period is always approximately 20 seconds	- Test -G62 =>Page 23-85
17664P1256 Coolant temperature sender -G62 Open circuit/short to positive	- Open circuit in wiring or short circuit to positive - G62 defective		

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
17668P1260 Unit injector solenoid, valve, No. 1 cyl. -N240 Implausible signal	- No control of unit injector valve	- Various running problems - Engine runs rough - Reduced engine power - Increased emission figures	- Test unit injector solenoid valves =>Page 23-32
17669P1261 Unit injector solenoid valve, No. 1 cyl. -N240 Control limit surpassed	- Control period too long - Contact resistance		
17670P1262 Unit injector solenoid valve, No. 1 cyl. -N240			

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
Control limit not reached	- Control period too short - Shortage of fuel - Air in fuel system	- Various running problems - Engine runs rough - Reduced engine power - Increased emission figures	- Test unit injector solenoid valves =>Page 23-32 - Test fuel supply system => Fuel supply system, Diesel engines; Repair group 20

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
17671P1263 Unit injector solenoid valve, No. 2 cyl. -N241 Implausible signal	- No control of unit injector valve	- Various running problems - Engine runs rough - Reduced engine power - Increased emission figures	- Test unit injector solenoid valves =>Page 23-32
17672P1264 Unit injector solenoid valve, No. 2 cyl. -N241 Control limit surpassed	- Control period too long - Contact resistance		
17673P1265 Unit injector solenoid valve, No. 2 cyl. -N241 Control limit not reached	- Control period too short - Shortage of fuel - Air in fuel system	- Various running problems - Engine runs rough - Reduced engine power - Increased emission figures	- Test unit injector solenoid valves =>Page 23-32 - Test fuel supply system => Fuel supply system, Diesel engines; Repair group 20

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
17674P1266 Unit injector solenoid valve, No. 3 cyl. -N242 Implausible signal	- No control of unit injector valve	- Various running problems - Engine runs rough - Reduced engine power - Increased emission figures	- Test unit injector solenoid valves =>Page 23-32
17675P1267 Unit injector solenoid valve, No. 3 cyl. -N242 Control limit surpassed	- Control period too long - Contact resistance		
17676P1268			

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Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
Unit injector solenoid valve, No. 3 cyl. -N242 Control limit not reached	- Control period too short - Shortage of fuel - Air in fuel system	- Various running problems - Engine runs rough - Reduced engine power - Increased emission figures	- Test unit injector solenoid valves =>Page 23-32 - Test fuel supply system => Fuel supply system, Diesel engines; Repair group 20

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
17677P1269 Unit injector solenoid valve, No. 4 cyl. -N243 Implausible signal	- No control of unit injector valve	- Various running problems - Engine runs rough - Reduced engine power - Increased emission figures	- Test unit injector solenoid valves =>Page 23-32
17678P1270 Unit injector solenoid valve, No. 4 cyl. -N243 Control limit surpassed	- Control period too long - Contact resistance		
17679P1271 Unit injector solenoid valve, No. 4 cyl. -N243 Control limit not reached	- Control period too short - Shortage of fuel - Air in fuel system	- Various running problems - Engine runs rough - Reduced engine power - Increased emission figures	- Test unit injector solenoid valves =>Page 23-32 - Test fuel supply system => Fuel supply system, Diesel engines; Repair group 20

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
17795P1387 Control unit defective	Internal fault in control unit	- Engine running problems - Engine cuts out	- Renew control unit => Page 23-57
17810P1402 Exhaust gas recirculation valve -N18 Short to positive	- Short to positive	- No exhaust gas recirculation	- Test N18 =>Page 01-52, Final control diagnosis
17845P1437 Valve 2 for exhaust gas recirculation - N213			

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
Short to positive	- Short to positive	- No exhaust gas recirculation	- Test -N213 =>Page 01-64, Final control diagnosis

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
17846 P1438 Exhaust gas recirculation valve 2 -N213 Open/short circuit to earth	- Wiring open circuit - Exhaust gas recirculation valve defective - Short to earth	- Too much exhaust gas recirculation - Reduced output, black smoke	Test -N213 =>Page 01-64, Final control diagnosis
17849 P1441 Exhaust gas recirculation valve -N18 Open circuit/short to earth	- Wiring open circuit - Exhaust gas recirculation valve defective - Short to earth	- Too much exhaust gas recirculation - Reduced output, black smoke	Test -N18 =>Page 01-52, Final control diagnosis

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
17910 P1502 Fuel pump relay -J17 Short circuit to positive	- Short circuit to positive - J17 defective	- Engine cuts out	- Test -J17 => Fuel supply system - Diesel engines; Repair group 20; Fuel supply system; Testing fuel pump relay -J17 and activation Fuel supply system; Testing fuel pump relay -J17 and activation
17911 P1503 Load signal for alternator terminal DF Implausible signal	- Alternator defective - Voltage regulator defective - Open circuit in wiring	- Additional heater not working	- Test alternator => Current flow diagrams, Electrical fault-finding and Fitting locations binder

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
17931 P1523 Crash signal from airbag control unit Implausible signal	- Fault in data wire to airbag control unit		=> Body, Self-diagnosis; Repair group 01; Self-diagnosis of airbag system



Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
17932P1524 Fuel pump relay -J17 Open circuit/short circuit to earth	- Short circuit to earth - -J17 defective	- Engine cuts out	- Test -J17 => Fuel supply system - Diesel engine; Repair group 20; Fuel supply system; Testing fuel pump relay -J17 and activation Fuel supply system; Testing fuel pump relay -J17 and activation

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
17948P1540 Road speed signal Signal too high	- Dash panel insert defective	- Speedometer reading not OK - No cruise control system function - No air conditioner function - Vehicle jolts when changing gears	- Test speed signal =>Page 23-122

2.6 - Fault codes 17954 - 19561

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
17954P1546 Charge pressure control solenoid valve -N75 Short to positive	- Short to positive	- Reduced engine power - Charge pressure too low	- Test -N75 =>Page 01-77, Basic setting, Display group 011
17957P1549 Charge pressure control solenoid valve -N75 Open circuit/short to earth	- Wiring open circuit - Solenoid valve defective		
	- Short to earth	- Reduced output - Charge pressure too high	

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
17958P1550 Charge pressure			

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
Control difference	- Charge pressure control solenoid -N75 defective - Hose connections interchanged, not connected - Leaks between turbocharger and engine (charge pressure routing) - Turbocharger defective	- Reduced engine power	- Test -N75 =>Page01-77, Basic setting, Display group 011 - Test charge pressure control => 4-Cylinder TDI engine, Mechanics; Repair group 21; Testing charge pressure system with turbocharger - Testing charge pressure system with turbocharger

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
17964P1556 Charge pressure control Regulating limit not reached	- Charge pressure control solenoid valve -N75 defective - Leaks between turbocharger and engine (charge pressure routing) - Turbocharger defective	- Reduced engine power	- Test -N75 =>Page01-77, Basic setting, Display group 011 - Test charge pressure control => 4-Cylinder TDI engine, Mechanics; Repair group 21; Testing charge pressure system with turbocharger - Testing charge pressure system with turbocharger
17965P1557 Charge pressure control Regulating limit surpassed	- Hose connections interchanged, not connected	- Charge pressure too high - Reduced engine power	
17977P1569 CCS Switch -E45 Implausible signal	- Open circuit or short in wiring - -E45 defective	- No cruise control system function	- Test cruise control system =>Page 23-125

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
17978P1570 Engine control unit blocked	- Attempted tampering - Engine control unit renewed without performing adaption to immobilizer control unit	- Engine starts but cuts out again immediately	- Perform adaption of immobilizer control unit to engine electronics control unit: => Electrical system, Self-diagnosis; Repair group 01
	- Short in the communication wire - Immobilizer control unit defective		- Test electronic immobilizer: => Electrical system, Self-diagnosis; Repair group 01

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
18008P1600 Voltage supply terminal 15 Voltage too low	- No current supply when ignition is on (terminal 15)	- Various running problems - Engine cuts out	- Test voltage supply for Diesel direct injection system =>Page 23-69
18009P1601			



Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
Voltage supply relay terminal 30 -J317 1)	- Relay defective - Relay sticking (sporadically)	- Engine will not start - Various running problems - Engine cuts out	
18017P1609 Crash-switch off triggered	- Airbag was triggered		=> Body, Self-diagnosis; Repair group 01; Self-diagnosis of airbag system Self-diagnosis of airbag system
	- Final control diagnosis of airbag system performed	- Fault entered in engine control unit by final control diagnosis	- Erase fault memory =>Page 01-7

1) Incorrect fault text display. The relevant component is:

Diesel direct injection system relay -J322

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
18020P1612 Engine control unit Wrong coding	- Invalid control unit coding	- Glow period warning lamp -K29 flashes	- Code control unit =>Page 01-83
18024P1616 Glow period warning lamp -K29 Short to positive	- Short to positive	- Glow period warning lamp -K29 not functioning	- Test glow period warning lamp -K29 =>Page 01-64, Final control diagnosis
18025P1617 Glow period warning lamp -K29 Open/short circuit to earth	- Wiring open circuit - Bulb defective - Short to earth	- Glow period warning lamp -K29 permanently on	

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
18026P1618 Glow plug relay -J52 Short to positive	- Wiring short to positive - -J52 defective	- No glow plug activation - Poor cold starting - Glow period warning lamp -K29 flashes	- Test -J52 =>Page 01-64, Final control diagnosis
18027P1619 Glow plug relay -J52 Open circuit/short to earth	- Wiring open circuit or short to earth - -J52 defective		
18034P1626 Drive train data bus No message from gearbox control unit	- Fault in data wiring to gearbox control unit	- Drivability problems (shift jolts, load change jerk)	- Test data bus => Page 23-132

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
18039P1631 Accelerator position sender -G79 Signal too high	- -G79 defective	- Increased idling speed	- Test -G79 and adjust => Fuel supply system - Diesel engines; Repair group 20
18040P1632 Accelerator position sender -G79 Voltage supply	- Operating voltage too high or too low - Wiring open circuit	- Glow period warning lamp -K29 flashes - Increased idling speed	
18047P1639 Accelerator position sender 1/2 -G79+G1852) Implausible signal	- -G79 defective	- Increased idling speed	

2) Incorrect fault text display. The relevant component is:

Accelerator pedal position sender -G79

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
18048P1640 Control unit defective	- Internal fault in control unit	- Engine running problems - Engine cuts out	- Renew control unit => Page 23-57
18056P1648 Drive train data bus Defective	- Fault in data wiring to gearbox control unit or ABS control unit - Fault in system: Auto- matic gearbox or ABS	- Drivability problems (shift jolts, load change jerk)	- Test data bus =>Page 23-134
18057P1649 Drive train data bus Message from ABS control unit missing	- Fault in data wiring to ABS control unit		
18058P1650 Drive train data bus Message from combi-instru- ment missing	- Fault in data wiring to dash panel insert		- Test data bus => Page 23-136

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
18062P1654 Please interrogate fault memory of combi- instrument	- Oil level/oil tem- perature sender G266 defective	- Oil level warning lamp lights up	Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted. This document is not to be used for any other purpose without the written consent of the Audi AG. The correct use of this document is guaranteed by the Audi AG. => Electrical system, Self-diagnosis; Repair group 01
18065P1657 Air conditioning input/output Short to positive	- Short to positive	- Reduced vehicle ac- celeration when air conditioning is switched on	- Test air conditioner compressor shut-off function=> Final con- trol diagnosis Page 01-64



Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
18067P1659 Radiator fan activation 1 Short to positive	- Short to positive		- Test radiator fan -V7 => Current flow diagrams, Electrical fault finding and fitting locations

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
18071P1663 Unit injector solenoid valve activation Short to positive	- Short to positive in engine wiring harness - Internal short circuit to positive in engine control unit	- Engine stops - (continuous fault) - Engine misfiring - (sporadic fault)	- Test unit injector solenoid valves =>Page 23-32
18072P1664 Unit injector solenoid valve activation Electrical fault in current circuit	- Open circuit in wiring or short circuit to earth in engine wiring harness		

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
18073P1665 Unit injector solenoid valve activation Mechanical fault	- Unit injector defective mechanically	- Engine misfiring - Engine stops	- Renew unit injector =>Page 23-38
18074P1666 Unit injector solenoid valve, No. 1 cyl. -N240 Electrical fault in current circuit	- Open circuit in wiring or short circuit to earth in engine wiring harness	- Various running problems - Engine runs rough - Reduced engine power - Increased emission figures	- Test unit injector solenoid valves =>Page 23-32
18075P1667 Unit injector solenoid valve, No. 2 cyl. -N241 Electrical fault in current circuit	- Open circuit in wiring or short circuit to earth in engine wiring harness	- Various running problems - Engine runs rough - Reduced engine power - Increased emission figures	- Test unit injector solenoid valves =>Page 23-32

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
18076P1668			

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
Unit injector solenoid valve, No. 3 cyl. -N242 Electrical fault in current circuit	- Open circuit in wiring or short circuit to earth in engine wiring harness	- Various running problems - Engine runs rough - Reduced engine power - Increased emission figures	- Test unit injector solenoid valves =>Page 23-32
18077P1669 Unit injector solenoid valve, No. 4 cyl. -N243 Electrical fault in current circuit	- Open circuit in wiring or short circuit to earth in engine wiring harness	- Various running problems - Engine runs rough - Reduced engine power - Increased emission figures	- Test unit injector solenoid valves =>Page 23-32
18080P1672 Radiator fan activation 1 Open circuit/short circuit to earth	- Open circuit in wiring/short circuit to earth		- Test radiator fan -V7 => Current flow diagrams, Electrical fault finding and Fitting locations binder

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
18090P1682 Drive train data bus Implausible message from ABS control unit	- Fault in data wiring to ABS control unit		- Test data bus =>Page 23-134
19458P3002 Kick-down switch -F8 Implausible signal	- Accelerator position sender -G79 defective	- Gearshift points of automatic gearbox not OK	- Test -G79 and adjust => Fuel supply system - Diesel engines; Repair group 20
19459P3003 Low heat output relay -J359 Short circuit to positive	- Open circuit in wiring or short circuit to positive - -J359 defective	- Additional heater element not working	- Test -J359 => Final control diagnosis, Page 01-64
19461P3005 High heat output relay -J360 Short circuit to positive	- Open circuit in wiring or short circuit to positive - -J360 defective		- Test -J360 => Final control diagnosis, Page 01-64

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
19463P3007 Camshaft position sender -G40			



Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
No signal	- G40 defective - Sender incorrect or incorrectly secured - Gap between sender and sender wheel on camshaft not OK - Open circuit in wiring or short circuit to earth	- Time to start engine is increased	- Test -G40 => Page 23-112
19464P3008 Camshaft position sender -G40 Signal outside tolerance	- Sender wheel on camshaft damaged, turned out of position or loose	- Engine will not start - Engine stops	- Test camshaft position and sender wheel position => 4-Cylinder TDI engine, Mechanics; Repair group 15; Removing and installing cylinder head Removing and installing cylinder head

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
19556 P3100 Intake manifold flap motor -V157 Short circuit to positive	- Short circuit to positive - -V157 defective	- Rough jolt when turning engine off	- Test -V157 => Final control diagnosis Page 23-24
19557 P3101 Intake manifold flap motor -V157 Open circuit/short circuit to earth	- Open circuit in wiring or short circuit to earth - -V157 defective		

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
19558 P3102 Intake manifold flap motor -V157 No signal	- Wiring open circuit	- Rough jolt when turning engine off	- Test -V157 => Final control diagnosis Page 23-24
19559 P3103 Intake manifold flap motor -V157 Defective	- -V157 defective		

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
19560P3104 Intake manifold flap change-over valve -N239 Short circuit to positive	- Short circuit to positive	- Rough jolt when turning engine off	- Test -N239 => Final control diagnosis, Page 23-18
19561P3105 Intake manifold flap change-over valve -N239			

Display on VAS 5051	Possible causes of fault	Possible effects	Fault remedy
Open circuit/short circuit to earth	- Open circuit in wiring or short circuit to earth - -N239 defective		

3 - Final control diagnosis

3.1 - Final control diagnosis

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3.2 - Vehicles with engines code letters ASZ, ATD

The final control diagnosis activates the following components in the stated sequence:

Activation sequence
1 Exhaust gas recirculation valve -N18
2 Air conditioner compressor shut-off
3 Charge pressure control solenoid valve -N75
4 Intake manifold flap change-over valve -N239
5 Glow period warning lamp -K29
6 Radiator fan control
7 Glow plug relay -J52
8 Low heat output relay -J359 1)
9 High heat output relay -J360 1)

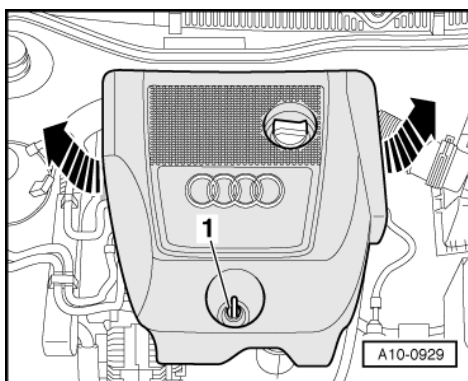
1) Only vehicles with manual gearbox

Requirements for test on vehicles with air conditioner:

- Vehicle at room temperature (above +15 °C)
- Air conditioner switched on
- Lowest temperature setting and maximum blower speed selected

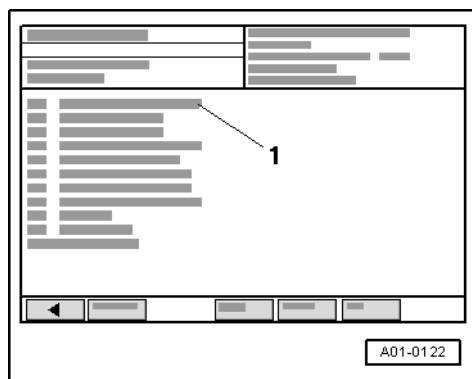
Notes:

- ♦ During the final control diagnosis, the individual control elements are only activated for 30 seconds each.
- ♦ If the final control diagnosis is to be repeated, switch off the ignition and then back on again.



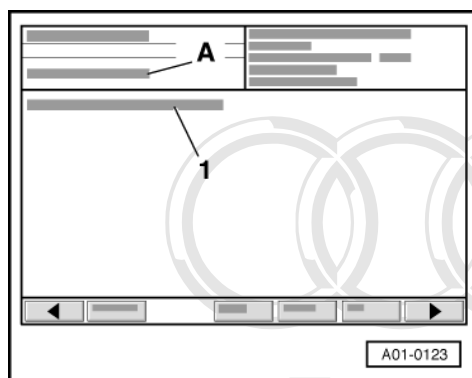
**Work sequence**

- -> Pull out oil dipstick -1- from guide tube.
- Remove engine cover -arrows-.
- Re-insert oil dipstick into guide tube.
- Connect the vehicle diagnostic, testing and information system VAS 5051 => Page 01-2, and select the vehicle system "01 - Engine electronics" from the menu. When doing this the engine should be idling.



-> Display on VAS 5051:

- Select diagnosis function "03 - Final control diagnosis" from the menu -1-

**Activating exhaust gas recirculation valve**

-> Display on VAS 5051:

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- A - 1st control element in test
- 1 - Exhaust gas recirculation valve -N18

- ◆ This valve is activated at intervals for about 30 seconds (clicks) unless the test programme is deliberately advanced to the next control element by pressing the ► button.

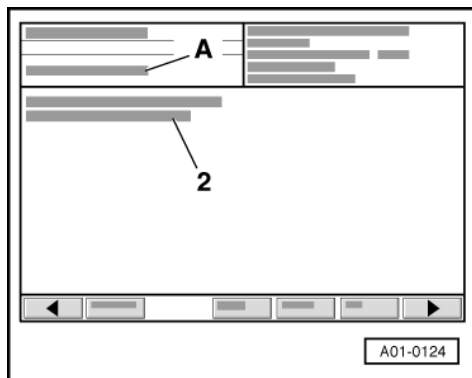
Notes:

- ◆ The clicking of the valve is not audible on account of engine noise and a determination by touching is difficult due to engine vibration.
- ◆ When the engine is cold, activation of the valve is audible through a changed combustion sound.
- ◆ To test valve, perform the complete final control diagnosis procedure once, and then repeat with the engine not running - activation of valve is now audible.

If the valve is not actuated (does not click):

- Test exhaust gas recirculation valve -N18

=> 4-Cyl. TDI engine, Mechanics; Repair group 26; Exhaust gas recirculation system Exhaust gas recirculation system



Activating air conditioner compressor shut-off

- Press the ► button.

-> Display on VAS 5051:

- A - 2nd control element in test
- 2 - Air conditioner compressor shut-off

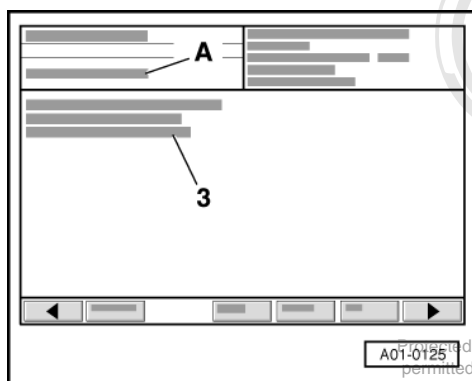
- ♦ The air conditioner compressor should stop running within 5 seconds (visual check), and then start and stop repeatedly every 5 seconds.

If the conditioner compressor is not switched off:

- Test air conditioner compressor shut-off
=> Page 23-119.

Note:

On vehicles without air conditioning this control element may be ignored. To continue the final control diagnostics, press the ► button.



Activating charge pressure control solenoid valve

- Press the ► button.

-> Display on VAS 5051:

- A - 3rd control element in test



3 - Charge pressure control solenoid valve -N75

- ♦ This valve is activated at intervals for about 30 seconds (clicks) unless the test programme is deliberately advanced to the next control element by pressing the ► button.

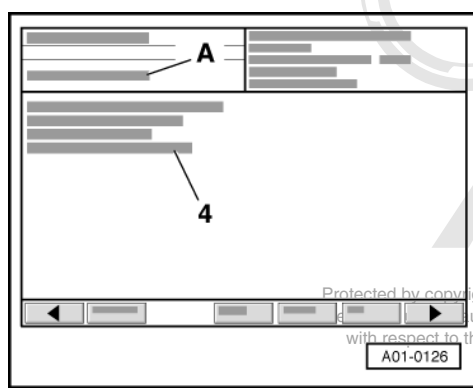
Notes:

- ♦ The clicking of the valve is not audible on account of engine noise and a determination by touching is difficult due to engine vibration.
- ♦ To test valve, perform the complete final control diagnosis procedure once, and then repeat with the engine not running - activation of valve is now audible.

If the valve is not actuated (does not click):

- Test charge pressure control solenoid valve -N75:

=> 4-Cyl. TDI engine, Mechanics; Repair group 21; Charge air system with turbocharger Charge air system with turbocharger



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Activating intake manifold flap change-over valve

- Press the ► button.

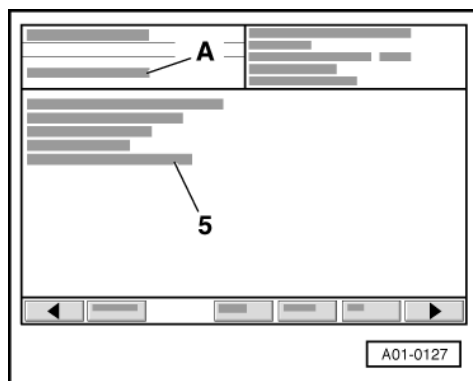
-> Display on VAS 5051:

- A - 4th control element in test
- 4 - Intake manifold flap change-over valve -N239

- ♦ The engine should stop

If the engine does not stop:

- Check intake manifold flap change-over
=>Page 23-18



Activating glow period warning lamp

- Press the ► button.

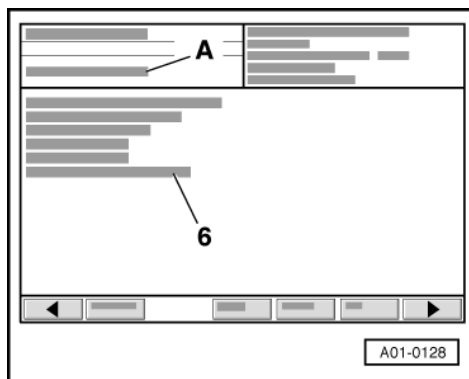
-> Display on VAS 5051:

- A - 5th control element in test
- 5 - Glow period warning lamp -K29

- ♦ The warning lamp is activated for about 30 seconds in intervals (flashes).

If the warning lamp is not activated (does not flash):

- Test signals to and from dash panel insert =>Page 23-136.



Activating radiator fan control

- Press the ► button.

-> Display on VAS 5051:

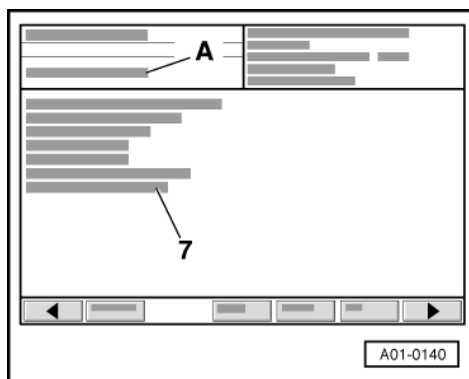
- A - 6th control element in test
- 6 - Radiator fan control

- ♦ The relay or radiator fan run-on control unit switches the radiator fan on and off for approx. 30 seconds in intervals unless the diagnosis is advanced to the next control element by pressing the ► button.

If the fan does not run:

- Test radiator fan and radiator fan activation:

=> Current flow diagrams, Electrical fault finding and Fitting locations binder



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Activating glow plug relay

- Press the ► button.

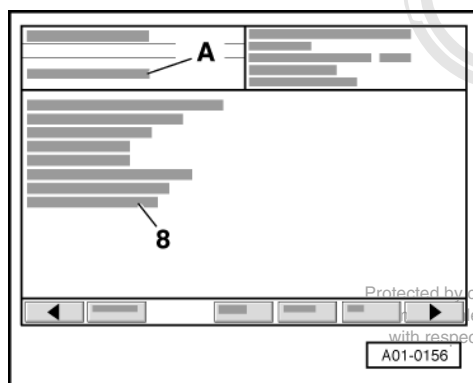
-> Display on VAS 5051:

- A - 7th control element in test
- 7 - Glow plug relay -J52

- ♦ The glow plug relay -J52 (on central electrics panel on left side of driver's footwell, relay position 4) switches on and off for approx. 30 seconds in intervals (clicks) unless the diagnosis is advanced to the next control element by pressing the ► button.
- ♦ If the relay is switching on and off as specified, the interior light will get dimmer and brighter due to the high current draw of the glow plugs. This gives an additional indication.

If the relay does not click:

- Check glow plug relay -J52
=> Page 28-4.



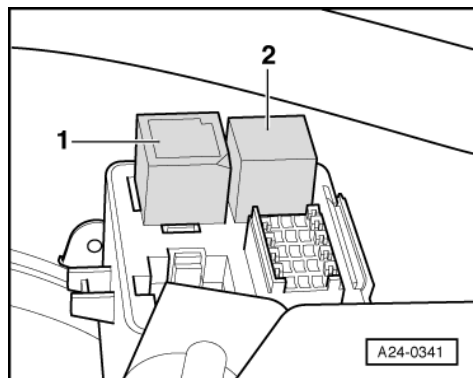
Only for vehicles with manual gearbox

Activating low heat output relay

- Press the ► button.

-> Display on VAS 5051:

- A - 8th control element in test
- 8 - Low heat output relay -J359

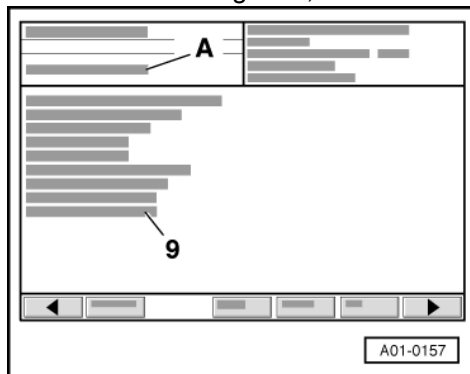


- ♦ -> The low heat output relay -J359 (under cover on left of bulkhead -item 2-) switches on and off for approx. 30 seconds in intervals (clicks) unless the diagnosis is advanced to the next control element by pressing the ► button.

If the relay does not click:

- Check low heater output relay -J359:

=> Current flow diagrams, Electrical fault finding and Fitting locations binder

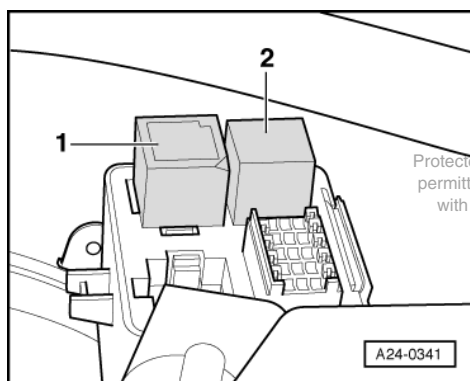


Only for vehicles with manual gearbox
Activating high heat output relay

- Press the ► button.

-> Display on VAS 5051:

- A - 9th control element in test
- 9 - High heat output relay -J360



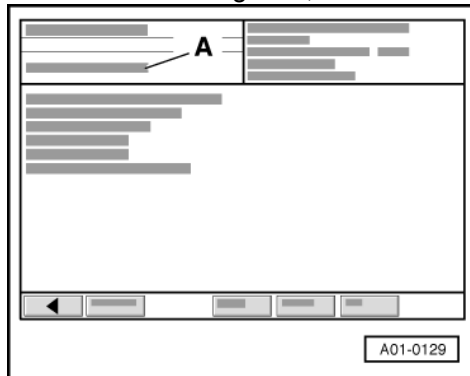
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- ♦ -> The high heat output relay -J360 (under cover on left of bulkhead -item 1-) switches on and off for approx. 30 seconds in intervals (clicks) unless the diagnosis is advanced to the next control element by pressing the ► button.
- ♦ If the relay is switching on and off as specified, the interior light will get dimmer and brighter due to the high current draw of the glow plugs. This gives an additional indication.

If the relay does not click:

- Check high heat output relay -J360:

=> Current flow diagrams, Electrical fault finding and Fitting locations binder





All models

- Press the ▶ button.
- > Display on VAS 5051:
 - A - Final control diagnosis is completed
- Press the ◀ button to exit from function "03 - Final control diagnosis".

3.3 - Vehicles with engine code letters AXR

The final control diagnosis activates the following components in the stated sequence:

Activation sequence
1 Exhaust gas recirculation valve -N18
2 Air conditioner compressor shut-off
3 Charge pressure control solenoid valve -N75
4 Valve 2 for exhaust gas recirculation -N213
5 Intake manifold flap flap motor -V157
6 Glow period warning lamp -K29
7 Radiator fan control
8 Glow plug relay -J52
9 Low heat output relay -J359 1)
10 High heat output relay -J360 1)

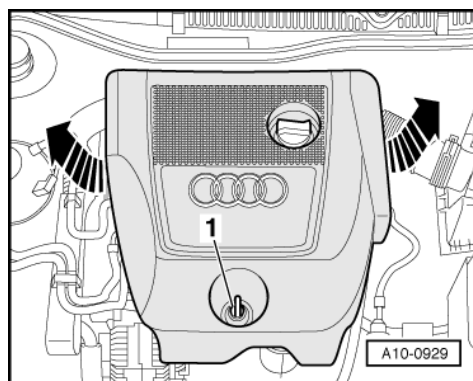
- 1) Only vehicles with manual gearbox

Requirements for test on vehicles with air conditioner:

- Vehicle at room temperature (above +15 °C)
- Air conditioner switched on
- Lowest temperature setting and maximum blower speed selected

Notes:

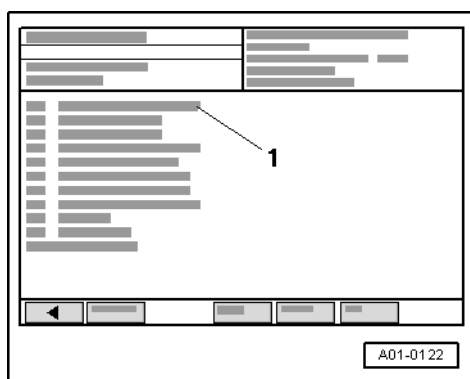
- ♦ During the final control diagnosis, the individual control elements are only activated for 30 seconds each.
- ♦ If the final control diagnosis is to be repeated, switch off the ignition and then back on again.



Work sequence

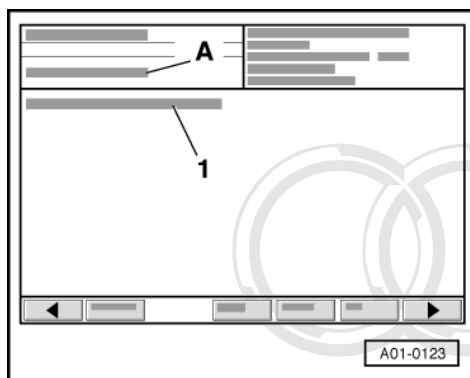
- -> Pull out oil dipstick -1- from guide tube.
- Remove engine cover -arrows-.

- Re-insert oil dipstick into guide tube.
- Connect the vehicle diagnostic, testing and information system VAS 5051 => Page 01-2, and select the vehicle system "01 - Engine electronics" from the menu. When doing this the engine should be idling.



-> Display on VAS 5051:

- Select diagnosis function "03 - Final control diagnosis" from the menu -1-



Activating exhaust gas recirculation valve

-> Display on VAS 5051:

A - 1st control element in test

1 - Exhaust gas recirculation valve -N18

- ◆ This valve is activated at intervals for about 30 seconds (clicks) unless the test programme is deliberately advanced to the next control element by pressing the ► button.

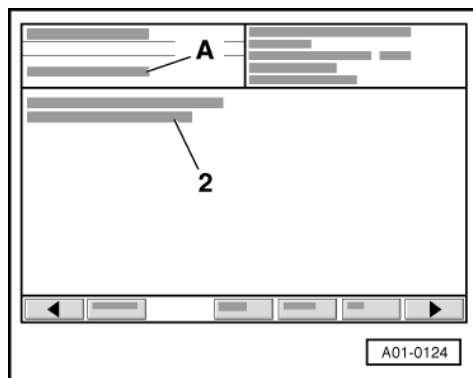
Notes:

- ◆ The clicking of the valve is not audible on account of engine noise and a determination by touching is difficult due to engine vibration.
- ◆ When the engine is cold, activation of the valve is audible through a changed combustion sound.
- ◆ To test valve, perform the complete final control diagnosis procedure once, and then repeat with the engine not running - activation of valve is now audible.

If the valve is not actuated (does not click):

- Test exhaust gas recirculation valve -N18

=> 4-Cyl. TDI engine, Mechanics; Repair group 26; Exhaust gas recirculation system Exhaust gas recirculation system



Activating air conditioner compressor shut-off

- Press the ▶ button.

-> Display on VAS 5051:

- A - 2nd control element in test
- 2 - Air conditioner compressor shut-off

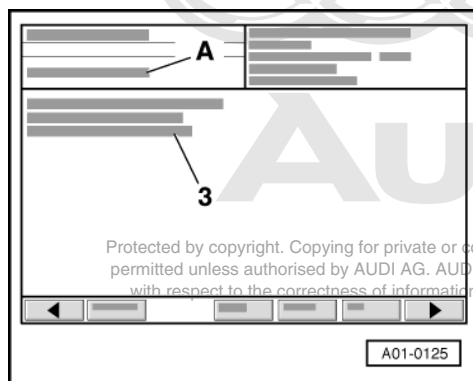
- ♦ The air conditioner compressor should stop running within 5 seconds (visual check), and then start and stop repeatedly every 5 seconds.

If the conditioner compressor is not switched off:

- Test air conditioner compressor shut-off
=> Page 23-119.

Note:

On vehicles without air conditioning this control element may be ignored. To continue the final control diagnostic, press the ▶ button.



Activating charge pressure control solenoid valve

- Press the ▶ button.

-> Display on VAS 5051:

- A - 3rd control element in test
- 3 - Charge pressure control solenoid valve -N75

- ♦ This valve is activated at intervals for about 30 seconds (clicks) unless the test programme is deliberately advanced to the next control element by pressing the ▶ button.

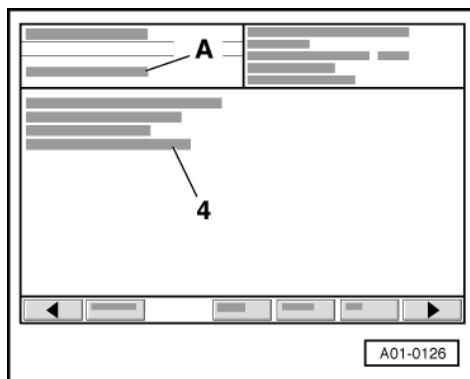
Notes:

- ◆ The clicking of the valve is not audible on account of engine noise and a determination by touching is difficult due to engine vibration.
- ◆ To test valve, perform the complete final control diagnosis procedure once, and then repeat with the engine not running - activation of valve is now audible.

If the valve is not actuated (does not click):

- Test charge pressure control solenoid valve -N75:

=> 4-Cyl. TDI engine, Mechanics; Repair group 21; Charge air system with turbocharger Charge air system with turbocharger



- Press the ► button.

-> Display on VAS 5051:

- A - 4th control element in test
- 4 - Exhaust gas recirculation valve 2 -N213

- ◆ This valve is activated at intervals for about 30 seconds (clicks) unless the test programme is deliberately advanced to the next control element by pressing the ► button.

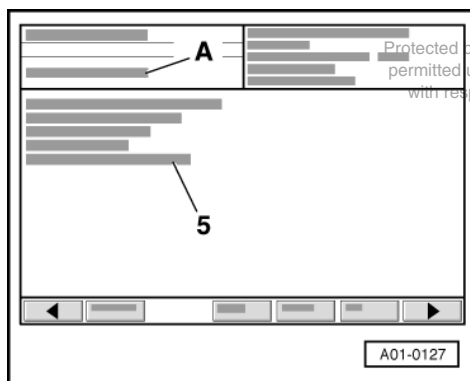
Notes:

- ◆ The clicking of the valve is not audible on account of engine noise and a determination by touching is difficult due to engine vibration.
- ◆ To test valve, perform the complete final control diagnosis procedure once, and then repeat with the engine not running. activation of valve is now audible.

If the valve is not actuated (does not click):

- Test exhaust gas recirculation valve -N18

=> 4-Cyl. TDI engine, Mechanics; Repair group 26; Exhaust gas recirculation system Exhaust gas recirculation system



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Activating intake manifold flap motor

- Press the ► button.

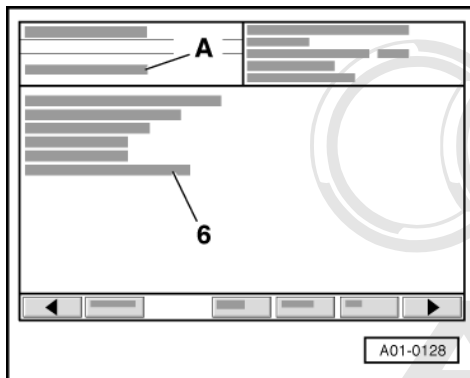
-> Display on VAS 5051:

- A - 5th control element in test
- 5 - Intake manifold flap motor -V157

- ♦ The engine should stop

If the engine does not stop:

- Check intake manifold flap motor
=>Page 23-24



Activating glow period warning lamp

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- Press the ► button.

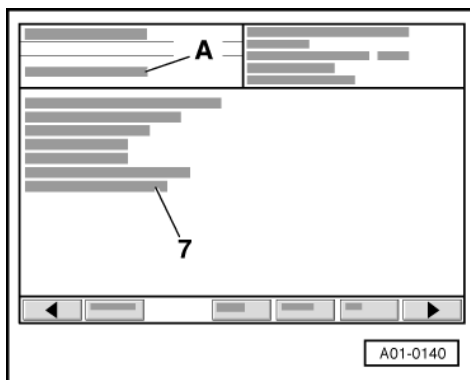
-> Display on VAS 5051:

- A - 6th control element in test
- 6 - Glow period warning lamp -K29

- ♦ The warning lamp is activated for about 30 seconds in intervals (flashes).

If the warning lamp is not activated (does not flash):

- Test signals to and from dash panel insert =>Page 23-136.



Activating radiator fan control

- Press the ► button.

-> Display on VAS 5051:

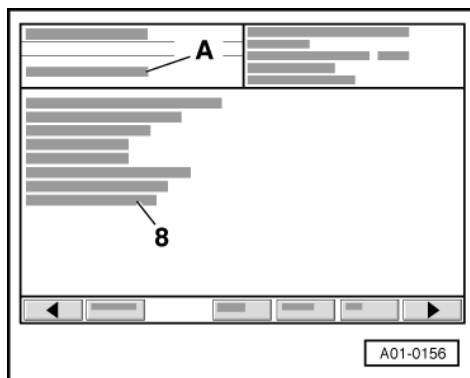
- A - 7th control element in test
- 7 - Radiator fan control

- ◆ The relay or radiator fan run-on control unit switches the radiator fan on and off for approx. 30 seconds in intervals unless the diagnosis is advanced to the next control element by pressing the ▶ button.

If the fan does not run:

- Test radiator fan and radiator fan control:

=> Current flow diagrams, Electrical fault finding and Fitting locations binder



Activating glow plug relay

- Press the ▶ button.

-> Display on VAS 5051:

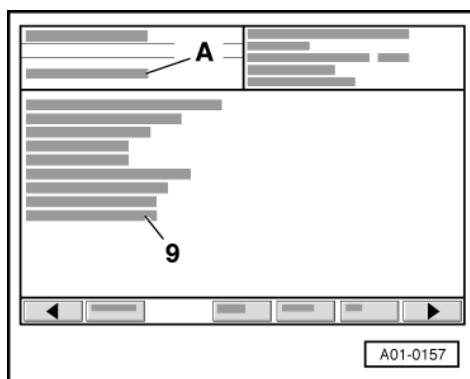
- A - 8th control element in test
- 8 - Glow plug relay -J52

- ◆ The glow plug relay -J52 (on central electrics panel on left side of driver's footwell, relay position 4) switches on and off for approx. 30 seconds in intervals (clicks) unless the diagnosis is advanced to the next control element by pressing the ▶ button.
- ◆ If the relay is switching on and off as specified, the interior light will get dimmer and brighter due to the high current draw of the glow plugs. This gives an additional indication.

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If the relay does not click:

- Check glow plug relay -J52
- => Page 28-4.





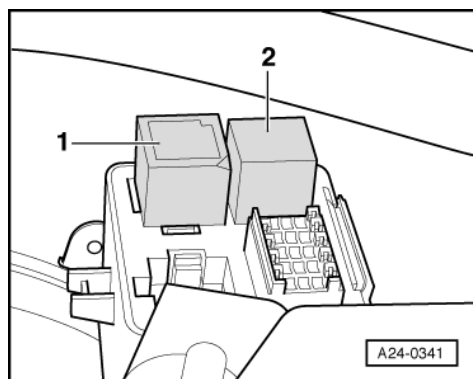
Only for vehicles with manual gearbox

Activating low heat output relay

- Press the ▶ button.

-> Display on VAS 5051:

- A - 9th control element in test
- 9 - Low heat output relay -J359

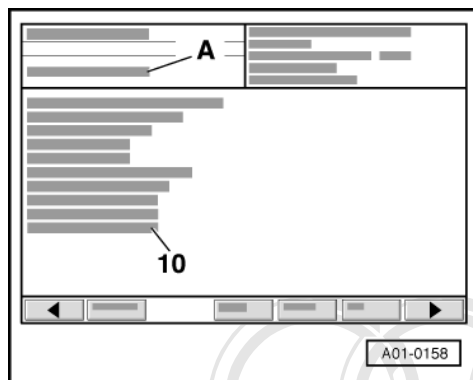


- ♦ -> The low heat output relay -J359 (under cover on left of bulkhead -item 2-) switches on and off for approx. 30 seconds in intervals (clicks) unless the diagnosis is advanced to the next control element by pressing the ▶ button.

If the relay does not click:

- Check low heater output relay -J359:

=> Current flow diagrams, Electrical fault finding and Fitting locations binder



Only for vehicles with manual gearbox

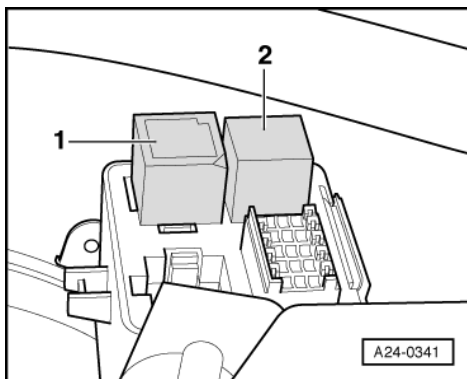
Activation of high heat output relay

- Press the ▶ button.

-> Display on VAS 5051:

- A - 10th control element in test
- 10 - High heat output relay -J360

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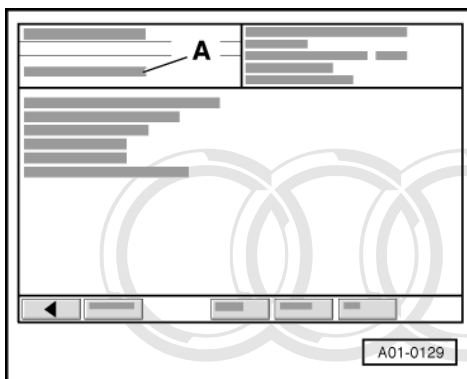


- ♦ -> The high heat output relay -J360 (under cover on left of bulkhead -item 1-) switches on and off for approx. 30 seconds in intervals (clicks) unless the diagnosis is advanced to the next control element by pressing the ► button.
- ♦ If the relay is switching on and off as specified, the interior light will get dimmer and brighter due to the high current draw of the glow plugs. This gives an additional indication.

If the relay does not click:

- Check high heat output relay -J360:

=> Current flow diagrams, Electrical fault finding and Fitting locations binder



All models

- Press the ► button.

-> Display on VAS 5051:

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A - Final control diagnosis is completed

- Press the ◀ button to exit from function "03 - Final control diagnosis".

4 - Basic setting

4.1 - Basic setting

Requirements for test:

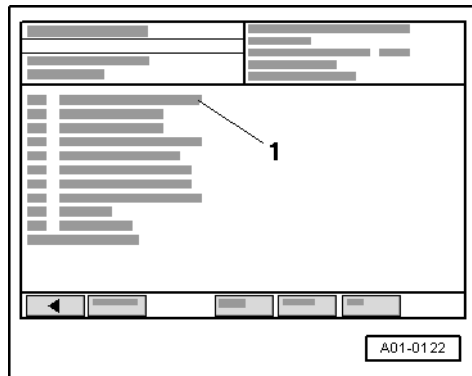
- Coolant temperature at least 80 °C
- Electrical consumers switched off (radiator fan must not run during the test)
- Air conditioner switched off
- Vehicles with automatic gearbox: selector lever in position P or N



- No faults stored in fault memory

Work sequence

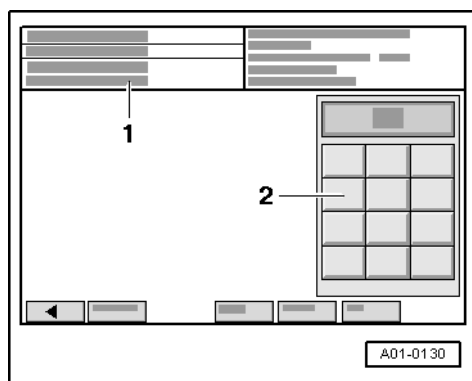
- Connect the vehicle diagnostic, testing and information system VAS 5051 => Page 01-2, and select the vehicle system "01 - Engine electronics" from the menu. When doing this the engine should be idling.



-> Display on VAS 5051:

- Select the diagnosis function "04 - Basic settings" from the menu -1-

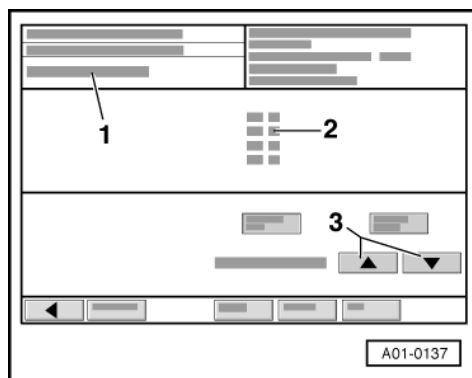
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-> Display on VAS 5051:

1 Enter display group

- Using the keypad -2-, enter the required display group number (3 figures) and confirm entry with the Q button.



-> Display on VAS 5051:

- 1 - Display group X
System in basic setting
- 2 - Display zone 1
Display zone 2
Display zone 3
Display zone 4

- Press the ◀ button to exit from diagnosis function "04 - Basic settings".

4.2 - Readout specifications for vehicles with 74 kW engine

Display group 003 at 1400 rpm

This display group is used for checking the exhaust gas recirculation. The solenoid valve for exhaust gas recirculation (EGR valve -N18) is opened and closed alternately for periods of 10 seconds. If readouts do not match specifications:

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=> 4-Cyl. diesel direct injection engine (TDI); Mechanics; Repair group 26; Exhaust gas recirculation system; Testing exhaust gas recirculation valve -N18 Exhaust gas recirculation system Testing exhaust gas recirculation valve -N18

Display group 3			◀ Indicated on display ◀ Display zones 1 ... 4
XXXX rpm	XXX	XXX %	
	mg/stroke		
			Duty cycle (activation) of EGR valve ▪ 63 ... 67% or 18 ... 22% alternately for periods of 10 seconds
			Intake air mass ▪ Display fluctuates up and down every 10 seconds (difference: at least 100 mg/stroke)
			EGR (exhaust gas recirculation) solenoid valve -N18 ▪ "EGR active" or "EGR n. active" alternately for periods of 10 seconds
			Engine speed ▪ 1380 ... 1420 rpm OK

Display group 011 at 1400 rpm

This display group is used for checking the charge pressure (boost pressure) control. The charge pressure control solenoid valve -N75 is opened and closed alternately for periods of 10 seconds. If readouts do not match specifications:

=> 4-Cyl. diesel direct injection engine (TDI), Mechanics; Repair group 21; Testing charge air system with turbocharger; Testing charge pressure control solenoid valve -N75 Testing charge air system with turbocharger Testing charge pressure control solenoid valve -N75

Display group 11			◀ Indicated on display ◀ Display zones 1 ... 4
XXXX rpm	XXX	XXX mbar	
		XXX %	
			Activation of charge pressure control solenoid valve -N75 ▪ 0 ... 2% or 98 ... 100% alternately for periods of 10 seconds



		Intake manifold pressure (charge pressure) ▪ Display fluctuates up and down every 10 seconds with difference between min. of 80 mbar and max. of 250 mbar)
		Charge pressure control solenoid valve -N75 ▪ "ON" or "OFF" alternately for periods of 10 seconds
		Engine speed ▪ 1380 ... 1420 rpm OK

4.3 - Readout specifications for vehicles with 96 kW engine

Display group 003 at 1400 rpm

This display group is used for checking the exhaust gas recirculation. The solenoid valve for exhaust gas recirculation (EGR valve -N18) is opened and closed alternately for periods of 10 seconds. If readouts do not match specifications:

=> 4-Cyl. diesel direct injection engine (TDI), Mechanics; Repair group 26; Exhaust gas recirculation system; Testing exhaust gas recirculation valve -N18 Exhaust gas recirculation system Testing exhaust gas recirculation valve -N18

Display group 3			• Indicated on display
XXXX rpm XXX	XXX	XXX %	• Display zones 1 ... 4
	mg/stroke		
			Duty cycle (activation) of EGR valve ▪ 63 ... 67% or 18 ... 22% alternately for periods of 10 seconds
			Intake air mass ▪ Display fluctuates up and down every 10 seconds (difference: at least 150 mg/stroke)
			EGR (exhaust gas recirculation) solenoid valve -N18 ▪ "EGR active" or "EGR n. active" alternately for periods of 10 seconds
			Engine speed ▪ 1380 ... 1420 rpm OK

Display group 011 at 1400 rpm

This display group is used for checking the charge pressure (boost pressure) control. The charge pressure control solenoid valve -N75 is opened and closed alternately for periods of 10 seconds. If readouts do not match specifications:

=> 4-Cyl. diesel direct injection engine (TDI), Mechanics; Repair group 21; Testing charge air system with turbocharger; Testing charge pressure control solenoid valve -N75 Testing charge air system with turbocharger Testing charge pressure control solenoid valve -N75

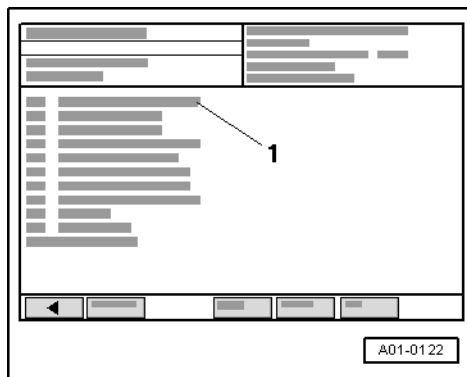
Display group 11			• Indicated on display
XXXX rpm XXX XXX mbar	XXX	XXX %	• Display zones 1 ... 4
			Activation of charge pressure control solenoid valve -N75 ▪ 0 ... 2% or 98 ... 100% alternately for periods of 10 seconds
			Intake manifold pressure (charge pressure) ▪ Display fluctuates up and down every 10 seconds (difference: at least 80 mbar)
			Charge pressure control solenoid valve -N75 ▪ "ON" or "OFF" alternately for periods of 10 seconds

Engine speed
▪ 1380 ... 1420 rpm OK

5 - Coding control unit

5.1 - Coding control unit

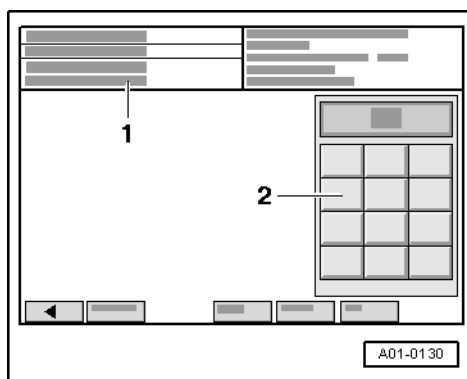
If the appropriate code for the vehicle is not displayed or if the control unit has been renewed, the control unit must be coded as follows.



Work sequence

- Connect the vehicle diagnostic, testing and information system VAS 5051 => Page 01-2, and select the vehicle system "01 - Engine electronics" from the menu. When doing this the ignition must be on.
- > Display on VAS 5051:
- Select diagnosis function "07 - Code control unit" from the menu -1-.

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-> Display on VAS 5051:

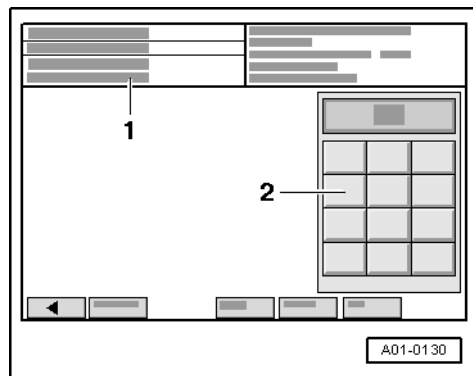
- 1 - Enter code word
(figures up to 32767)
- Using the keypad -2-, enter the correct control unit coding as shown in the coding table => Page 01-84.

Coding	For vehicles with
00001	Automatic gearbox



Coding	For vehicles with
00002	Manual gearbox (front-wheel drive)
00003	Manual gearbox (4-wheel drive)

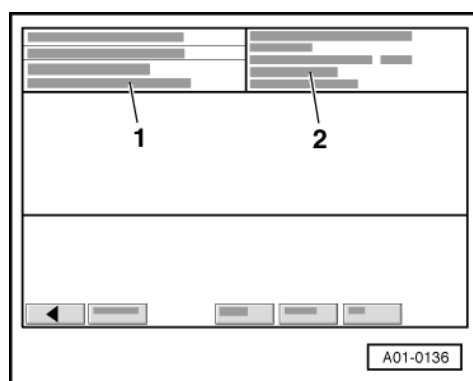
- Confirm input with Q button



-> Display on VAS 5051:

- 1 - Coding is being performed.

- Wait until the next display appears



-> Display on VAS 5051:

- 1 - Coding of vehicle system performed
- 2 - Control unit identification with new coding (previous coding in brackets)

- Press the ◀ button to exit from the diagnosis function "07 - Code control unit"
- Switch ignition off and then on again.

Notes:

- ♦ The newly entered code will be activated the next time the ignition is switched on.
- ♦ If the ignition is not switched off and then on again after entering the correct coding, it will not be possible to erase fault code 01044 ("Control unit incorrectly coded") from the fault memory.
- Erase fault memory => Page 01-7.
- Activate the cruise control system
=> Page 23-128.



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6 - Reading measured value block (data block)

6.1 - Reading measured value block (data block)

Requirements for test:

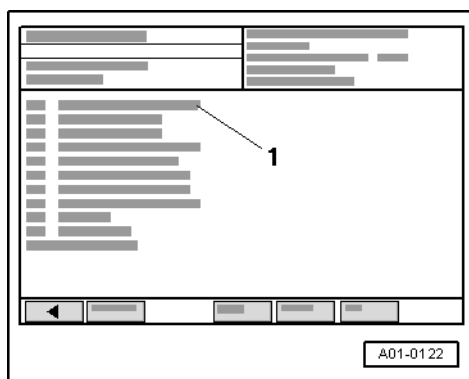
- Electrical consumers switched off (radiator fan must not run during the test)
- Air conditioner switched off
- No faults stored in fault memory

Test sequence

- Connect the vehicle diagnostic, testing and information system VAS 5051 => Page 01-2, and select the vehicle system "01 - Engine electronics" from the menu. When doing this the ignition must be on.

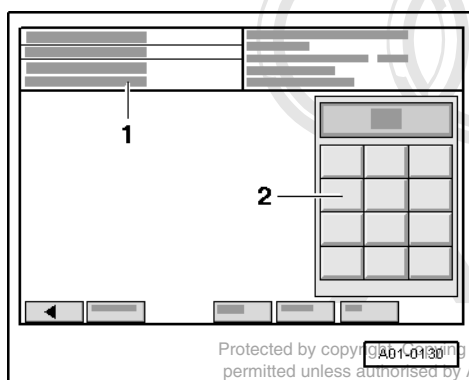
or, depending on the function required:

- Start the engine.



-> Display on VAS 5051:

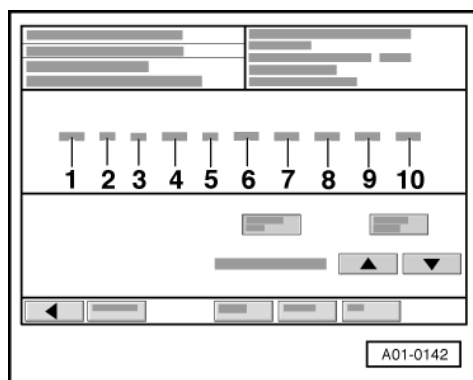
- Select diagnosis function "08 - Read data block" from the menu -1-.



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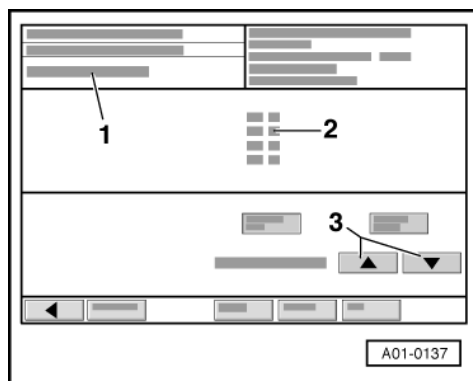
-> Display on VAS 5051:

- 1 - Enter display group
- Using the keypad -2-, enter the required Display group number (3 figures) => Display group overview, Page 01-90 and confirm entry with Q button.



-> Display on VAS 5051 for display group 000:

- 1 - Display group 0
- 2 - Display zones 1 2 3 4 5 6 7 8 9 10



-> Display on VAS 5051 for display groups 001 ... 255:

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

Notes:

- ♦ A blank readout indicates a vacant display zone (containing no information).
- ♦ Other display groups can be selected as follows:

Display group	VAS 5051
Up	Press s
Down	Press t

- Press the ◀ button to exit from the function "08 - Read data block".

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6.2 - Performing road test at full throttle

Requirements for test:

- Coolant temperature at least 80 °C

Warning
Observe safety precautions => Page 01-1.

Test sequence

- Accelerate vehicle from overrun at full throttle in third gear or with selector lever at position 2 (without kick-down), and watch rev counter.
- Read off displayed values at about 3000 rpm, or alternatively print out screen content or self-diagnosis log.

6.3 - Display group overview

Display Gr. number	Indicated on display	Meaning
000 General vehicle inspection	Read measured value block 0 1 2 3 4 5 6 7 8 9 10	1 = Engine speed 2 = Commencement of injection 3 = Accelerator pedal position 4 = Injection quantity 5 = Intake manifold pressure (charge/boost pressure) 6 = Atmospheric pressure (ambient air pressure) 7 = Coolant temperature 8 = Intake manifold temperature 9 = Fuel temperature 10 = Intake air mass

Display Gr. number	Indicated on display	Meaning
001 Injection quantity	Read measured value block 1 1 2 3 4	1 = Engine speed 2 = Injection quantity 3 = Injection period (specified) 4 = Coolant temperature
002 Idling speed	Read measured value block 2 1 2 3 4	1 = Engine speed 2 = Accelerator pedal position 3 = Operating status: X X 1 AC compressor switched on X 1 X Idling speed switch closed 1 X X Increased idling speed: ▪ because air conditioner is switched on 4 = Coolant temperature

Display Gr. number	Indicated on display	Meaning
003 Exhaust gas recirculation	Read measured value block 3 1 2 3 4	1 = Engine speed 2 = Intake air mass (specified) 3 = Intake air mass (actual) 4 = Duty cycle (activation) of exhaust gas recirculation valve -N18
004 Activation unit injector valves	Read measured value block 4 1 2 3 4	1 = Engine speed 2 = Commencement of injection (specified) 3 = Injection period (actual) 4 = Synchronisation angle



Display Gr. number	Indicated on display	Meaning
005	Read measured value block 5 1 2 3 4	(Ignore)

Display Gr. number	Indicated on display	Meaning
006 Switch positions	Read measured value block 6 1 2 3 4	1 = Road speed 2 = Pedal monitoring: X X 1 Brake light switch -F closed X 1 X Brake pedal switch -F47 open 1 X X Clutch pedal switch -F36 open 3 = Accelerator pedal position 4 = Operating status of cruise control system (CCS): 0 Control unit with CCS function CCS switched off 1 CCS switched on 2 5 5 Control unit without CCS function
007 Temperatures	Read measured value block 7 1 2 3 4	1 = Fuel temperature 2 = (Ignore) 3 = Intake manifold temperature 4 = Coolant temperature

Display Gr. number	Indicated on display	Meaning
008 Injection quantity limitation	Read measured value block 8 1 2 3 4	1 = Engine speed 2 = Desired injection quantity (driver input) 3 = Injection quantity limitation during gear change (for automatic gearbox) 4 = Injection quantity limitation (by smoke control map)
009	Read measured value block 9 1 2 3 4	(Ignore)
010 Air quantities	Read measured value block 10 1 2 3 4	1 = Intake air mass 2 = Atmospheric pressure (ambient pressure) 3 = Intake manifold pressure (charge pressure) 4 = Accelerator pedal position

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Display Gr. number	Indicated on display	Meaning
011 Charge pressure control	Read measured value block 11 1 2 3 4	1 = Engine speed 2 = Charge pressure (specified) 3 = Charge pressure (actual) 4 = Duty cycle (activation) of charge pressure control solenoid -N75
012	Read measured value block 12	1 = (Ignore)

Display Gr. number	Indicated on display	Meaning
	1 2 3 4	
013 Smooth idling control	Read measured value block 13 1 2 3 4	1 = Engine smoothness injection quantity, Cylinder 1 2 = Engine smoothness injection quantity, Cylinder 2 3 = Engine smoothness injection quantity, Cylinder 3 4 = Engine smoothness injection quantity, Cylinder 4
015	Read measured value block 15 1 2 3 4	Ignore

Display Gr. number	Indicated on display	Meaning
016 Additional heater	Read measured value block 16 1 2 3 4	1 = Alternator load 2 = Additional heater switched off because: X X X X X X X 1 Coolant temperature > 70 °C...80 °C or intake air temperature > 5 °C X X X X X X 1 X Alternator defective X X X X X 1 X X Battery voltage less than 9 V X X X X 1 X X X Engine speed < 760 rpm X X X 1 X X X X Engine started within the last 10 seconds X X 1 X X X X X Coolant temperature sender -G62 or intake manifold temperature sender -G72 defective or additional heater output stage defective X 1 X X X X X X (Ignore) 1 X X X X X X X (Ignore)
	Continued ▼	

Display Gr. number	Indicated on display	Meaning
016 Additional heater	Read measured value block 16	3 = Heater element activation X 1 Low heating output relay -J359 activated 1 X High heating output relay -J360 activated
017	Read measured value block 17 1 2 3 4	4 = Supply voltage for control unit (Ignore)
018	Read measured value block 18 1 2 3 4	1 = Status of unit injector solenoid valve 1 2 = Status of unit injector solenoid valve 2 3 = Status of unit injector solenoid valve 3 4 = Status of unit injector solenoid valve 4
020	Read measured value block 20 1 2 3 4	(Ignore)
021	Read measured value block 21 1 2 3 4	(Ignore)

Display Gr. number	Indicated on display	Meaning
022	Read measured value block 22 1 2 3 4	(Ignore)



Display Gr. number	Indicated on display	Meaning
023	Read measured value block 23 1 2 3 4	1 = Switching period of solenoid valve, Cylinder 1 2 = Switching period of solenoid valve, Cylinder 2 3 = Switching period of solenoid valve, Cylinder 3 4 = Switching period of solenoid valve, Cylinder 4
125	Read measured value block 125 1 2 3 4	1 = Automatic gearbox data bus 2 = ABS data bus 3 = Dash panel insert data bus 4 = Vacant

6.4 - Readout specifications for general vehicle inspection - vehicles with 74 kW engine

Display Group 000 at idling speed (engine warm, coolant temperature not below 75°C)

Display zones 1 ... 5

Display group 0										Indicated on display
XX	XXX	XXX	XX	XXX	XXX	XX	XXX	XXX	XXX	Display zones
1	2	3	4	5	6	7	8	9	10	
Display zones 6 ... 10 => Page 01-100										
Intake manifold pressure (charge pressure): ignore										
Injection quantity: 11 ... 33 okay										
▪ If outside tolerance => Display Group 001, Page 01-103										
Accelerator pedal position: 0 (pedal not depressed)										
Commencement of injection: 113...133 okay										
▪ If outside tolerance => Display Group 004, Page 01-104										
Engine speed:										
▪ Manual gearbox: 41 ... 45 okay										
▪ Automatic gearbox: 38 ... 42 okay										
If outside tolerance => Display group 002, Page 01-107										

Display zones 6 ... 10

Display group 0										Indicated on display
XX	XXX	XXX	XX	XXX	XXX	XX	XXX	XXX	XXX	Display zones
1	2	3	4	5	6	7	8	9	10	
Intake air mass: 60 ... 111 okay 1)										
▪ If outside tolerance => Display Group 003, Page 01-111										
Fuel temperature: no specification										
Intake manifold temperature: no specification										
Coolant temperature: 88 ... 36 okay										
▪ > 88: run engine till warm										
Atmospheric pressure (ambient air pressure): no specification										
Display zones 1 ... 5 => Page 01-99										

1) Exhaust gas recirculation switches off after 2 minutes idling. If necessary, open throttle briefly (above 1500 rpm) to obtain readout.

Display Group 000 at full throttle (road test, coolant temperature not below 75°C)

Important: Always observe safety precautions => Page 01-1.

Important: Observe rules for road test at full throttle => Page 01-89.

Display zones 1 ... 5

Display group 0										Indicated on display
XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	Display zones
1	2	3	4	5	6	7	8	9	10	
Display zones 6 ... 10 => Page 01-102										
Charge pressure: 181 ... 221 okay										
▪ If outside tolerance => Display group 011, Page 01-116										
Injection quantity: 142 ... 164 (injection quantity at full throttle) okay										
▪ If outside tolerance => interrogate fault memory, Page 01-7										
Accelerator pedal position: 255 (fully depressed, kick-down not actuated)										
Commencement of injection: 76 ... 47										
▪ If outside tolerance => Display group 004, Page 01-104										
Engine speed: 134 ... 154 (2800 ... 3200 rpm))										

Display zones 6 ... 10

Display group 0										Indicated on display
XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	Display zones
1	2	3	4	5	6	7	8	9	10	
Intake air mass: > 240 okay										
▪ < 240: => Display Group 010, Page 01-115										
Fuel temperature: ignore										
Intake manifold temperature: no specification										
Coolant temperature: 88...36 okay										
▪ > 88: run engine till warm										
Atmospheric pressure (ambient air pressure): ignore										
Display zones 1 ... 5 => Page 01-101										

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6.5 - Readout specifications for unit injectors - vehicles with 74 kW engine

Display Group 001 at idling speed (engine warm, coolant temperature not below 75°C)

Display group 1				⇒	• Indicated on display
XXXX rpm	XX.X mg/stroke	XX.X °CA	XXX.X °C		• Display zones 1 ... 4
				Coolant temperature:	
				75 ... 110 °C: okay	
				▪ < 75 °C: => run en-	
				gine till warm	
				Specified injection period required by control unit: 3 ... 8 °CA (crankshaft angle) okay	
				Injection quantity: 3.0 ... 9.0 mg/stroke okay	
				▪ < 3.0 mg/stroke:	
				▪ Unit injectors defective => Renew unit injectors, Page 23-38	
				Engine speed:	
				▪ Manual gearbox: 860 ... 940 rpm okay	
				▪ Automatic gearbox: 790 ... 870 rpm okay	

2)Check fuel supply system for leaks:
=> Fuel supply system - Diesel engines; Repair group 20; Checking fuel supply system for leaks Checking fuel supply system for leaks

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Display Group 004 at idling speed (engine warm, coolant temperature not below 75°C)

Display group 4				◀ Indicated on display
XXXX rpm XX.X °B(A)TDC XX.X °CA XX.X °CA				◀ Display zones 1 ... 4
			Synchronisation angle: -3 ... +3 °CA okay ▪ > +3 °CA or < -3 °CA: ▪ Hall sender -G40 defective; ▪ Gap width between sender and sender wheel on camshaft not okay; ▪ Open circuit or short circuit to earth	=> Test-G40, Page 23-112
			Hall sender -G40 loose, Sender wheel defective or turned out of position	=> Test3)
Injection period specified by control unit: 3 ... 8 °CA okay Commencement of injection specified by control unit : 4°BTDC ... 2°ATDC okay ▪ > 4°BTDC: Engine too cold => run engine till warm				
Engine speed: ▪ Manual gearbox: 860 ... 940 rpm okay ▪ Automatic gearbox: 790 ... 870 rpm okay				

3) Testing position of camshaft and sender wheel:
 => 4-Cylinder TDI engine, Mechanics; Repair group 15; Removing and installing cylinder head
 Removing and installing cylinder head

Display Group 004 at full throttle (road test, coolant temperature not below 75°C)

Important: Always observe safety precautions => Page 01-1.

Important: Observe rules for road test at full throttle => Page 01-89.

Display group 4				- Indicated on display - Display zones 1 ... 4
XXXX rpm	XX.X °BTDC	XX.X °CA	XX.X °CA	
				Synchronisation angle: -3 ... +3 °CA okay ▪ > +3 °CA or < -3 °CA: => Page 01-111
				Injection period specified by control unit: 19 ... 24 °CA okay Commencement of injection specified by control unit: -16 -25°CA okay ▪ > -16° CA: engine too cold => run engine till warm
	Engine speed ▪ 2800 ... 3200 rpm okay			

Display group 018 at idling speed (engine warm, coolant temperature not below 75°C)

Display group 18				- Indicated on display - Display zones 1 ... 4
XX	XX	XX	XX	
				Status of unit injector solenoid valve 4: "0" okay ▪ Other reading than 0: => Display zone 1
				Status of unit injector solenoid valve 3: "0" okay ▪ Other reading than 0: => Display zone 1
				Status of unit injector solenoid valve 2: "0" okay ▪ Other reading than 0: => Display zone 1
				Status of unit injector solenoid valve 1: "0" okay ▪ Other reading than 0: ▪ Unit injector solenoid valves defective => Test unit injector solenoid valves, Page 23-32 ▪ Fuel starvation or air in fuel supply system => Test2)
2) Check fuel supply system for leaks: => Fuel supply system - Diesel engines; Repair group 20; Checking fuel supply system for leaks Checking fuel supply system for leaks				

6.6 - Readout specifications for engine idling speed - vehicles with 74 kW engine

Display Group 002 at idling speed (engine warm, coolant temperature not below 75°C)

Display group 2				- Indicated on display - Display zones 1 ... 4
XXXX rpm	X.X %	X X X	XX.X °C	
				Coolant temperature 75 ... 110 °C: okay ▪ < 75 °C: => run engine till warm



		Operating status: ▪ XX1: AC compressor ON ▪ X1X: Idling speed switch closed ▪ 1XX: Increased idling speed with AC compressor ON
		Accelerator pedal position: 0.0 % okay ▪ > 0.0 %: ▪ accelerator pedal position sender -G79 incorrectly set or defective, open circuit in wiring ▪ => test4)
		Engine speed: ▪ Manual gearbox: 860 ... 940 rpm okay ▪ Automatic gearbox: 790 ... 870 rpm okay
4) Test accelerator pedal position sender: => Fuel supply system - Diesel engines; Repair group 20		

Display group 010 at idling speed (engine warm, coolant temperature not below 75°C)

Display group 10			▪ Indicated on display
XXX mg/stroke XXXX mbar XXXX mbar XXX %			▪ Display zones 1 ... 4
			Accelerator pedal position: 0.0 % okay ▪ > 0.0 %: ▪ Accelerator pedal position sender -G79 incorrectly adjusted or defective, open circuit in wiring => test 4)
			Intake manifold pressure (charge pressure) in mbar: no specification
			Atmospheric pressure (ambient air pressure): no specification
			Intake air mass: 200 ... 370 mg/stroke okay 1) ▪ If outside tolerance => Display group 003, Page01-111
1)Afteridling for 2 minutes exhaust gas recirculation shuts off. Brief throttle burst above 1500 rpm may be required to achieve specifications.			
4) Testing accelerator pedal position sender: => Fuel supply system - Diesel engines; Repair group 20			

Display group 013 at idling speed (engine warm, coolant temperature not below 75°C)

Display group 13			▪ Indicated on display
X.XX mg/stroke X.XX mg/stroke X.XX mg/stroke X.XX mg/stroke			▪ Display zones 1 ... 4
			Engine smoothness injection quantity, Cylinder 4: -2.8 mg/stroke ... +2.8 mg/stroke okay ▪ > +2.8 mg/stroke or < -2.8 mg/stroke => Page 01-110
			Engine smoothness injection quantity, Cylinder 3: -2.8 mg/stroke ... +2.8 mg/stroke okay ▪ > +2.8 mg/stroke or < -2.8 mg/stroke => Page 01-110
			Engine smoothness injection quantity, Cylinder 2: -2.8 mg/stroke ... +2.8 mg/stroke okay ▪ > +2.8 mg/stroke or < -2.8 mg/stroke => Page 01-110
			Engine smoothness injection quantity, Cylinder 1: -2.8 mg/stroke ... +2.8 mg/stroke okay ▪ > +2.8 mg/stroke or < -2.8 mg/stroke => Page 01-110

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Evaluation: Idling speed smooth running control display

The injection system is equipped with an idling speed smooth running control. There may be power differences between the individual cylinders (component tolerances, injector delivery, compressions etc.) which are recognised and equalized via selective injected quantities.

Recognition at idling speed is via the signal from the engine speed sender. If the signals are delivered at the same rhythm then all cylinders work the same. If one cylinder is weaker then the crankshaft takes longer for the next half revolution. Conversely a more powerful cylinder accelerates the crankshaft so less time is taken.

If the control unit recognises a difference, then the relevant cylinder is given more or less fuel, until the engine runs evenly again.

+... mg/H: The respective cylinder is less powerful and is therefore supplied with more fuel.

-... mg/H: The respective cylinder is more powerful and is therefore supplied with less fuel.

6.7 - Readout specifications for exhaust gas recirculation - vehicles with 74 kW engine

Display Group 003 at idling speed (engine warm, coolant temperature not below 75°C)

Display group 3				Indicated on display
XXXX rpm	XXX mg/stroke	XXX mg/stroke	XX %	Display zones 1 ... 4
				Duty cycle (activation) of exhaust gas recirculation valve
				No specification
				Current intake air mass 200 ... 370: okay 1)
				Air mass too small:
				unmetered air in intake tract; excessive exhaust gas recirculation => test 5)
				Air mass too great:
				too little exhaust gas recirculation => test 5)
				Constant 539 mg/stroke:
				substitute value => interrogate fault memory
				Air mass specified by control unit: 220 ... 350 mg/stroke: okay
				> 350 mg/stroke: engine too cold => run engine till warm
Engine speed				
Manual gearbox 860 ... 940 rpm okay				
Automatic gearbox 790 ... 870 rpm okay				
1) Exhaust gas recirculation switches off after 2 minutes idling. If necessary, open throttle briefly (above 1500 rpm) to obtain readout.				
5) Testing exhaust gas recirculation:				
=> 4-Cyl. TDI engine, Mechanics; Repair group 26; Exhaust gas recirculation system Exhaust gas recirculation system				

6.8 - Readout specifications for temperature senders - vehicles with 74 kW engine

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Display Group 007 with ignition on (engine cold and not running)

Display group 7				Indicated on display
XXX.X °C	XXX %	XXX.X °C	XXX.X °C	Display zones 1 ... 4



			Coolant temperature (at coolant temperature sender -G62) ▪ In case of a fault, the fuel temperature will be displayed ▪ If the fuel temperature display is defective as well, a constant temperature of -5.4°C will be displayed; test -G62 => Page 23-85 Intake manifold temperature (at intake manifold temperature sender -G72) ▪ In case of a fault, a constant temperature of 135.9 °C will be displayed; ▪ test -G72 => Page 23-100
		Ignore	
		Fuel temperature (at fuel temperature sender -G81) ▪ In case of a fault, a constant temperature of 40.5 °C will be displayed; test -G81 => Page 23-104	

Notes:

- ♦ No specifications can be given for temperature values.
- ♦ When the engine is cold, the temperatures of the fuel, intake manifold and coolant should be approximately the same as the ambient temperature. If one of the temperature readings differs noticeably, test the relevant sender.

6.9 - Readout specifications for engine power output - vehicles with 74 kW engine

Display Group 008 at full throttle (road test, coolant temperature not below 75°C)

Important: Always observe safety precautions => Page 01-1.

Important: Observe rules for road test at full throttle => Page 01-89.

Display zone 1 ... 2

Display group 8				◀ Indicated on display
XXXX rpm XX.X mg/stroke	XX.X mg/stroke	XX.X mg/stroke		◀ Display zones 1 ... 4
				Display zones 3 and 4 => Page 01-114
				Desired injection quantity (accelerator pedal position): 42 ... 52 mg/stroke okay ▪ < 42 mg/stroke: ▪ Accelerator pedal not fully depressed, accelerator pedal position sender -G79 incorrectly adjusted or defective => test 4)
				Engine speed: 2800...3200 rpm
				4) Test accelerator pedal position sender: => Fuel supply system - Diesel engines; Repair group 20

Display zones 3 ... 4

Display group 8				◀ Indicated on display
XXXX rpm XX.X mg/stroke XX.X mg/stroke XX.X mg/stroke				◀ Display zones 1 ... 4

			Injection quantity limitation according to detected air mass (to avoid exhaust smoke): 16 ... 36 mg/stroke okay ▪ < 16 mg/stroke: ▪ detected air mass too small => test air mass meter, Page 23-107 ▪ Exhaust gas recirculation at full throttle => test 5) Injection quantity limitation according to engine speed (torque limitation): 25 ... 47 mg/stroke: okay ▪ < 25 mg/stroke: engine speed too high or too low ▪ > 47 mg/stroke: injection quantity increased as a result of tuning Display zones 1 and 2 => Page 01-113
5) Testing exhaust gas recirculation: => 4-Cyl. TDI engine, Mechanics; Repair group 26; Exhaust gas recirculation system Exhaust gas recirculation system			

Display Group 010 at full throttle (road test, coolant temperature not below 75°C)

Important: Always observe safety precautions => Page 01-1.

Important: Observe rules for road test at full throttle => Page 01-89.

Display group 10 XXX mg/stroke XXXX mbar XXXX mbar XXX %		▪ Indicated on display ▪ Display zones 1 ... 4
		Accelerator pedal position: 100 % okay ▪ < 100 %: ▪ Accelerator pedal not fully depressed ▪ Accelerator pedal position sender -G79 incorrectly adjusted or defective => test 4) Intake manifold pressure (charge pressure): 1850 ... 2250 mbar okay ▪ If outside tolerance: charge pressure control defective => Display group 011, Page 01-116 Atmospheric pressure (ambient air pressure): no specification Intake air mass: 800 ... 1100 mg/stroke okay ▪ < 800 mg/stroke: ▪ Engine speed too low or too high ▪ Charge pressure too low => monitor display zone 3 ▪ Air mass meter defective => test, Page 23-107
4) Test accelerator pedal position sender: => Fuel supply system - Diesel engines; Repair group 20		

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6.10 - Readout specifications for charge pressure control - vehicles with 74 kW engine

Display Group 011 at full throttle (road test, coolant temperature not below 75°C)

Important: Always observe safety precautions => Page 01-1.

Important: Observe rules for road test at full throttle => Page 01-89.

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Display group 11				• Indicated on display
XXXX rpm	XXXX mbar	XXXX mbar	XX %	• Display zones 1 ... 4
				Duty cycle (activation) of charge pressure control solenoid valve -N75: 45 ... 80% okay
				Current charge pressure 1850 ... 2250 mbar: okay
				▪ < 1850 mbar or > 2250 mbar:
				▪ Charge pressure control defective, turbocharger defective => test6)
				Charge pressure specified by control unit: 1900 ... 2100 mbar okay
				▪ > 2100 mbar: charge pressure increased as a result of tuning
Engine speed: 2800 ... 3200 rpm				

6) Testing charge pressure control:
=> 4-Cyl. TDI engine, Mechanics; Repair group 21; Testing charge air system with turbocharger Testing charge air system with turbocharger

6.11 - Readout specifications for data bus - vehicles with 74 kW engine

Display group 125 (ignition on)

Display group 125				• Indicated on display
XXX	XXXX	XXXX	XXXX	• Display zones 1 ... 4
				Vacant
				Combi 1: okay (= dash panel insert)
				▪ If display indicates Combi 0 => Test data bus, Page 23-136
				ABS 1: okay.
				▪ If display indicates ABS 0 => Test data bus, Page 23-134
Vehicles with manual gearbox: vacant				
Vehicles with automatic gearbox: Gear 1: okay				
▪ If display indicates Gear 0 => Test data bus, Page 23-132				

6.12 - Readout specifications for general vehicle inspection - vehicles with 96 kW engine

Display Group 000 at idling speed (engine warm, coolant temperature not below 80 °C)

Display zones 1 ... 5

Display group 0										• Indicated on display
XX	XXX	XXX	XX	XXX	XXX	XX	XXX	XXX	XXX	• Display zones
1	2	3	4	5	6	7	8	9	10	
Display zones 6 ... 10 => Page 01-119										
Intake manifold pressure (charge pressure): ignore										
Injection quantity: 11 ... 33 okay										
▪ If outside tolerance => Display Group 001, Page 01-122										
Accelerator pedal position: 0 (pedal not depressed)										
Commencement of injection: 113 ... 133 okay										
▪ If outside tolerance => Display Group 004, Page 01-123										
Engine speed:										
▪ Manual gearbox: 41 ... 45 okay										
▪ Automatic gearbox: 38 ... 42 okay										
If outside tolerance => Display group 002, Page 01-126										

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Display zones 6 ... 10

Display group 0										• Indicated on display
XX	XXX	XXX	XX	XXX	XXX	XX	XXX	XXX	XXX	• Display zones
1	2	3	4	5	6	7	8	9	10	
Intake air mass: 63 ... 105 okay 1)										
▪ If outside tolerance => Display Group 003, Page 01-130										
Fuel temperature: no specification										
Intake manifold temperature: no specification										
Coolant temperature: 80 ... 36 okay										
▪ > 80: run engine till warm										
Atmospheric pressure (ambient air pressure): no specification										
Display zones 1 ... 5 => Page 01-118										

1) Exhaust gas recirculation switches off after 2 minutes idling. If necessary, open throttle briefly (above 1500 rpm) to obtain readout.



Display Group 000 at full throttle (road test, coolant temperature not below 80 °C)

Important: Always observe safety precautions => Page 01-1.

Important: Observe rules for road test at full throttle => Page 01-89.

Display zones 1 ... 5

Display group 0										• Indicated on display
XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	• Display zones
1	2	3	4	5	6	7	8	9	10	
Display zones 6 ... 10 => Page 01-121										
Charge pressure: 206 ... 255 okay										
▪ If outside tolerance => Display group 011, Page 01-135										
Injection quantity: 171 ... 219 (injection quantity at full throttle) okay										
▪ If outside tolerance => interrogate fault memory, Page 01-7										
Accelerator pedal position: 255 (fully depressed, kick-down not actuated)										
Commencement of injection: 85 ... 60										
▪ If outside tolerance => Display group 004, Page 01-123										
Engine speed: 134...154 (2800 ... 3200 rpm)										

Display zones 6 ... 10

Display group 0										• Indicated on display
XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	• Display zones
1	2	3	4	5	6	7	8	9	10	
Intake air mass: > 245 okay										
▪ < 245: => Display Group 010, Page 01-134										
Fuel temperature: ignore										
Intake manifold temperature: no specification										
Coolant temperature: 80 ... 36 okay										
▪ > 80: run engine till warm										
Atmospheric pressure (ambient air pressure): ignore										
Display zones 1 ... 5 => Page 01-120										

6.13 - Readout specifications for unit injectors - vehicles with 96 kW engine

Display Group 001 at idling speed (engine warm, coolant temperature not below 80 °C)

Display group 1				⇒	• Indicated on display
XXXX rpm	XX.X mg/stroke	XX.X °CA	XXX.X °C		• Display zones 1 ... 4

			Coolant temperature ▪ 80...110 °C: okay ▪ < 80 °C: => run engine till warm
			Specified injection period required by control unit: 3 ... 8 °CA okay
			Injection quantity: 3.0 ... 13.0 mg/stroke okay ▪ < 3.0 mg/stroke: ▪ Unit injectors defective => Renew unit injectors, Page 23-38
			Engine speed ▪ Manual gearbox 860 ... 940 rpm okay ▪ Automatic gearbox 790 ... 870 rpm okay
2) Check fuel supply system for leaks: => Fuel supply system - Diesel engines; Repair group 20; Checking fuel supply system for leaks Checking fuel supply system for leaks			

Display Group 004 at idling speed (engine warm, coolant temperature not below 80 °C)

Display group 4		▪ Indicated on display	
XXXX rpm XX.X °B(A)TDC XX.X °CA XX.X °CA ▪ Display zones 1 ... 4			
		Synchronisation angle: -3 ... +3 °CA okay ▪ > +3 °CA or < -3 °CA: ▪ Hall sender -G40 defective; ▪ Gap width between sender and sender wheel on camshaft not okay; ▪ Open circuit or short circuit to earth	=> Test-G40, Page 23-112
		Hall sender -G40 loose, Sender wheel defective or turned out of position	=> Test3)
Injection period specified by control unit: 3 ... 8 °CA okay			
Commencement of injection specified by control unit : 4°BTDC ... 2.5°ATDC okay ▪ > 4°BTDC: Engine too cold => run engine till warm			
Engine speed ▪ Manual gearbox 860 ... 940 rpm okay ▪ Automatic gearbox 790 ... 870 rpm okay			
3) Testing position of camshaft and sender wheel: => 4-Cylinder TDI engine, Mechanics; Repair group 15; Removing and installing cylinder head Removing and installing cylinder head			

Display Group 004 at full throttle (road test, coolant temperature not below 80 °C)

Important: Always observe safety precautions => Page 01-1.

Important: Observe rules for road test at full throttle => Page 01-89.

Display group 4				▪ Indicated on display ▪ Display zones 1 ... 4
XXXX rpm	XX.X °BTDC	XX.X °CA	XX.X °CA	
			Synchronisation angle: -3 ... +3 °CA okay ▪ > +3°CA or < -3°CA:=>Page 01-123	
			Injection period specified by control unit: 16 ... 28 °CA okay	
			Commencement of injection specified by control unit: -13 ... -23 °CA okay ▪ > -13° CA: engine too cold => run engine till warm	
Engine speed: 2800...3200 rpm okay				



Display group 018 at idling speed (engine warm, coolant temperature not below 80°C)

Display group 18				
XX	XX	XX	XX	▪ Indicated on display ▪ Display zones 1 ... 4
				Status of unit injector solenoid valve 4: 0 okay ▪ Other reading than 0: =>Display zone 1
				Status of unit injector solenoid valve 3: 0 okay ▪ Other reading than 0: => Display zone 1
				Status of unit injector solenoid valve 2: 0 okay ▪ Other reading than 0: => Display zone 1
				Status of unit injector solenoid valve 1: 0 okay ▪ Other reading than 0: ▪ Unit injector solenoid valves defective =>Test unit injector solenoid valves, Page 23-32 ▪ Fuel starvation or air in fuel supply system => Test2)
				2)Testing fuel supply system for leaks: => Fuel supply system - Diesel engines; Repair group 20; Testing fuel supply system for leaks Testing fuel supply system for leaks

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6.14 - Readout specifications for engine idling speed - vehicles with 96 kW engine

Display Group 002 at idling speed (engine warm, coolant temperature not below 80 °C)

Display group 2			⇒	▪ Indicated on display
XXXX rpm X.X %	X X X	XX.X °C		▪ Display zones 1 ... 4
			Coolant temperature: 80 ... 110 °C: okay	
			▪ < 80 °C: => run engine till warm	
			Operating status:	
			▪ XX1: AC compressor ON	
			▪ X1X: Idling speed switch closed	
			▪ 1XX: Increased idling speed	
			with AC compressor ON	
			Accelerator pedal position: 0.0 % okay	
			▪ > 0.0 %:	
			▪ accelerator pedal position sender -G79 incorrectly set or defective, open circuit in wiring	
			▪ => test4)	
			Engine speed	
			▪ Manual gearbox 860 ... 940 rpm okay	
			▪ Automatic gearbox 790 ... 870 rpm okay	
4) Test accelerator pedal position sender:				
=> Fuel supply system - Diesel engines; Repair group 20				

Display group 010 at idling speed (engine warm, coolant temperature not below 80°C)

--

Display group 10				• Indicated on display
XXX mg/stroke XXXX mbar XXXX mbar XXX %				• Display zones 1 ... 4
				Accelerator pedal position: 0.0 % okay
				▪ > 0.0 %:
				▪ Accelerator pedal position sender -G79 incorrectly adjusted or defective, open circuit in wiring => test 4)
				Intake manifold pressure (charge pressure) in mbar: no specification
				Atmospheric pressure (ambient air pressure): no specification
				Intake air mass: 210 ... 350 mg/stroke okay 1)
				▪ If outside of tolerance => Display group 003, Page 01-130
1)Afteridling for 2 minutes exhaust gas recirculation shuts off. Brief throttle burst above 1500 rpm may be required to achieve specifications.				
4) Testing accelerator pedal position sender:				
=> Fuel supply system - Diesel engines; Repair group 20				

Display group 013 at idling speed (engine warm, coolant temperature not below 80 °C)

Display group 13				• Indicated on display
X.XX mg/stroke X.XX mg/stroke X.XX mg/stroke X.XX mg/stroke				• Display zones 1 ... 4
				Engine smoothness injection quantity, Cylinder 4:
				-2.8 mg/stroke ... +2.8 mg/stroke okay
				▪ > +2.8 mg/stroke or < -2.8 mg/stroke => Page 01-129
				Engine smoothness injection quantity, Cylinder 3:
				-2.8 mg/stroke ... +2.8 mg/stroke okay
				▪ > +2.8 mg/stroke or < -2.8 mg/stroke => Page 01-129
				Engine smoothness injection quantity, Cylinder 2: -2.8 mg/stroke ... +2.8 mg/stroke okay
				▪ > +2.8 mg/stroke or < -2.8 mg/stroke => Page 01-129
				Engine smoothness injection quantity, Cylinder 1: -2.8 mg/stroke ... +2.8 mg/stroke okay
				▪ > +2.8 mg/stroke or < -2.8 mg/stroke => Page 01-129

Evaluation: Idling speed smooth running control display

The injection system is equipped with an idling speed smooth running control. There may be power differences between the individual cylinders (component tolerances, injector delivery, compressions etc.) which are recognised and equalized via selective injected quantities.

Recognition at idling speed is via the signal from the engine speed sender. If the signals are delivered at the same rhythm then all cylinders work the same. If one cylinder is weaker then the crankshaft takes longer for the next half revolution. Conversely a more powerful cylinder accelerates the crankshaft so less time is taken.

If the control unit recognises a difference, then the relevant cylinder is given more or less fuel, until the engine runs evenly again.

+... mg/H: The respective cylinder is less powerful and is therefore supplied with more fuel.

-... mg/H: The respective cylinder is more powerful and is therefore supplied with less fuel.

6.15 - Readout specifications for exhaust gas recirculation - vehicles with 96 kW engine

Display Group 003 at idling speed (engine warm, coolant temperature not below 80 °C)

--



Display group 3				• Indicated on display • Display zones 1 ... 4
XXXX rpm	XXX mg/stroke	XXX mg/stroke	XX %	
				Duty cycle (activation) of exhaust gas re-circulation valve ▪ No specification
				Current intake air mass 210 ... 350: okay 1) ▪ Air mass too small: ▪ unmetered air in intake tract; excessive exhaust gas recirculation => test 5) ▪ Air mass too great: ▪ too little exhaust gas recirculation => test 5) ▪ Constant 539 mg/stroke: ▪ substitute value => interrogate fault memory
				Air mass specified by control unit: 230 ... 310 mg/stroke: okay ▪ > 310 mg/stroke: engine too cold => run engine till warm
				Engine speed ▪ Manual gearbox 860 ... 940 rpm okay ▪ Automatic gearbox 790 ... 870 rpm okay
1) Exhaust gas recirculation switches off after 2 minutes idling. If necessary, open throttle briefly (above 1500 rpm) to obtain readout. 5) Testing exhaust gas recirculation: => 4-Cyl. TDI engine, Mechanics; Repair group 26; Exhaust gas recirculation system Exhaust gas recirculation system				

6.16 - Readout specifications for temperature senders - vehicles with 96 kW engine

Display Group 007 with ignition on (engine cold and not running)

Display group 7				• Indicated on display • Display zones 1 ... 4
XXX.X °C	XXX %	XXX.X °C	XXX.X °C	
				Coolant temperature (at coolant temperature sender -G62) ▪ In case of a fault, the fuel temperature will be displayed ▪ If the fuel temperature display is defective as well, a constant temperature of -5.4°C will be displayed; test -G62 => Page 23-85
				Intake manifold temperature (at intake manifold temperature sender -G72) ▪ In case of a fault, a constant temperature of 135.9 °C will be displayed; ▪ test -G72 => Page 23-100
			Ignore	
				Fuel temperature (at fuel temperature sender -G81) ▪ In case of a fault, a constant temperature of 40.5 °C will be displayed; test -G81 => Page 23-104

Notes:

- ♦ No specifications can be given for temperature values.
- ♦ When the engine is cold, the temperatures of the fuel, intake manifold and coolant should be approximately the same as the ambient temperature. If one of the temperature readings differs noticeably, test the relevant sender.

6.17 - Readout specifications for engine power output - vehicles with 96 kW motor

Display Group 008 at full throttle (road test, coolant temperature not below 80 °C)

Important: Always observe safety precautions => Page 01-1.

Important: Observe rules for road test at full throttle => Page 01-89.

Display zone 1 ... 2

Display group 8			• Indicated on display
XXXX rpm	XX.X mg/stroke	XX.X mg/stroke	• Display zones 1 ... 4
			Display zones 3 and 4 => Page 01-133
Desired injection quantity (accelerator pedal position): 65 ... 70 mg/stroke okay			
▪ < 65 mg/stroke: ▪ Accelerator pedal not fully depressed, accelerator pedal position sender -G79 incorrectly adjusted or defective => test 4)			
Engine speed: 2800...3200 rpm okay			
4) Test accelerator pedal position sender:			
=> Fuel supply system - Diesel engines; Repair group 20			

Display zones 3 ... 4

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Display group 8			• Indicated on display
XXXX rpm	XX.X mg/stroke	XX.X mg/stroke	• Display zones 1 ... 4
			Injection quantity limitation according to detected air mass (to avoid exhaust smoke): 16 ... 34 mg/stroke okay
			▪ < 16 mg/stroke: ▪ detected air mass too small => test air mass meter, Page 23-107 ▪ Exhaust gas recirculation at full throttle => test 5)
			Injection quantity limitation according to engine speed (torque limitation):
			25 ... 51 mg/stroke: okay
			▪ < 25 mg/stroke: engine speed too high or too low ▪ > 51 mg/stroke: injection quantity increased as a result of tuning
			Display zones 1 and 2 => Page 01-132
5) Testing exhaust gas recirculation:			
=> 4-Cyl. TDI engine, Mechanics; Repair group 26; Exhaust gas recirculation system Exhaust gas recirculation system			



Display Group 010 at full throttle (road test, coolant temperature not below +80°C)

Important: Always observe safety precautions => Page 01-1.

Important: Observe rules for road test at full throttle => Page 01-89.

Display group 10				• Indicated on display
XXX mg/stroke	XXXX mbar	XXXX mbar	XXX %	• Display zones 1 ... 4
				Accelerator pedal position: 100 % okay
				▪ < 100 %:
				▪ Accelerator pedal not fully depressed
				▪ Accelerator pedal position sender -G79 incorrectly adjusted or defective => test 4)
				Intake manifold pressure (charge pressure): 2100 ... 2600 mbar okay
				▪ If outside tolerance: charge pressure control defective => Display group 011, Page 01-135
				Atmospheric pressure (ambient air pressure): no specification
				Intake air mass: 900 ... 1250 mg/stroke okay
				▪ < 900 mg/stroke:
				▪ Engine speed too low or too high
				▪ Charge pressure too low => monitor display zone 3
				▪ Air mass meter defective => test, Page 23-107
4) Test accelerator pedal position sender:				
=> Fuel supply system - Diesel engines; Repair group 20				

6.18 - Readout specifications for charge pressure control - vehicles with 96 kW engine

Display Group 011 at full throttle (road test, coolant temperature not below +80 °C)

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Important: Always observe safety precautions => Page 01-1.

Important: Observe rules for road test at full throttle => Page 01-89.

Display group 11				• Indicated on display
XXXX rpm	XXXX mbar	XXXX mbar	XX %	• Display zones 1 ... 4
				Duty cycle (activation) of charge pressure control solenoid valve -N75: 40 ... 95% okay
				Current charge pressure 2100 ... 2600 mbar: okay
				▪ < 2100 mbar or > 2600 mbar:
				▪ Charge pressure control defective, turbocharger defective => test 6)
				Charge pressure specified by control unit: 2200 ... 2400 mbar okay
				▪ > 2400 mbar: charge pressure increased as a result of tuning
				Engine speed: 2800 ... 3200 rpm
6) Testing charge pressure control:				
=> 4-Cyl. TDI engine, Mechanics; Repair group 21; Testing charge air system with turbocharger Testing charge air system with turbocharger				

6.19 - Readout specifications for data bus - vehicles with 96 kW engine

Display group 125 (ignition on)

Display group 125				▪ Indicated on display
XXX	XXXX	XXXX	XXXX	▪ Display zones 1 ... 4
			Vacant	
			Combi 1: okay (= dash panel insert)	
			▪ If display indicates Combi 0 => Test data bus, Page 23-136	
			ABS 1: okay.	
			▪ If display indicates ABS 0 => Test data bus, Page 23-134	
Vehicles with manual gearbox: vacant				
Vehicles with automatic gearbox: Gear. 1: okay				
▪ If display indicates Gear. 0 => Test data bus, Page 23-132				



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23 - Mixture preparation, Injection

1 - Servicing Diesel direct injection system

1.1 - Servicing Diesel direct injection system

1.2 - Safety precautions

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

- ♦ The ignition must be switched off before connecting or disconnecting injection or glow plug system wiring or tester cables.
- ♦ If the engine is to be turned at starter speed, without starting, e.g. when checking compressions, disconnect unit injector connector on cylinder head.

- ♦ =>
- ♦

- ♦ Always use measuring appliance set V.A.G 1594 A to connect test instruments (such as voltage tester V.A.G 1527 B or hand-held multimeter V.A.G 1526 A etc.).

Observe following if test and measuring instruments are required during a test drive:

Warning

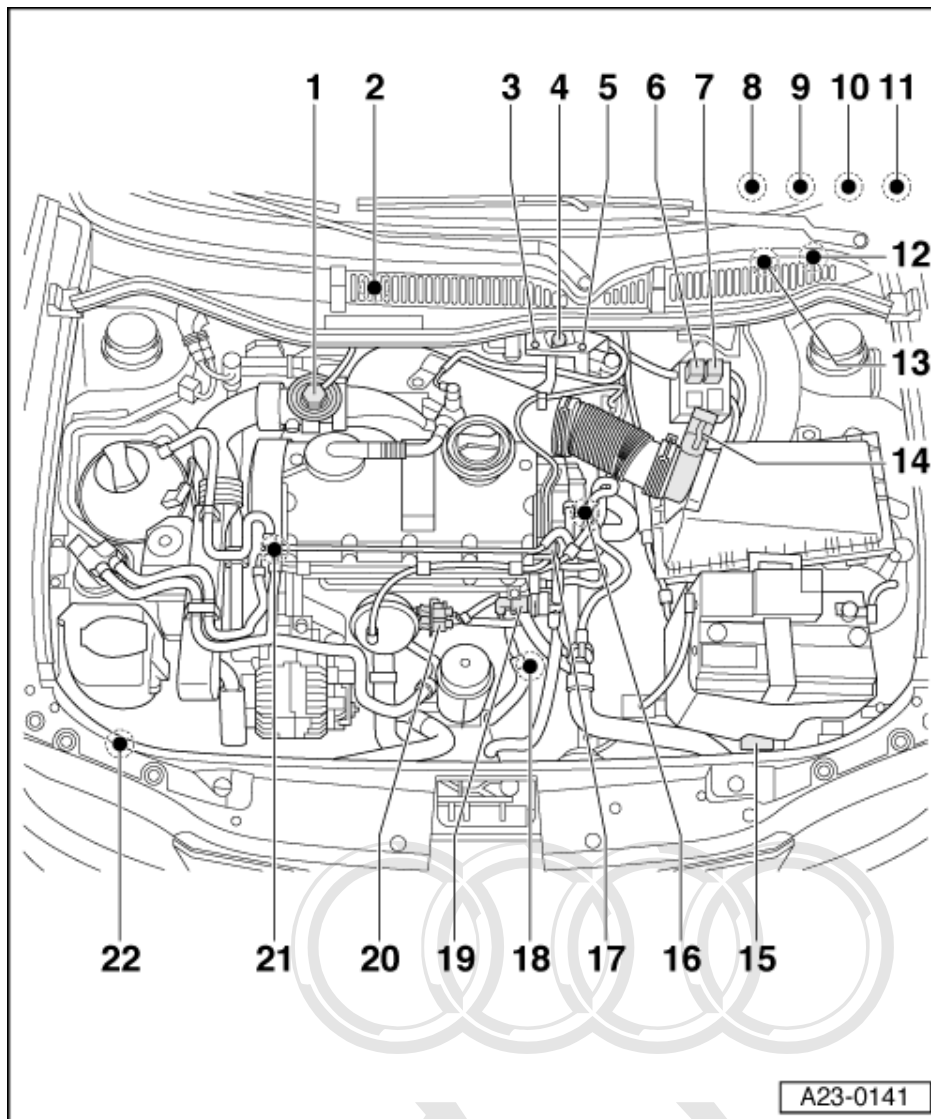
- ♦ **Test equipment must always be secured on the rear seat and operated from the rear seat by a second person.**
- ♦ **If test equipment is operated from the front passenger seat, the occupant could be injured by the passenger's airbag in an accident.**

1.3 - Rules for cleanliness

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

- ♦ Thoroughly clean all unions and the adjacent areas before disconnecting.
- ♦ Place parts that have been removed on a clean surface and cover with plastic sheeting or paper. Do not use fluffy cloths.
- ♦ Carefully cover or seal opened components if the repair cannot be carried out immediately.
- ♦ Only install clean components:
Only unpack replacement parts immediately prior to installation.
Do not use parts that have been stored loose (e.g. in tool boxes etc.).
- ♦ When the system is open:
Do not work with compressed air if this can be avoided.
Do not move vehicle unless absolutely necessary.
- ♦ Also ensure that no diesel fuel runs onto the coolant hoses. Hoses coming in contact with fuel must be cleaned immediately. Damaged hoses must be replaced.

1.4 - Fitting locations overview



Note:

Some components are located under the engine cover. Removing

=>Fig.23-9.

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1 Intake manifold

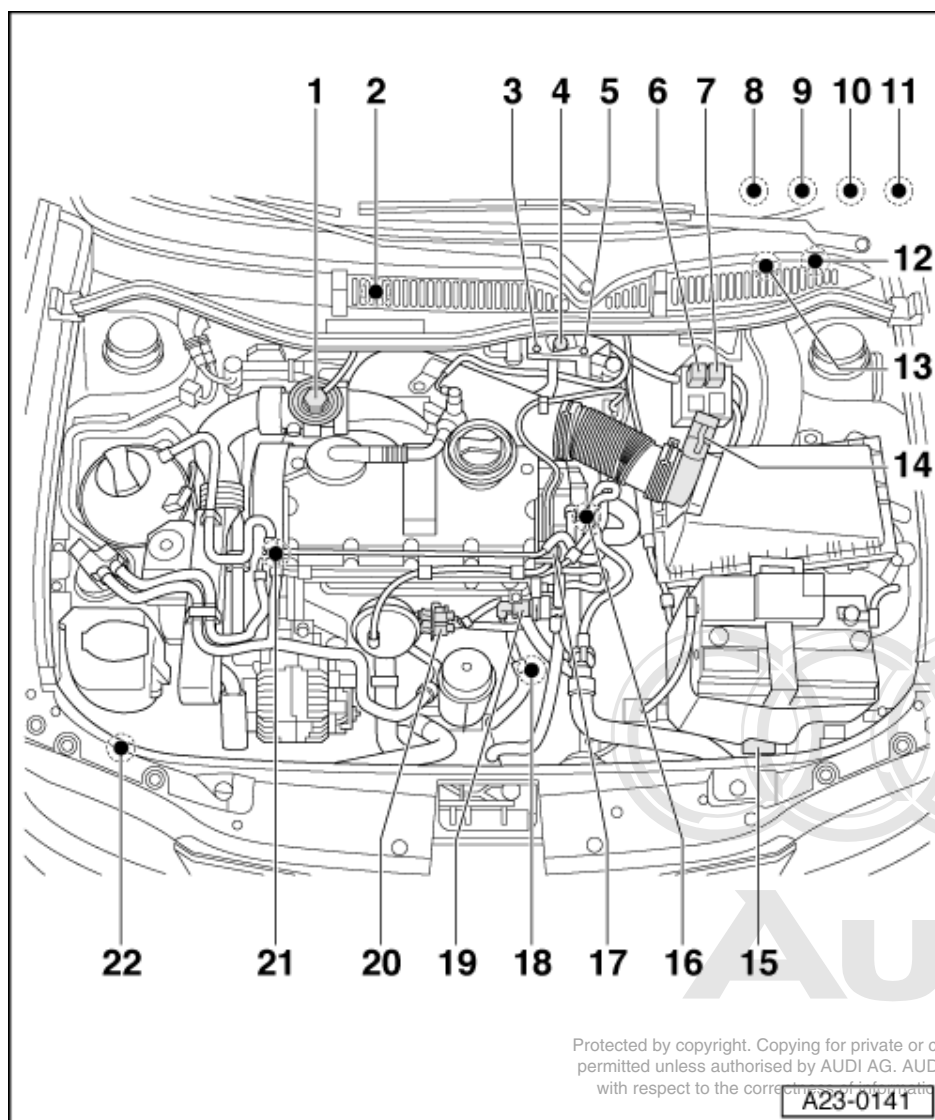
- ◆ With mechanical exhaust gas recirculation valve
- ◆ With intake manifold flap (engine with code letters ASZ, ATD)
- ◆ With intake manifold flap motor -V157 (engine with code letters AXR); Fitting location=>Fig.23-11

2 Diesel direct injection system control unit -J248

- ◆ With altitude sender -F96
- ◆ Renewing => Page 23-57
- ◆ Checking voltage supply=>Page 23-69

3 Exhaust gas recirculation valve 1 -N18

- ◆ Fitting location
=> Fig.23-12



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4 Intake manifold flap change-over valve -N239 (engine with code letters ASZ, ATD) or exhaust gas recirculation valve 2 -N213 (engine with code letters AXR)

- ◆ Fitting location
=> Fig.23-12
- ◆ Checking intake manifold flap change-over valve=>Page 23-18

5 Charge pressure control valve -N75 (solenoid valve)

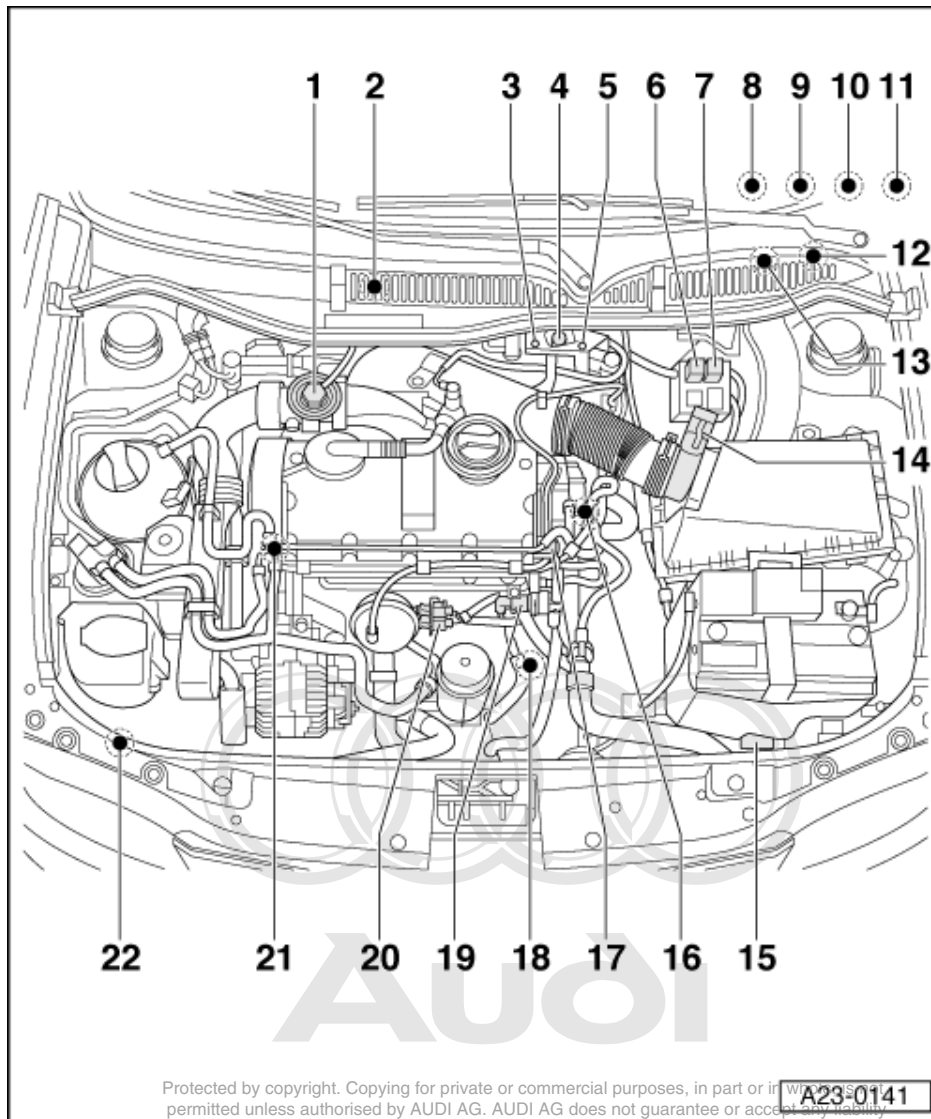
- ◆ Fitting location
=> Fig.23-12

6 Low heat output relay -J359

- ◆ For vehicles with manual gearbox
- ◆ Fitting location
=> Fig.23-12

7 High heat output relay -J360

- ◆ For vehicles with manual gearbox
- ◆ Fitting location
=> Fig.23-12



8 Glow period warning lamp -K29

- ♦ In instrument cluster

9 Accelerator position sender -G79

- ♦ Fitting location
=> Fig.23-9

10 Brake light switch -F and brake pedal switch -F47

- ♦ Fitting location
=> Fig.23-10

11 Clutch pedal switch -F36

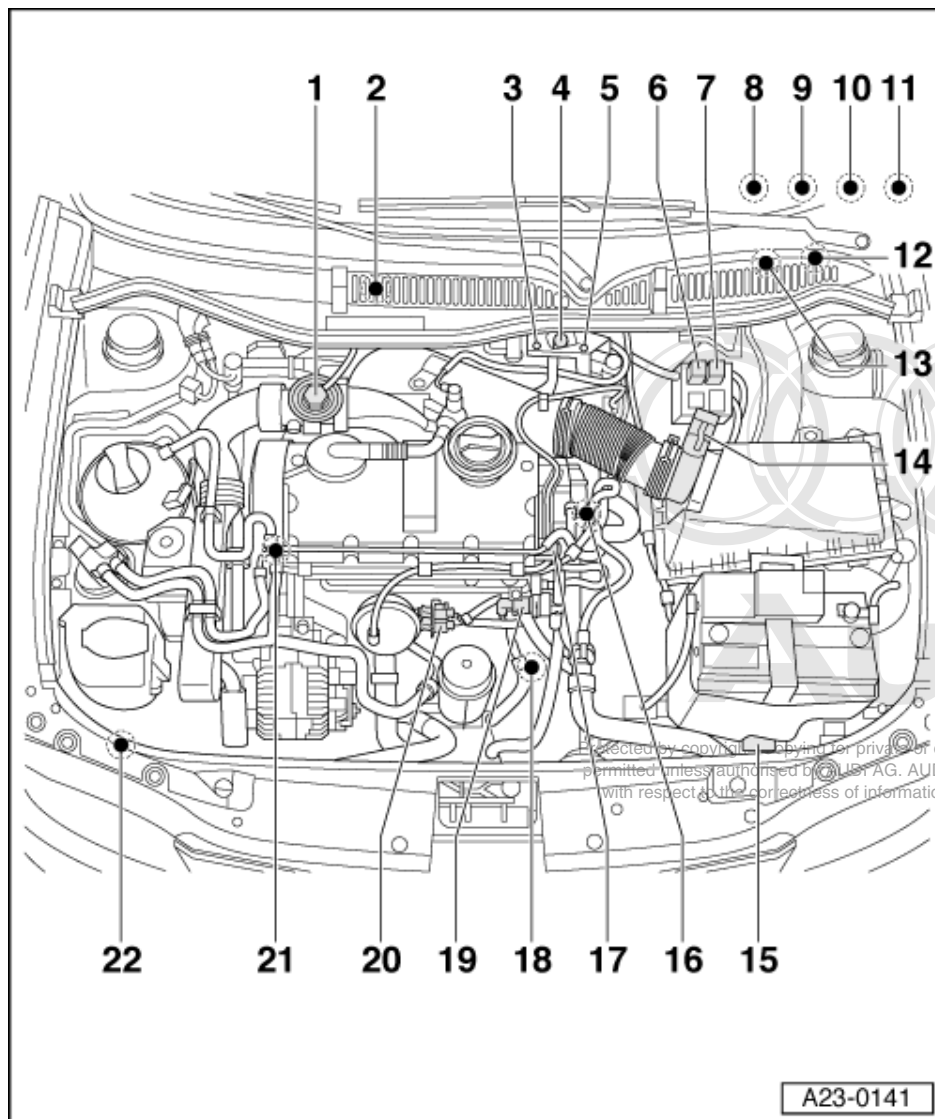
- ♦ Fitting location
=> Fig.23-11

12 Glow plug relay -J52

- ♦ Fitting location
=> Fig.23-14

13 Diesel direct injection system relay -J322

- ♦ Fitting location
=> Fig.23-14



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14 Air mass meter -G70

- ♦ Testing =>Page 23-107

15 Radiator fan control unit -J293

- ♦ For vehicles with air conditioning

16 Coolant temperature sender -G62

- ♦ Testing =>Page 23-85
- ♦ If necessary release pressure in cooling system before removing

17 Connector

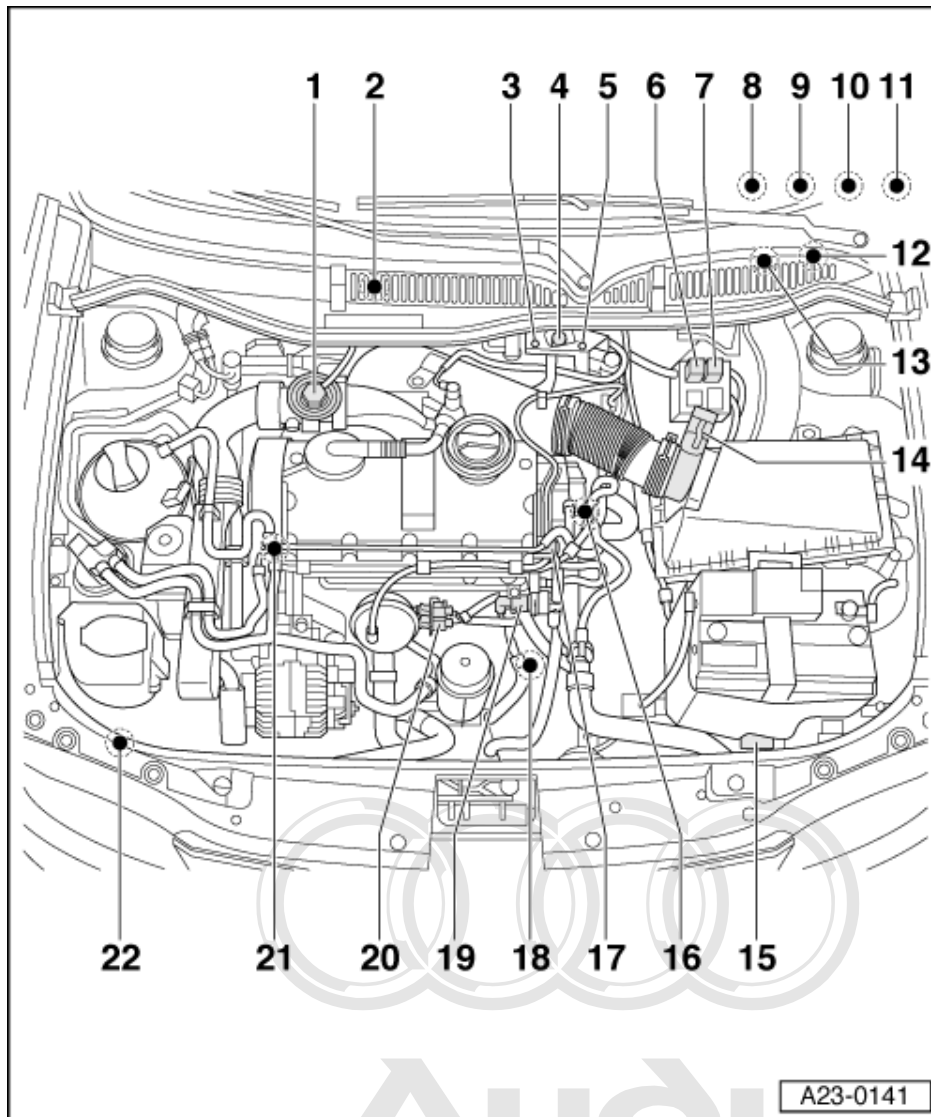
- ♦ For unit injector
-N240...-N243

18 Engine speed sender -G28

- ♦ Checking => Page 23-77

**19 Fuel temperature sender
-G81**

- ♦ Fitting location => Fig. 23-13



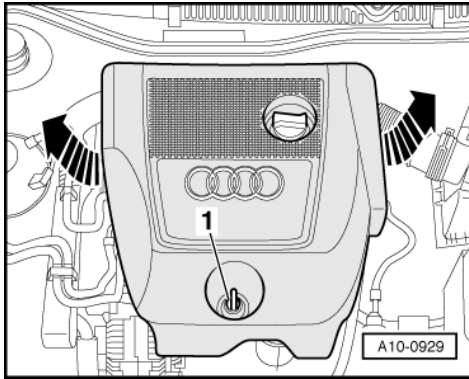
20 3 pin connectors

- ◆ For engine speed sender -G28
- ◆ For Hall sender -G40 for camshaft position
- ◆ Fitting location
=> Fig.23-10

21 Hall sender -G40

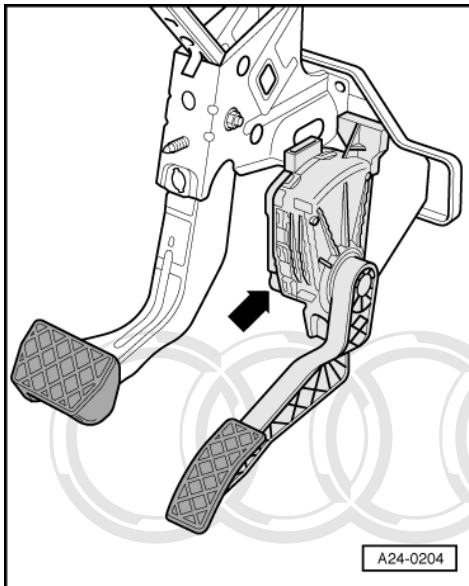
- ◆ For camshaft position
- ◆ Fitting location
=>Fig.23-13

22 Intake manifold pressure sender -G71 with intake manifold temperature sender -G72



-> Fig.1 Removing engine cover

- Pull out oil dipstick -1- from dipstick tube.
- Remove engine cover -arrows-.
- Re-insert oil dipstick into guide tube.

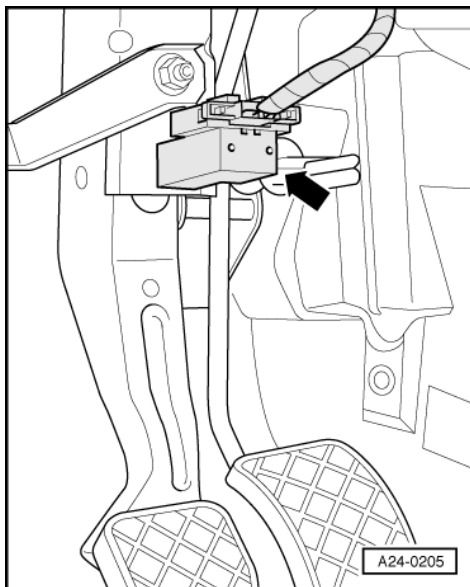


-> Fig.2 Fitting location of accelerator position sender -G79

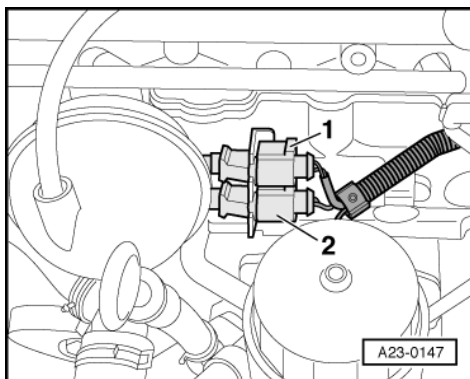
Note:

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Illustration shows arrangement on LHD vehicles



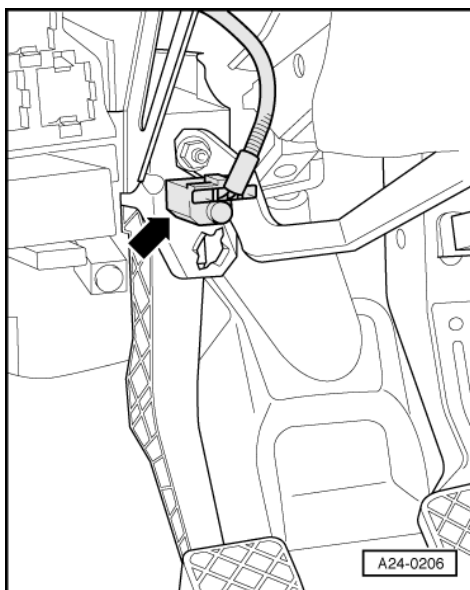
-> Fig.3 Fitting location of brake light switch -F and brake pedal switch -F47



-> Fig.4 Fitting locations of 3-pin connectors

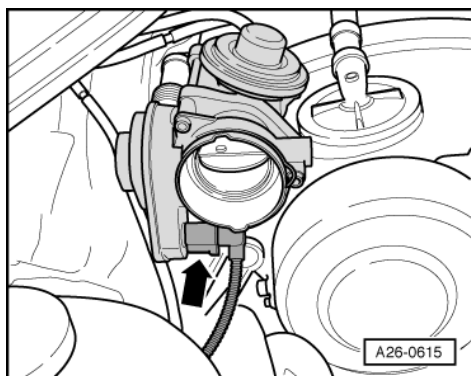
- 1 - For Hall sender-G40 (black)
- 2 - For engine speed sender -G28 (grey)

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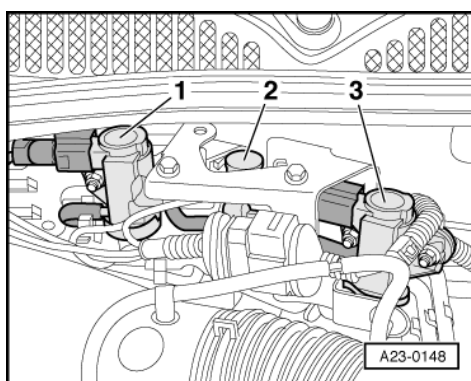


-> Fig.5 Fitting location of clutch pedal switch -F36



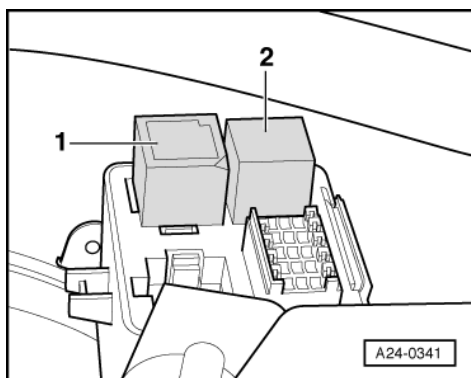
-> Fig.6 Fitting location for intake manifold flap motor -V157 (engine with code letters AXR)

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-> Fig.7 Fitting location of valves on bulkhead in engine compartment

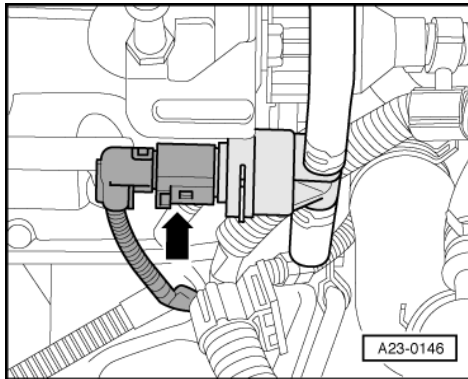
- 1 - Exhaust gas recirculation valve -N18
- 2 - Intake manifold flap change-over valve -N239 (vehicles with engine code letters ASZ, ATD) or exhaust gas recirculation valve 2 -N213 (vehicles with engine code letters AXR)
- 3 - Charge pressure control solenoid valve -N75



-> Fig.8 Fitting location for low heat output relay -J359 and high heat output relay -J360

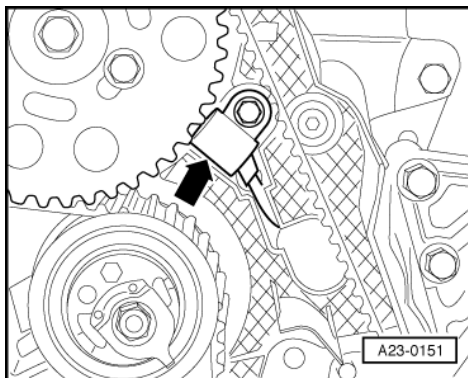
- ♦ Under cover on bulkhead (left side)
 - 1 - High heat output relay -J360

2 - Low heat output relay -J359



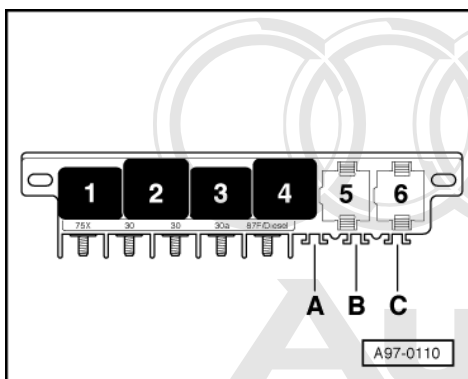
-> Fig.9 Fitting location of fuel temperature sender -G81

- ◆ Front left-hand side on engine



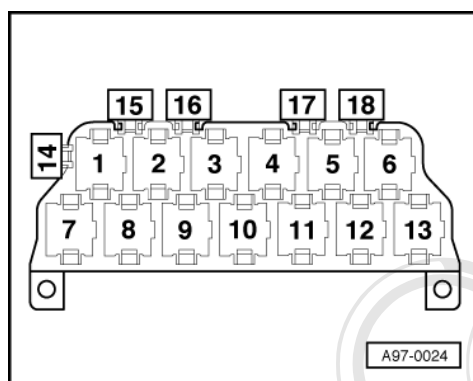
-> Fig.10 Fitting location for Hall sender -G40

- ◆ Front right-hand side on engine



-> Fig.11 Fitting location for glow plug relay -J52

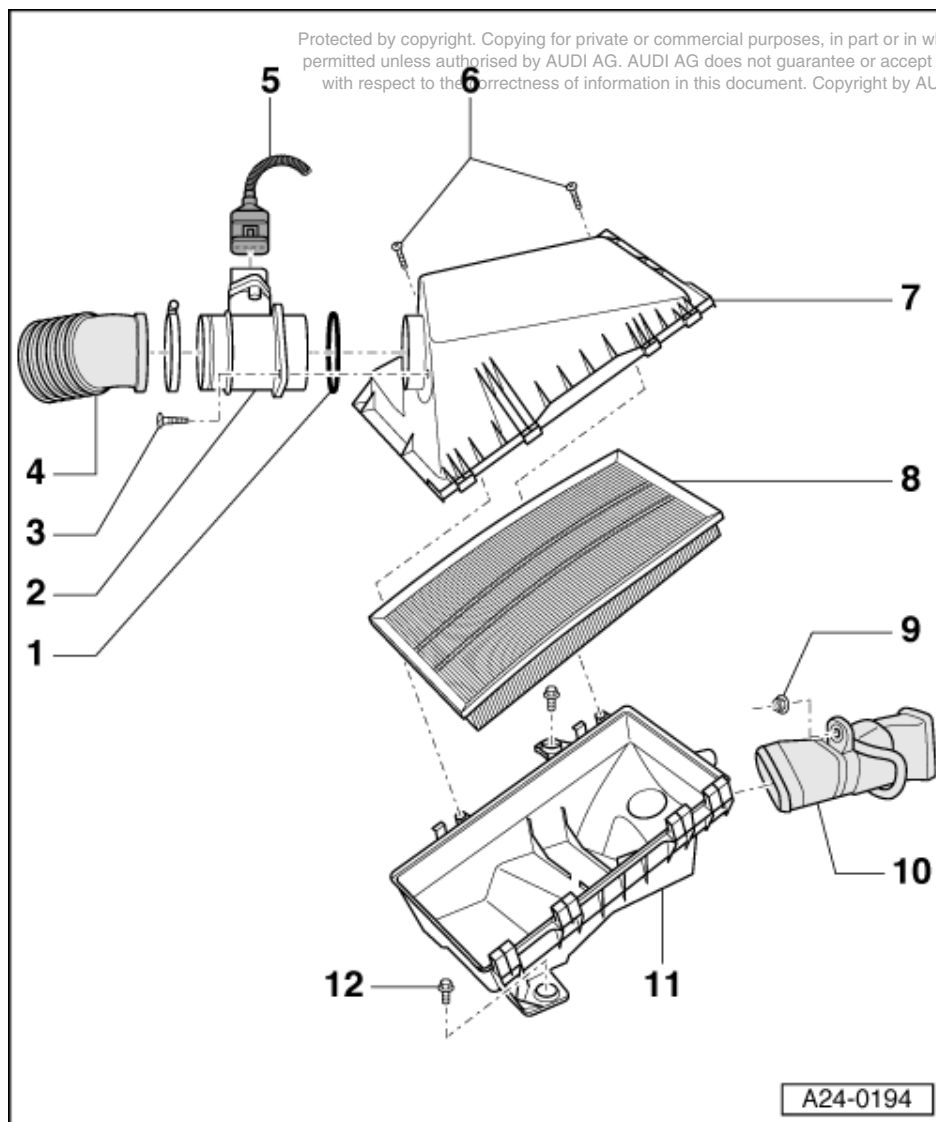
- ◆ In the central electrics panel at left of driver side foot-well, plug-in position 4.



-> Fig.12 Fitting location for diesel direct injection system relay -J322

- ♦ In 13-slot relay carrier at left under dash panel, plug-in position 12

1.5 - Dismantling and assembling air cleaner

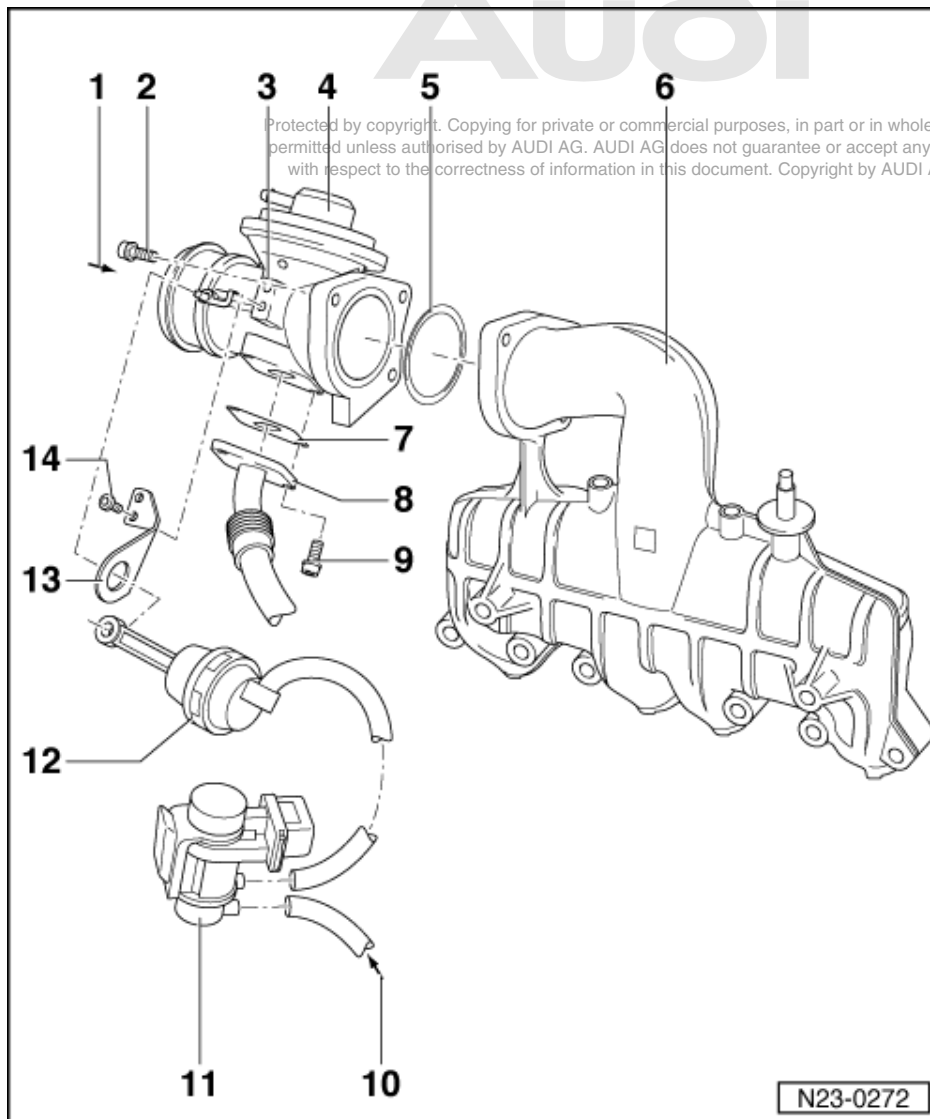


- 1 Seal
- 2 Air mass meter -G70
- 3 Cross-head screw
- 4 Air ducting
- 5 5 pin connector
- 6 Cross-head screw
- 7 Air cleaner housing, upper part
- 8 Filter element
- ♦ Observe change intervals

=> Maintenance

- 9 Nut - 10 Nm
- 10 Air intake connection
- 11 Air cleaner housing, lower part
- 12 Hexagon bolt - 10 Nm

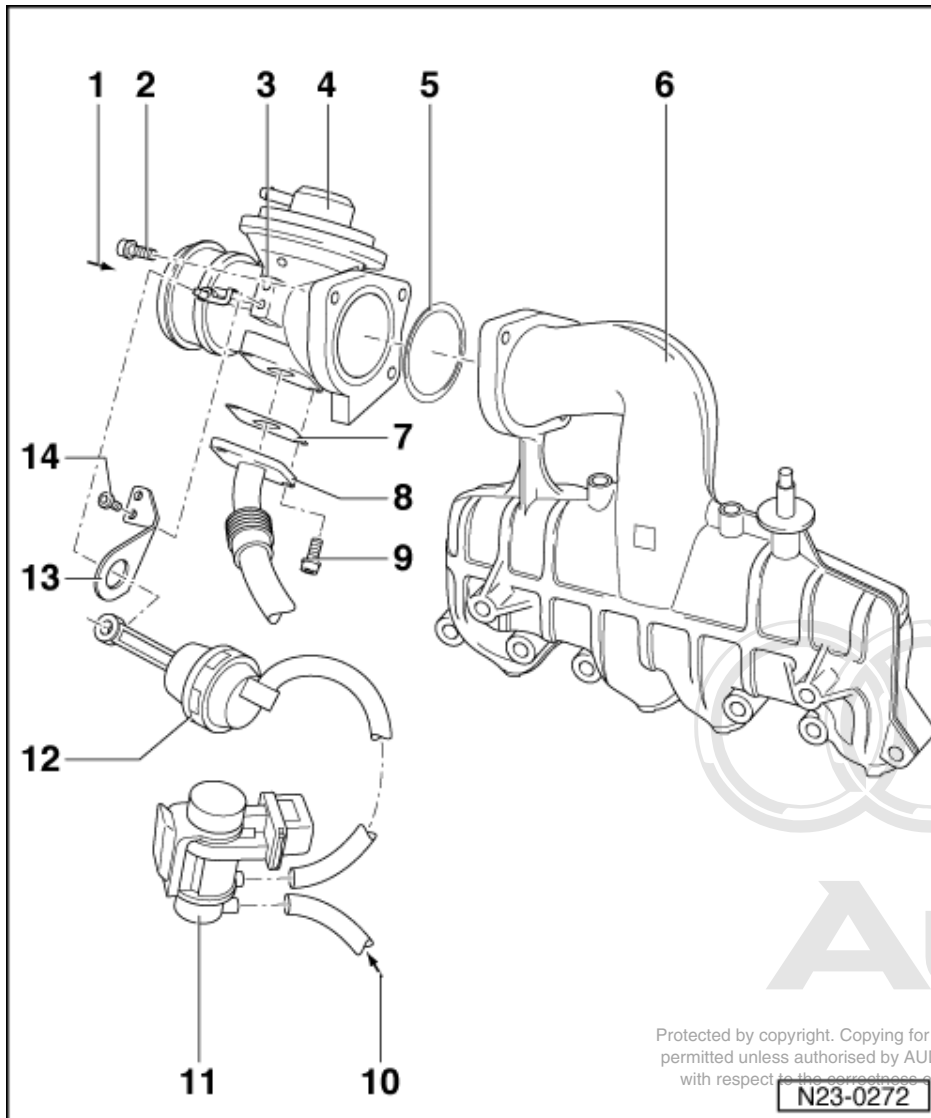
1.6 - Servicing intake manifold flap





The intake manifold flap is closed for approx. 3 seconds when stopping engine and then opens again. This reduces the stop jolt.

- 1 From charge air cooler
- 2 10 Nm
- 3 Intake connecting flange
 - ♦ With exhaust gas recirculation valve and intake manifold flap
- 4 Mechanical exhaust gas recirculation valve
- 5 O-ring
 - ♦ Renew
- 6 Intake manifold



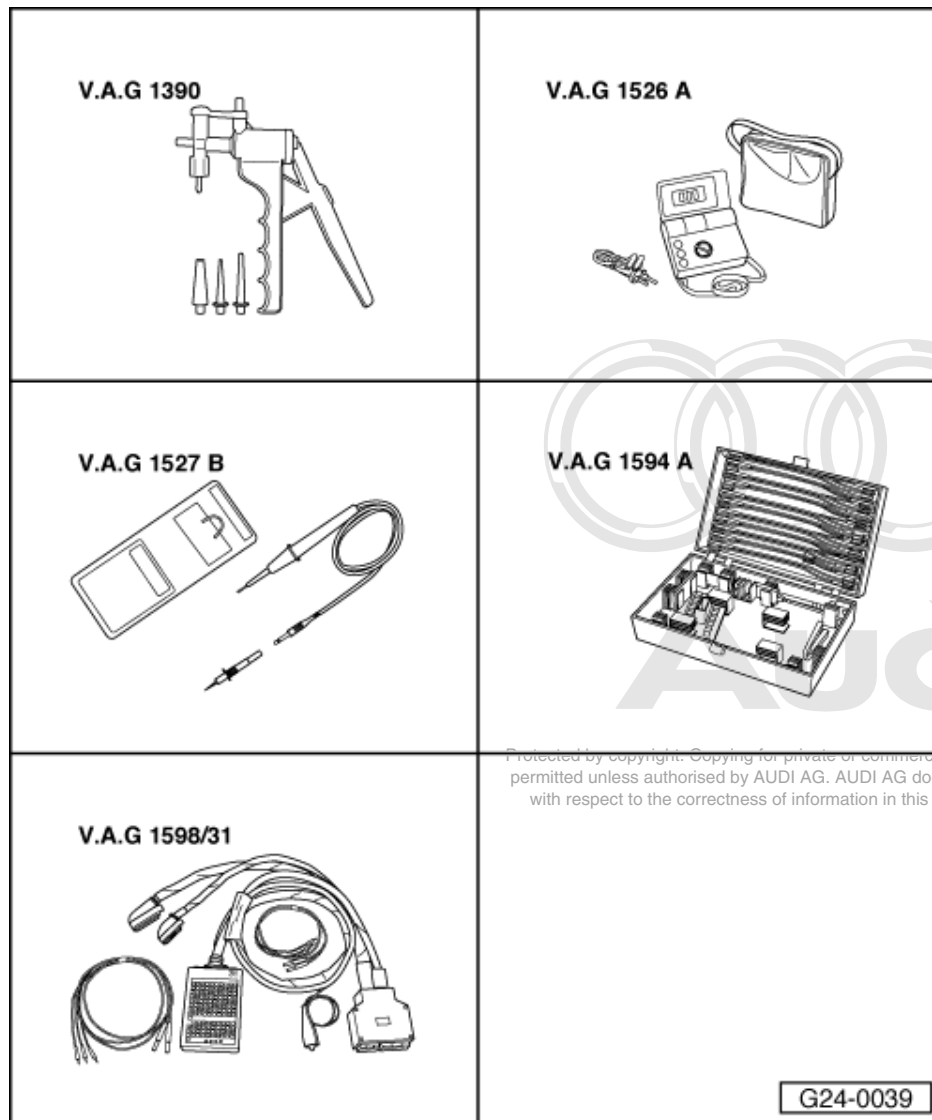
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N23-0272

- 7 Gasket
 - ♦ Renew
- 8 Connecting pipe
 - ♦ To exhaust manifold
- 9 25 Nm
- 10 Vacuum supply
 - ♦ From vacuum pump
- 11 Intake manifold flap change-over valve -N239
 - ♦ Checking => Page 23-18
- 12 Vacuum control element

13 Bracket

14 10 Nm



Testing change-over function of intake manifold flap

Special tools and workshop equipment required

- ◆ V.A.G 1390
- ◆ V.A.G 1526 A
- ◆ V.A.G 1527 B
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598/31

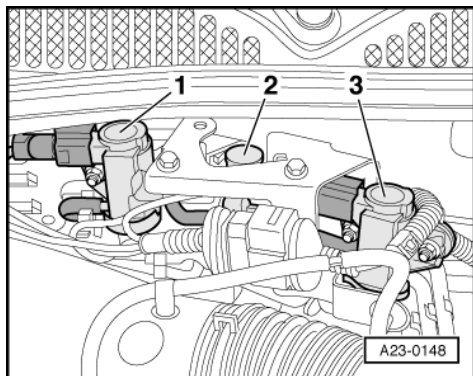
Checking function

- Start engine and run at idling speed.
- Switch off ignition.
- Observe positioning lever on intake manifold flap (2nd person required).
 - After switching off the ignition, the intake manifold flap should close and open again after approx. 3 seconds.



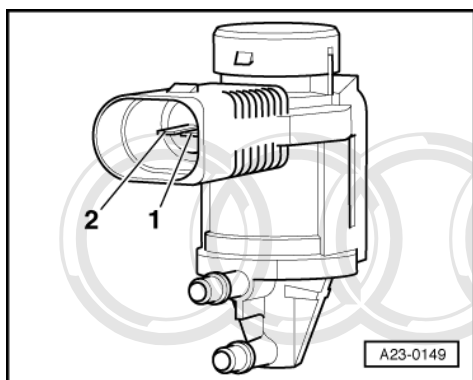
If change-over does not occur, the following checks must be carried out.

- Check intake manifold flap change-over mechanics for freedom of movement. To do this operate rods by hand.
- Check function of vacuum positioning element with hand vacuum pump V.A.G 1390.
- Check vacuum pipes for correct connection.



If no fault is found in the mechanical components:

- -> Unplug connector on intake manifold flap change-over valve -N239 -item 2-.



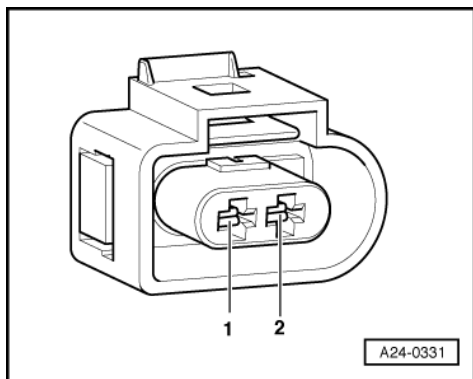
Testing internal resistance

- Connect multimeter (resistance measurement range) between contacts 1 and 2.
- Specification: 25 ... 45 Ω

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If the specification is not obtained:

- Renew intake manifold flap change-over valve.



Checking voltage supply

Test requirement:

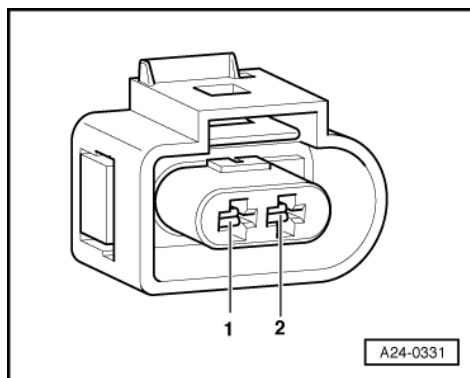
- Fuse for intake manifold flap change-over valve OK
- => Current flow diagrams, Electrical fault finding and Fitting locations binder
- Diesel direct injection relay OK; Test=>Page 23-69.
 - -> Connect multimeter (voltage measurement range) as follows:

Connector Contact	Measure against
1	Engine earth

- Switch on ignition.
 - Specification: approx. battery voltage

If the specification is not obtained:

- Test wiring for open circuits and rectify if necessary.



Checking activation

- -> Connect voltage tester V.A.G 1527 B between contacts 1 and 2
- Start final control diagnosis and select intake manifold flap change-over valve -N239 =>Page 01-52.
 - The LED should flash slowly.

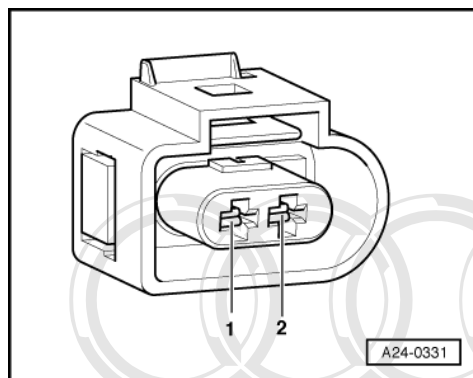
Note:

The LEDs on voltage testers with a low current draw continue to glow faintly between impulses from the engine control unit (rather than going out completely) and become much brighter when receiving an impulse.

- Press the ◀ button to exit from function "03 - Final control diagnosis".
- Select diagnosis function "06 - End output".
- Switch off ignition.

If the LED does not react as described:

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
- Connecting test box to engine control unit without protective covering=>Page 23-49.
- Connecting test box to engine control unit with protective covering=>Page 23-51.



- -> Test for open circuit and short to positive or earth in the following wiring connections:

Connector Contact	Test box V.A.G 1598/31 Socket
2	81

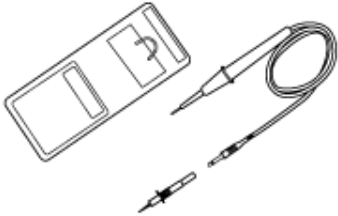
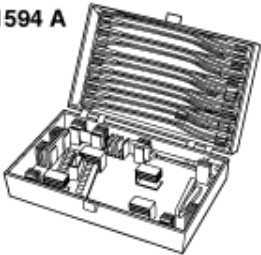
- Rectify any open/short circuit as necessary.

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If no fault is found:

- Fit a new engine control unit.
 - Removing and installing engine control unit without protective housing=>Page 23-57.
 - Removing and installing engine control unit with protective housing=>Page 23-60.

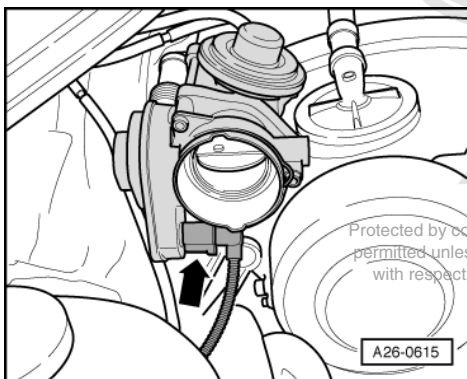
1.7 - Servicing intake manifold flap motor -V157 (engine with code letters AXR)

V.A.G 1526 A 	V.A.G 1527 B 
V.A.G 1594 A 	V.A.G 1598/31 
	G24-0022

Testing intake manifold flap motor

Special tools and workshop equipment required

- ◆ V.A.G 1526 A
- ◆ V.A.G 1527 B
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598/31



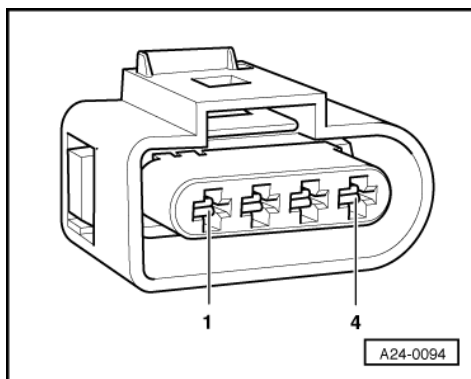


Test sequence

- Start final control diagnosis and activate intake manifold flap motor -V157=>Page 01-64.
 - Opening and closing of intake manifold flap should be audible

If intake manifold flap does not function:

- -> Unplug connector -arrow- from intake manifold flap motor.



Checking voltage supply

Test requirement:

- Fuses for engine electronics OK.

=> Current flow diagrams, Electrical fault finding and Fitting locations binder

- -> Connect multimeter (voltage measurement range) as follows:

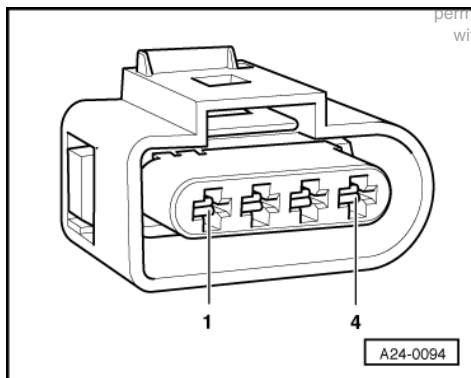
Connector Contact	Measure against
2	Engine earth

- Switch on ignition.
 - Specification: approx. battery voltage

If the specification is not attained:

- Test wiring for open circuits and rectify if necessary.

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If the specification is obtained:

Testing earth supply

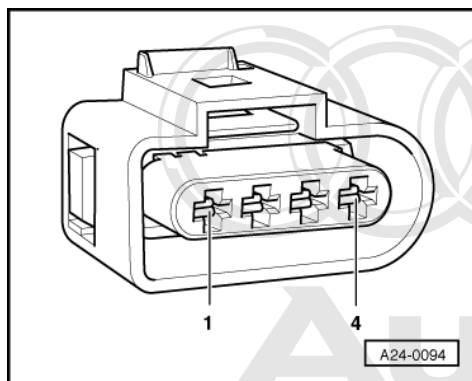
- -> Connect multimeter (voltage measurement range) as follows:

Connector Contact	Measure against
1	Battery positive

- Specification: approx. battery voltage

If the specification is not attained:

- Test wiring for open circuits and rectify if necessary.



If the specification is obtained:

Checking activation

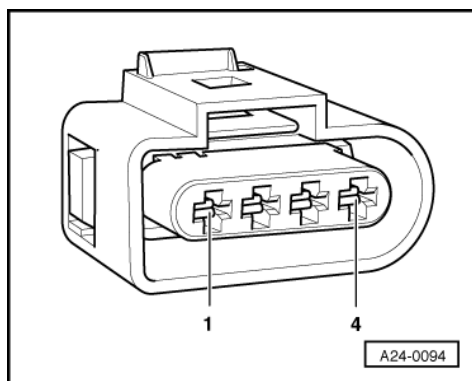
- -> Connect voltage tester V.A.G 1527 B between contacts 3 and 4.
- Start final control diagnosis and activate intake manifold flap motor -V157=>Page 01-64.
 - The LED should flash.
- Press the *button to exit from function "03 - Final control diagnosis".
- Select diagnosis function "06 - End output".
- Switch off ignition.

If the LED flashes, but motor -V157 does not activate flap:

- Replace intake manifold flap motor -V157.

If the LED does not flash:

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
 - Connecting test box to engine control unit without protective housing=>Page 23-49.
 - Connecting test box to engine control unit with protective housing=>Page 23-51.





- -> Test for open circuit and short to positive or earth in the following wiring connections:

Connector Contact	Test box V.A.G 1598/31 Socket
3	81
4	75

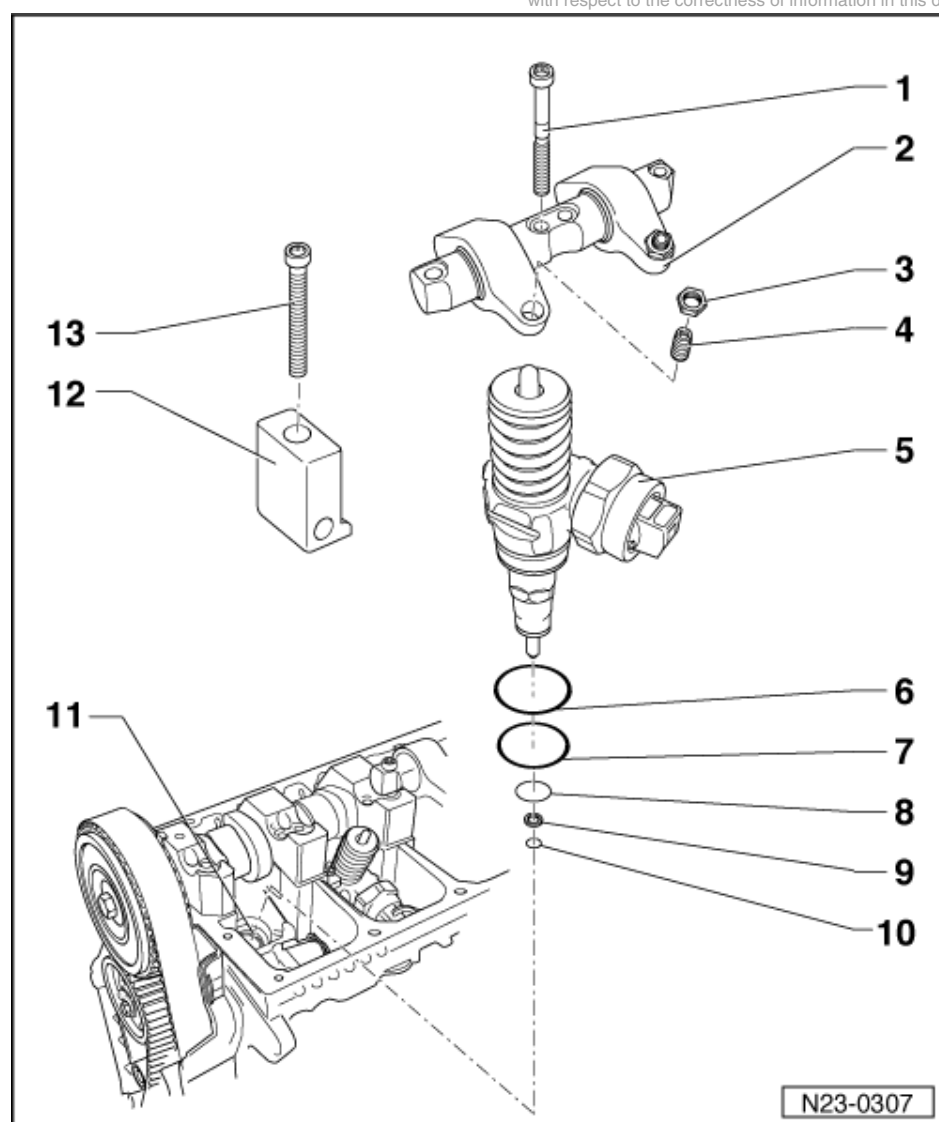
- Rectify any open/short circuit as necessary.

If no fault is found:

- Replace engine control unit
 - Removing and installing engine control unit without protective housing=>Page 23-57.
 - Removing and installing engine control unit with protective housing=>Page 23-60.

1.8 - Servicing unit injector

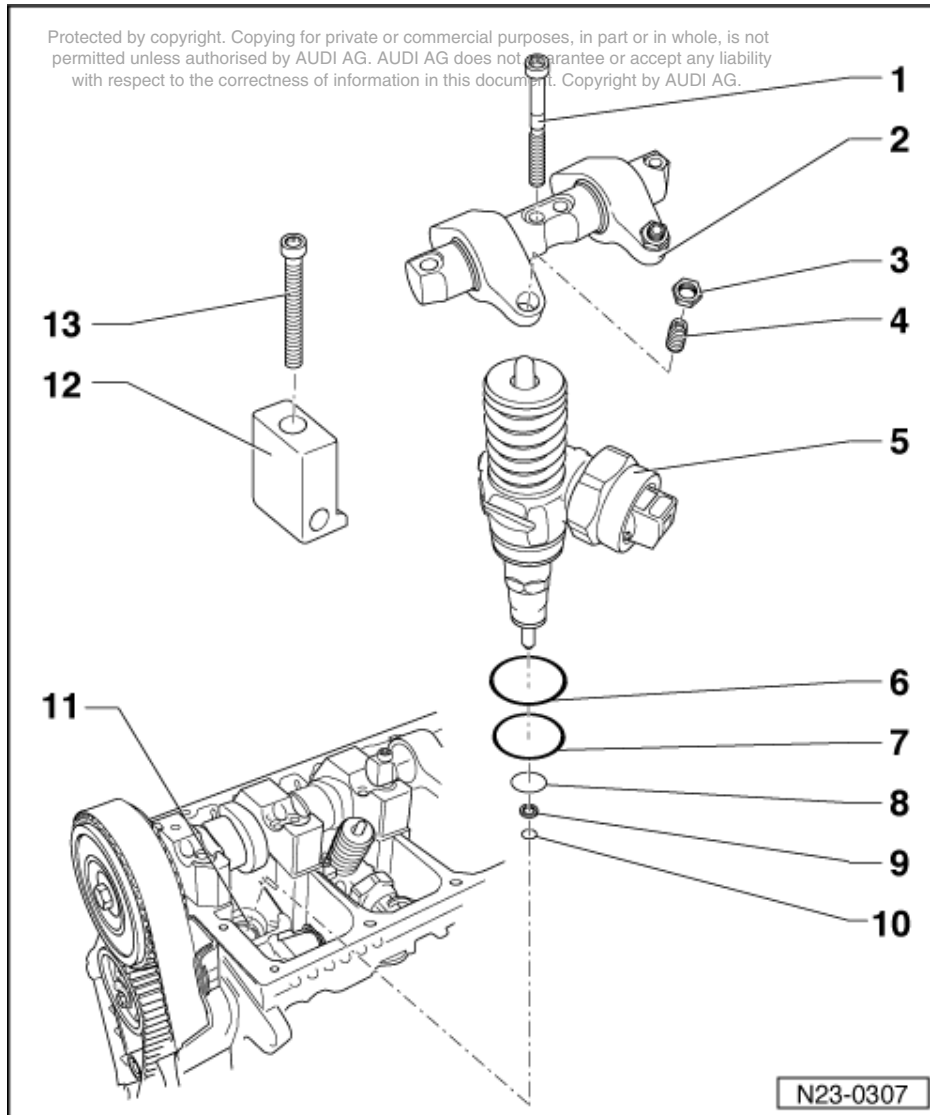
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Notes:

- ♦ Observe rules for cleanliness
=>Page 23-3.

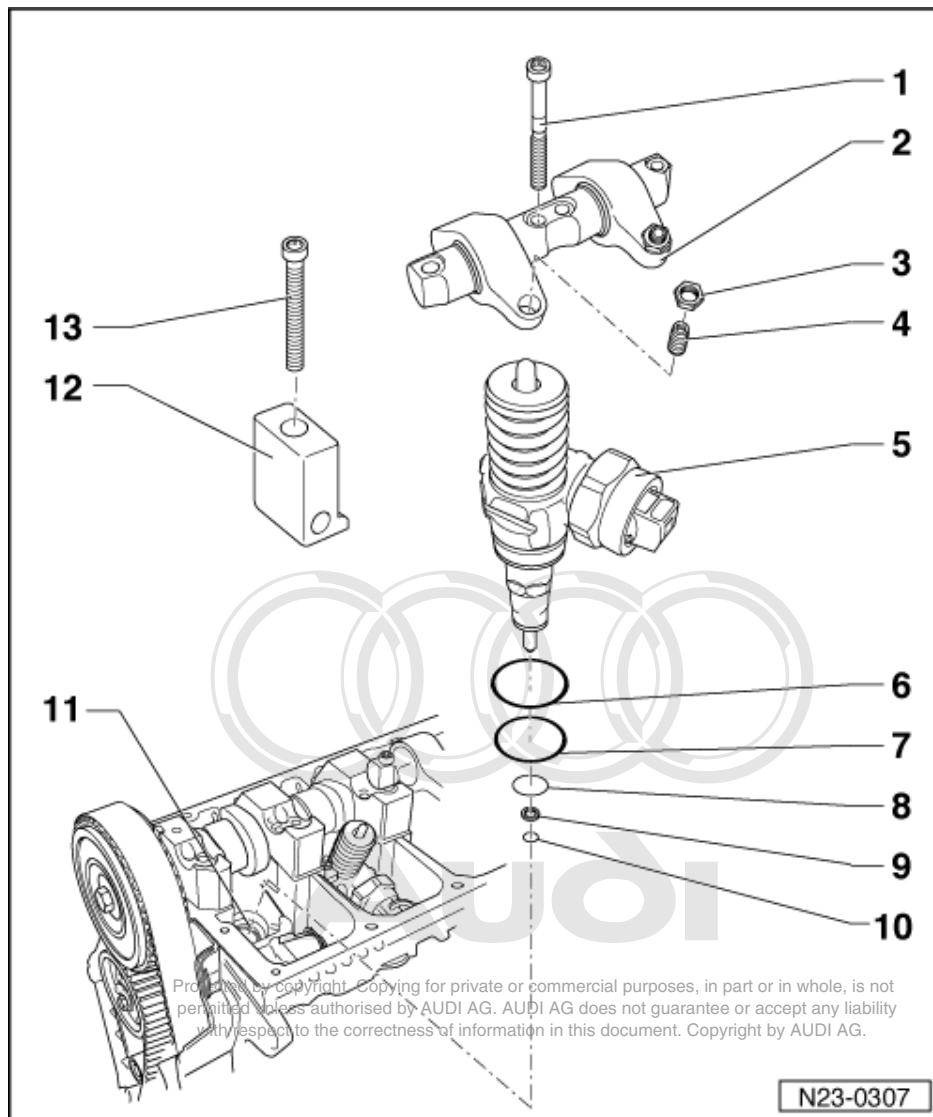
- ♦ Always renew seals and gaskets.
- 1 20 Nm + 1/4 turn (90°) further
 - ♦ Renew
- 2 Rocker arm shaft
 - ♦ With rocker arm
 - ♦ Removing and installing =>Page 23-38, Removing and installing unit injector
- 3 Lock nut



- 4 Adjustment screw
 - ♦ Removing and installing
=>Page 23-38
 - ♦ Grease contact surface to unit injector ball pin with G 000 100 grease
 - ♦ Renew if there are signs of wear and when fitting a new unit injector
- 5 Unit injector
 - ♦ Removing and installing
=>Page 23-38
 - ♦ Check ball pin for signs of wear, replace if necessary
 - ♦ Grease contact surface to adjustment screw with G 000 100 grease
- 6 O-ring
 - ♦ Renew

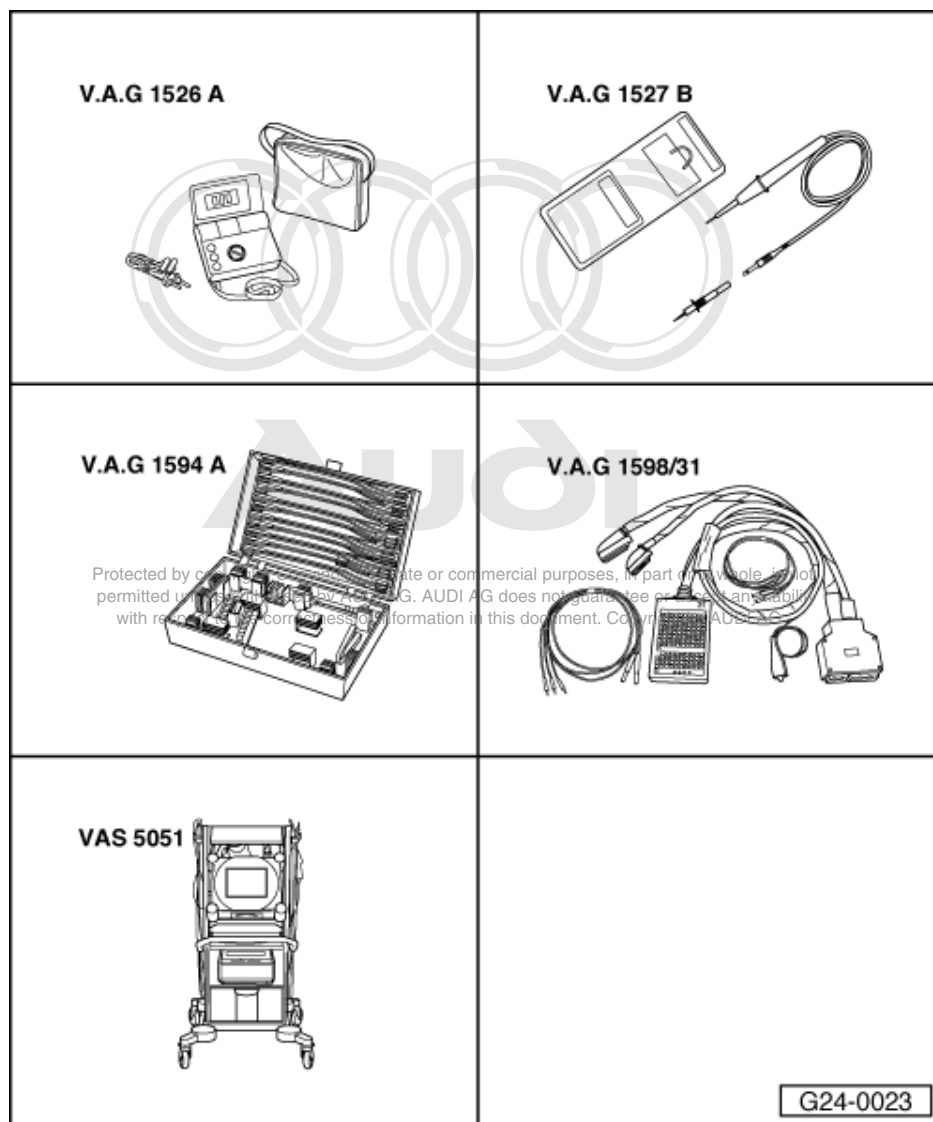


=>Page 23-46



- 7 O-ring
 - ♦ Renew
- 8 O-ring
 - ♦ Renew
- 9 Heat insulation seal
 - ♦ Renew
- 10 Circlip
- 11 Cylinder head
- 12 Tensioning block
- 13 12 Nm + 3/4 turn (270 °) further
 - ♦ Renew

1.9 - Testing unit injector solenoid valves

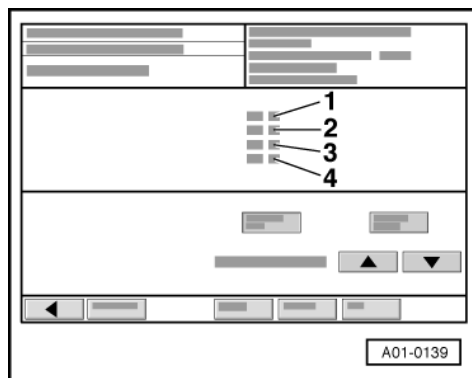


Special tools and workshop equipment required

- ◆ V.A.G 1526 A
- ◆ V.A.G 1527 B
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598/31
- ◆ VAS 5051 with VAS 5051/1

Test sequence

- Connect the vehicle diagnostic, testing and information system VAS 5051 => Page 01-2, and select the vehicle system "01 - Engine electronics" from the menu. When doing this the engine should be idling.



- Read data block, Display Group 018, engine idling=>Page 01-125.

-> Display on VAS 5051:

- Specification: "0" in all 4 display zones for correct control
Press the ◀ button to exit from the function "08 - Read data block".
Select diagnosis function "06 - End output".

If the display shows a reading other than "0".

Checking activation

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
 - Connecting test box to engine control unit without protective housing=>Page 23-49.
 - Connecting test box to engine control unit with protective housing=>Page 23-51.
- Connect voltage tester V.A.G 1527 B as follows:
Operate starter briefly.

Test box V.A.G 1598/31 Socket	Specification
114 + 116	LED should flash
114 + 117	LED should flash
114 + 118	LED should flash
114 + 121	LED should flash

If the specifications are not obtained:

- Test the wiring => Page 23-37.

If the specifications are obtained:

Testing internal resistance

- Connect multimeter (resistance test range) as follows:

Test box V.A.G 1598/31 Socket	Specification
114 + 116	approx. 0.5 ω
114 + 117	approx. 0.5 ω
114 + 118	approx. 0.5 ω
114 + 121	approx. 0.5 ω



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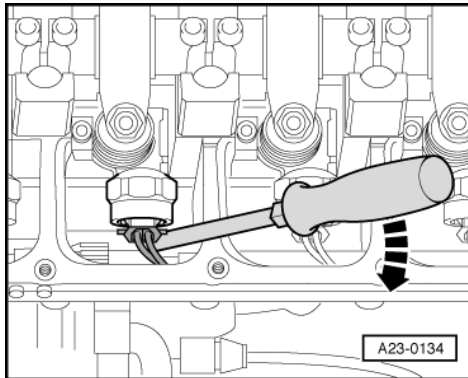
Note:

The specification of approx 0.5 ω applies to a measurement taken directly at the solenoid valve of the unit injector. With the measuring method used here, the wiring resistance has to be added to this figure, so that the reading will always be 0.3 ... 0.5 ω above the specified value.

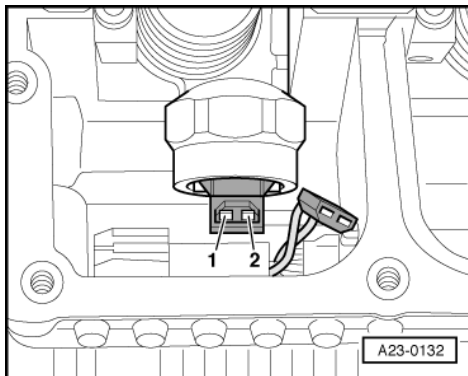
If the specification is exceeded considerably or if the reading is 0 ω or $\infty \omega$:

- Remove cylinder head cover

=> 4-Cyl diesel direct injection engine (TDI); Repair group 15; Removing and installing cylinder head; Removing and installing cylinder head cover Removing and installing cylinder head Removing and installing cylinder head cover



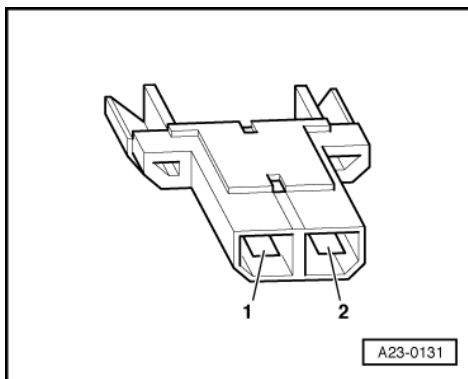
- -> Lever connector off unit injector with a screwdriver -arrow-. Support the opposite side of the connector with light finger pressure to stop it from jamming.



- -> To measure internal resistance, connect multimeter directly to unit injector solenoid valve with connector disconnected (resistance measurement range).
- Specification: approx. 0.5 ω

If the specification is not attained:

- Replace unit injector



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If the specification is obtained:

Testing wiring

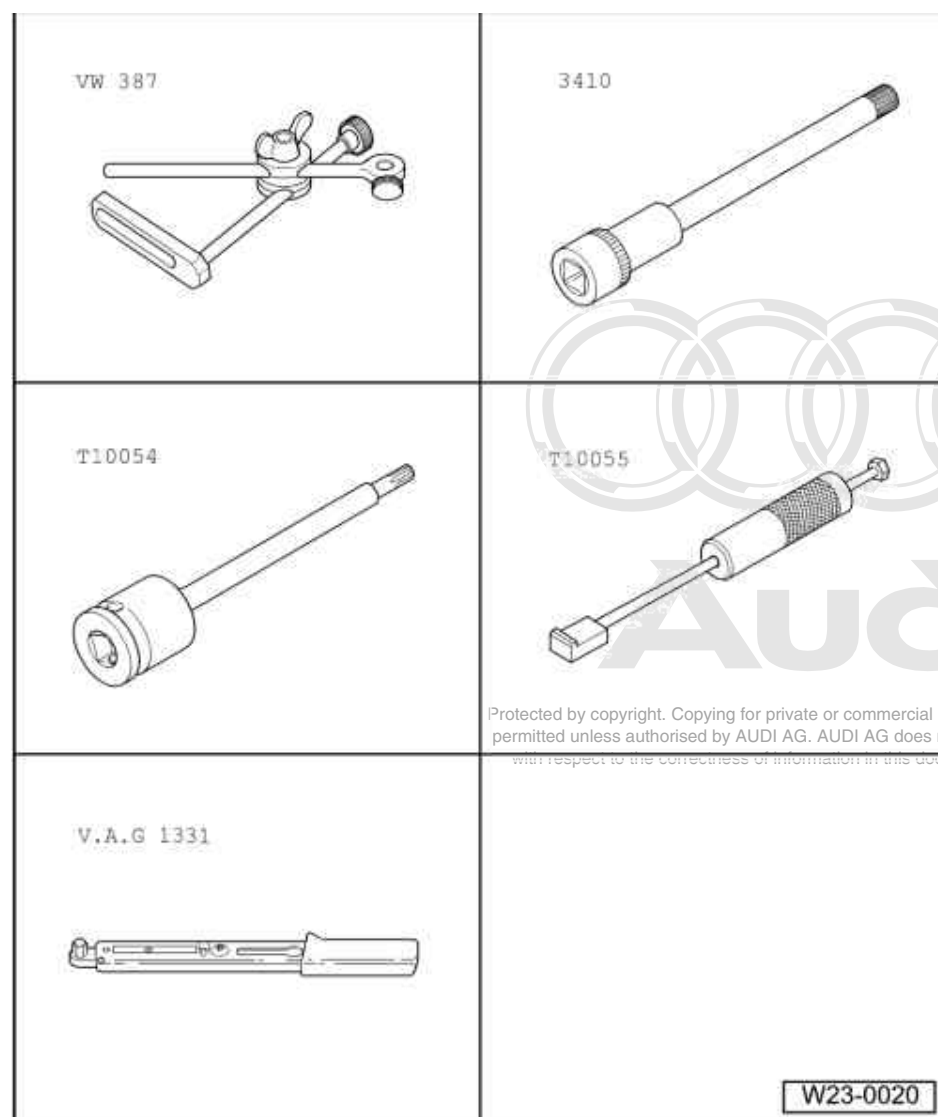
- -> Test for open circuit and short to positive or earth in the following wiring connections:

Cylinder	Connector for solenoid valve Contact	Test box V.A.G 1598/31 Socket
1	2	116
2	2	117
3	2	118
4	2	121
all	1	114

If no fault is found:

- Replace engine control unit:
 - Removing and installing engine control unit without protective housing=>Page 23-57.
 - Removing and installing engine control unit with protective housing=>Page 23-60.

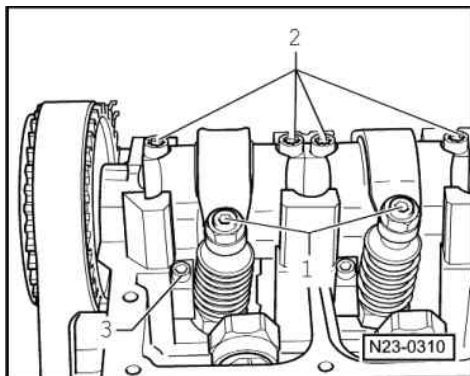
1.10 - Removing and installing unit injector



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Special tools and workshop equipment required

- ◆ VW 387 Universal dial gauge bracket
- ◆ 3410 Insert
- ◆ T10054 Insert
- ◆ T10055 Puller
- ◆ Workshop depth gauge VAS 5276 (measuring range at least 400 mm)
- ◆ Angle wrench V.A.G 1756

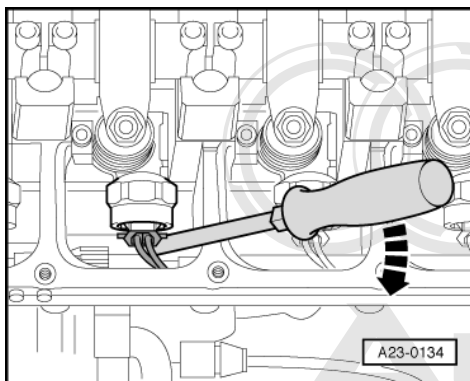


Removing

- Remove cylinder head cover:

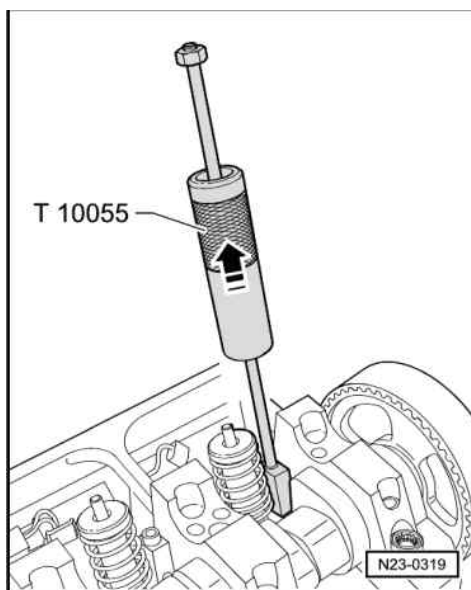
=> 4-Cyl. diesel direct injection engine (TDI), Mechanics; Repair group 15; Removing and installing cylinder head; Removing and installing cylinder head cover Removing and installing cylinder head cover

- Turn crankshaft until the set of cams for the unit injector which is to be removed/installed point evenly upwards.
- -> Loosen lock nuts of adjustment screws -1- and screw the screws out until the relevant rocker arm lies against the plunger spring of the unit injector.
- Remove rocker arm shaft securing bolts -2- (working from outside to inside) using insert 3410 and take rocker arm shaft off.
- Remove tensioning block securing bolt -3- with insert T10054 and remove the tensioning block.



- -> Lever connector off unit injector with a screwdriver -arrow-. Support the opposite side of the connector with light finger pressure to stop it from jamming.

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- -> Apply the puller T 10055 into the slot on the side of the unit injector in place of the tensioning block.
- Pull unit injector upwards out of cylinder head seat with gentle taps.

Installing

Notes:

- ♦ New unit injectors are supplied with O rings and heat insulating seal.
- ♦ If a new unit injector is installed, the appropriate adjustment screw in the rocker arm must also be renewed.
- ♦ If the removed unit injector is re-installed, renew O-rings and heat insulating seal => Page 23-46.
- ♦ Each time work is performed which requires the unit injector to be adjusted, the adjustment screw in the rocker arm and also the unit injector ball pin must be cleaned and checked for signs of wear. If wear is evident the ball pin and the adjustment screw must be replaced.
- ♦ Grease the contact surface between ball pin and adjustment screw with G 000 100 grease.
- Check that the three O rings and the heat insulating seal along with circlip are seating correctly before installing unit injector.

Note:

The O-rings must not be twisted.

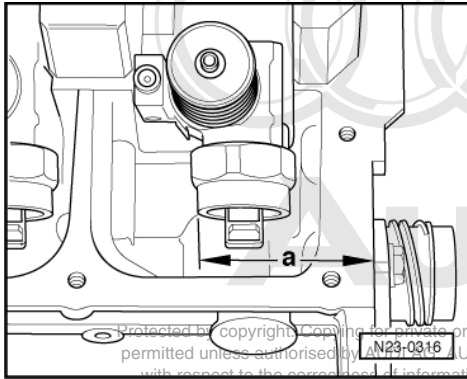
- Oil the O-rings and fit the unit injector into the cylinder head with great care.
- Push the unit injector evenly into the cylinder head onto its stop.
- Fit the tensioning block into the slot on the side of the unit injector.

Note:

If the unit injector is not at right angles to the tensioning block the securing bolt may loosen, which can result in damage to the unit injector or the cylinder head.

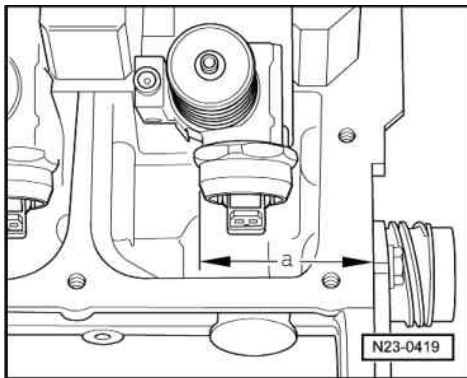
- Therefore align the unit injector as follows.
- Screw the new securing bolt into the tensioning block until the unit injector can still be turned easily.
- Now align the unit injector at right angles with the camshaft bearing blocks.
- Using a workshop depth gauge (measuring range at least 400 mm), check distance "a" from outside edge of cylinder head to round surface of unit injector.

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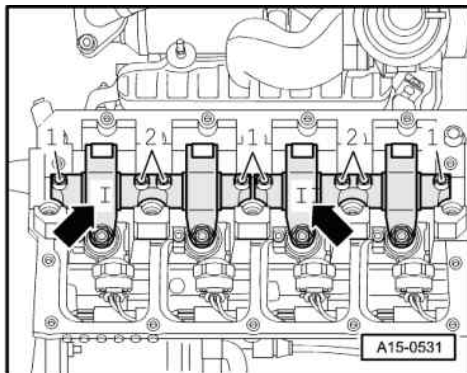
-> Unit injectors with cylindrical collar on nut:

Cylinder	Dimension "a"
1	332.2 ±0.8 mm
2	244.2 ±0.8 mm
3	152.8 ±0.8 mm
4	64.8 ±0.8 mm



-> Unit injectors with chamfered collar on nut:

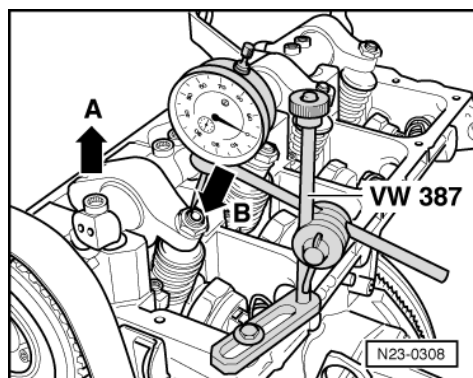
Cylinder	Dimension "a"
1	333.0 ±0.8 mm
2	245.0 ±0.8 mm
3	153.6 ±0.8 mm
4	65.6 ±0.8 mm





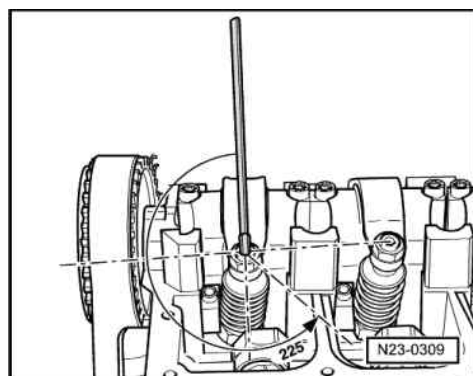
All models

- Align the unit injector as necessary and tighten the securing bolt as follows:
 - Tightening torque: 12 Nm and turn 3/4 turn (270°) further
- ➔ Fit the rocker arm shaft.
- First tighten inner bolts -2- then outer bolts -1- in several stages.
 - Tightening torque: 20 Nm + 1/4 turn (90°) further



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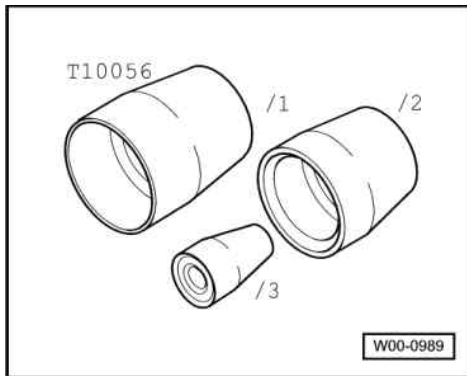
- ➔ Fit the dial gauge onto the adjustment screw of the unit injector as shown.
- Turn the crankshaft in direction of engine rotation until the roller of the rocker arm is positioned on the peak of the drive cam.
 - Roller side -arrow A- positioned at highest point
 - Dial gauge -arrow B- positioned at lowest point
- Remove dial gauge.
- Turn adjustment screw inwards into rocker arm until a firm resistance is felt (unit injector positioned at stop).



- ➔ Using angle wrench V.A.G 1756 (special tool), back off adjuster screw 225° from stop.
- Hold adjustment screw in this position and tighten the lock nut to 30 Nm.
- Connect unit injector connector, install cylinder head cover and toothed belt guard.

=> 4-Cyl. diesel direct engine (TDI), Mechanics; Repair group 15; Removing and installing cylinder head; Removing and installing cylinder head cover Removing and installing cylinder head Removing and installing cylinder head cover

1.11 - Removing and installing O rings for unit injector



Special tools and workshop equipment required

- ◆ T10056 Assembly sleeves

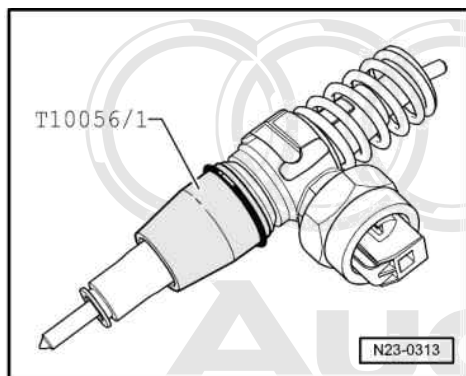
Removing

- Unit injector removed
- Lever old O rings very carefully out of unit injector.
- Above all ensure that burrs are not caused on the seating for the O ring.
- Pull heat shield seat off together with securing clip.

Installing

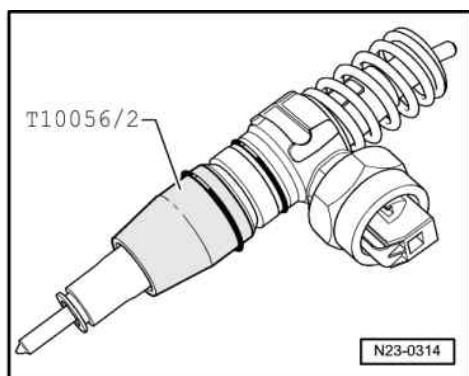
Notes:

- ◆ Always use the assembly sleeves to fit the O rings. There is a danger of damaging the O rings if the sleeves are not used.
- ◆ Prevent O rings from rolling when sliding them on. The O rings must not be twisted when seated on the unit injector.
- Clean O ring seating surfaces on unit injector very carefully.

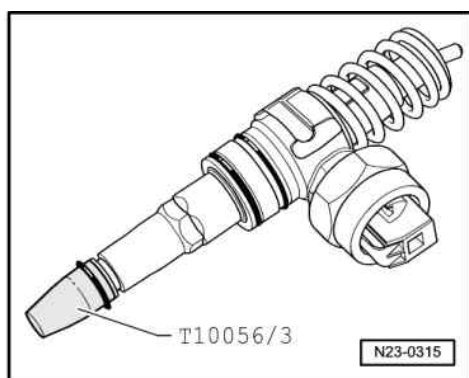


- -> Slide assembly sleeve T10056/1 onto stop on unit injector.
- Slide upper O ring carefully onto assembly sleeve and into seat on unit injector.
- Remove assembly sleeve.

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- -> Slide assembly sleeve T10056/2 onto stop on unit injector.
- Slide the middle O ring carefully onto assembly sleeve and into seat on unit injector.
- Remove assembly sleeve.

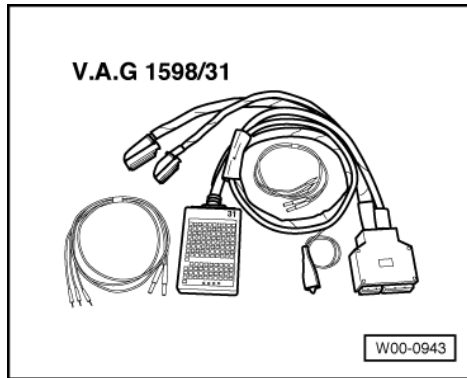


- -> Slide assembly sleeve T10056/3 onto stop on unit injector.
- Slide lower O ring carefully onto assembly sleeve and into seat on unit injector.
- Remove assembly sleeve.
- Fit new heat shield seal together with securing clip.

1.12 - Wiring and component check with test box V.A.G 1598/31 on engine control unit without protective housing

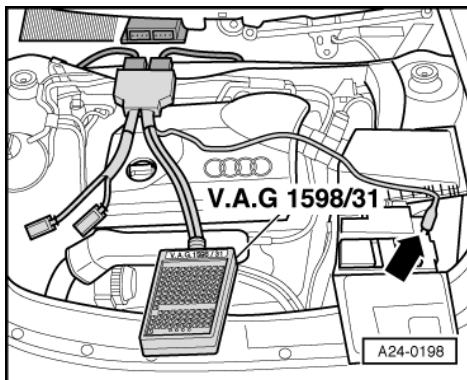
Notes:

- ♦ Test box V.A.G 1598/31 is designed so that it can be connected to the wiring harness for the engine control unit and to the engine control unit itself at the same time.
- ♦ This has the advantage of enabling the engine management system to remain fully operational even with the test box connected (for example, when testing signals while the engine is running).
- ♦ The instructions for performing the individual tests indicate whether or not the engine control unit itself also needs to be connected to the test box.
- ♦ Always use adapter set V.A.G 1594A to connect test equipment (e.g. voltage tester V.A.G 1527B, hand-held multimeter V.A.G 1526A etc.).



Special tools and workshop equipment required

- ♦ V.A.G 1598/31



Work sequence

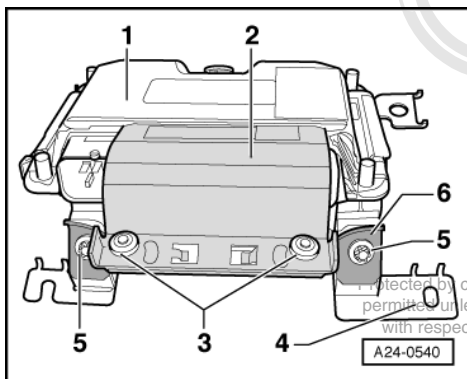
- Switch off ignition.
- Remove engine control unit without protective housing=>Page 23-57.
- -> Connect test box V.A.G 1598/31 to wiring harness connectors. Also connect the earth clamp on the test box (not shown in the illustration) to vehicle earth. The instructions for performing the individual tests indicate whether or not the engine control unit itself also needs to be connected to the test box.
- Carry out test as described in the repair instructions.

Note:

After reconnecting the engine control unit the following operations must be performed:

- Interrogate and if necessary erase the fault memory => Page 01-7.

1.13 - Wiring and component check with test box V.A.G 1598/31 on engine control unit with protective housing



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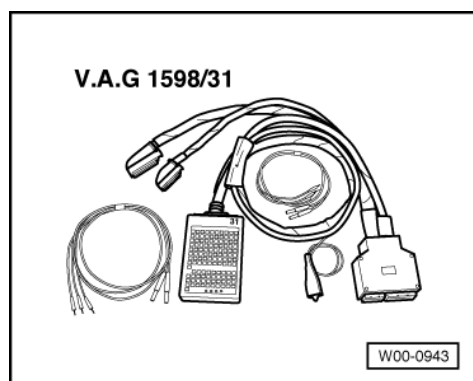
-> The engine control unit -1- is secured with a locking plate -2- and shear bolts -3- to a protective housing -4-.

The threads of the bolts are coated with a locking compound.

The engine control unit must be separated from the protective housing in order to detach the connectors from the control unit (for example, when connecting the test box or replacing the engine control unit).

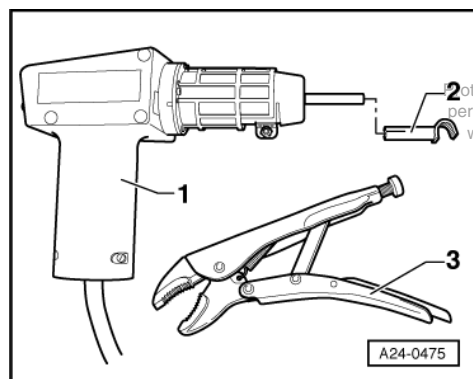
Notes:

- ♦ Test box V.A.G 1598/31 is designed so that it can be connected to the wiring harness for the engine control unit and to the engine control unit itself at the same time.
- ♦ This has the advantage of enabling the engine management system to remain fully operational even with the test box connected (for example, when testing signals while the engine is running).
- ♦ The instructions for performing the individual tests indicate whether or not the engine control unit itself also needs to be connected to the test box.
- ♦ Always use adapter set V.A.G 1594A to connect test equipment (e.g. voltage tester V.A.G 1527B, hand-held multimeter V.A.G 1526A etc.).

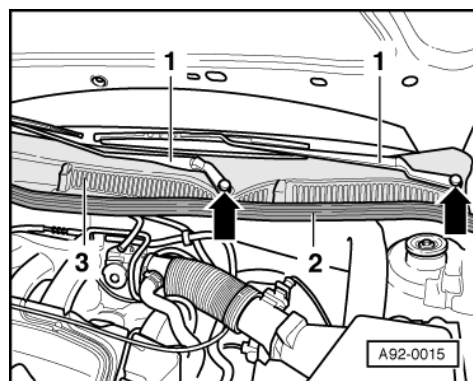


Special tools and workshop equipment required

- ♦ V.A.G 1598/31

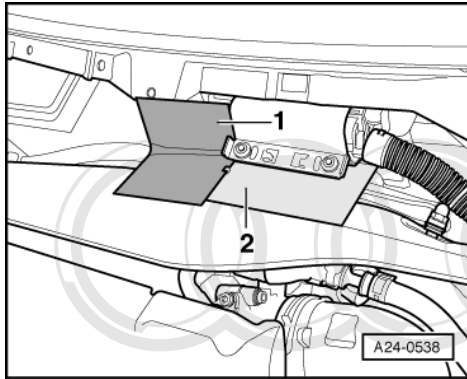


- 1 - Hot air blower (in wiring harness repair set VAS 1978)
- 2 - Shrink element for hot air blower (in wiring harness repair set VAS 1978)
- 3 - Vice grip wrench (commercial type)



Work sequence

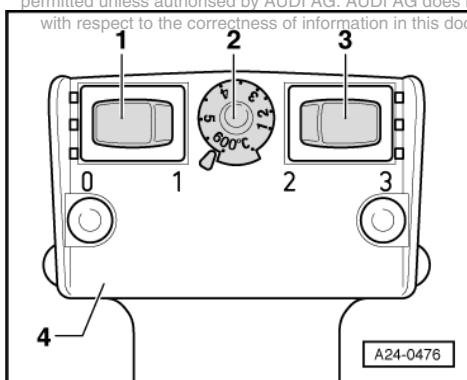
- Switch off ignition.
- Lever off cover caps (2x) on wiper arms with a screwdriver.
- -> Loosen hexagon nuts -arrows- several turns.
- Loosen wiper arms -1- by moving them around gently on the wiper shafts.
- Remove hexagon nuts completely and take off wiper arms.
- Remove rubber seal -2- from plenum chamber cover.
- Detach cover from plenum chamber -3- and move clear towards windscreen.



Caution

Keep exactly to the following procedure to avoid damage (burning) to the wiring, connectors, insulation or the control units. Follow the operating instructions supplied with the hot-air blower.

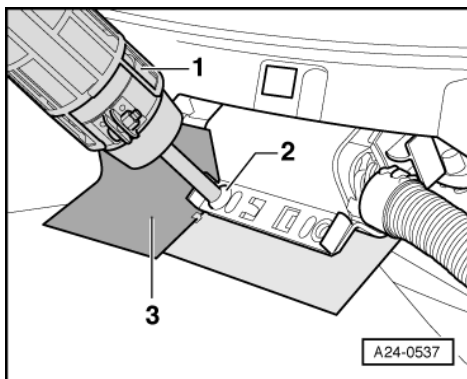
-> In order to avoid damaging wiring and connectors, you must fashion a shield -item 1 and 2- with sheet metal or similar. This is to prevent overheating of the connector housing and wiring harness.



- -> Set controls on hot-air blower as shown in illustration: temperature control -2- to maximum heat and two-stage air delivery switch -3- to setting 3.

Note:

Thereafter, heat the screw base on locking plate, in which the shear bolts are located. This step reduces the locking effect of the compound on the shear bolt threading, which enables easier removal of the bolts.





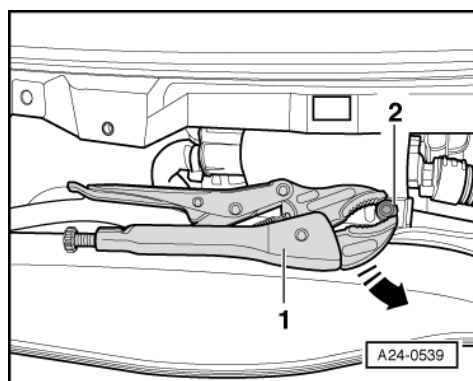
As a result of the warming process, the shear bolts and parts of the metal housing will also be very hot. Take care to avoid burns! If possible, heat only the thread base and not other nearby sensitive components - cover such parts if needed.

- -> Apply nozzle -1- of hot-air blower to bolt -2- on locking plate.

Note:

Be especially careful here, since control unit connectors are located in the immediate vicinity.

- Switch on the blower and apply heat to the thread for about 20 to 25 seconds.



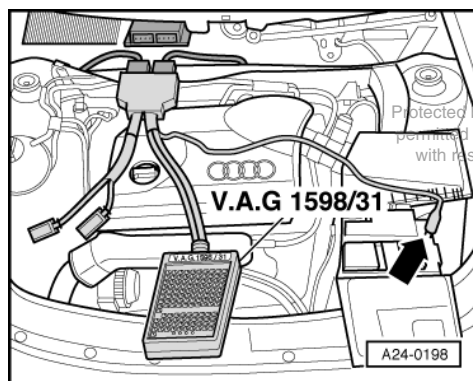
- -> Grip head of the shear bolts -2- with vice grip pliers -1- and turn anti-clockwise (direction of arrow). The pliers will have to be reapplied several times.

The procedure is the same for the second shear bolt.

Note:

Be especially care here, since engine control unit connectors are in the immediate vicinity.

- Release catches and unplug control unit connectors.



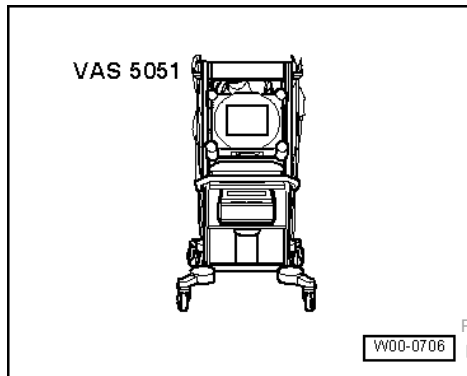
- -> Connect test box V.A.G 1598/31 to wiring harness connectors. Also connect the earth clamp on the test box (not shown in the illustration) to vehicle earth. The instructions for performing the individual tests indicate whether or not the engine control unit itself also needs to be connected to the test box.
- Carry out test as described in the repair instructions.

Note:

After reconnecting the engine control unit the following operations must be performed:

- Interrogate and if necessary erase the fault memory => Page 01-7.

1.14 - Renewing engine control unit without protective housing



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Special tools and workshop equipment required

- ♦ VAS 5051 and VAS 5051/1

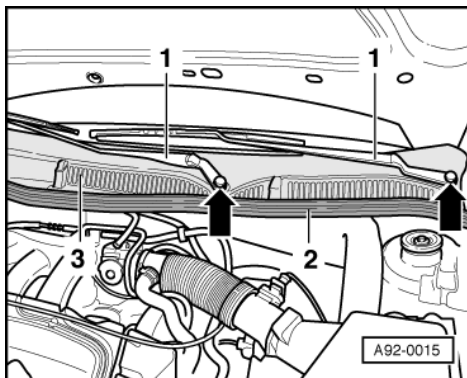


Removing

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

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

- Always start by calling up and printing out the control unit identification.
- Switch off ignition.



- Lever off cover caps (2x) on wiper arms with a screwdriver.
- -> Loosen hexagon nuts -arrows- several turns.
- Loosen wiper arms -1- by moving them around gently on the wiper shafts.
- Remove hexagon nuts completely and take off wiper arms.

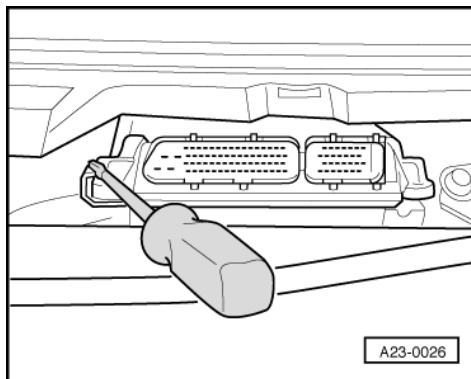


- Remove rubber seal -2- from plenum chamber cover.
- Detach cover from plenum chamber -3- and move clear towards windscreen.

Note:

Always make sure that the ignition is switched off before unplugging or fitting the connectors for the engine control unit.

- Release catches and unplug control unit connectors.



- -> Press back retainer on bracket using a screwdriver, then pull engine control unit towards the front of the vehicle to remove.

Installing

Install in reverse sequence; note the following points:

- Bend back retainer on bracket.

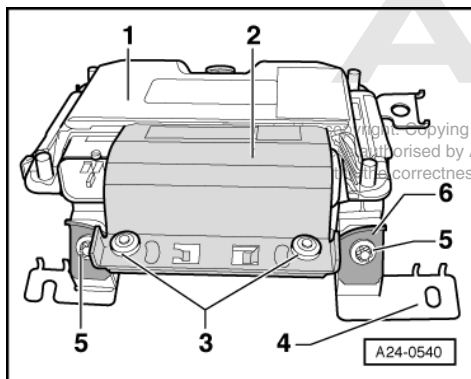
Note:

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

- Interrogate and if necessary erase the fault memory => Page 01-7.
- Check the notes on coding new engine control units => Page 01-83.
- On vehicles with cruise control (identifiable by controls on steering column), activate the cruise control via the engine control unit => Page 23-128.
- Perform adaption of immobilizer to engine control unit.

=> Electrical System; Repair Group 01; Self-diagnosis of electronic immobilizer; Adaptation procedure when engine control unit is replaced

1.15 - Renewing engine control unit with protective housing

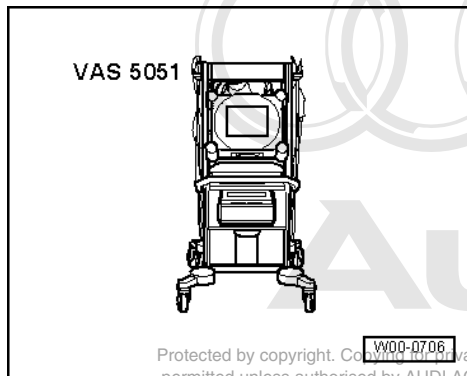


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-> The engine control unit -1- is secured with a locking plate -2- and shear bolts -3- to a protective housing -4-.

The threads of the bolts are coated with a locking compound.

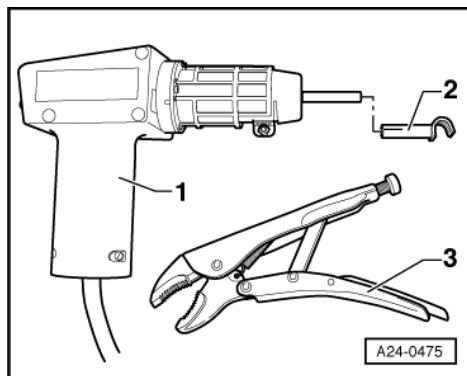
The engine control unit must be separated from the protective housing in order to detach the connectors from the control unit (for example, when connecting the test box or replacing the engine control unit).



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Special tools and workshop equipment required

- ♦ VAS 5051 and VAS 5051/1



- 1 - Hotair blower (in wiring harness repair set VAS 1978)
- 2 - Shrink element for hot air blower (in wiring harness repair set VAS 1978)
- 3 - Vice grip wrench (commercial type)



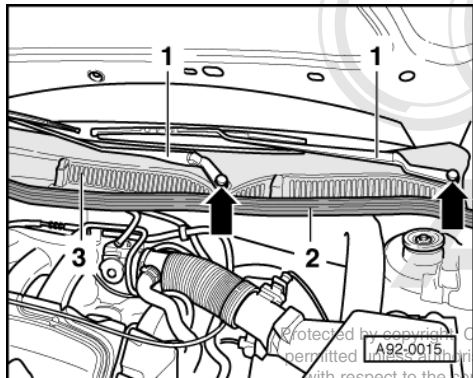
Removing

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

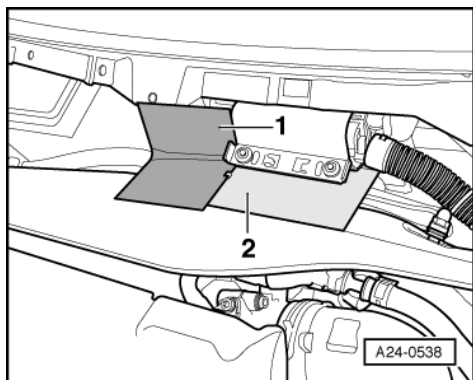


-> The display on vehicle diagnostic, test and information system VAS 5051 will show the control unit identification and the coding -2-.

- Always start by calling up and printing out the control unit identification.
- Switch off ignition.



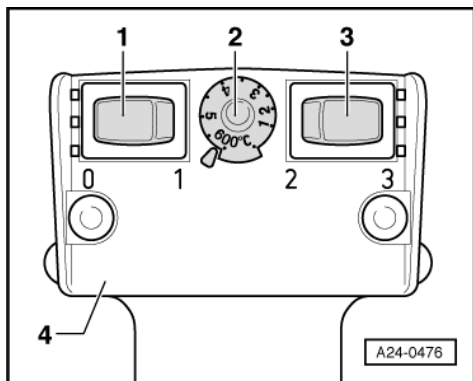
- Lever off cover caps (2x) on wiper arms with a screwdriver.
- -> Loosen hexagon nuts -arrows- several turns.
- Loosen wiper arms -1- by moving them around gently on the wiper shafts.
- Remove hexagon nuts completely and take off wiper arms.
- Remove rubber seal -2- from plenum chamber cover.
- Detach cover from plenum chamber -3- and move clear towards windscreen.



Caution

Keep exactly to the following procedure to avoid damage (burning) to the wiring, connectors, insulation or the control units. Follow the operating instructions supplied with the hot-air blower.

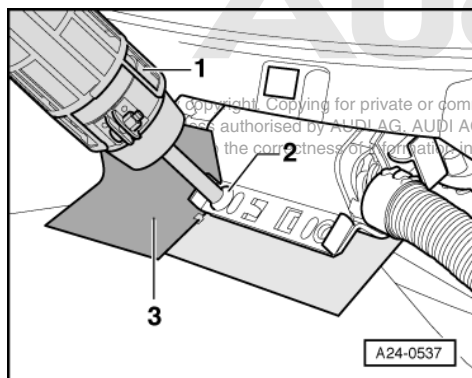
-> In order to avoid damaging wiring and connectors, you must fashion a shield -item 1 and 2- with sheet metal or similar. This is to prevent overheating of the connector housing and wiring harness.



- -> Set controls on hot-air blower as shown in illustration:
temperature control -2- to maximum heat and two-stage air delivery switch -3- to setting 3.

Note:

Thereafter, heat the screw base on locking plate, in which the shear bolts are located. This step reduces the locking effect of the compound on the shear bolt threading, which enables easier removal of the bolts.



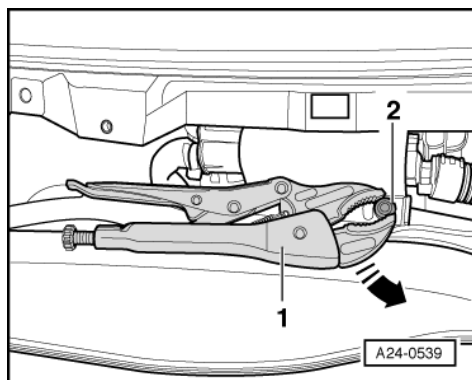
As a result of the warming process, the shear bolts and parts of the metal housing will also be very hot. Take care to avoid burns! If possible, heat only the thread base and not other nearby sensitive components - cover such parts if needed.

- -> Apply nozzle -1- of hot-air blower to bolt -2- on locking plate.

Note:

Be especially careful here, since control unit connectors are located in the immediate vicinity.

- Switch on the blower and apply heat to the thread for about 20 to 25 seconds.



- -> Grip head of the shear bolts -2- with vice grip pliers -1- and turn anti-clockwise (direction of arrow). The pliers will have to be reapplied several times.

The procedure is the same for the second shear bolt.

Note:

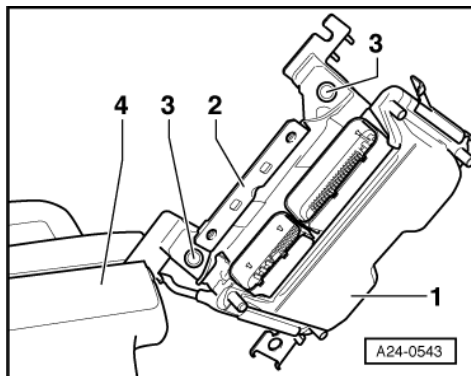
Be especially careful here, since control unit connectors are located in the immediate vicinity.

- Release catches and unplug control unit connectors.
- Remove windscreen wiper system



=> Electrical system; Repair group 92; Windscreen wiper system; Removing and installing windscreen wiper system
system Windscreen wiper system Removing and installing windscreen wiper system

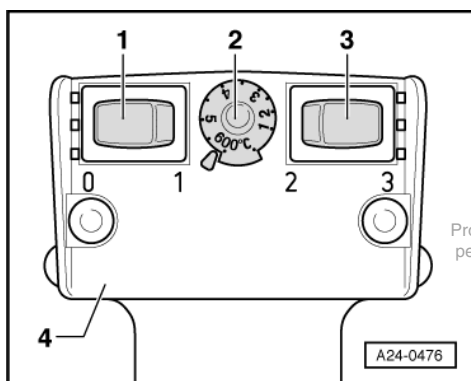
- Remove engine control unit with protective housing from bracket on body.



The control unit must not be pulled over the locking plate - this can place the control unit under tension and cause damage!

-> The locking plate -2- must only be unscrewed from mounting bracket after the whole unit is removed. The control unit can be only pulled out after the shear bolts -3- have been unscrewed from the locking plate!

- Clamp the control unit -1- in a vice -4-, as shown in illustration.



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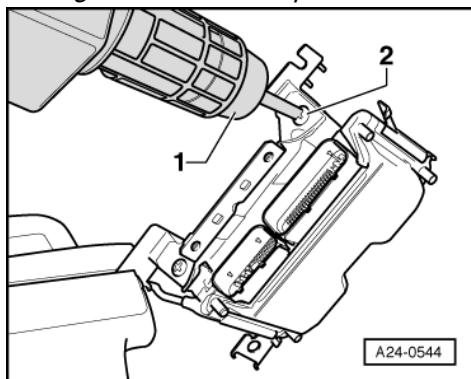
Caution

Keep exactly to the following procedure to avoid damage (burning) to the wiring, connectors, insulation or the control units. Follow the operating instructions supplied with the hot-air blower.

- -> Set controls on hot-air blower as shown in illustration:
temperature control -2- to maximum heat and two-stage air delivery switch -3- to setting 3.

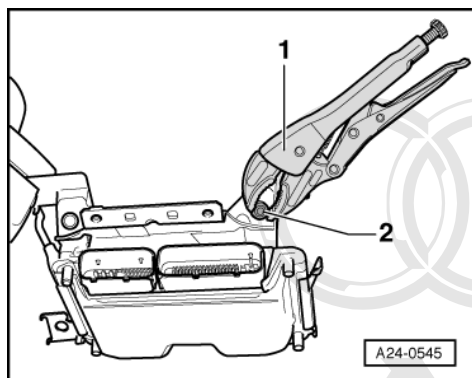
Note:

Thereafter, heat the screw base on locking plate, in which the shear bolts are located. This step reduces the locking effect of the compound on the shear bolt threading, which enables easier removal of the bolts.



As a result of the warming process, the shear bolts and parts of the metal housing will also be very hot. Take care to avoid burns! If possible, heat only the thread base and not other nearby sensitive components - cover such parts if needed.

- -> Apply nozzle -1- of hot-air blower to bolt -2- on locking plate.
- Switch on the blower and apply heat to the thread for about 20 to 25 seconds.



- -> Grip head of the shear bolts -2- with vice grip pliers -1- and turn anti-clockwise (direction of arrow). The pliers will have to be reapplied several times.

The procedure is the same for the second shear bolt.

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The engine control unit can now be removed from the metal housing.

Installing

Installation is performed in the reverse sequence; the engine control unit is placed back into protective housing and new shear bolts are to be used.

- Bend back retainer on bracket.

Note:

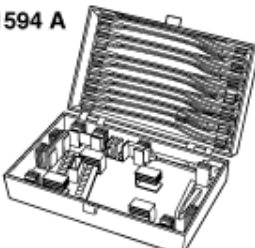
After installing the new engine control unit the following operations must be performed:

- Interrogate and if necessary erase the fault memory => Page 01-7.
- Check the notes on coding new engine control units=>Page 01-83.
- On vehicles with cruise control (identifiable by controls on steering column), activate the cruise control via the engine control unit => Page 23-128.
- Perform adaption of immobilizer to engine control unit.

=> Electrical System; Repair Group 01; Self-diagnosis of electronic immobilizer; Adaptation procedure when engine control unit is replaced Self-diagnosis of electronic immobilizer Adaptation procedure when engine control unit is replaced



1.16 - Testing voltage supply for diesel direct injection system

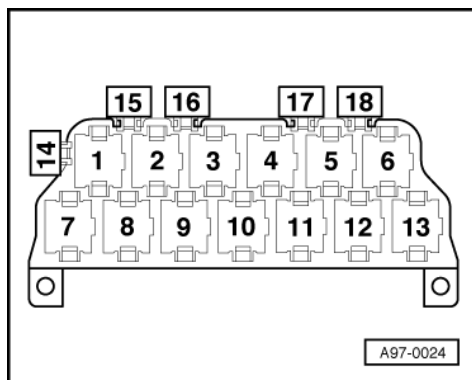
V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598/31 	
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Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/31

With the ignition switched on, the injection system receives its voltage supply via diesel direct injection system relay -J322.

In order for relay -J322 to close, a voltage must be applied to the diesel direct injection system control unit via terminal 15. This means that relay -J322 is only earthed (via the diesel direct injection system control unit) if a voltage is applied to the control unit via terminal 15.



Note:

-> Fitting location for diesel direct injection relay -J322: in 13-slot relay carrier at left under dash panel, plug-in position 12.

Test requirement:

- Battery voltage not less than 12.7 V
- Fuses for engine electronics OK.

=> Current flow diagrams, Electrical fault finding and Fitting locations binder

Test sequence

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
 - Connecting test box to engine control unit without protective housing=>Page 23-49.
 - Connecting test box to engine control unit with protective housing=>Page 23-51.
- Remove storage compartment on driver's side.

=> General body repairs, Interior; Repair group 68; Storage compartments, covers; Removing driver's storage compartment Storage compartments, covers Removing driver's storage compartment

Testing earth supply

- Connect multimeter (voltage measurement range) as follows:

Test box V.A.G 1598/31 Socket	Measure against
4	Battery positive
5	Battery positive

- Specification: approx. battery voltage

If the specifications are not obtained:

- Check wiring connections according to current flow diagram.

Checking voltage supply (terminal 15)

- Connect multimeter (voltage measurement range) as follows:

Test box V.A.G 1598/31 Socket	Measure against
37	Engine earth

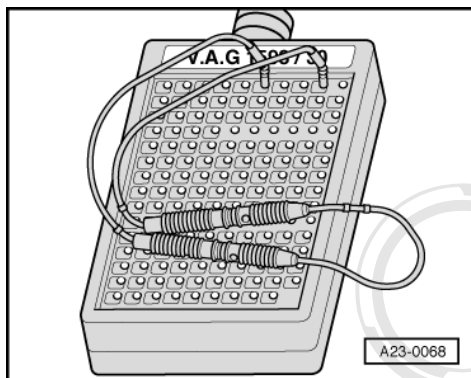
- Switch on ignition.



- Specification: approx. battery voltage

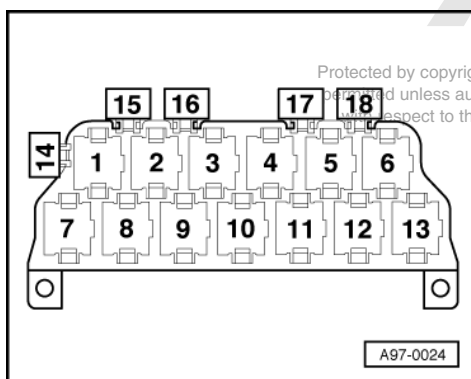
If the specification is not attained:

- Test wiring for open circuits and rectify if necessary.



Testing voltage supply (terminal 30)

- -> Connect sockets 4 and 18 of test box to each other using auxiliary cable from V.A.G 1594 A.



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- -> The relay -J322 (in 13-slot relay carrier at left under dash panel, plug-in position 12) should pick up audibly and perceptibly

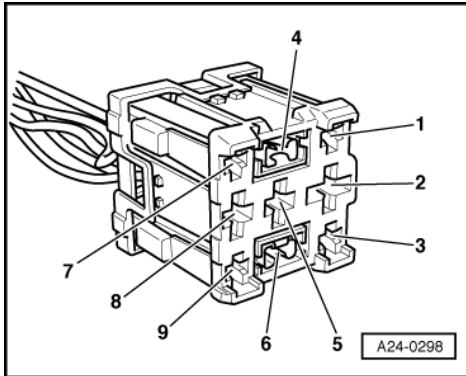
If the relay does not pick up:

- Check relay -J322 => Page 23-74.

If the relay picks up

- Connect multimeter (voltage measurement range) as follows:

Test box V.A.G 1598/31 Socket	Specification
1 + 5	approx. battery voltage
2 + 5	approx. battery voltage

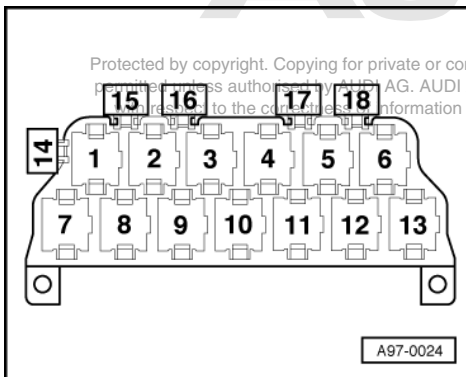


- -> Test the following wiring connections for open circuits:

13-slot relay carrier at left under dash panel, plug-in position 12 Contact	Test box V.A.G 1598/31 Socket
6	1
6	2

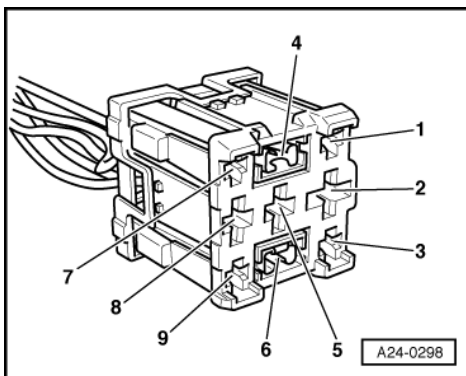
If no fault is detected in the wiring:

Testing diesel direct injection system relay -J322



Requirements for test:

- Earth connection and voltage connection of engine control unit okay
 - Engine control unit connected.
 - Relay clicks when ignition is switched on.
- -> Unplug relay -J322 in 13-slot relay carrier at left under dash panel, plug-in position 12.

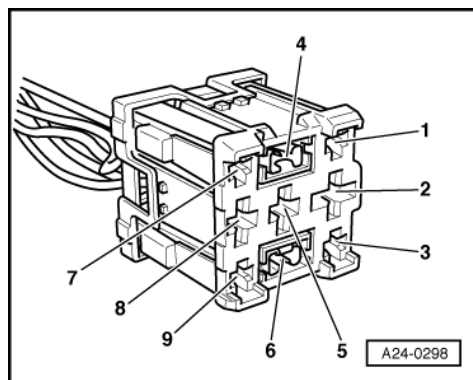




- -> Connect multimeter (voltage measurement range) as follows:

13-slot relay carrier at left under dash panel, plug-in position 12 Contact	Measure against
2	Engine earth

- Specification: approx. battery voltage



If the specification is not attained:

- -> Test for open circuit and short to positive or earth in the following wiring connections:

13-slot relay carrier at left under dash panel, plug-in position 12 Contact	Test box V.A.G 1598/31 Socket
9	18

If no wiring fault is detected:

- Replace engine control unit
 - Removing and installing engine control unit without protective housing=>Page 23-57.
 - Removing and installing engine control unit with protective housing=>Page 23-60.

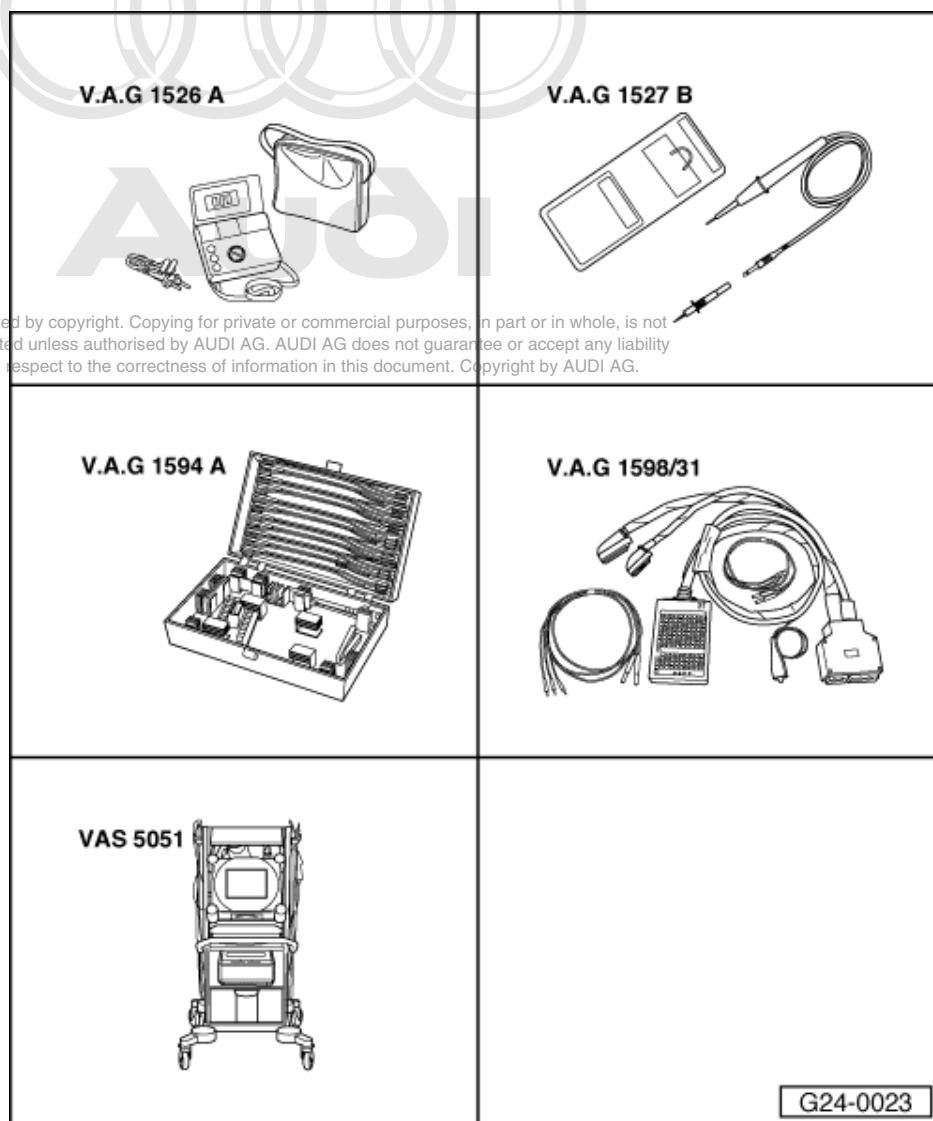
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If no wiring fault is detected and no voltage was present between contacts 1+2:

- Renew relay -J322.

2 - Testing control unit input values

2.1 - Testing control unit input values



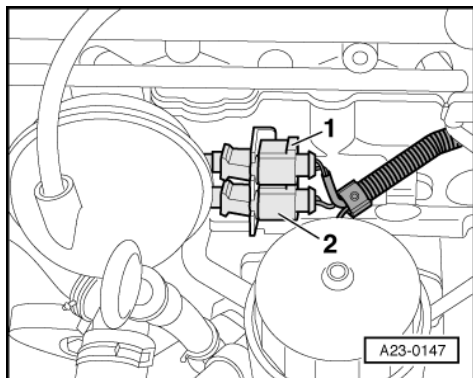
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Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1527 B
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/31
- ♦ VAS 5051 with VAS 5051/1

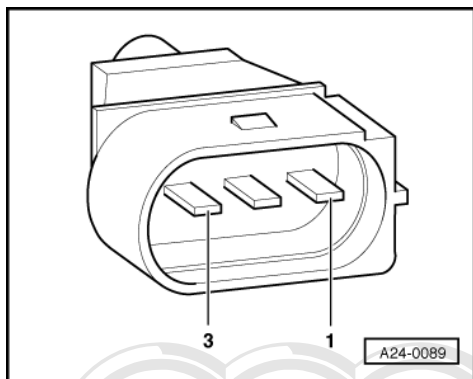
2.2 - Testing engine speed sender -G28

The engine speed sender is speed and reference mark sender. A failure stops the engine.



Testing internal resistance

- Switch off ignition.
- -> Disconnect grey connector to engine speed sender -2-.



- -> Connect multimeter (resistance measurement range) between contacts 1 and 2.
- Specification: 450 ... 550 Ω

If the specification is not obtained:

- Fit a new engine speed sender.

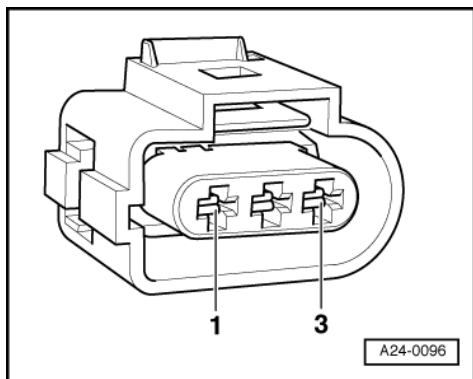
If the specification is obtained:

Checking wiring connections

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself:

- Connecting test box to engine control unit without protective housing=>Page 23-49.

- Connecting test box to engine control unit with protective housing=>Page 23-51.



- -> Test for open circuit and short to positive or earth in the following wiring connections:

Connector Contact	Test box V.A.G 1598/31 Socket
1 (Signal)	110
2 (Earth)	102
3 (Screening)	102

- Test all wires for short circuits with each other.

If no fault is detected in the wiring:

- Replace engine control unit

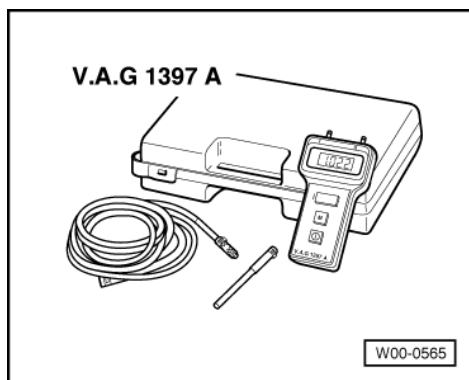
- Removing and installing engine control unit without protective housing=>Page 23-57.

- Removing and installing engine control unit with protective housing=>Page 23-60.

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2.3 - Testing intake manifold pressure sender -G71 and altitude sender -F96

The altitude sender is located in the diesel direct injection system control unit. The intake manifold pressure sender is a separate component and is located together with the intake manifold temperature sender in a housing in the charge air cooler.

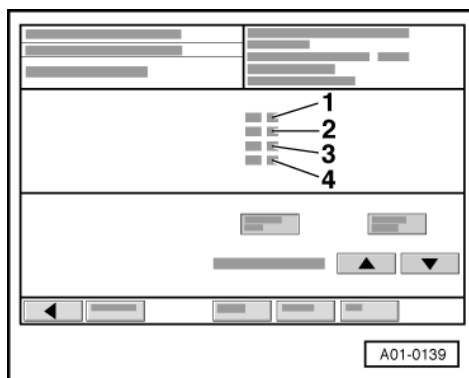


Special tools and workshop equipment required

- ♦ Turbocharger tester V.A.G 1397 A

Note:

The turbocharger test unit is required to provide an independent figure for comparison. The turbocharger test unit must be set to measuring range I (absolute pressure). A barometer can be used instead.





Test sequence

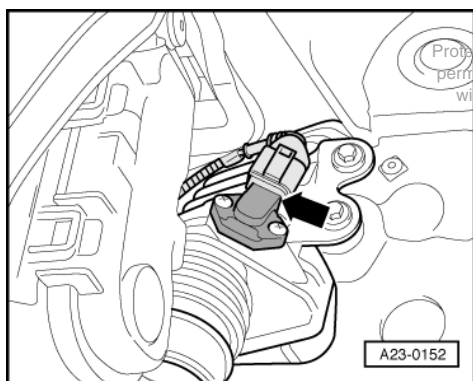
- Read data block, Display group 010, engine not running=>Page01-127.
- Observe the readouts in display zone 2 (altitude sender -F96) and display zone 3 (intake manifold pressure sender -G71).
 - Specification: The pressures should be the same.
 - Tolerance: ± 30 mbar

If the value in display zone 2 deviates:

- Replace engine control unit
 - Removing and installing engine control unit without protective housing=>Page 23-57.
 - Removing and installing engine control unit with protective housing=>Page 23-60.

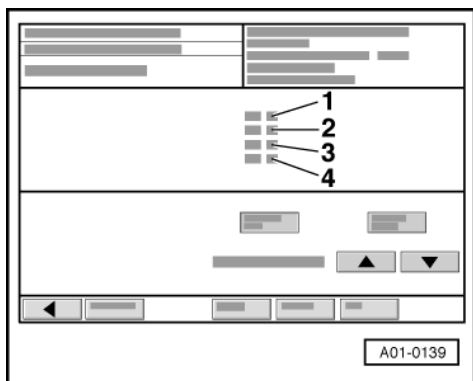
If the value in display zone 3 deviates:

- Remove windscreen washer reservoir and set aside.
- Start engine and run at idling speed.



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- -> Unplug connector at intake manifold pressure sender -G71 (in charge air cooler) -arrow-.



- Read measured value block, Display Group 010, engine running at idling speed=>Page01-127.

-> Display on VAS 5051:

- Observe figures in display zone 3 (intake manifold pressure sender -G71).
 - Specification: displayed reading should decrease continuously until it equals value of altitude sender (display zone 2)
- Press the ◀ button to exit from the function "08 - Read data block".
- Select diagnosis function "06 - End output".
- Switch off ignition.

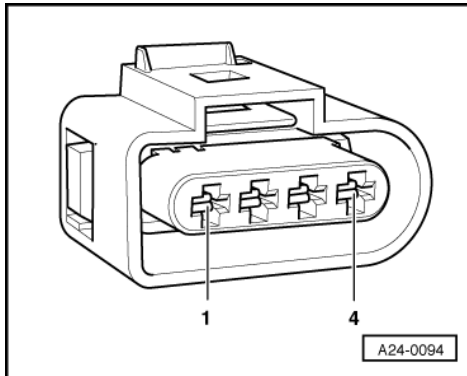
If the specification is obtained:

- Renew intake manifold pressure sender with intake manifold temperature sender.

If the specification is not obtained:

Checking wiring connections

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
 - Connecting test box to engine control unit without protective housing=>Page 23-49.
 - Connecting test box to engine control unit with protective housing=>Page 23-51.



- -> Test for open circuit and short to positive or earth in the following wiring connections:

Connector Contact	Test box V.A.G 1598/31 Socket
1	52
3	31
4	71

- Rectify any open/short circuit as necessary.

If no fault is found:

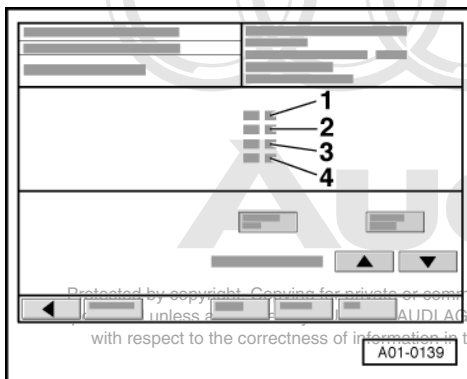
- Replace engine control unit
 - Removing and installing engine control unit without protective housing=>Page 23-57.
 - Removing and installing engine control unit with protective housing=>Page 23-60.

2.4 - Testing coolant temperature sender -G62

Fitting location => Fitting locations overview, Page 23-4

Test requirement:

- Engine cold



**Test sequence**

- Read data block, Display group 007, engine cold and running at idling speed=>Page 01-131

-> Display on VAS 5051:

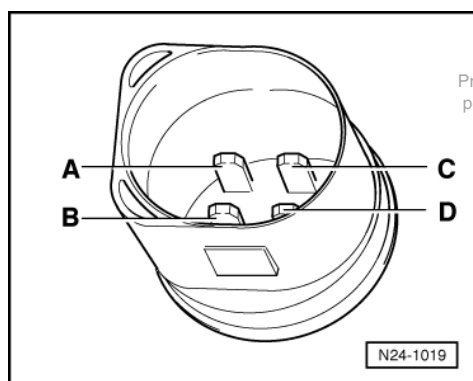
- Check readout in display zone -4-.
 - Specification: The temperature value should increase steadily.

Note:

In case of a fault, the fuel temperature will be displayed.

If the fuel temperature display is defective as well, a constant temperature of -5.4°C will be displayed.

- Press the ◀ button to exit from the function "08 - Read data block".
- Select diagnosis function "06 - End output".
- Switch off ignition.

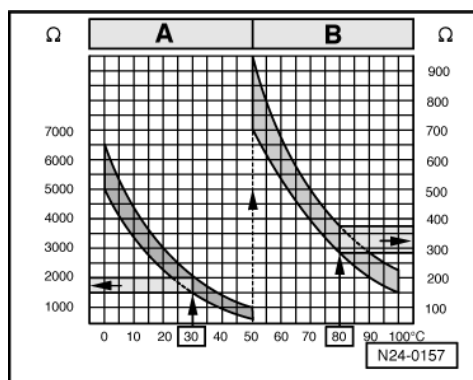


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If an implausible value is displayed in display zone 4:

Testing internal resistance

- Unplug 4 pin connector from coolant temperature sender G62.
- -> Connect multimeter (resistance test range) between contacts C and D on the sender.



Scale A shows resistance values for temperature range 0...50 °C and scale B the values for temperature range 50...100 °C.

-> Examples:

- ♦ 30 °C corresponds to a resistance from 1500...2000 Ω

- ♦ 80 °C corresponds to a resistance from 275...375 ω

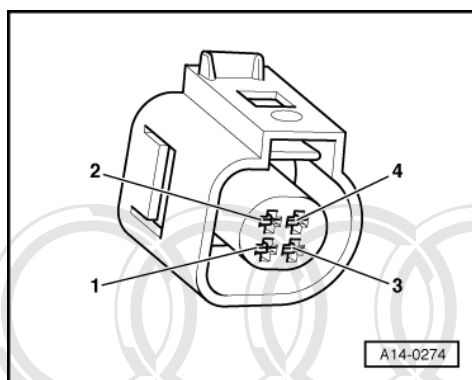
If the specification is not attained:

- Fit a new coolant temperature sender.

If the specification is obtained:

Checking wiring connections

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself:
 - Connecting test box to engine control unit without protective housing=>Page 23-49.
 - Connecting test box to engine control unit with protective housing=>Page 23-51.



- -> Test for open circuit and short to positive or earth in the following wiring connections:

Connector Contact	Test box V.A.G 1598/31 Socket
3	112
4	104

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- Test for short circuits between the two wires.

Rectify any open/short circuit as necessary.

If no fault is found:

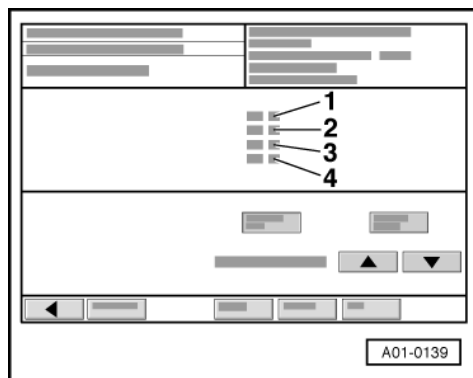
- Replace engine control unit
 - Removing and installing engine control unit without protective housing=>Page 23-57.
 - Removing and installing engine control unit with protective housing=>Page 23-60.

2.5 - Checking brake light switch -F and brake pedal switch -F47

Note:

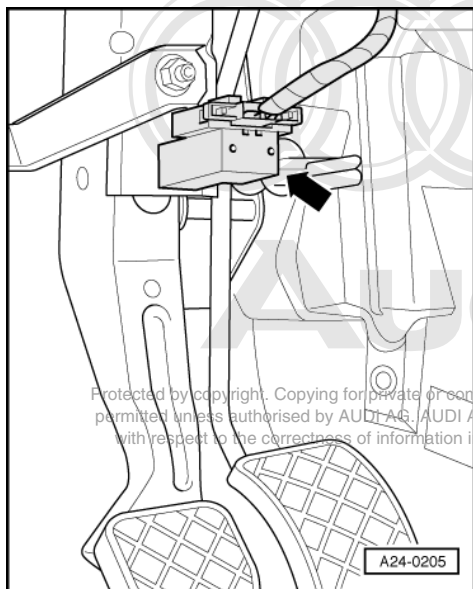
For safety reasons, the signal from the accelerator position sender (potentiometer) instructing the engine control unit to increase the engine speed is suppressed whenever the brake is operated. The engine control unit therefore needs the brake light switch signal and also the brake pedal switch signal.

If the brake is operated while the accelerator is held down at a constant position, the engine is immediately governed down to idling speed. A defective switch can cause the engine to be throttled back when this is not desired.



Test sequence

- Read data block, Display group 006
=> Page 01-86.
- > Display on VAS 5051:
 - Check display in display zone -2-.
 - Specification: 0 0 0
 - Slowly depress brake pedal.
 - Specification: 0 1 1
The two display values should change from 0 to 1.
 - Allow brake pedal to return slowly to its normal position.
 - Specification: 0 0 0
The two display values should change back from 1 to 0.
 - Press the ◀ button to exit from the function "08 - Read data block".
 - Select diagnosis function "06 - End output".
 - Switch off ignition.



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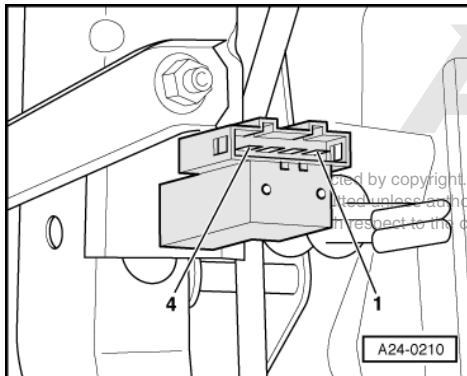
If the display values do not appear as described:

Testing switches

- Remove storage compartment (shelf) on driver's side.

=> General body repairs, Interior; Repair group 68; Storage compartments, covers; Removing driver's storage compartment Storage compartments, covers Removing driver's storage compartment

- -> Unplug connector from brake light switch / brake pedal switch -arrow-.



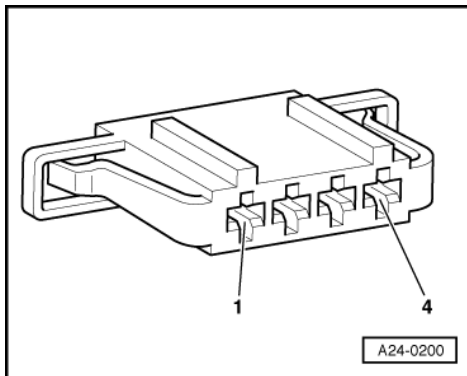
- -> Connect multimeter (resistance measurement range) between contacts 1 and 4.
 - Specification: $\infty \omega$ (no continuity)
- Depress the brake pedal.
 - Specification: approx. 0ω
- Connect multimeter (resistance measurement range) between contacts 2 and 3.
 - Specification: approx. 0ω
- Depress the brake pedal.
 - Specification: $\infty \omega$ (no continuity)

If the specifications are not obtained:

- Renew brake light switch / brake pedal switch.

If the specifications are obtained:

- Check voltage supply.



Checking voltage supply

- -> Connect voltage tester V.A.G 1527 B as follows:

Connector Contact	Measure against
1	Body earth

- The LED should light up.

Connector Contact	Measure against
-------------------	-----------------



2	Body earth
---	------------

- Switch on ignition.
 - The LED should light up.
- Switch off ignition.

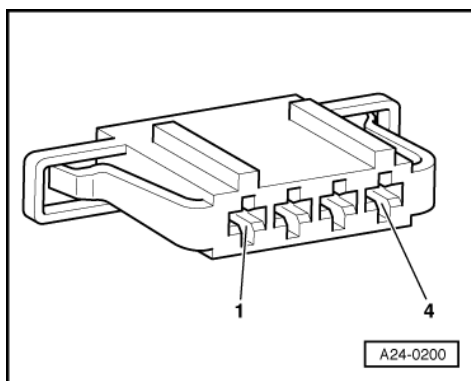
If the LED does not light up:

- Test wiring for open circuits and rectify if necessary.

If the LED lights up:

Checking wiring connections

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself:
 - Connecting test box to engine control unit without protective housing=>Page 23-49.
 - Connecting test box to engine control unit with protective housing=>Page 23-51.



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- -> Test for open circuit and short to positive or earth in the following wiring connections:

Connector Contact	Test box V.A.G 1598/31 Socket
3	65
4	32

- Rectify short circuit or open circuit if necessary.

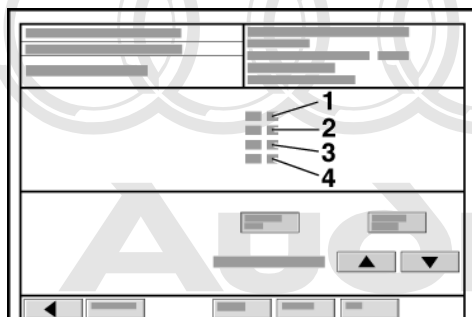
If no fault is found:

- Replace engine control unit
 - Removing and installing engine control unit without protective housing=>Page 23-57.
 - Removing and installing engine control unit with protective housing=>Page 23-60.

2.6 - Testing clutch pedal switch -F36

Note:

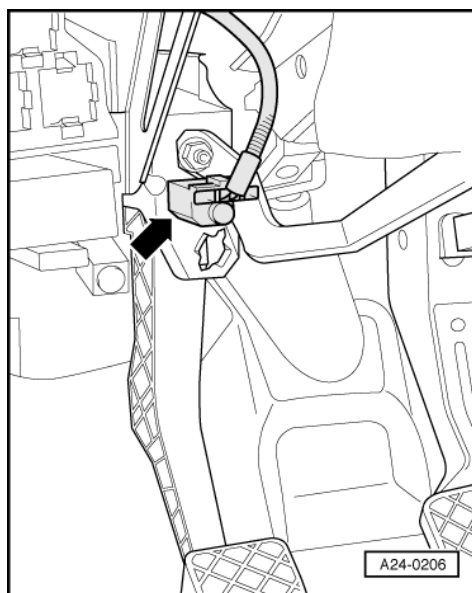
This signal is used to avoid over-revving and load change jolts when disengaging the clutch. It is also needed for the cruise control system.



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Test sequence

- Read data block, Display group 006
=> Page 01-86.
- > Display on VAS 5051:
 - Check display in display zone -2-.
 - Specification: 0 0 0
 - Depress clutch pedal.
 - Specification: 1 0 0
 - Press the ◀ button to exit from the function "08 - Read data block".
 - Select diagnosis function "06 - End output".
 - Switch off ignition.



If the specifications are not obtained:

Testing switches

- Remove storage compartment (shelf) on driver's side.

=> General body repairs, Interior; Repair group 68; Storage compartments, covers; Removing driver's storage compartment Storage compartments, covers Removing driver's storage compartment

- -> Unplug connector from clutch pedal switch -arrow-.



Switch with 2-pin connector:

- Connect multimeter (resistance measurement range) between contacts 1 and 2.

Switch with 4-pin connector:

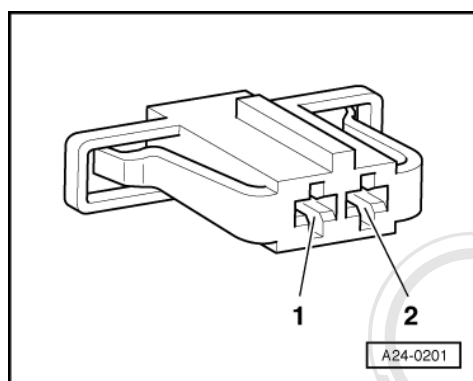
- Connect multimeter (resistance measurement range) between contacts 2 and 3.

All models

- Specification: approx. 0 ω
Depress the clutch pedal.
- Specification: ∞ ω (no continuity)

If the specifications are not obtained:

- Renew clutch pedal switch.



If the specifications are obtained:

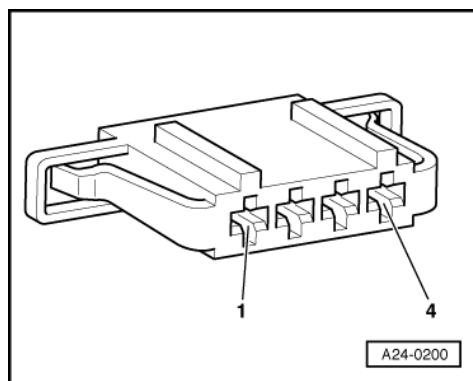
Testing voltage supply

- Connect voltage tester V.A.G 1527 B as follows:

-> Switch with 2-pin connector:

Connector Contact	Measure against
1	Body earth

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-> Switch with 4-pin connector:

Connector Contact	Measure against
2	Body earth

All models

- Switch on ignition.
- The LED should light up.
- Switch off ignition.

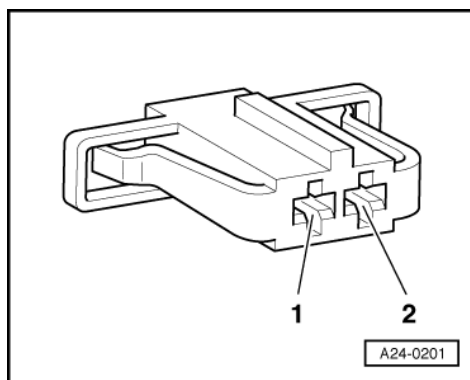
If the LED does not light up:

- Test wiring for open circuits and rectify if necessary.

If the LED lights up:

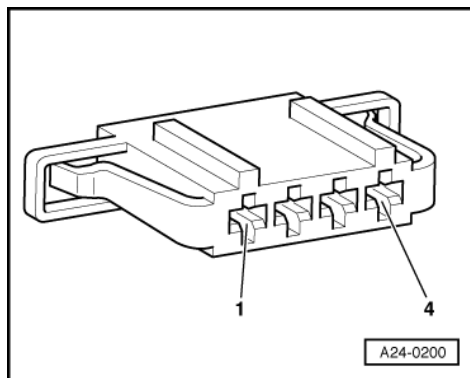
Testing wiring

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- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself:
 - Connecting test box to engine control unit without protective housing=>Page 23-49.
 - Connecting test box to engine control unit with protective housing=>Page 23-51.
 - Test for open circuit and short to positive or earth in the following wiring connection:



-> Switch with 2-pin connector:

Connector Contact	Test box V.A.G 1598/31 Socket
2	66





-> Switch with 4-pin connector:

Connector Contact	Test box V.A.G 1598/31 Socket
3	66

All models

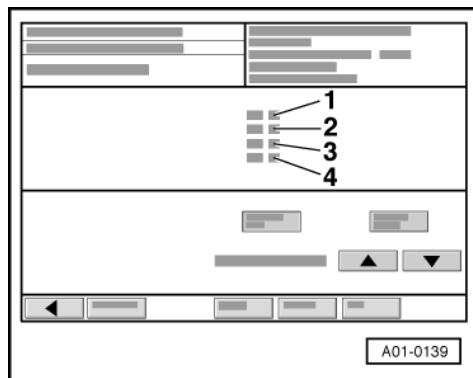
- Rectify short circuit or open circuit if necessary.

If no fault is found:

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- Replace engine control unit
 - Removing and installing engine control unit without protective housing=>Page 23-57.
 - Removing and installing engine control unit with protective housing=>Page 23-60.

2.7 - Checking intake manifold temperature sender -G72

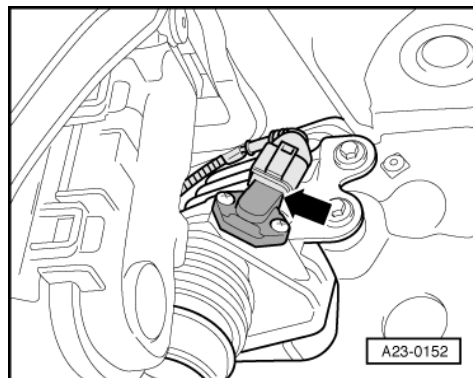


Test sequence

- Read data block, Display group 007, engine cold and not running=>Page 01-131

-> Display on VAS 5051:

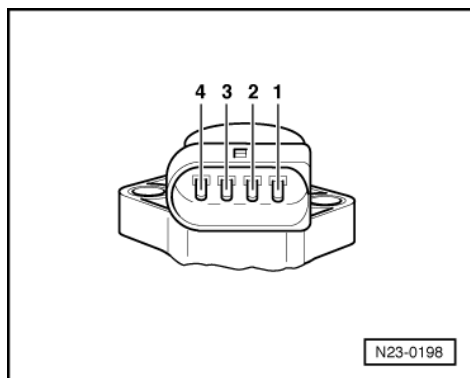
- Check readouts in display zones -1-, -3- and -4-.
 - Specification: All temperature values approx. the same
- Press the ◀ button to exit from the function "08 - Read data block".
- Select diagnosis function "06 - End output".
- Switch off ignition.



If an implausible value is displayed in display zone 3 (substitute value if fault occurs: 135.9 °C):

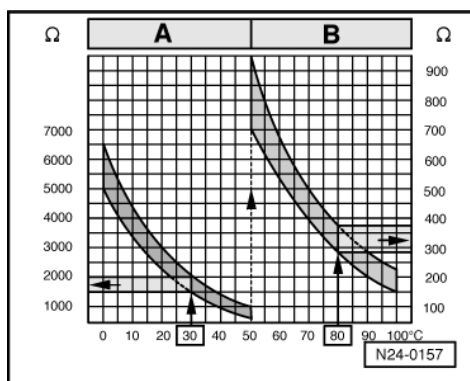
Testing internal resistance

- Remove windscreen washer fluid reservoir.
- -> Unplug connector at intake manifold temperature sender -G72 (in charge air cooler) -arrow-.



- -> Connect multimeter between contacts 1 and 2 of sender (resistance measurement range).

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Scale A shows resistance values for temperature range 0...50 °C and scale B the values for temperature range 50...100 °C.

-> Examples:

- ♦ 30 °C corresponds to a resistance from 1500...2000 Ω
- ♦ 80 °C corresponds to a resistance from 275...375 Ω

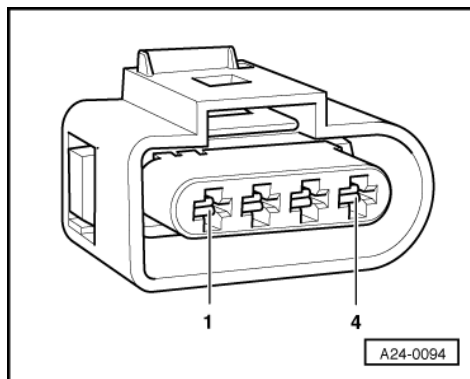
If the specification is not obtained:

- Renew intake manifold pressure sender with intake manifold temperature sender.

If the specification is obtained:

Checking wiring connections

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself:
 - Connecting test box to engine control unit without protective housing=>Page 23-49.
 - Connecting test box to engine control unit with protective housing=>Page 23-51.





- -> Test for open circuit and short to positive or earth in the following wiring connections:

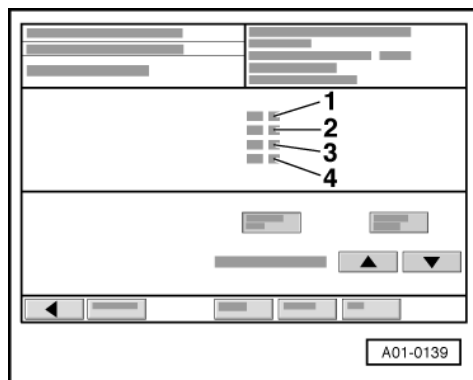
Connector Contact	Test box V.A.G 1598/31 Socket
1	52
2	73

- Test all wires for short circuits with each other.
- Rectify any open/short circuit as necessary.

If no fault is found:

- Replace engine control unit
 - Removing and installing engine control unit without protective housing=>Page 23-57.
 - Removing and installing engine control unit with protective housing=>Page 23-60.

2.8 - Testing fuel temperature sender -G81



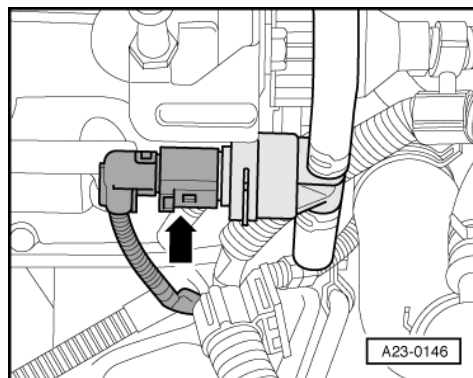
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Test sequence

- Read data block, Display group 007, engine cold and not running=>Page01-131.

-> Display on VAS 5051:

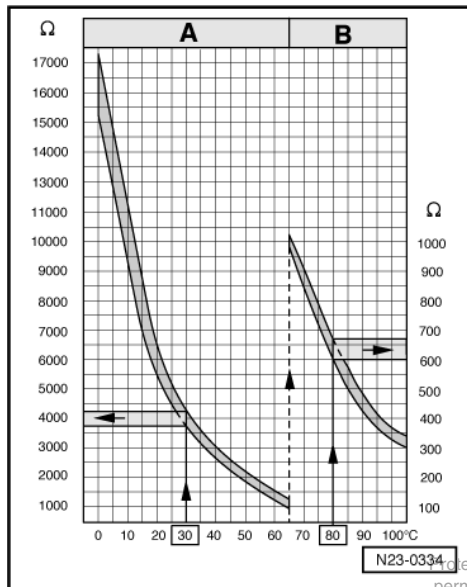
- Check readouts in display zones -1-, -3- and -4-.
 - Specification: All temperature values approx. the same
- Press the ◀ button to exit from the function "08 - Read data block".
- Select diagnosis function "06 - End output".
- Switch off ignition.



If an implausible value is displayed in display zone 1 (substitute value if fault has occurred: 40.5 °C):

Testing internal resistance

- -> Unplug connector at fuel temperature sender -G81 -arrow-.
- Connect multimeter to sender (resistance measurement range).



Scale A shows resistance values for temperature range 0...65 °C and scale B the values for temperature range 65...100 °C.

-> Examples:

- ◆ 30 °C corresponds to a resistance from 3790...4270 Ω
- ◆ 80 °C corresponds to a resistance from 600...660 Ω

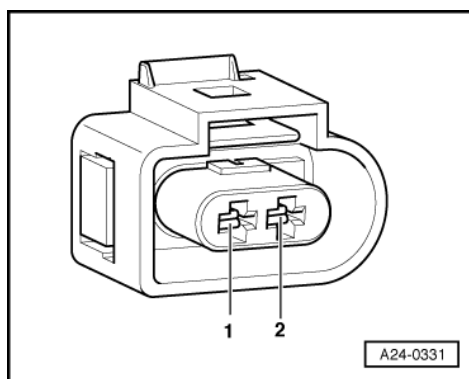
If the specification is not obtained:

- Renew fuel temperature sender.

If the specification is obtained:

Checking wiring connections

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself:
 - Connecting test box to engine control unit without protective housing=>Page 23-49.
 - Connecting test box to engine control unit with protective housing=>Page 23-51.



- -> Test for open circuit and short to positive or earth in the following wiring connections:



Connector Contact	Test box V.A.G 1598/31 Socket
1	103
2	111

- Rectify any open/short circuit as necessary.

If no fault is found:

- Replace engine control unit
 - Removing and installing engine control unit without protective housing=>Page 23-57.
 - Removing and installing engine control unit with protective housing=>Page 23-60.

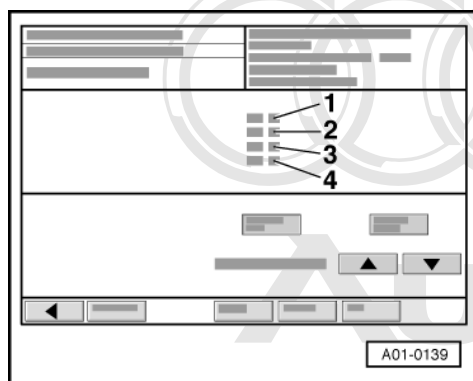
2.9 - Testing air mass meter -G70

The air mass meter signal is used by the control unit to calculate the quantity injected and to control the required exhaust gas recirculation. The smaller the signal from air mass meter the smaller the quantity of fuel injected.

Test sequence

Warning

Observe safety precautions => Page 01-1.



- Read data block, Display group 010, engine idling=>Page01-127

-> Display on VAS 5051:

- Check display in display zone -1-.
 - Specification for 74 kW engine: 200 ... 370 mg/stroke
 - Specification for 96 kW engine: 210 ... 350 mg/stroke

If the specification is not obtained:

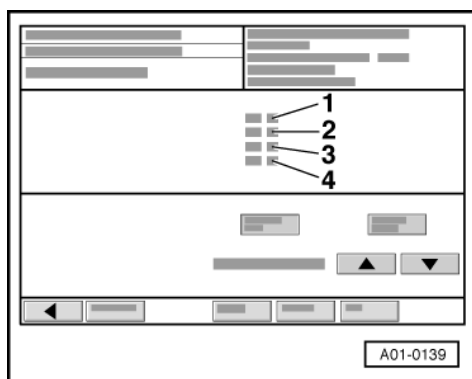
- Check exhaust gas recirculation:

=> 4-Cyl. TDI engine, Mechanics; Repair group 26; Exhaust gas recirculation system Exhaust gas recirculation system

If the specification is obtained:

- Accelerate from 2000 rpm at full throttle (without kick-down) in third gear (or with selector lever at position 2), and watch rev counter.

- Press PRINT key on V.A.G 1551 at approx. 3000 rpm. The accelerator pedal must be fully depressed at this moment in time.



-> Display on VAS 5051:

- Check readout in display zone -4-.
 - Specification: 100 % (accelerator position)
- Repeat test and accelerate vehicle at full throttle.
- Check display in display zone -1-.
 - Specification for 74 kW engine: > 800 mg/stroke (intake air mass)
 - Specification for 96 kW engine: > 900 mg/stroke (intake air mass)
- Press the ◀ button to exit from the function "08 - Read data block".
- Select diagnosis function "06 - End output".
- Switch off ignition.

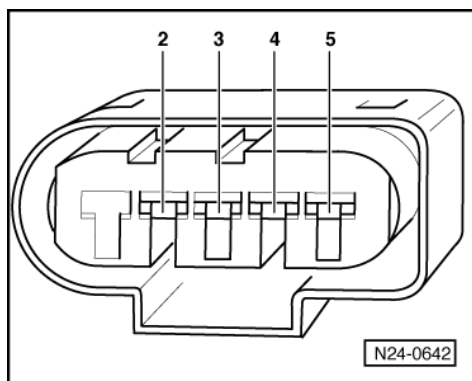
If the specification is not obtained:

Fit a new air mass meter -G70.

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If a constant 539 mg/H (predetermined substitute value) is displayed in display zone 1.

- Check voltage supply.



Checking voltage supply

- Unplug connector for air mass meter -G70
 - =>Fitting locations overview, Page23-7, Item 14.
- -> Connect multimeter (voltage measurement range) as follows:
- Switch on ignition.

Connector Contact	Specification
2 + earth	approx. battery voltage
2 + 3	approx. battery voltage

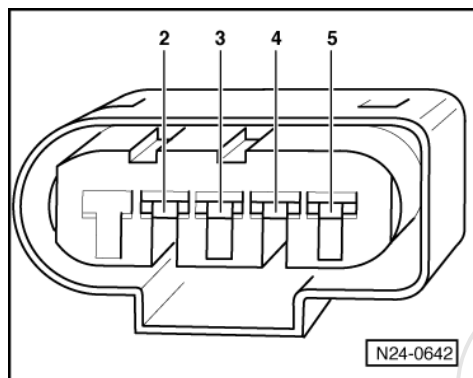


4 + earth	approx. 5 V
3 + 4	approx. 5 V

If the specifications are not obtained:

Checking wiring connections

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself:
 - Connecting test box to engine control unit without protective housing=>Page 23-49.
 - Connecting test box to engine control unit with protective housing=>Page 23-51.



- -> Test for open circuit and short to positive or earth in the following wiring connections:

Connector Contact	Test box V.A.G 1598/31 Socket
3	49
4	30
5	68

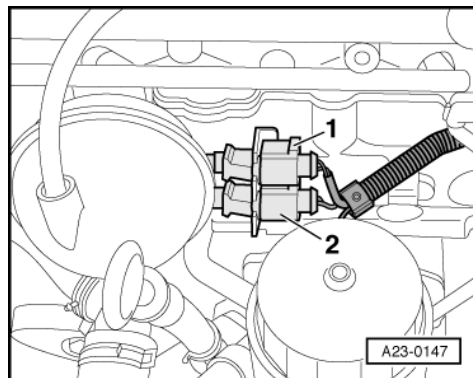
- Rectify any open/short circuit as necessary.

If no fault is found:

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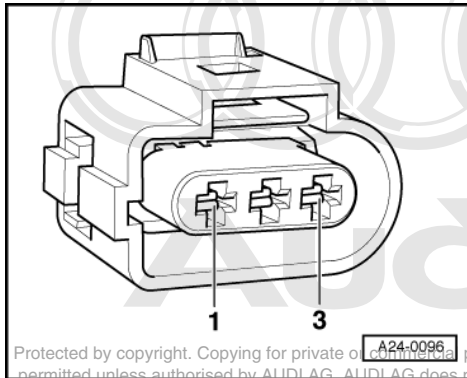
- Replace engine control unit
 - Removing and installing engine control unit without protective housing=>Page 23-57.
 - Removing and installing engine control unit with protective housing=>Page 23-60.

2.10 - Checking Hall sender for camshaft position -G40



Checking voltage supply

- -> Unplug black connector -1- for Hall sender.



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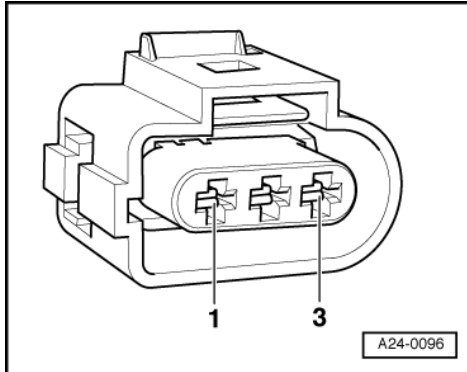
- -> Connect multimeter (voltage measurement range) as follows:

Connector Contact	Measure against
1	Engine earth

- Switch on ignition.
 - Specification: approx. battery voltage

If the specification is not attained:

- Test wiring for open circuits and rectify if necessary.

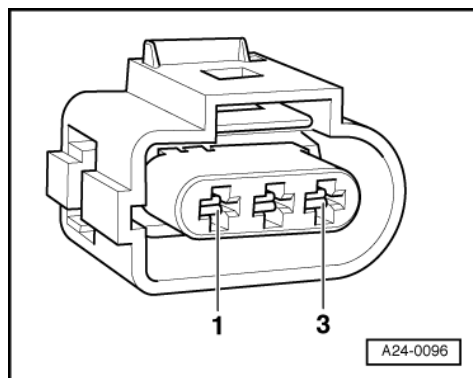


Testing earth supply

- -> Connect multimeter (voltage measurement range) between contact 1 (positive) and 3 (earth).
- Switch on ignition.
 - Specification: approx. battery voltage

If the specification is not attained:

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself:
 - Connecting test box to engine control unit without protective housing=>Page 23-49.
 - Connecting test box to engine control unit with protective housing=>Page 23-51.

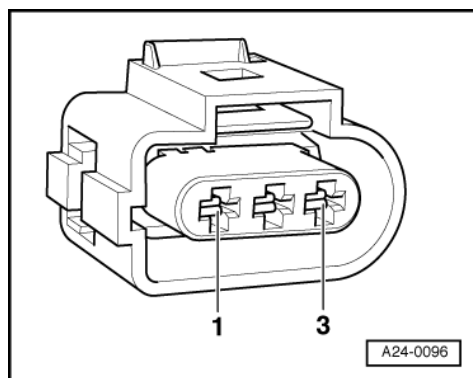


- -> Test for open circuit and short circuit to positive in the following wiring connection:

Connector Contact	Test box V.A.G 1598/31 Socket
3	101

If no wiring fault is detected and no voltage was present between contacts 1+3:

- Replace engine control unit
 - Removing and installing engine control unit without protective housing=>Page 23-57.
 - Removing and installing engine control unit with protective housing=>Page 23-60.



If no wiring fault is detected and voltage was present between contacts 1 + 3:

Testing signal wiring

- -> Test for open circuit and short to positive or earth in the following wiring connections:

Connector Contact	Test box V.A.G 1598/31 Socket
2	109

- Rectify any open/short circuit as necessary.

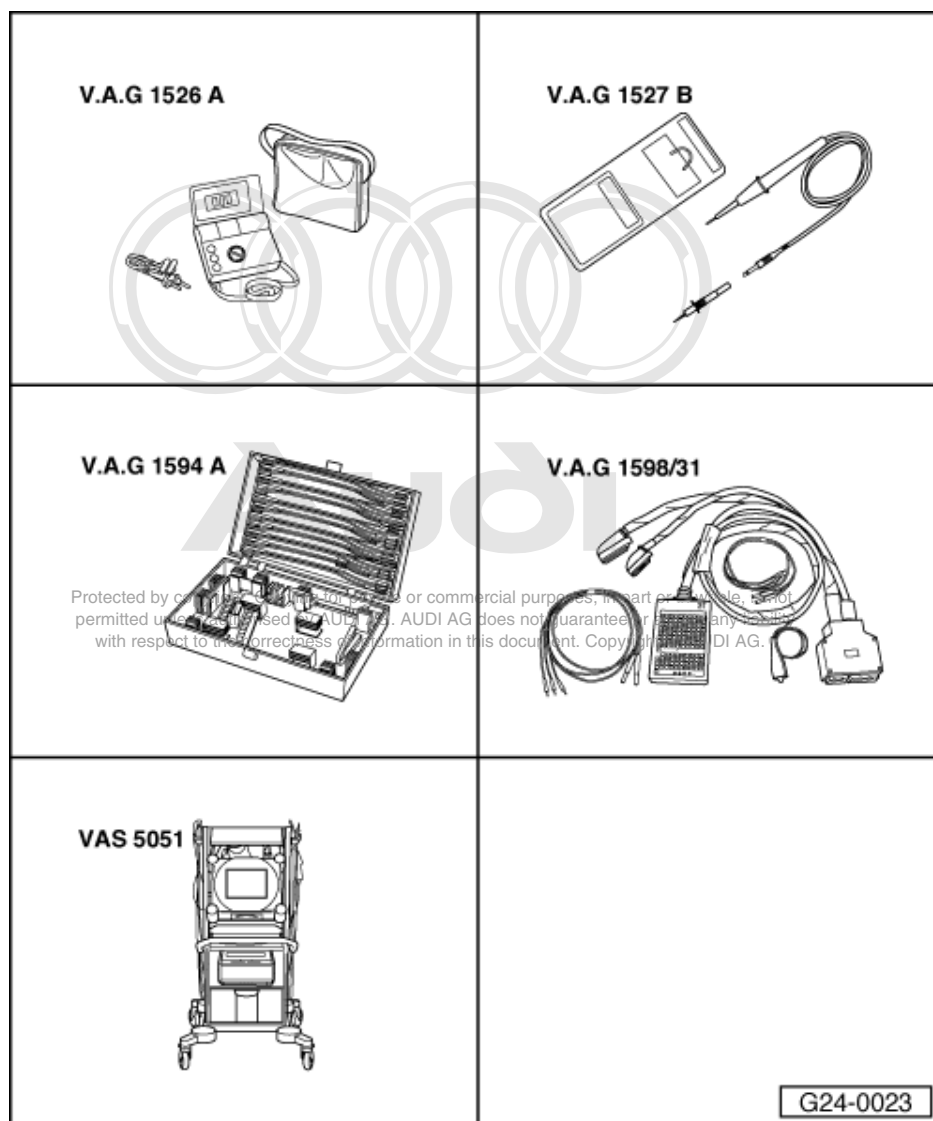
If no fault is found:

- Renew the Hall sender.

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3 - Testing auxiliary signals

3.1 - Testing auxiliary signals



Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1527 B
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/31
- ♦ VAS 5051 with VAS 5051/1

3.2 - Testing AC compressor signal and AC compressor shut-off

Requirements for test:

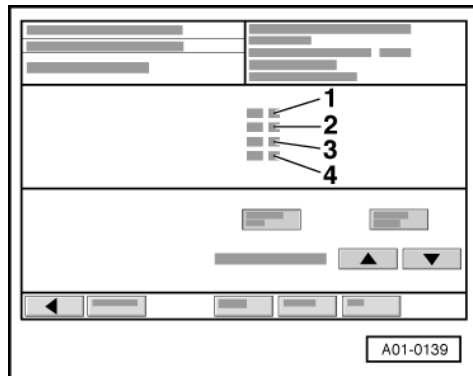
- Air conditioner okay
- No faults stored in fault memory
- Vehicle at room temperature (above +15 °C)



- Engine at operating temperature.

Testing AC compressor signal

The engine control unit receives the information that the air conditioner will be switched on shortly via the air conditioner ready signal.



Test sequence

- Read measured value block, Display group 002, engine idling=>Page 01-126.

-> Display on VAS 5051:

- Check display in display zone -3-.
 - Specification: 0 X 0

Note:

Display value "X" can be ignored during test procedure.

- Switch on air conditioner, press the "Auto" key and select the lowest temperature.
 - Specification: 1 X 1
- Press the ◀ button to exit from the function "08 - Read data block".
- Select diagnosis function "06 - End output".
- Switch off ignition.

If the specification is not obtained:

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself:
 - Connecting test box to engine control unit without protective housing=>Page 23-49.
 - Connecting test box to engine control unit with protective housing=>Page 23-51.
- Test for open circuit and short to positive or earth in the following wiring connection:

Test box V.A.G 1598/31 Socket	AC operating and display unit -E87 Contact
34	=> Current flow diagrams, Electrical fault-finding and Fitting locations binder

- Rectify any open/short circuit as necessary.

Testing AC compressor shut-off

The engine control unit will shut off the air conditioner compressor in the following cases:

- ◆ Heavy acceleration from low speeds (control unit detects angle change at accelerator position sender -G79 and receives road speed signal)
- ◆ In the emergency programme (emergency running mode)
- ◆ If the coolant temperature rises above 120 °C
- ◆ For about 6 seconds after every engine start

Test sequence

- Switch on air conditioning system.
- Select the function "Final control diagnosis" and activate air conditioner compressor shut-off=>Page01-64.
- ◆ The air conditioning compressor should shut off within 5 seconds (check visually) and then every 5 seconds cut in and shut off again.
- Press the **◀** button to exit from function "03 - Final control diagnosis".
- Select diagnosis function "06 - End output".
- Switch off ignition.

If the conditioner compressor is not switched off:

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit.Do notconnect to the engine control unit itself:
 - Connecting test box to engine control unit without protective housing=>Page 23-49.
 - Connecting test box to engine control unit with protective housing=>Page 23-51.
- Test for open circuit and short to positive or earth in the following wiring connection:

Test box V.A.G 1598/31 Socket	AC operating and display unit -E87 Contact
29	=> Current flow diagrams, Electrical fault-finding and Fitting locations binder

- Rectify any open/short circuit as necessary.

3.3 - Testing speed signal

The speed signal is required to ensure that the air conditioner compressor is switched off when accelerating. It is also required for the cruise control system and to ensure smoother driving (jolt damping).

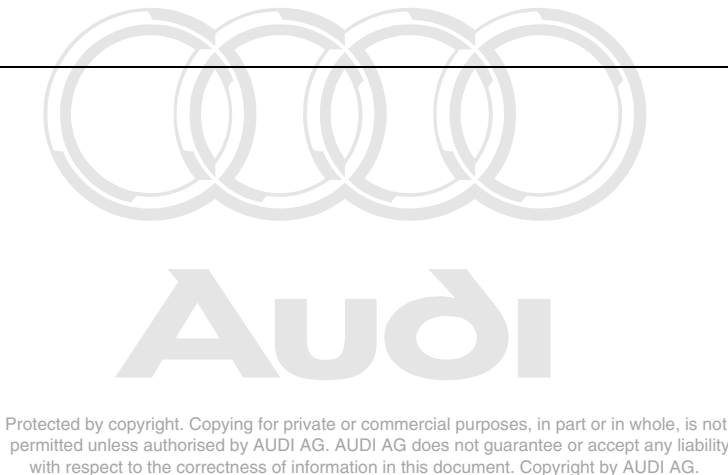
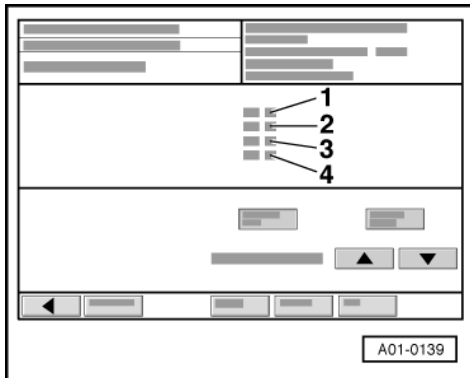
Test requirement:

- Speedometer OK. Testing:

=> Current flow diagrams, Electrical fault finding and Fitting locations binder

Test sequence

Warning
Observe safety precautions => Page 01-1.





- Read data block, Display group 006, engine running at idling speed => Page 01-86.
- Take vehicle for a test drive.

-> Display on VAS 5051:

- Check display in display zone -1-.
 - Specification: The current road speed should be displayed (compare with speedometer).
- Press the ◀ button to exit from the function "08 - Read data block".
- Select diagnosis function "06 - End output".
- Switch off ignition.

If the specification is not obtained:

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself:
 - Connecting test box to engine control unit without protective housing => Page 23-49.
 - Connecting test box to engine control unit with protective housing => Page 23-51.
- Switch on ignition.
- Raise the vehicle (preferably using a lifting platform) until the front left wheel is clear of the ground.
- Connect voltage tester V.A.G 1527 B to sockets 4 (earth) and 20 (speed signal) on test box V.A.G 1598/31.
- Turn the front left wheel.
 - The LED should flash very briefly.

If the LED does not flash:

- Test for open circuit and short to positive or earth in the following wiring connection:

Test box V.A.G 1598/31 Socket	Dash panel insert Contact
20	=> Current flow diagrams, Electrical fault-finding and Fitting locations binder

- Rectify any open/short circuit as necessary.

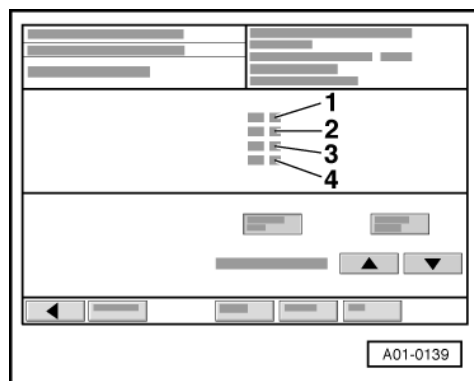
If no wiring fault is detected:

- Establish which systems (e.g. radio, automatic gearbox, air conditioner etc.) are using the speed signal, disconnect them one by one from the dash panel insert, and keep repeating the test until the cause of the problem has been identified.

3.4 - Testing cruise control system (CCS)

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The CCS has no components of its own (except for the operating switch). All CCS functions are carried out by the Diesel direct injection system.



Test sequence

- Read data block, Display group 006, engine running at idling speed => Page 01-86.

-> Display on VAS 5051:

- Check readout in display zone -4-.
 - Specification: 0 (CCS OFF) or 1 (CCS ON)

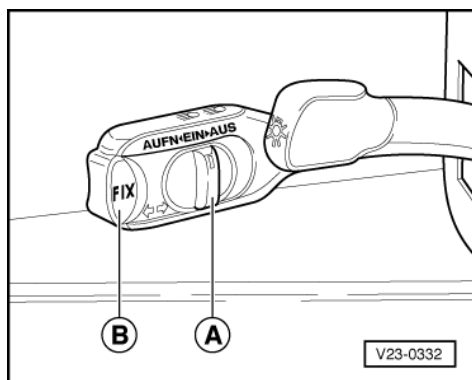
Note:

If a value of 255 appears in display zone 4:

- Activate cruise control system => Page 23-128.
- Press the ◀ button to exit from the function "08 - Read data block".
- Select diagnosis function "06 - End output".
- Switch off ignition.

If the specification is not obtained:

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself:
 - Connecting test box to engine control unit without protective housing => Page 23-49.
 - Connecting test box to engine control unit with protective housing => Page 23-51.



- -> Connect multimeter (voltage measurement range) as follows:
- Switch on ignition.

Test box V.A.G 1598/31 Socket	Switch position	Specification
4 + 45	Switch A "ON"	0 V
	Switch A "RES."	approx. battery voltage
4 + 44	Switch B not operated	0 V
	Switch B operated	approx. battery voltage
4 + 14	Switch A "OFF"	0 V
	Switch A "ON"	approx. battery voltage
4 + 46	Switch A "OFF"	0 V
	Switch A "ON"	approx. battery voltage

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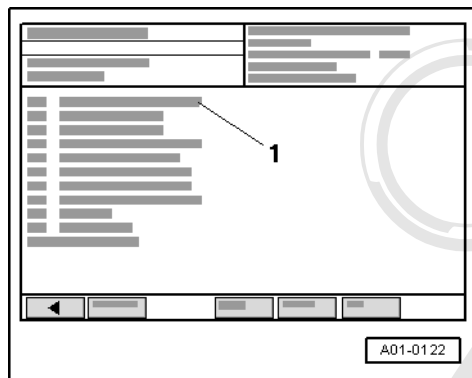
If the specifications are not obtained:

- Measure voltage directly at CCS switch.

=> Current flow diagrams, Electrical fault finding and Fitting locations binder

3.5 - Activating / deactivating cruise control system

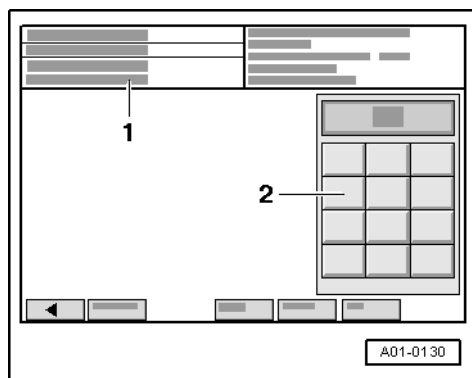
- Connect the vehicle diagnostic, testing and information system VAS 5051 => Page 01-2, and select the vehicle system "01 - Engine electronics" from the menu. When doing this the ignition must be on.



-> Display on VAS 5051:

- Select diagnosis function "11 - Login procedure" from menu -1-

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-> Display on VAS 5051:

- 1 - Enter code number

Activating cruise control:

- Using keypad -2-, enter code number 11463 and confirm entry with Q button.

Deactivating cruise control:

- Using keypad -2-, enter code number 16167 and confirm entry with Q button.
- Press the Q button to exit from the function "11 - Login procedure".
- Select diagnosis function "06 - End output".
- Switch off ignition.

3.6 - Testing engine speed signal

The engine speed signal is required for the rev counter, air conditioner and automatic gearbox.

However, since the signal cannot be read in the form in which it is generated by engine speed sender -G28, it has to be processed by the engine control unit first.

Test sequence

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit.Do notconnect to the engine control unit itself:
 - Connecting test box to engine control unit without protective housing=>Page 23-49.
 - Connecting test box to engine control unit with protective housing=>Page 23-51.
- Test for open circuit and short to positive or earth in the following wiring connection:

Test box V.A.G 1598/31 Socket	Dash panel insert Contact
27	=> Current flow diagrams, Electrical fault-finding and Fitting locations binder

If the wiring is OK:

- Replace engine control unit
 - Removing and installing engine control unit without protective housing=>Page 23-57.
 - Removing and installing engine control unit with protective housing=>Page 23-60.

4 - Testing signals from and to automatic gearbox

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4.1 - Testing signals from and to automatic gearbox

4.2 - Testing signal wire (CAN bus) between engine control unit and gearbox control unit

The engine control unit and the gearbox control unit are connected to each other via a CAN bus. The CAN bus consists of two signal wires which are used to transmit information (e.g. engine speed and accelerator pedal position).

Test sequence

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit.Do notconnect to the engine control unit itself:
 - Connecting test box to engine control unit without protective housing=>Page 23-49.
 - Connecting test box to engine control unit with protective housing=>Page 23-51.
- Test for open circuit and short to earth or positive in the following wiring connections:

Test box V.A.G 1598/31 Socket	Automatic gearbox control unit Contact
6 7	=> Current flow diagrams, Electrical fault-finding and Fitting locations binder

- Rectify any open/short circuit as necessary.



5 - Testing signals from and to ABS control unit

5.1 - Testing signals from and to ABS control unit

5.2 - Testing signal wire (CAN bus) between engine control unit and ABS control unit

The engine control unit and the ABS control unit are connected to each other via a CAN bus. The CAN bus consists of two signal wires which are used to transmit information (e.g. engine torque, engine speed).

Test sequence

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself:
 - Connecting test box to engine control unit without protective housing=>Page 23-49.
 - Connecting test box to engine control unit with protective housing=>Page 23-51.
- Test for open circuit and short to earth or positive in the following wiring connections:

Test box V.A.G 1598/31 Socket	ABS control unit -J104 Contact
6 7	=> Current flow diagrams, Electrical fault-finding and Fitting locations binder

- Rectify any open/short circuit as necessary.

6 - Testing signals to and from dash panel insert

6.1 - Testing signals to and from dash panel insert

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6.2 - Testing signal wire (CAN bus) between engine control unit and dash panel insert

The engine control unit and the dash panel insert are connected to each other via a CAN bus. The CAN bus consists of two signal wires which are used to transmit information (e.g. engine torque, engine speed).

Test sequence

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself:
 - Connecting test box to engine control unit without protective housing=>Page 23-49.
 - Connecting test box to engine control unit with protective housing=>Page 23-51.
- Test for open circuit and short to earth or positive in the following wiring connections:

Test box V.A.G 1598/31 Socket	Dash panel insert Contact
-------------------------------------	------------------------------

6 7	=> Current flow diagrams, Electrical fault-finding and Fitting locations binder
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- Rectify any open/short circuit as necessary.

7 - Testing a 2-wire bus system (CAN bus)

7.1 - Testing a 2-wire bus system (CAN bus)

7.2 - Testing data exchange between engine control unit, gearbox control unit and ABS/EDL control unit or dash panel insert

Notes:

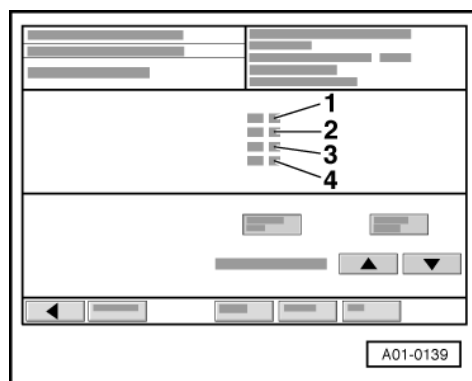
- ◆ The data exchange between the various control units is carried out via a data bus.
- ◆ The term "CAN data bus" refers to a system for transmitting and distributing data.
- ◆ The wires which connect the control units and convey the data between them are called data wires.
- ◆ Data is transmitted via data wires in sequence, i.e. in a specific order to the connected control units (e.g. engine rpm and accelerator pedal position).

Testing bus system

The fault table indicates that the data exchange between the engine control unit, gearbox control unit and ABS/EDL control unit or dash panel insert should be tested.

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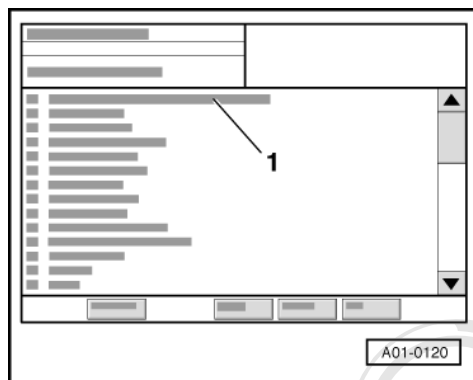
- Check that multi-pin connectors for control units are properly seated



- Read data block, Display group 125, ignition switched on=>Page01-136.

-> Display on VAS 5051:

- Check display in display zones 1 ... 3.
 - Specifications:
 - Gear. 1 (automatic gearbox only)
 - ABS 1
 - Combi 1 (= dash panel insert)
- Press the ◀ button to exit from the function "08 - Read data block".
- Select diagnosis function "06 - End output".
- Check that the engine control unit, gearbox control unit and ABS/EDL control unit or dash panel insert are the correct versions for the vehicle (check Part No. and coding).



If a specification is not met:

-> Display on VAS 5051:

- Select the diagnosis function "00 - Interrogate all fault memories" from the menu -1-.
- The fault memory of all on-board systems with self-diagnostic capability will be read.

When a control unit answers with its identification the number of stored faults appears on the display or "No fault recognised".

Any system faults that are stored will be displayed one after the other and printed out. VAS 5051 will then transmit the next address word.

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If faults have been stored relating to the "Drive train data bus" or to the "CAN data bus":

- Check that the engine control unit, gearbox control unit and ABS/EDL control unit or dash panel insert are the correct versions for the vehicle (check Part No. and coding).

If the correct control units are installed, test the CAN data bus system.

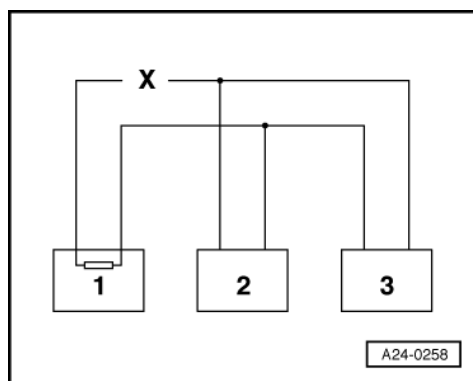
Testing a "two-wire bus system"

Three or more control units communicating via a "two-wire bus system"

- Read out the faults stored in the control units.

Note:

This will help to trace a fault in the wiring.



Example 1:

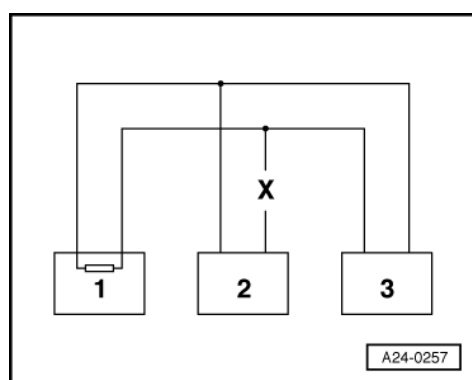
From the faults present in the fault memories, you can see that control unit 1 has no connection to control units 2 or 3.

Control unit	Faults present in fault memory:
1	- No message from control unit 2 - No message from control unit 3
2	- No message from control unit 1
3	- No message from control unit 1

- Switch off ignition.
- Disconnect the control units which are linked by the bus wires and check whether there is an open circuit in one of the bus wires

=> Current flow diagrams, Electrical fault finding and Fitting locations binder

- If no fault can be found in the bus wires replace control unit 1.



Example 2:

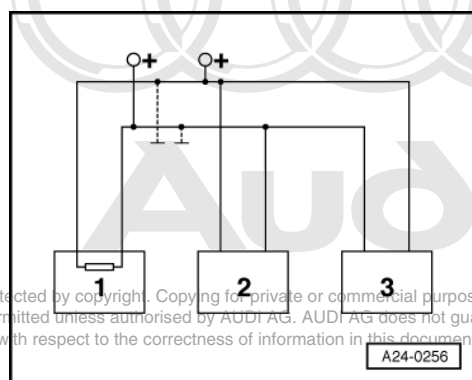
From the faults present in the fault memories, you can see that control unit 2 has no connection to control units 1 or 3.

Control unit	Faults present in fault memory:
1	- No message from control unit 2
2	- No message from control unit 1 - No message from control unit 3
3	- No message from control unit 2

- Switch off ignition.
- Disconnect the control units which are linked by the bus wires and check whether there is an open circuit in one of the bus wires

=> Current flow diagrams, Electrical fault finding and Fitting locations binder

- If no fault can be found in the bus wires replace control unit 2.



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Example 3:

From the faults present in the fault memories, you can see that none of the control units are able to transmit or receive signals.

Control unit	Faults present in fault memory:
1	- Data bus drive defective
2	- Data bus drive defective
3	- Data bus drive defective

- Switch off ignition.
- Disconnect the control units which are linked by the bus wires and check for a short circuit to positive or earth in the bus wires.

=> Current flow diagrams, Electrical fault finding and Fitting locations binder

If the cause of the fault "Data bus drive defective" cannot be found in the data bus wires, check whether one of the control units is causing the fault.

At this stage all the control units which communicate via the CAN data bus are disconnected. The ignition is switched off.

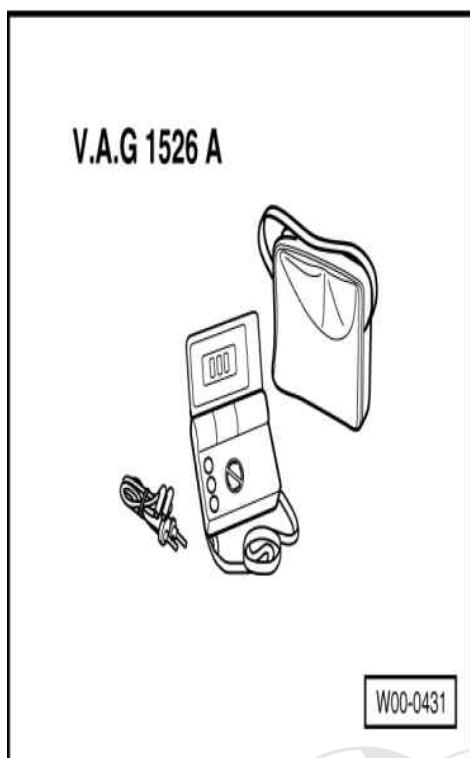
- Connect one of the control units.
- Connect vehicle diagnostic, testing and information system VAS 5051. Switch on the ignition and erase the fault memory of the control unit which has just been connected. End output from diagnostic system with function "06 - End output".
- Switch the ignition off and then on again.
- Leave the ignition switched on for 10 seconds. Then interrogate the fault memory of the control unit that has just been connected, using the fault reader.
- If the fault "Data bus drive defective" is now indicated, replace the control unit which has just been connected.
- If the fault "Data bus drive defective" is not indicated, connect the next control unit, and repeat the above procedure.

28 - Glow plug system

1 - Checking glow plug system

1.1 - Checking glow plug system

1.2 - Testing operation

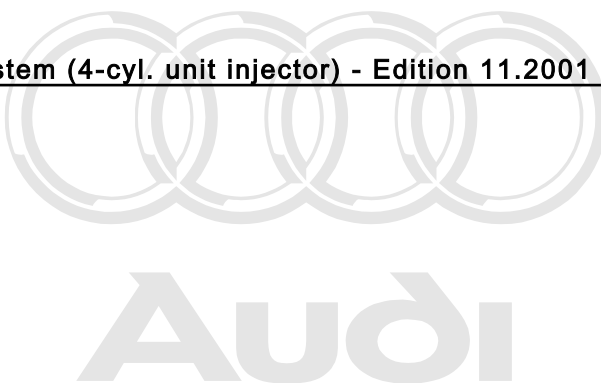
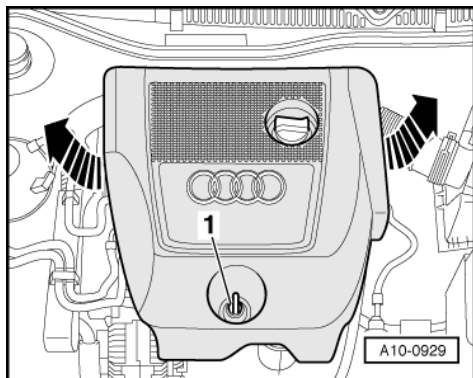


Special tools and workshop equipment required

- ♦ V.A.G 1526 A



- ♦ V.A.G 1594 A



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Requirements for test:

- Battery voltage not less than 12.7 V
- Diesel direct injection system relay OK; Test=>Page 23-69.

Test sequence

- -> Pull out oil dipstick -1- from dipstick tube.
- Remove engine cover -arrows-.
- Re-insert oil dipstick into guide tube.
- Unplug 4-pin connector from coolant temperature sender -G62 => Fitting locations overview Page 23-4.

Note:

Unplugging the connector for coolant temperature sender -G62 simulates the condition of the engine when cold. Therefore when the ignition is switched on, the glow plug system is activated.

- Pull glow plug connector rail off glow plugs.
- Connect multimeter (voltage measurement range) between one glow plug connector and engine earth.
- Switch on ignition.
 - Specification: approx. battery voltage for about 20 seconds

Notes:

- ♦ Glow period warning lamp -K29 should light up during the simulated glow period.
- ♦ If the warning lamp does not light up, test glow period warning lamp -K29=>Page 01-64.
- Switch off ignition.

If the specification is not obtained:

- Check glow plug fuse in electronics box in plenum chamber

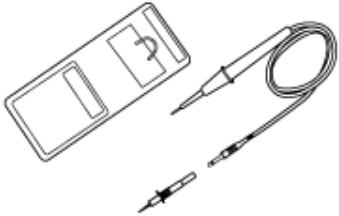
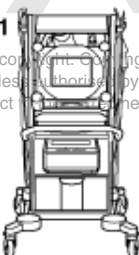
If the glow plug fuse is okay:

- Test glow plug relay=> Page 28-4.

If no fault is found, but the engine takes several seconds to start at very low temperatures:

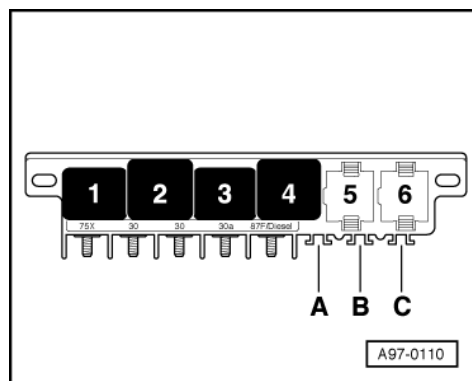
- Test glow plugs => Page 28-10.

1.3 - Testing glow plug relay -J52 and activation

V.A.G 1526 A 	V.A.G 1527 B 
V.A.G 1594 A 	V.A.G 1598/31 
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Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1527 B
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/31
- ♦ VAS 5051 with VAS 5051/1



**Note:**

-> The glow plug relay -J52 is located in the central electrics on the left of the driver's footwell, plug-in position 4.

Test requirement:

- Battery voltage not less than 12.7 V

Testing operation of glow plug relay

- Remove engine cover panel => Page 28-2.
- Pull glow plug connector rail off glow plugs.
- Connect voltage tester V.A.G. 1527 B between one of the glow plug connectors and engine earth.
- Remove storage compartment on driver's side.

=> General body repairs, Interior; Repair group 68; Storage compartments, covers; Removing driver's storage compartment Storage compartments, covers Removing driver's storage compartment

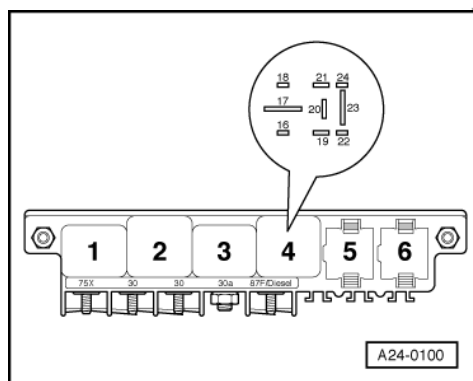
- Start final control diagnosis and activate glow plug relay
=>Page01-64.
 - The glow plug relay should pick up audibly and perceptibly; the LED should light up
- Press the ◀ button to exit from function "03 - Final control diagnosis".
- Select diagnosis function "06 - End output".
- Switch off ignition.

A - If the relay does not pick up:

- Test voltage supply to glow plug relay => Page 28-7.
- Test activation of glow plug relay => Page 28-7.

B - If the relay picks up but the LED does not light up:

- Test wiring connection between relay panel terminal 23 to glow plugs
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**Testing voltage supply to glow plug relay**

- -> Connect multimeter (voltage measurement range) to earth and contact 17 on relay panel.
- Specification: approx. battery voltage

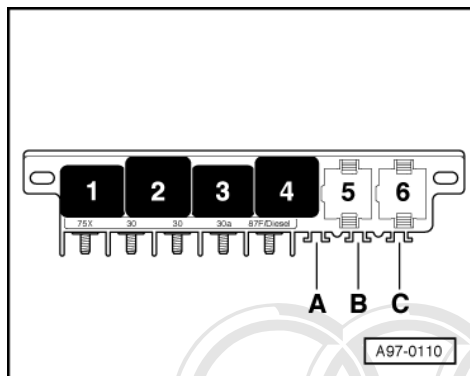
If the specification is not obtained:

- Replace central electrics unit

Testing activation of glow plug relay

- Switch off ignition.
- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself:
 - Connecting test box to engine control unit without protective housing => Page 23-49.

- Connecting test box to engine control unit with protective housing=>Page 23-51.
- Bridge contacts 4 and 42 on the test box using test leads from adapter set V.A.G 1594 A.
- Switch on ignition.



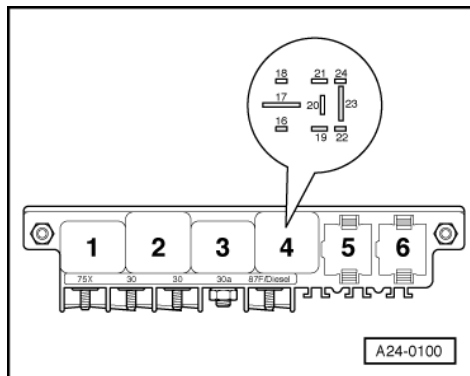
- -> The glow plug relay should pick up. (Relay is located in plug-in position 4 in central electrics on left of driver's footwell).

If the relay picks up now but not during the final control diagnosis:

- Replace engine control unit
 - Removing and installing engine control unit without protective housing=>Page 23-57.
 - Removing and installing engine control unit with protective housing=>Page 23-60.

If the relay does not pick up:

- Switch off ignition.
- Disconnect cable bridge.
- Disconnect glow plug relay.



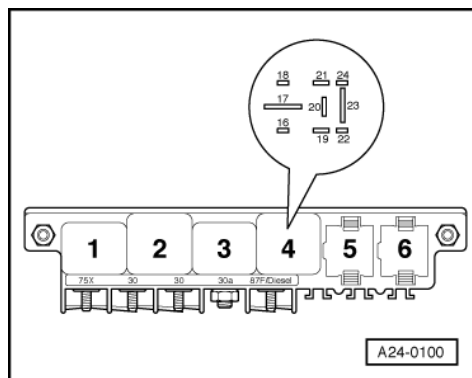
- -> Connect multimeter (voltage measurement range) between earth and contact 19 on relay panel.
- Switch on ignition.
 - Specification: approx. battery voltage

If the specification is not obtained:

- Check the wiring.

=> Current flow diagrams, Electrical fault finding and Fitting locations binder

If the specification is obtained:



- -> Test for open circuit and short to positive or earth in the following wiring connections:

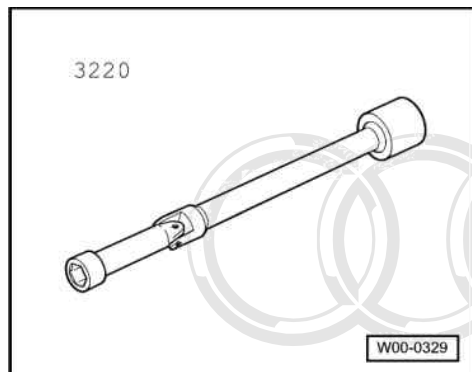
Central electrics on left of driver's footwell, relay position 4 Contact	Test box V.A.G 1598/31 Socket
16	42

- Rectify any open/short circuit as necessary.

If no fault is found:

- Fit a new glow plug relay.
- Reconnect the engine control unit.

1.4 - Checking glow plugs



Special tools and workshop equipment required

- ♦ Jointed spanner 3220
- ♦ 2 test leads with a diameter of at least 2.5 mm²

Test sequence

- Switch off ignition.
- Remove engine cover panel => Page 28-2.
- Pull glow plug connector rail off glow plugs.
- Remove glow plugs with jointed spanner 3220.
- Place the glow plug which is to be tested on a fireproof surface.
- Connect the connecting pin of the glow plug to the positive terminal of a fully charged 12 V battery.
- Connect the threaded section of the glow plug to the negative terminal of the battery.

Notes:

- ♦ Connect the glow plug using test leads which have a diameter of at least 2.5 mm².



- ♦ The connector clamps on the test leads must be robust and securely fitted.
- Check the glow plug as it is being activated.
- If the glow plug does not glow or if only part of the pin glows, renew the glow plug.

Tightening torque

Component	Nm
Glow plugs	15

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