



Audi

Audi A4 1995 ➤

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Simos injection and ignition system (4-cylinder)

Engine ID	ANA	ALZ							
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Edition 07.1999

List of Workshop Manual Repair GroupsList of Workshop Manual Repair GroupsList of Workshop Manual Repair Groups Audi A4 1995 ➤

Simos injection and ignition system (4-cylinder)
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Repair Group

01 - Self-diagnosis

24 - Mixture preparation, Injection

28 - Ignition system



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

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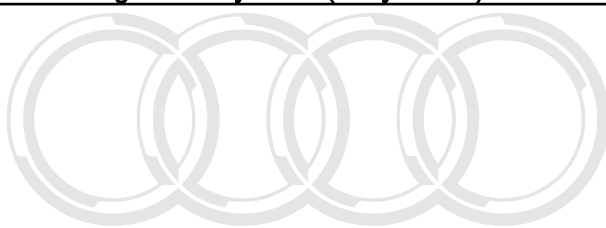


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Simos injection and ignition system (4-cylinder) - Edition 07.1999



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01 - Self-diagnosis

1 - Self-diagnosis

1.1 - Self-diagnosis

1.2 - Technical data for self-diagnosis

Equipment

The term "self-diagnosis" relates specifically to the electrical and electronic part of the control system.

The control unit is equipped with a fault memory so that the fault can be traced quickly in the event of an electronic/electrical component failure or an open circuit.

The advantages of self-diagnosis can only be fully exploited by using the vehicle diagnostic, testing and information system VAS 5051 or the fault reader V.A.G. 1551, in operating mode 1 "Rapid data transfer."

For a list of functions which can be performed with vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G. 1551, refer to=>Page **2** , "Selectable functions".

The fault memory is equipped with a non-volatile memory and therefore does not depend on the power supply.

Important:

♦ If the engine control unit detects faults which cause higher exhaust emissions, these faults are indicated by the exhaust emissions warning lamp (MIL) in the dash panel insert.

Refer to=>Page **2** for notes on this warning lamp.

♦ Faults relating to the electronic throttle are also indicated by the EPC warning lamp in the dash panel insert (EPC = electronic power control).

Refer to=>Page **3** for notes on this warning lamp.

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.

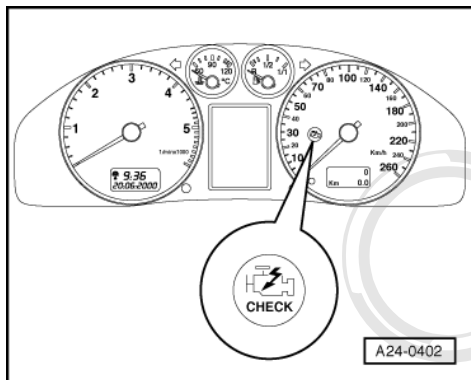


Selectable functions

Vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551		Ignition on, engine not running	Engine idling	Vehicle being driven	Page
Address words					
01	Engine electronics	Yes	Yes	Yes	5
00	Automatic test sequence	Yes	Yes	Yes	7
Functions					
01	Interrogate control unit version	Yes	Yes	Yes	8
02	Interrogate fault memory	Yes	Yes	Yes	8
03	Final control diagnosis	Yes	No	No	20
04	Basic setting	Yes	Yes	Yes	22
05	Erase fault memory	Yes	Yes	Yes	8
06	End output	Yes	Yes	Yes	9
07	Code control unit	Yes	No	No	24
08	Read measured value block	Yes	Yes	Yes	25

1.4 - Function of exhaust emissions warning lamp -K83 MIL (Malfunction Indicator Lamp)

If the engine control unit detects faults affecting the emission control system, this is indicated by the exhaust emissions warning lamp.



-> -> Location of exhaust emissions warning lamp

Note:

Depending on the type of fault, the exhaust emissions warning lamp can either flash or light up continuously. Interrogate fault memory in either case=>Page 8

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Flashing light:

- ♦ This indicates a fault which will cause damage to the catalytic converter if the vehicle is driven further under the current conditions. If the warning lamp is flashing, the vehicle should only be driven with reduced power (until the MIL goes out or remains on continuously); the fault should be rectified as soon as possible.

Continuous light:

- ♦ This indicates a fault that causes an increase in exhaust emissions. Interrogate fault memory of engine control unit and automatic gearbox (if fitted).

- ♦ If the vehicle does not run properly, or the customer reports driveability problems, and the exhaust emissions warning lamp does not light up, check the function of the warning lamp and then interrogate the fault memory. The fault memory may have stored faults which are not indicated immediately by the exhaust emissions warning lamp.

Testing operation:

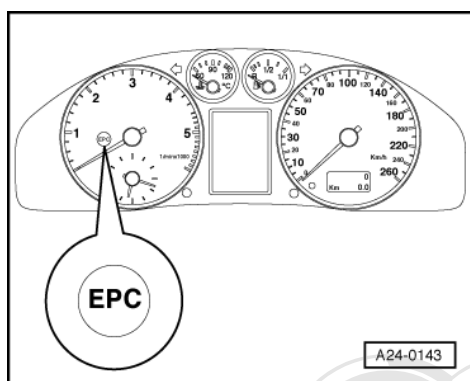
- Switch on ignition.

The exhaust emissions warning lamp should light up.

- Interrogate fault memory (=>Page 8) if the exhaust emissions warning lamp does not light up.

1.5 - Notes on EPC warning lamp (fault warning lamp for electronic throttle-K132) in dash panel insert

"EPC" stands for Electronic Power Control and refers to the electronic throttle control system.



-> Fitting location of EPC warning lamp

When the ignition is switched on the engine control unit tests all the components whose functions relate to the electronic throttle system.

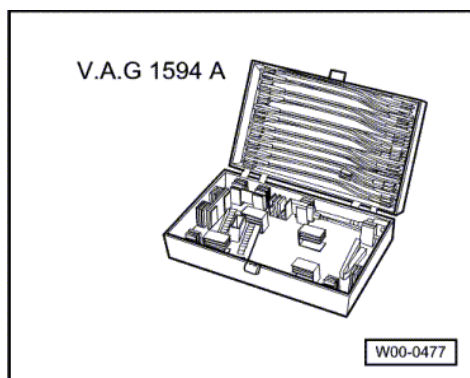
After starting the engine the EPC warning lamp goes out, provided that there was no fault detected in the electronic throttle system.

If a fault is detected in the electronic throttle system while the engine is running, the engine control unit will activate the EPC warning lamp (see Fault Table for list of possible faults). At the same time a fault code is stored in the fault memory of the engine control unit.

1.6 - Testing electronic throttle warning lamp -K132

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Note:

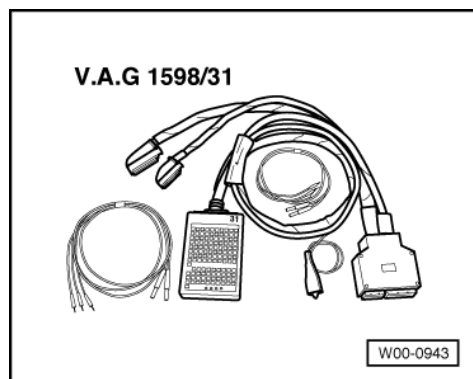




Electronic throttle warning lamp -K132 is also known as the EPC warning lamp (EPC = electronic power control).

Special tools and workshop equipment required

- ♦ V.A.G 1594 A



- ♦ V.A.G 1598/31

Testing operation of warning lamp

- Switch on ignition.
 - The EPC warning lamp should light up.

A - Electronic throttle warning lamp -K132 does not light up

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page 56 .
- Bridge contacts 1 and 73 on the test box using test leads from adapter set V.A.G 1594 A.
- Switch on ignition.
 - The warning lamp should light up.

If the warning lamp does not light up:

- Switch off ignition.
- Remove dash panel insert, then test bulb or LED and voltage supply:

=> Electrical system; Repair group 90; Dash panel insert; Removing and installing dash panel insert Dash panel insert Removing and installing dash panel insert

If no fault is found:

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

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

- Rectify short circuit or open circuit if necessary.

If the wiring is OK:

- Fit a new engine control unit => Page 58 .

B - Electronic throttle warning lamp -K132 lights up continuously

- Interrogate fault memory of engine control unit.

If no faults are stored:

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page 56 .
- Test for short to earth in the following wiring connection:

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

- Rectify any short circuits.

If the wiring is OK:

- Fit a new engine control unit => Page 58 .

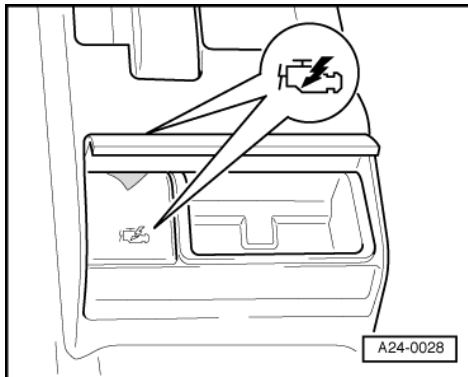
1.7 - Connecting vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and selecting functions

Requirements for test:

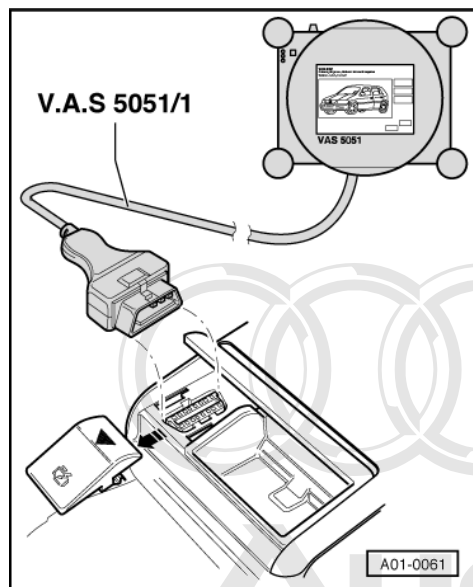
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- Battery voltage not less than 11V
- Earth connections on engine and gearbox OK

Work sequence



- -> Open rear ashtray and remove cover for diagnostic connector.



- -> Connect up vehicle diagnostic, testing and information system VAS 5051 with diagnostic cable VAS 5051/1. Alternatively, connect fault reader V.A.G 1551 using diagnostic cable V.A.G 1551/3A.

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Warning:
Observe safety precautions => Page **1**.

Note:

The following description only covers the procedure for performing self-diagnosis with fault reader V.A.G 1551.

If using vehicle diagnostic, testing and information system VAS 5051, follow the operating instructions supplied with the equipment.

-> Indicated in display

V.A.G - SELF DIAGNOSIS HELP
1 - Rapid data transfer 1)
2 - Flash code output 1)

1) appears alternately

Note:

If the display remains blank:

=> Fault reader operating instructions

Depending on the function required (see table of selectable functions => Page **2**):

- Switch on ignition.

or

- Start the engine.
- Switch on fault reader printer with the print key. The warning lamp in the key should light up.
- Press key 1 for "Rapid data transfer".

-> When this display appears:

Rapid data transfer HELP
Enter address word XX

Note:

Address word 00 is used to start the automatic test sequence (i.e. fault memory interrogation for all vehicle systems with self-diagnosis capability in "Rapid data transfer" mode).

- Press keys 0 and 1 for address word "Engine electronics" and confirm entry with Q key.

-> The display on fault reader V.A.G 1551 will show the control unit identification, as in this example.

3B0906018A 1.6l/2V SIMOS3 G00HS0002
Coding 08001 WSC 12345

Note:

The control unit identification can be printed out by pressing the PRINT key on fault reader V.A.G 1551.

Control unit identification (example)

- 3B0906018A	Part No. For allocation to vehicle: => Parts list
- 1.6 ltr. / 2V	Engine capacity; 2 valves per cylinder
- SIMOS 3.4	Designation and version of injection system; Simos stands for "Siemens Motor Steuerung" (Siemens engine management)
- "G"	With cruise control (G)
- or no display	or without cruise control
- 00	Number of adaption channels which have been altered; standard setting: 00
- HS	For manual gearbox (hand-shift)
- 0002	Status of data (software version) in control unit
- Coding 08001	Control unit coding
- WSC 12345	Workshop Code of V.A.G 1551 which was used to perform the last coding

Notes:

- ◆ Incorrect coding may lead to higher emissions and increased strain on the automatic gearbox resulting from harsh gear-shift jolts.
- ◆ Incorrect coding also causes non-existent faults to be stored in the fault memory.

If the coding differs from the vehicle version, then:

- Check coding of engine control unit
=> Coding engine control unit, Page 24
- Press =>key.

-> Indicated on display (chassis No. of vehicle):

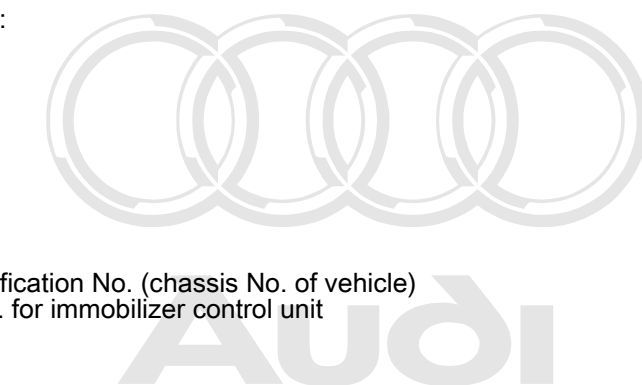
WAUZ8DZYN000126 AUZ5ZOWN0801181

- ◆ WAUZZZ8DZYN002341:17-digit vehicle identification No. (chassis No. of vehicle)
- ◆ AUZ5ZOWN0590944:14-digit Identification No. for immobilizer control unit

- Press =>key.

-> Indicated on display (function selection):

Rapid data transfer HELP
Select function XX



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Notes:

- ♦ By entering "01" ("Interrogate control unit version") and confirming with the Q key, the control unit identification can be displayed again.

Rapid data transfer HELP
Control unit does not answer

-> Indicated on display:

- Perform fault-finding procedure as described in "Fault-finding programme: diagnostic wiring".

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

Rapid data transfer HELP
K wire not switching to earth

Rapid data transfer HELP
K wire not switching to positive

Rapid data transfer HELP
Fault in communication build-up

2 - Interrogating and erasing fault memory

2.1 - Interrogating and erasing fault memory

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 5).
When doing this the engine must be running at idling speed.

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.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

- Press keys 0 and 2 for the function "Interrogate fault memory" and confirm entry with Q key.

-> Indicated on display:

No fault recognised

- Press =>key.

or

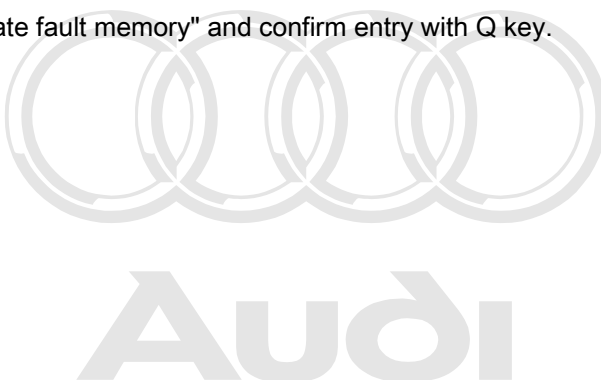
-> Indicated on display:

X faults recognised

If the printer on the fault reader is switched on the stored faults will be displayed and printed out in sequence.

- Locate and eliminate faults printed out as per fault table
=> Page 9 .
- Press =>key.

-> Indicated on display:



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Rapid data transfer HELP
Select function XX

- Press keys 0 and 5 for the function "Erase fault memory" and confirm entry with Q key.

-> Indicated on display:

Rapid data transfer
Fault memory is erased!

- Press ➡key.
- 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).

- If the fault memory was erased the readiness code must be generated again => Page 27 .

End output

-> Indicated on display:

Rapid data transfer HELP
Select function XX

- Press keys 0 and 6 for the function "End output" and confirm entry with Q key.

-> Indicated on display:

Rapid data transfer HELP
Insert address word XX

- Switch off ignition and unplug the diagnostic connector

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2.2 - 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.
- ◆ Faults relating to the electronic throttle are also indicated by the EPC warning lamp in the dash panel insert (EPC = Electronic Power Control).
- ◆ Faults which impair the function of the emission control system are indicated by an exhaust emissions warning lamp (MIL), also located in the dash panel insert. Depending on the type of fault, the emissions warning lamp may either light up as soon as the fault is detected, or it may only light up if the fault is still present after the next engine start.
- ◆ Sporadically occurring faults (temporary faults) will be indicated on the V.A.G 1551 display as "SP". The word "sporadic" means "intermittent" or "occurring at irregular intervals".
- ◆ 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 40 engine warm-up phases, the fault code will be automatically erased.
- ◆ Components that are indicated as being faulty by the V.A.G 1551 should not be renewed immediately.
 - Always start by checking the wiring and connectors for the component using the current flow diagram.
 - Also test the earth connections using the current flow diagram. This is particularly important in the case of sporadic faults (indicated by the letters "SP" on the fault reader display).
- ◆ If the connector for the engine control unit is unplugged or if the battery is disconnected, all the learned values stored in the control unit will be erased, although the contents of the fault memory will remain intact.



The next time the engine is started the idling may be rough at first, in which case it should be left to idle for a few minutes until the learning process has been completed.

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P0102	16486	Air mass meter -G70 Signal too small 1)	Test air mass meter=> Page 78
P0103	16487	Air mass meter -G70 Signal too large 1)	
P0112	16496	Intake air temp. sender -G42 Signal too small 1)	Test intake air temperature sender => Page 83
P0113	16497	Intake air temp. sender -G42 Signal too large 1)	

1) If this fault occurs, the engine control unit will only switch on the exhaust emissions warning lamp (MIL) if the fault is detected again after two further engine starts. For notes on MIL=>Page 2.

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P0116	16500	Coolant temp. sender -G62 Implausible signal 1)	Test coolant temperature sender => Page 85
P0117	16501	Coolant temp. sender -G62 Signal too small 1)	
P0118	16502	Coolant temp. sender -G62 Signal too large 1)	
P0130	16514	Bank 1, Probe 1 Electrical fault in current circuit 1)	- Test lambda control => Page 88
P0131	16515	Bank 1, Probe 1 Voltage too low 1)	
P0132	16516	Bank 1, Probe 1 Voltage too high 1)	
P0133	16517	Bank 1, Probe 1 Signal too slow 1)	
P0134	16518	Bank 1, Probe 1 No activity 1)	

1) If this fault occurs, the engine control unit will only switch on the exhaust emissions warning lamp (MIL) if the fault is detected again after two further engine starts. For notes on MIL=>Page 2.

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P0137	16521	Bank 1, Probe 2 Voltage too low 1)	Test lambda control => Page 88
P0138	16522	Bank 1, Probe 2 Voltage too high 1)	
P0140	16524	Bank 1, Probe 2 No activity 1)	

1) If this fault occurs, the engine control unit will only switch on the exhaust emissions warning lamp (MIL) if the fault is detected again after two further engine starts. For notes on MIL=>Page 2.

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		

Fault code		Readout on fault reader display	Fault rectification
P0170	16554	Bank 1, Fuel measuring system Faulty 1)	Test lambda control => Page 26 (catalytic converter diagnosis)
P0171	16555	Bank 1, Fuel measuring system System too lean 1)	Test lambda control => Page 88 Check catalytic converter system and exhaust manifold for leaks
P0172	16556	Bank 1, Fuel measuring system System too rich 1)	Carry out steps 1 ... 8 => Readiness code, Page 26 (lambda probe and catalytic converter diagnosis)

1) If this fault occurs, the engine control unit will only switch on the exhaust emissions warning lamp (MIL) if the fault is detected again after two further engine starts. For notes on MIL=>Page 2.

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P0300	16684	Misfiring recognised 1)	Check whether there is fuel in fuel tank. Check hose connections, (valves for intake manifold change-over function and secondary air system); check intake air system for leaks => Page 66 Test ignition cables, connectors and spark plugs Test twin-spark ignition system => Page 160 Test misfiring recognition=> Page 167 If the fault is not rectified by the measures listed above, the dual-mass flywheel might be the cause of the fault.
P0301	16685	Cyl.1 Misfiring recognised 1)	
P0302	16686	Cyl.2 Misfiring recognised 1)	
P0303	16687	Cyl.3 Misfiring recognised 1)	
P0304	16688	Cyl.4 Misfiring recognised 1)	

1) If this fault occurs, the engine control unit will only switch on the exhaust emissions warning lamp (MIL) if the fault is detected again after two further engine starts. For notes on MIL=>Page 2.

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P0321	16705	Engine speed sender -G28 Implausible signal 1)	Test engine speed sender =>Page 162
P0322	16706	Engine speed sender -G28 No signal 1)	
P0327	16711	Knock sensor 1 -G61 Signal too small	Test knock sensor or knock control => Page 163
P0328	16712	Knock sensor 1 -G61 Signal too large	

1) If this fault occurs, the engine control unit will only switch on the exhaust emissions warning lamp (MIL) if the fault is detected again after two further engine starts. For notes on MIL=>Page 2.

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P0335	16719	Engine speed sender -G28 Malfunction 1)	Test engine speed sender =>Page 162
P0341	16725	Camshaft pos. sensor => -G40 Implausible signal 1)	Test Hall sender => Page 166



Fault code		Readout on fault reader display	Fault rectification
P0342	16726	Camshaft pos. sensor => -G40 Signal too small 1)	

1) If this fault occurs, the engine control unit will only switch on the exhaust emissions warning lamp (MIL) if the fault is detected again after two further engine starts. For notes on MIL=>Page 2.

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P0420	16804	Bank 1, Catalyst system Efficiency too low 1)	Replace catalytic converter, then delete adaptive values (learned values) =>Page 26
P0441	16825	Tank breathing system Flow rate faulty 1)	- Carry out steps 1 to 4 => Readiness code, Page 26

1) If this fault occurs, the engine control unit will only switch on the exhaust emissions warning lamp (MIL) if the fault is detected again after two further engine starts. For notes on MIL=>Page 2.

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P0461	16845	Fuel status signal Implausible signal 1)	Check wiring connection between engine control unit and dash panel insert => Current flow diagrams, Fault-finding and Fitting locations binder Test signal from fuel gauge sender or check fuel gauge => Electrical system; Repair group 01; Self-diagnosis of dash panel insert; Read measured value block Self-diagnosis of dash panel insert; Read measured value block
P0501	16885	Vehicle speed signal Implausible signal	- Test vehicle speed signal=> Page 146

1) If this fault occurs, the engine control unit will only switch on the exhaust emissions warning lamp (MIL) if the fault is detected again after two further engine starts. For notes on MIL=>Page 2.

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P0506	16890	Idling speed control Revs below specification 1)	Test throttle valve control part => Page 128
P0507	16891	Idling speed control Revs above specification 1)	Check hose connections, (valves for intake manifold change- over function and secondary air system); check intake air system for leaks => Page 82.
P0571	16955	Brake light switch -F Implausible signal 2)	Test brake light switch and brake pedal switch => Page 138
P0600	16984	Data bus drive Message missing 1)	Test CAN data bus => Page 152

1) If this fault occurs, the engine control unit will only switch on the exhaust emissions warning lamp (MIL) if the fault is detected again after two further engine starts. For notes on MIL=>Page 2.

2) If this fault occurs, the engine control unit activates the EPC warning lamp in the dash panel insert as soon as the fault is detected. Notes on EPC warning lamp=>Page 3.

Note:

The system monitors both brake light switch -F and brake pedal switch -F47.

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		Renew engine control unit => Page 58
P0601	16985	Control unit defective 1)	
P0604	16988	Control unit defective 1)	
P0606	16990	Control unit defective 1) 2)	
P0656	17040	Fuel consumption signal Fault in electrical circuit	Test consumption signal for on-board computer => Page 145
P1102	17510	Bank 1 - Probe 1, Heating element circuit Short to Positive 1)	Test lambda probe heating => Page 102
P1105	17513	Bank 1 - Probe 2, Heating element circuit Short to Positive 1)	

1) If this fault occurs, the engine control unit will only switch on the exhaust emissions warning lamp (MIL) if the fault is detected again after two further engine starts. For notes on MIL=>Page 2 .

2) If this fault occurs, the engine control unit activates the EPC warning lamp in the dash panel insert as soon as the fault is detected. Notes on EPC warning lamp=>Page 3 .

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		Test lambda probe heating => Page 102
P1115	17523	Bank 1 - Probe 1, Heating element circuit Short to Earth 1)	
P1116	17524	Bank 1 - Probe 1, Heating element circuit Open circuit 1)	
P1117	17525	Bank 1 - Probe 2, Heating element circuit Short to Earth 1)	
P1118	17526	Bank 1 - Probe 2, Heating element circuit Open circuit 1)	
P1141	17549	Load determination Implausible value 1)	Check that the correct throttle valve control part is installed (see part No.) Test air mass meter => Page 58

1) If this fault occurs, the engine control unit will only switch on the exhaust emissions warning lamp (MIL) if the fault is detected again after two further engine starts. For notes on MIL=>Page 2 .

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		Test angle sender for throttle valve drive => Page 131
P1171	17579	Angle sens. 2 for throt. valve drive -G188 Implausible signal 1) 2)	
P1172	17580	Angle sens. 2 for throt. valve drive -G188 Signal too small 1) 2)	
P1173	17581	Angle sens. 2 for throt. valve drive -G188 Signal too large 1) 2)	

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Fault code		Readout on fault reader display	Fault rectification
P1176	17584	Bank 1, Lambda correction after cat Control limit reached 1)	Check lambda probe ageing on lambda probe before catalytic converter => Page 26

1) If this fault occurs, the engine control unit will only switch on the exhaust emissions warning lamp (MIL) if the fault is detected again after two further engine starts. For notes on MIL=>Page 2.

2) If this fault occurs, the engine control unit activates the EPC warning lamp in the dash panel insert as soon as the fault is detected. Notes on EPC warning lamp=>Page 3.

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		Test injectors =>Page 66
P1213	17621	Injector Cyl. 1 -N30 Short to Positive 1)	
P1214	17622	Injector Cyl. 2 -N31 Short to Positive 1)	
P1215	17623	Injector Cyl. 3 -N32 Short to Positive 1)	
P1216	17624	Injector Cyl. 4 -N33 Short to Positive 1)	
P1225	17633	Injector Cyl. 1 -N30 Short to Earth 1)	
P1226	17634	Injector Cyl. 2 -N31 Short to Earth 1)	
P1227	17635	Injector Cyl. 3 -N32 Short to Earth 1)	
P1228	17636	Injector Cyl. 4 -N33 Short to Earth 1)	

1) If this fault occurs, the engine control unit will only switch on the exhaust emissions warning lamp (MIL) if the fault is detected again after two further engine starts. For notes on MIL=>Page 2.

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		Test injectors =>Page 66
P1237	17645	Injector Cyl. 1 -N30 Open circuit 1)	
P1238	17646	Injector Cyl. 2 -N31 Open circuit 1)	
P1239	17647	Injector Cyl. 3 -N32 Open circuit 1)	
P1240	17648	Injector Cyl. 4 -N33 Open circuit 1)	

1) If this fault occurs, the engine control unit will only switch on the exhaust emissions warning lamp (MIL) if the fault is detected again after two further engine starts. For notes on MIL=>Page 2.

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		Check hose connections, check intake air system for leaks => Page 83
P1335	17743	Engine torque monitoring 2 Control limit surpassed 1) 2)	

P1336	17744	Engine torque monitoring Control limit surpassed	Test air mass meter => Page 85
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1) If this fault occurs, the engine control unit will only switch on the exhaust emissions warning lamp (MIL) if the fault is detected again after two further engine starts. For notes on MIL=>Page 2 .

2) If this fault occurs, the engine control unit activates the EPC warning lamp in the dash panel insert as soon as the fault is detected. Notes on EPC warning lamp=>Page 3 .

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P1340	17748	Camshaft pos. sensor => -G40 Wrong allocation	Test Hall sender => Page 166
P1359	17767	Ignition circuit, Cyl. 2 Short to Positive	Test twin-spark ignition system with two ignition coils => Page 160 .
P1356	17764	Ignition circuit, Cyl. 1 Short to Positive	
P1357	17765	Ignition circuit, Cyl. 1 Short to Earth	
P1359	17767	Ignition circuit, Cyl. 2 Short to Positive	
P1360	17768	Ignition circuit, Cyl. 2 Short to Earth	

Note:

Faults regarding "Ignition circuit..." apply to wiring connections between the engine control unit and the ignition output stage of the ignition coil via which the engine control unit activates the output stages. "Ignition circuit, Cyl. 1..." applies to cylinders one and four, "Ignition circuit, Cyl. 2..." applies to cylinders two and three.

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P1386	17794	Control unit defective 1) 2)	Renew engine control unit => Page 58
P1388	17796	Control unit defective 1) 2)	
P1397	17805	Sender wheel for engine speed Adaption limit reached	Sender wheel for engine speed faulty Test engine speed sender => Page 162 .

1) If this fault occurs, the engine control unit will only switch on the exhaust emissions warning lamp (MIL) if the fault is detected again after two further engine starts. For notes on MIL=>Page 2 .

2) If this fault occurs, the engine control unit activates the EPC warning lamp in the dash panel insert as soon as the fault is detected. Notes on EPC warning lamp=>Page 3 .

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P1401	17809	Valve for exhaust gas recirculation -N18 Short to earth1)	Test exhaust gas recirculation valve => 4-Cylinder engine (2-valve), Mechanics; Repair group 26
P1402	17810	Valve for exhaust gas recirculation -N18 Short to positive1)	
P1410	17818	Tank breather valve -N80 Short to positive1)	Test ACF solenoid valve 1 => Page 122
P1421	17829	Secondary air inlet valve -N112 Short to earth1)	Test secondary air system=>Page 106



Fault code		Readout on fault reader display	Fault rectification
P1422	17830	Secondary air inlet valve -N112 Short to positive1)	

1) If this fault occurs, the engine control unit will only switch on the exhaust emissions warning lamp (MIL) if the fault is detected again after two further engine starts. For notes on MIL=>Page 2.

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P1423	17831	Bank 1, secondary air system Through-flow too small 1)	Check pipes/hoses and components of secondary air system => 4-Cylinder engine (2-valve), Mechanics; Repair group 26; Secondary air system Secondary air system Check secondary air system => Page 82 Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted without the express written permission of AUDI AG. Audi AG does not accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.
P1424	17832	Bank 1, secondary air system Leak recognised 1)	
P1425	17833	Tank breather valve -N80 Short to Earth 1)	
P1426	17834	Tank breather valve -N80 Open circuit 1)	

1) If this fault occurs, the engine control unit will only switch on the exhaust emissions warning lamp (MIL) if the fault is detected again after two further engine starts. For notes on MIL=>Page 2.

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P1432	17840	Secondary air inlet valve -N112 Open circuit 1)	Test secondary air system=>Page 106
P1434	17842	Relay for secondary air pump - J299 Short to Positive 1)	
P1435	17843	Relay for secondary air pump - J299 Short to Earth 1)	
P1440	17848	Valve for exhaust gas recirculation -N18 Open circuit 1)	Test exhaust gas recirculation valve => 4-Cylinder engine (2-valve), Mechanics; Repair group 26
P1442	17850	Valve for exhaust gas recirculation -N18 Signal too great1)	
P1443	17851	Valve for exhaust gas recirculation -N18 Signal too low1)	
P1501	17909	Fuel pump relay -J17 Short to Earth 1)	Test fuel pump relay => Page 72
P1502	17910	Fuel pump relay -J17 Short to Positive 1)	

1) If this fault occurs, the engine control unit will only switch on the exhaust emissions warning lamp (MIL) if the fault is detected again after two further engine starts. For notes on MIL=>Page 2.

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P1512	17920	Intake manif. change-over valve - N156 Short to Positive	Test intake manifold change-over function => Page 116

P1515	17923	Intake manif. change-over valve - N156 Short to Earth	
P1516	17924	Intake manif. change-over valve - N156 Open circuit	
P1523	17931	Crash signal from airbag control unit Implausible signal	Test crash signal => Page 150 and => Body, Self-diagnosis; Repair group 01; Self-diagnosis of airbag system Self-diagnosis of airbag system

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P1542	17950	Angle sender for throt. val. drive - G187 Implausible signal 1) 2)	Test angle sender for throttle valve drive => Page 131
P1543	17951	Angle sender for throt. val. drive - G187 Signal too small 1) 2)	
P1544	17952	Angle sender for throt. val. drive - G187 Signal too large 1) 2)	
P1545	17953	Throttle valve control Faulty 1) 2)	Test throttle valve control part => Page 128
P1558	17966	Throttle valve drive -G186 Fault in electrical circuit 1) 2)	Test wiring connections between throttle valve control part and engine control unit => Page 131
P1559	17967	Throttle valve control part -J338 Fault in basic setting 1) 2)	Perform adaption => Page 128

1) If this fault occurs, the engine control unit will only switch on the exhaust emissions warning lamp (MIL) if the fault is detected again after two further engine starts. For notes on MIL=>Page **2** .

2) If this fault occurs, the engine control unit activates the EPC warning lamp in the dash panel insert as soon as the fault is detected. Notes on EPC warning lamp=>Page **3** .

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P1560	17968	Maximum engine revs surpassed	Rectify mechanical faults
P1564	17972	Throttle valve control part -J338 Low voltage at base setting 1) 2)	Charge battery and repeat adaption => Page 128
P1565	17973	Throttle valve control part -J338 Lower stop is not reached 1) 2)	Test throttle valve control part => Page 128
P1568	17976	Throttle valve control part -J338 Mechanical fault 1) 2)	
P1569	17977	CCS switch -E45 Implausible signal	=> Electrical system; Repair group 01; Self-diagnosis of cruise control system (CCS) Self-diagnosis of cruise control system (CCS)

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Fault code		Readout on fault reader display	Fault rectification
P1570	17978	Engine control unit blocked	Perform adaption of electronic immobilizer to engine control unit => Electrical system; Repair group 01; Self-diagnosis of immobilizer Self-diagnosis of immobilizer

1) If this fault occurs, the engine control unit will only switch on the exhaust emissions warning lamp (MIL) if the fault is detected again after two further engine starts. For notes on MIL=>Page 2.

2) If this fault occurs, the engine control unit activates the EPC warning lamp in the dash panel insert as soon as the fault is detected. Notes on EPC warning lamp=>Page 3.

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P1579	17987	Throttle valve control part -J338 Adaption not started/Basic settings not performed	Perform adaption of throttle valve control part; observe test requirements => Page 128
P1602	18010	Voltage supply Kl. 30 Voltage too low	Test voltage supply from terminal 30 to control unit => Page 76
P1603	18011	Control unit defective 1) 2)	Renew engine control unit => Page 58
P1606	18014	Poor road info/eng.sp.mom from ABS CU (specified engine torque from ABS control unit) Fault in electrical circuit 1)	Test coding of engine control unit and ABS control unit Test wiring connection between engine control unit and ABS control unit => Current flow diagrams, Electrical fault finding and Fitting locations
P1609	18017	Crash switch-off triggered (Crash triggered)	Test crash signal => Page 150 and => Body, Self-diagnosis; Repair group 01; Self diagnosis of airbag system Self diagnosis of airbag system

1) If this fault occurs, the engine control unit will only switch on the exhaust emissions warning lamp (MIL) if the fault is detected again after two further engine starts. For notes on MIL=>Page 2.

2) If this fault occurs, the engine control unit activates the EPC warning lamp in the dash panel insert as soon as the fault is detected. Notes on EPC warning lamp=>Page 3.

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P1612	18020	Engine control unit Wrong coding	Code engine control unit or check coding => Page 24
P1625	18033	Drive train data bus Implausible message from gearbox CU	Test CAN data bus => Page 152
P1626	18034	Drive train data bus No message from gearbox CU 1)	

1) If this fault occurs, the engine control unit will only switch on the exhaust emissions warning lamp (MIL) if the fault is detected again after two further engine starts. For notes on MIL=>Page 2.

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P1630	18038	Accelerator position sender -G79 Signal too small 2)	Test accelerator position sender =>Page 135
P1631	18039	Accelerator position sender -G79 Signal too large 2)	
P1633	18041	Accelerator position sender 2 -G185 Signal too small 2)	

P1634	18042	Accelerator position sender 2 -G185 Signal too large 2)	
P1635	18043	Data bus drive No message from air conditioner CU	Test CAN data bus => Page 152
P1636	18044	Data bus drive No message from airbag CU	
P1639	18047	Accelerator position sender 1/2 -G79+G185 Implausible signal 2)	Test accelerator position sender =>Page 135
P1640	18048	Control unit defective 1)	- Renew engine control unit => Page 58

1) If this fault occurs, the engine control unit will only switch on the exhaust emissions warning lamp (MIL) if the fault is detected again after two further engine starts. For notes on MIL=>Page **2** .

2) If this fault occurs, the engine control unit activates the EPC warning lamp in the dash panel insert as soon as the fault is detected. Notes on EPC warning lamp=>Page **3** .

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P1648	18056	Data bus drive Defective 1)	Test CAN data bus => Page 152
P1649	18057	Data bus drive Message from ABS control unit missing 1)	
P1650	18058	Data bus drive Message from combi-instrument (dash panel insert) missing	
P1657	18065	Air conditioning input/output Short to positive	- Test wiring connection between engine control unit contact 76 and air conditioner operating and display unit according to current flow diagram

1) If this fault occurs, the engine control unit will only switch on the exhaust emissions warning lamp (MIL) if the fault is detected again after two further engine starts. For notes on MIL=>Page **2** .

Fault code		Readout on fault reader display	Fault rectification
SAE	V.A.G		
P1677	18085	Electr. throttle control fault lamp - K132 Short to positive 2)	Test warning lamp for electronic throttle => Page 3
P1678	18086	Electr. throttle control fault lamp - K132 Short to earth 2)	
P1692	18100	Warning lamp for self-diagnosis - K83 Short to earth	Test warning lamp for electronic throttle -K132 => Page 3
P1693	18101	Warning lamp for self-diagnosis - K83 Short to positive	

2) If this fault occurs, the engine control unit activates the EPC warning lamp in the dash panel insert as soon as the fault is detected. Notes on EPC warning lamp=>Page **3** .

Note:

Electronic throttle control fault lamp -K132 is also known as the EPC warning lamp, or electronic power control fault lamp (term used in current flow diagrams).

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3 - Final control diagnosis

3.1 - Final control diagnosis

Notes:

- The final control diagnosis can only be performed with the ignition switched on and the engine not running.
- The electric fuel pump runs continuously throughout the final control diagnosis.
- During the final control diagnosis the individual control elements are activated in turn for about 50 seconds each (secondary air pump relay -J299 for about 10 seconds), unless the test programme is deliberately advanced to the next control element by pressing the ➡ key.
- The control elements can be tested either by listening or by touching.
- The final control diagnosis is terminated if the engine is started or if an engine speed pulse is detected.
- If the final control diagnosis is to be repeated without first running the engine briefly, switch the ignition off for about 2 seconds and then back on again.

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

Activation sequence
1 Fuel pump relay
2 ACF solenoid valve 1 -N80
3 Valve for exhaust gas recirculation -N18 (only for engines with codeALZ)
4 Intake manifold change-over valve -N156
5 Secondary air inlet valve -N112
6 Secondary air pump relay -J299

Requirements for test:

- Fuses for engine electronics OK.
- Fuel pump relay OK.

Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 5 .)
When doing this the ignition must be switched on.

-> Indicated on display:

Rapid data transfer HELP Select function XX

- Enter "03" to select the function "Final control diagnosis".

-> Indicated on display:

Rapid data transfer Q 03-Final control diagnosis
--

Activating fuel pump relay

- Confirm input with Q key.

-> Indicated on display:

Final control diagnosis Fuel pump relay -J17

The fuel pump relay will continue to be activated (i.e. will click) for about 50 seconds unless the ➡ key is pressed to deliberately advance the programme to the next control element.

If the relay is not activated (does not click):

- Test activation of fuel pump relay -J17=>Page **72**.

Activating ACF solenoid valve 1 -N80

- Confirm input with Q key.

-> Indicated on display:

Final control diagnosis
ACF solenoid 1 -N80

The solenoid valve will continue to be activated (i.e. will click) for about 50 seconds unless the ⇒ key is pressed to deliberately advance the programme to the next control element.

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

- Test solenoid valve 1 for activated charcoal filter -N80
=>Page **122**.

Activating solenoid valve for exhaust gas recirculation -N18

(only for engines with code ALZ)

- Press ⇒key.

-> Indicated on display:

Final control diagnosis
Exhaust gas recirculation valve -N18

The solenoid valve will continue to be activated (i.e. will click) for about 50 seconds unless the ⇒ key is pressed to deliberately advance the programme to the next control element.

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

- Test exhaust gas recirculation valve -N18=> Page **60**.

Activating intake manifold change-over valve -N156

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-> Indicated on display:

Final control diagnosis
Intake manifold change-over valve -N156

This valve will click (i.e. switch on and off) continuously for about 50 seconds unless the programme is deliberately advanced by pressing the⇒key.

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

- Test intake manifold change-over function -N156=>Page **116**.

Activating secondary air inlet valve

- Press ⇒key.

-> Indicated on display:

Final control diagnosis
Secondary air inlet valve -N112

The valve will continue to be activated (i.e. will click) for about 50 seconds, or until the ⇒ key is pressed to advance the programme to the next control element.



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

- Test secondary air inlet valve -N112=>Page 107 .

Activating relay for secondary air pump

- Press =>key.

-> Indicated on display:

Final control diagnosis
Secondary air pump relay -J299

The engine control unit activates the secondary air pump relay -J299 for about 10 seconds. At the same time, the secondary air pump relay activates the secondary air pump motor -V101. The secondary air pump motor runs for about 10 seconds (well audible) unless the final control diagnosis is deliberately terminated by pressing the => key.

If secondary air pump motor does not run:

- Test secondary air pump relay -J299
=>Page 112 .
- Press =>key.

-> Indicated on display:

Final control diagnosis
END

- Press =>key.

-> Indicated on display (function selection):

Rapid data transfer HELP
Select function XX

Note:

If the final control diagnosis is to be repeated, switch the ignition off for about 2 seconds and then back on again.

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4 - Basic setting

4.1 - Basic setting

With the ignition on and engine not running, the following operations can be performed in the "Basic setting" mode (function 04):

- ♦ Adaption of throttle valve control part to engine control unit
=>Display group 60
(=>Page 128)
- ♦ Adaption of EGR valve to engine control unit =>Display group 074 (=>Page 60)

With the engine running, the following operation can be performed in the basic setting mode:

- ♦ Learning process for lambda control => Page 91

Requirements for operations performed with the engine running:

- No faults stored in fault memory
- Coolant temperature at least 80 °C
- Electrical consumers switched off (radiator fan must not run during the test)

Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 5 .)
When doing this the engine must be idling.
- Interrogate and erase fault memory => Page 8 .
- Leave engine idling.

-> Indicated on display:

Rapid data transfer HELP
 Select function XX

- Enter "04" to select "Basic setting" and confirm with Q key.

-> Indicated on display:

Basic setting Q
 Enter display group number XXX

- Enter the required Display Group number.

Example:

- Enter "000" to select Display Group number 000 and confirm entry with Q key.

Note:

When the display group is selected the ACF valve is closed and the air conditioner compressor is switched off.

-> Indicated on display:

System in basic setting 0 Q
 1 2 3 4 5 6 7
 8 9 10

Notes:

- ◆ In Display Group 000 the measured values are shown in decimal form.
- ◆ If the printer is switched on, the current display can be printed out.
- ◆ Other display groups can be selected as follows:

Display group	V.A.G 1551	VAS 5051
Higher	Press key 3	Press skey
Lower	Press key 1	Press tkey

- If all the display zones show the specified values, press the => key.

-> Indicated on display (function selection):

Rapid data transfer HELP
 Select function XX

Display Group 000 (decimal readouts)									
▪ Engine idling (coolant temperature not below 80 °C)									
1	2	3	4	5	6	7	8	9	10
◀ Display zones									
Learned value for mixture formation at part throttle							Specification		Corresponds to
Learned value for mixture formation at idling speed							102...154		-10...10%
Control value for mixture formation							127...128		-0.5...0.5 %
Learned value for idling speed control							90...167		-15...15 %
Idling speed control							102...154		-10...10 %
Throttle valve angle							90...167		-15...15 %
Voltage of on-board electrical system (supply voltage)							2...12		0.94...5.6°
							110...147		11...15 V

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Display Group 000 (decimal readouts)			
	Engine speed (idling speed)	21...30	700...960 rpm
	Engine load (without electrical consumers)	38...103	15...40 %
	Coolant temperature (requirement for basic setting)	171...217	80...115 °C

5 - Coding control unit

5.1 - Coding control unit

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 5 .)
When doing this the ignition must be switched on.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

- Enter "07" for the function "Code control unit" and confirm entry with Q key.

-> Indicated on display:

Code control unit Q
Enter code number XXXXX (0-32000)

- Enter the correct code number for the vehicle and confirm by pressing Q.

Note:

See next page for a list of the possible coding variants that can be selected.

List of possible coding variants that can be selected for engines with code letters ANA:

Coding	For vehicles with
08001	Manual gearbox without ESP 1)
08011	Manual gearbox with ESP 1)

List of possible coding variants that can be selected for engines with code letters ALZ:

Coding	For vehicles with
06001	Manual gearbox without ESP 1)
06011	Manual gearbox with ESP 1)

1) The abbreviation "ESP" stands for electronic stability program. There will be an ESP switch in the centre console if the vehicle is equipped with an ESP system.

-> The display on fault reader V.A.G 1551 will show the control unit identification, as in this example.

3B0906018A 1.6l/2V SIMOS3 G00HS0002
Coding 08011 WSC 12345

Note:

If an unauthorised code number is entered:

-> Indicated on display:

Function is unknown or
cannot be carried out at the moment

- Repeat procedure, entering correct code number.

- Press ➡key.

-> Indicated on display (function selection):

Rapid data transfer	HELP
Select function XX	

- Press keys 0 and 6 for the function "End output" and confirm entry with the Q key.

Note:

An incorrect coding results in:

- ◆ Engine performance problems / poor driveability
- ◆ Increased fuel consumption
- ◆ Increased emissions
- ◆ Faults stored in fault memory which are not actually present

6 - Reading measured value block (data block)

6.1 - Reading measured value block (data block)

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

Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 5 .)
- When doing this the engine must be idling.

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

- Enter "08" to select the function "Read measured value block" and confirm entry with Q key.

-> Indicated on display:

Read measured value block	Q
Enter display group number XXX	

- Enter the required Display Group number (3 figures) and confirm entry with Q key.

Note:

The choice of display group number depends on which functions and components are to be tested.

-> Indicated on display for Display Group 000:

Read measured value block						0
1	2	3	4	5	6	
7	8	9	10			

-> Indicated on display (example) for Display Group 001:

Read measured value block				1
1	2	3	4	

**Notes:**

- ♦ If the printer is switched on, the current display can be printed out.
- ♦ Other display groups can be selected as follows:

Display group	V.A.G 1551	VAS 5051
Higher	Press key 3	Press skey
Lower	Press key 1	Press tkey

7 - Readiness code

7.1 - Readiness code

The readiness code appears as an 8-digit display in the measured value block 086. Each digit represents a specific part of the emission control system.

When the operation of any of these components is tested via the self-diagnosis, the digit on the display corresponding to this component will change from "1" to "0" (always provided that the test is fully completed).

Thus, if the readiness code is generated after successfully completing the test procedure, it will appear as "00000000" (on vehicles with engine code letters ALZ), or "10100000" for vehicles with engine code letters ANA.

Generally the readiness code is reset if:

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- ♦ the fault memory has been erased,
- ♦ or if the voltage supply to the engine control unit has been cut off (e.g. connector unplugged or battery disconnected).

If this happens, the readiness code has to be regenerated

=>Page 27 .

When the vehicle is being driven under varying load conditions, the control unit activates the various emission-related tests within a "short trip", and the readiness code is generated automatically. In this case, however, the final diagnostic readouts are not obtained.

7.2 - Reading off readiness code

Test sequence

- Connect the vehicle diagnostic, test and information system VAS 5051 (or fault reader V.A.G 1551). Select engine electronics control unit by entering address word "01" => Page 5 ; when doing this the ignition must be on.

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

- Enter "08" to select the function "Read measured value block" and confirm entry with Q key.

-> Indicated on display:

Read measured value block	Q
Enter display group number XXX	

- Enter "086" for "Display Group 086" and confirm entry with Q key.

-> Indicated on display:

Read measured value block 86
1 2 3 4

- Check readiness code in display zone 1.
 - Specification:
for engine code letters ANA: "10100000"
for engine code letters ALZ: "00000000"

Explanation of 8-digit number block for readiness code in display zone 1

1	2	3	4	5	6	7	8	Diagnostic function
							0	Catalytic converter
							0	Heating for catalytic converter (n.a. / always "0")
					0			Fuel tank breather system
			0					Secondary air system
		0						Air conditioner (currently no diagnosis function / always "0")
	0							Lambda probes
	0							Lambda probe heating
1								Exhaust gas recirculation (engine code ALZ)

If the specification "10100000" or display "00000000" is obtained:

- Press =>key.

-> Indicated on display (function selection):

Rapid data transfer HELP
Select function XX

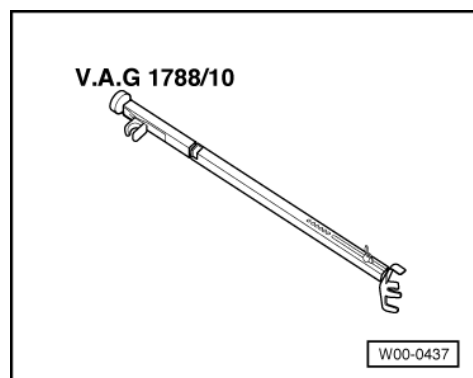
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If the specification is not attained:

- Generate readiness code => Page 27

7.3 - Generating readiness code

Special tools and workshop equipment required



- ♦ Speed regulator V.A.G 1788/10

Requirements:

- Vehicle is stationary
- Coolant temperature at least 80 °C.



- Electrical consumers switched off (radiator fan must not run during the test)

Work sequence

- Connect the vehicle diagnostic, test and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" => Page 5.

Work step 1: interrogate fault memory

- Ignition switched on.

-> Indicated on display:

Rapid data transfer Select function XX	HELP
---	------

- Press keys 0 and 2 for the function "Interrogate fault memory" and confirm entry with Q key.

-> The number of faults stored or "No fault recognised!" will be shown on the display.

X Faults recognised!

If a fault is stored:

- Rectify fault and erase fault memory. Then take vehicle for a road test and interrogate fault memory once again to check for faults.

If no faults are stored:

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- Press =>key.

Work step 2: erase fault memory

- Ignition switched on.

-> Indicated on display:

Rapid data transfer Select function XX	HELP
---	------

- Press keys 0 and 5 for the function "Erase fault memory" and confirm entry with Q key.

Note:

If the fault memory is erased, the readiness code is set back and therefore has to be regenerated.

-> Indicated on display:

Rapid data transfer Fault memory is erased!
--

- Press =>key.

Work step 3: adjust the throttle valve control part to the engine control unit

- Ignition switched on.

-> Indicated on display:

Rapid data transfer Select function XX	HELP
---	------

- Enter "04" to select "Basic setting" and confirm with Q key.

-> Indicated on display:

Introduction of basic setting Q
Enter display group number XXX

- Enter "060" for Display Group 060 and confirm entry with Q key.

-> Indicated on display:

System in basic setting 60
1 2 3 4

- Check the readout in display zone 4:

	Display zones			
	1	2	3	4
Display Group 060: Adaption of throttle valve control part				
Display	xx %	xx %	---	---
Indicates	Throttle valve angle (angle sender 1)	Throttle valve angle (angle sender 2)	Learning stage counter	Adaption status
Range	0 ... 100 %	0 ... 100 %	0 ... 8	ADP. runs ADP. O.K. ADP. ERROR
Specification	5.9...92.2 %	95.1...8.7 %	0	ADP O.K.
Note			During the adaption process the learning stage counter should count from 0 to 8. (Some of the figures may be skipped)	If readout does not match specification, see note => Page 130

If the specification "ADP O.K." is attained:

- Press C key.

Work step 4: adaption of exhaust gas recirculation valve

- Engine idling

-> Indicated on display:

Introduction of basic setting Q
Enter display group number XXX

- Enter "074" for Display Group 074 and confirm entry with Q key.

-> Indicated on display:

System in basic setting 74
1 2 3 4

- Check display values for EGR valve in display zone 4.

	Display zones			
	1	2	3	4
Display group 074: Adaption of EGR valve				
Display	xxx rpm	xx %	xx %	---
Indicates	Engine speed	Amount of opening (EGR valve potentiometer)		Adaption status
Range	0...6500 rpm			Test ON Test OFF Syst. OK Syst. n. OK



Specification	Display zones			
	xxx rpm	xx %	xx %	Syst. OK
Note	If readout does not match specification, check EGR valve for dirt or obstructions/foreign bodies.			If readout does not match specification, check EGR valve => 4-Cylinder engine (2-valve), Mechanics; Repair group 26

If the specification "Syst. OK" is obtained:

- Press C key.

Work step 5: diagnosis of fuel tank breather system

- Engine idling

Note:

After starting the engine, enter address word "01" to re-select the engine control unit if necessary, and enter "04" to select the function "Introduction of basic setting".

-> Indicated on display:

Introduction of basic setting Q
Enter display group number XXX

- Enter "070" for Display Group 070 and confirm entry with Q key.

-> Indicated on display:

System in basic setting 70
1 2 3 4

- Check the specification in display zone 4:

Note:

If the test does not start or if the display jumps from "Test ON" to "Test OFF", press the accelerator briefly. The test will now be repeated.

	Display zones			
	1	2	3	4
Display Group 070: Diagnosis of fuel tank breather valve				
Display	xx %	xx.x %		---
Indicates	Fuel tank breather valve: amount of opening	Lambda control variation		Status of diagnosis
Range	0...99 %	-25.0 ... 25.0 %		Test OFF Test ON TBV O.K. TBV n. O.K. Abort
Specification	0...99 %	-15.0...15.0 %		TBV O.K.
Note				If "TBV n. O.K." appears on display, interrogate fault memory (=> Page 122 .

If the specification "TBV O.K." is attained:

- Press key C.

Work step 6: diagnosis of secondary air system

- Lambda control must be activated (measured value block 99; display zone 4; display "on").

-> Indicated on display:

Introduction of basic setting Q
Enter display group number XXX

- Enter "077" for Display Group 077 and confirm entry with Q key.

-> Indicated on display:

System in basic setting 77
1 2 3 4

- Depress and hold brake pedal; engine speed is automatically increased to about 1400 rpm.
- Check the readout in display zone 4:

	Display zones			
	1	2	3	4
Display Group 077: Diagnosis of secondary air system				
Display	xxxx rpm			---
Indicates	Engine speed			Status of diagnosis
Range	0...6500 rpm			Test OFF Test ON Syst. O.K. Syst. n. O.K.
Specification	about 1400 rpm			Syst. O.K.
Note				If "Syst. n. O.K." appears on display, interrogate fault memory => Page 8.

Note:

The test takes about 30 seconds. If the test cannot be performed, stop the engine and restart. The secondary air pump should run during the test.

If the specification "Syst. O.K." is attained:

- Press =>key.

-> Indicated on display (function selection):

Rapid data transfer HELP
Select function XX

Work step 7: diagnosis of lambda probe ageing (cycle duration), lambda probe before catalytic converter

- Engine running between 3000 and 4000 rpm.

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-> Indicated on display:

Rapid data transfer HELP
Select function XX

- Enter "04" to select "Basic setting" and confirm with Q key.

-> Indicated on display:

Introduction of basic setting Q
Enter display group number XXX

- Enter "034" for Display Group 034 and confirm entry with Q key.



-> Indicated on display:

System in basic setting 34
1 2 3 4

- Check the readout in display zone 4:

	Display zones			
	1	2	3	4
Display group 034: Diagnosis of lambda probe ageing, lambda probe before catalytic converter				
Display	xxxx rpm	xxx °C	x.x s	---
Indicates	Engine speed	Exhaust temperature	Cycle duration of lambda probe (before catalytic converter)	Status of diagnosis
Range	0...6500 rpm	70...850 °C	0.0...5.0 sec.	Test OFF Test ON B1-P1 O.K. B1-P1 n. O.K.
Specification	3000...4000 rpm	Higher than 250 °C	0.0...5.0 sec.	B1-P1 O.K.
Note				If "B1-P1 n. O.K" appears on display: interrogate fault memory => Page 8.

If the specification "B1-P1 O.K." is attained:

- Press key C.

Work step 8: diagnosis of lambda probe ageing, lambda probe after catalytic converter

-> Indicated on display:

Introduction of basic setting 0
Enter display group number 043
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- Enter "043" for Display Group 043 and confirm entry with Q key.

-> Indicated on display:

System in basic setting 43
1 2 3 4

- Depress and hold brake pedal; engine speed is automatically increased to about 1400 rpm.
- Check the readout in display zone 4:

	Display zones			
	1	2	3	4
Display group 034: Diagnosis of lambda probe ageing				
Display	xxxx rpm	xxx °C	x.xx V	---
Indicates	Engine speed	Exhaust temperature	Cycle duration of lambda probe (before catalytic converter)	Status of diagnosis
Range	0...6500 rpm	70...850 °C	0.00...1.00 V	Test OFF Test ON B1-P2 O.K. B1-P2 n. O.K.
Specification	about 1400 rpm	Higher than 250 °C	0.00...0.95 V	B1-P2 O.K.

	Display zones			
Note				If "B1-P2 n. O.K" appears on display: interrogate fault memory => Page 8.

If the specification "B1-P2 O.K." is attained:

- Press key C.

Work step 9: diagnosis of catalytic converter

- Engine running between 3000...4000 rpm.

-> Indicated on display:

Introduction of basic setting	Q
Enter display group number XXX	

- Enter "046" for Display Group 046 and confirm entry with Q key.

-> Indicated on display:

System in basic setting 46
1 2 3 4

- Check the readout in display zone 4:

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The diagnostic test of the catalytic converter takes approx. 60 seconds.

	Display zones			
	1	2	3	4
Display group 046: Diagnosis of catalytic converter				
Display	xxxx rpm	xxx °C	x.x s	---
Indicates	Engine speed	Exhaust temperature	Catalytic converter: conversion	Status of diagnosis
Range	0...6500 rpm	70...850 °C	0...100%	Test OFF Test ON Cat B1 O.K. Cat B1 n. O.K.
Specification	3000...4000 rpm	Higher than 400 °C		Cat B1 O.K.
Note				If "Cat B1 n. O.K." appears on display, interrogate fault memory => Page 34.

Note:

Alternatively, the catalytic converter diagnosis can be done during a test drive. In this case activate display group 46 via "Read measured value block". Diagnosis can be performed if the vehicle is driven at a constant speed of about 70 km/h.

If the specification "Cat B1 O.K." is attained:

- Press =>key.

-> Indicated on display (function selection):



Rapid data transfer HELP
Select function XX

Work step 10: Reading off readiness code

- Read off the readiness code (as an additional check)=>Page 26 .

8 - Erasing adaptive values (learned values)

8.1 - Erasing adaptive values (learned values)

8.2 - Erasing adaptive values (learned values)

Note:

After replacing the catalytic converter, learned values in engine control unit have to be deleted. Description of procedure follows.

- Connect the vehicle diagnostic, test and information system VAS 5051 (or fault reader V.A.G 1551). Select engine electronics control unit by entering address word "01" => Page 5 ; when doing this the ignition must be on.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

- Press keys 1 and 0 for function "Adaption" and confirm entry with Q key.

-> Indicated on display:

Adaption
Feed in channel number XX

- Press key 0 twice for "Channel number 0" and confirm entry with Q key.

-> Indicated on display:

Adaption Q
Erase learnt values?

- Confirm input with Q key.

-> Indicated on display:

Adaption
Learnt values have been erased

- Press the =>key.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

- Then perform adaption of throttle valve control part => Page 128
- Perform adaption of EGR valve=>Page 60 .

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24 - Mixture preparation, Injection

1 - Servicing Simos injection system

1.1 - Servicing Simos injection system

1.2 - 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.

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

- ♦ Always switch off the ignition before connecting or disconnecting injection or ignition system wiring or tester cables.
- ♦ In order to run the engine at starting speed without actually starting it (for example, to test compression), unplug the connectors on the ignition coils and also the connectors on the injectors.
- ♦ During some of the tests the control unit may identify and record faults. The fault memory should therefore be interrogated and (if necessary) erased after completing the tests and any repair work that may be required.
- ♦ Always switch off the ignition before cleaning the engine.
- ♦ Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.

Warning

Fuel system is under pressure. Before opening the system place a cloth around the connection. Then release pressure by carefully loosening the connection.

1.3 - Rules for cleanliness

When working on the fuel supply/injection system, pay careful attention to the following 6 rules for ensuring maximum cleanliness:

- ♦ Thoroughly clean all unions and the adjacent areas before disconnecting.
- ♦ Place parts that have been removed on a clean surface and cover them over. Do not use fluffy cloths.
- ♦ Carefully cover over or seal opened components if the repair cannot be completed 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.
- ♦ Electrical connectors:
Protect against dirt and moisture when disconnected.



Make sure they are dry before re-connecting.

1.4 - Technical data

Engine code letters		ANA (1.6 ltr. / 74 kW engine) ALZ (1.6ltr. / 75 kW engine)
Idling speed Not adjustable - controlled by idling speed stabilisation		700 ... 960 rpm
Engine speed limitation by switching off the injectors		6500 rpm
Fuel pressure at idling speed	Vacuum hose connected	approx. 3.5 bar
	Vacuum hose disconnected	approx. 4.0 bar
Holding pressure after 10 minutes		at least 2.5 bar
Injectors	Spray pattern	same on all injectors
	Injection qty. (30 sec.)	85... 105 ml
	Resistance (room temperature)	14 ... 17 ω

1.5 - Fitting locations overview

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

- ♦ Fitting location
=> Fig. 44
- ♦ Testing=>Page 135

Brake light switch -F and brake pedal switch -F47

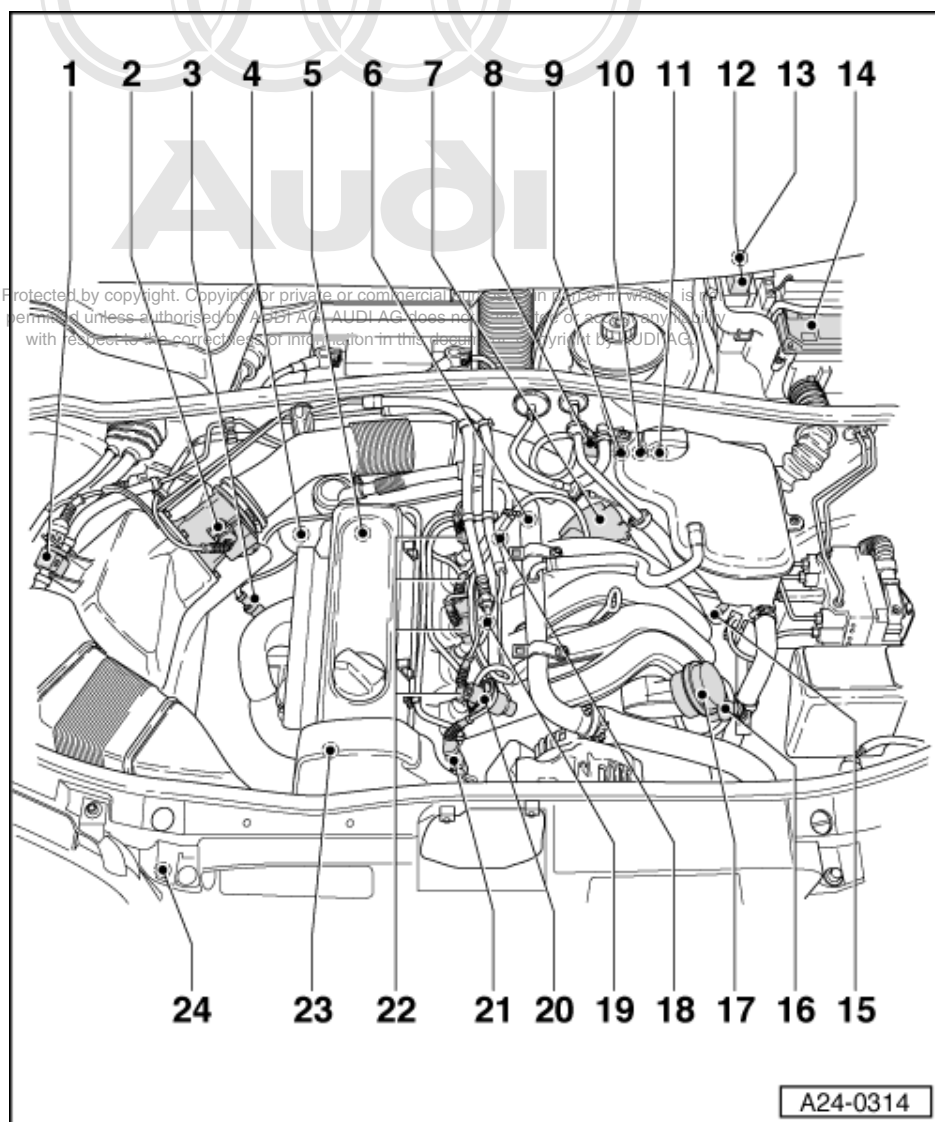
- ♦ Fitting location
=> Fig. 44
- ♦ Testing=>Page 138

Clutch pedal switch -F36

- ♦ Fitting location
=> Fig. 44
- ♦ Testing=>Page 142



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Exhaust gas recirculation valve -N18

- ◆ Fitting location: on rear of cylinder head

Electronic throttle control fault lamp -K132

- ◆ EPC warning lamp

- ◆ =>Fig. 44

- ◆ Testing=>Page 3

Exhaust emissions warning lamp -K83 MIL (Malfunction Indicator Lamp)

- ◆ "MIL"

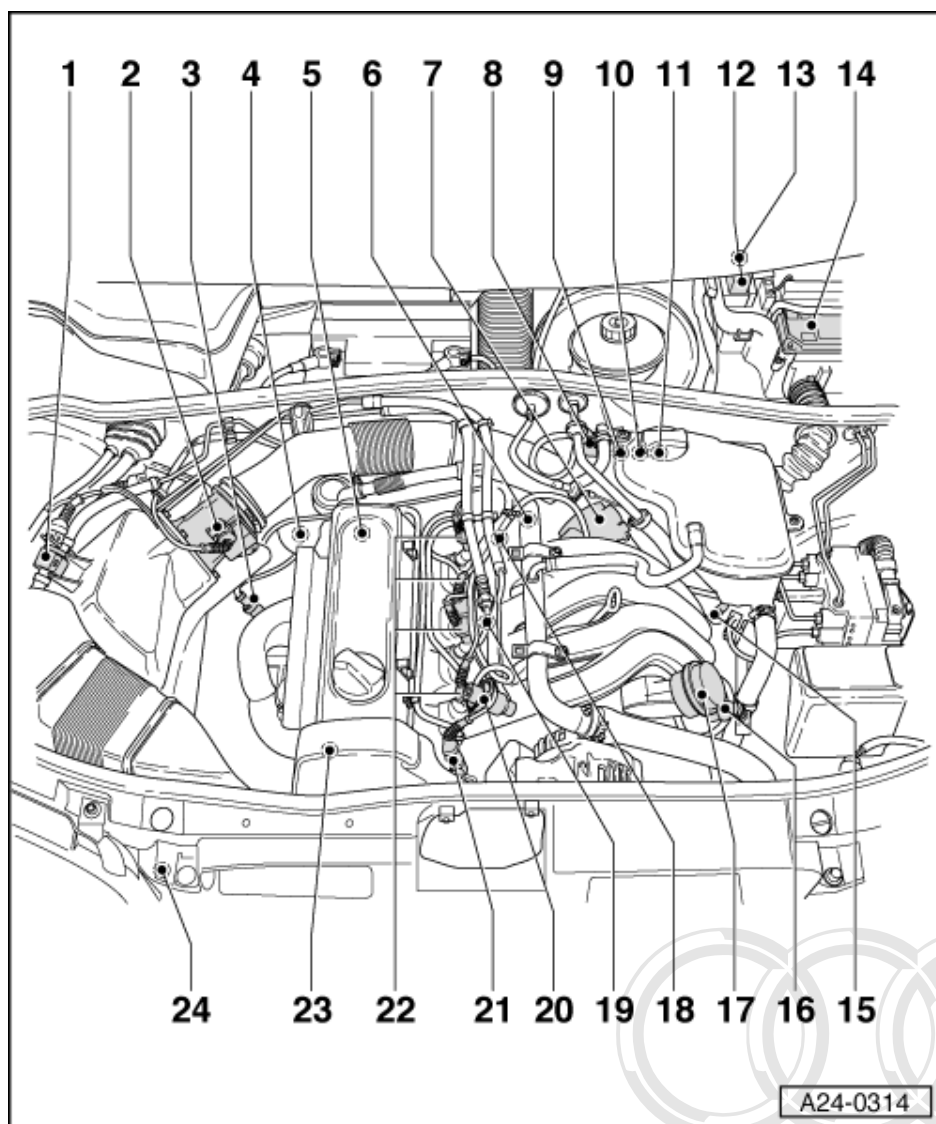
- ◆ =>Fig.5, Page 45

- ◆ Testing=>Page 2

1 Activated charcoal filter solenoid valve 1 -N80

- ◆ Testing =>Page 122

2 Air mass meter -G70



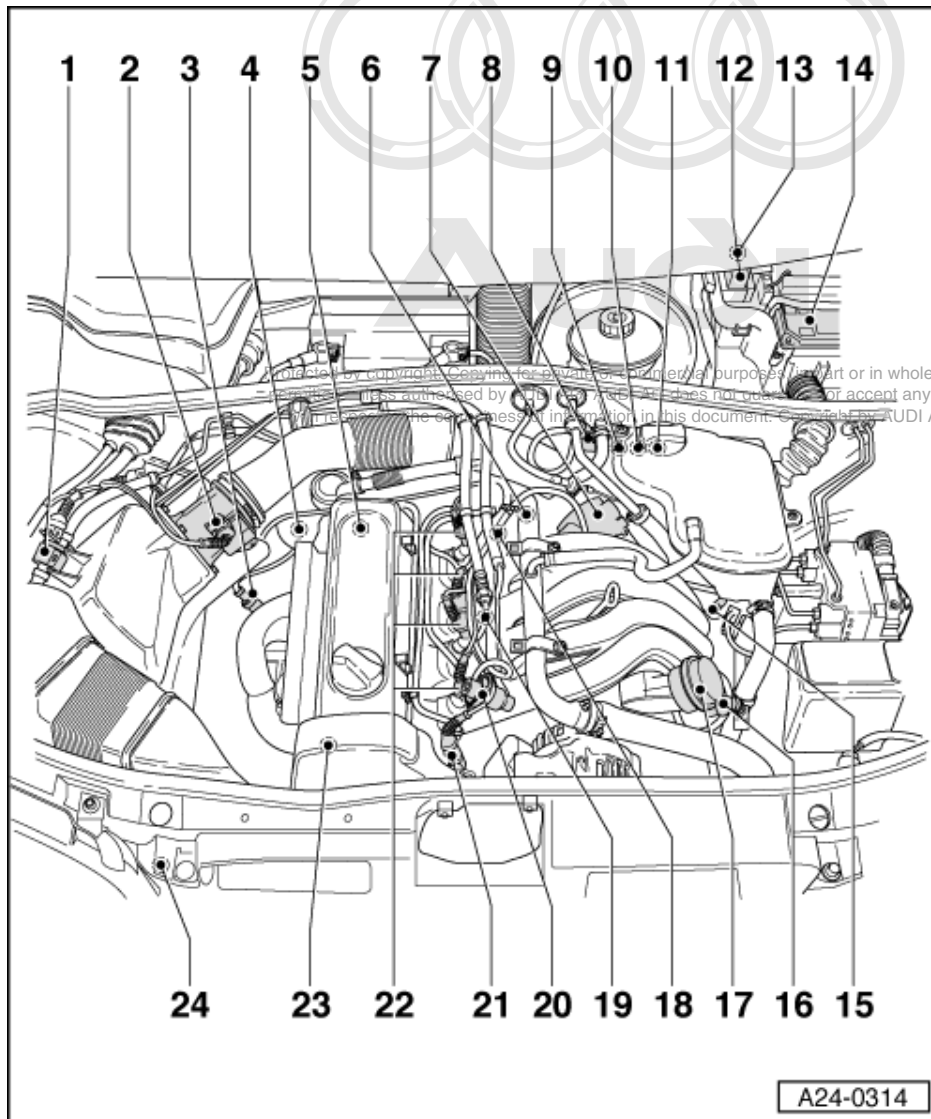
A24-0314

3 Lambda probe (before catalytic converter) -G39 - 55Nm

- ♦ Checking lambda probe and lambda control before catalytic converter=> Page 90
- ♦ Checking lambda probe heating before catalytic converter
=> Page 102
- ♦ Removing and installing
=> Page 105

4 Lambda probe (after catalytic converter) -G130 - 55 Nm

- ♦ Checking lambda probe and lambda control after catalytic converter => Page 97
- ♦ Testing lambda probe heating for lambda probe (after catalytic converter) => Page 102
- ♦ Removing and installing
=> Page 105



5 Coolant temperature sender -G62

- ♦ Testing =>Page **85**

6 Ignition coils (N and N128) with output stage (N122)

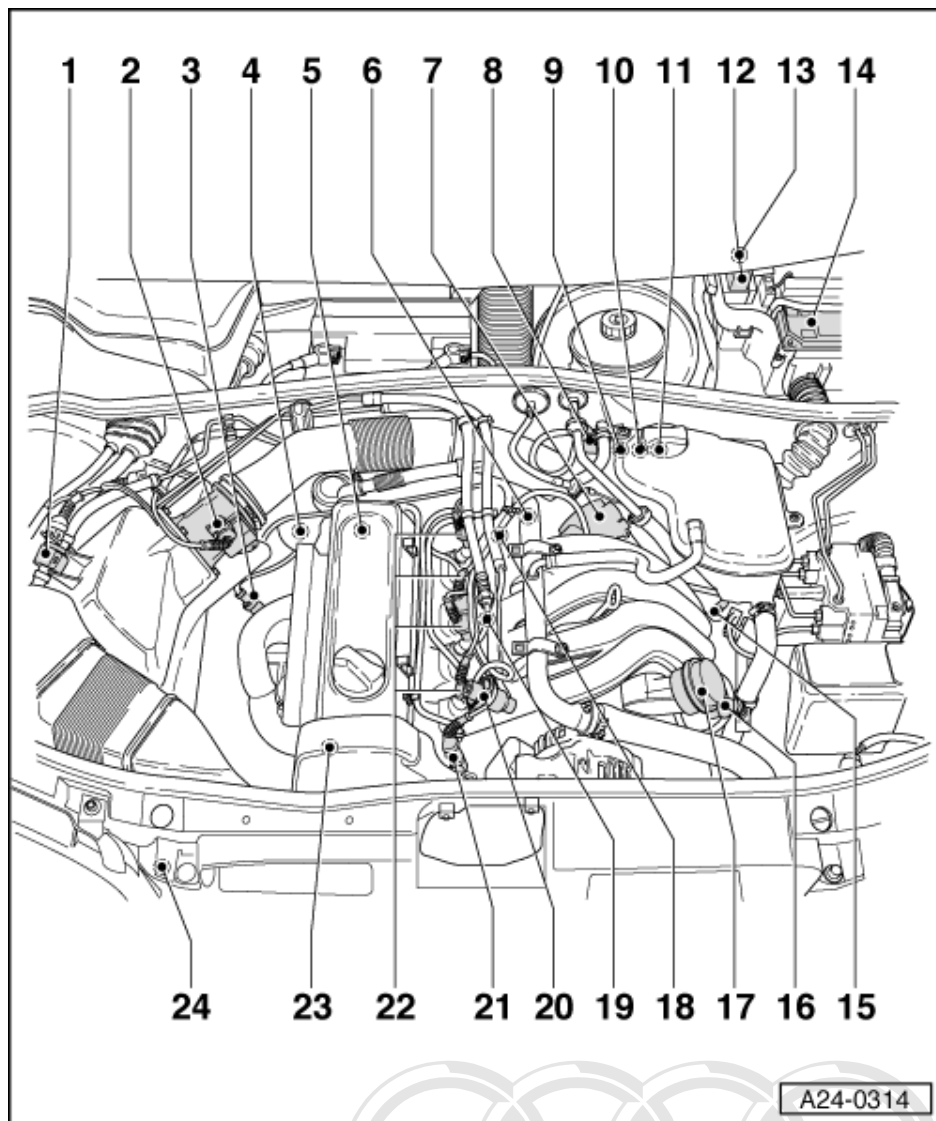
- ♦ Tightening torque for securing bolts: 9 Nm.

7 Throttle valve control part -J338

- ♦ With throttle valve drive -G186, angle sender for throttle valve drive -G187 and angle sender 2 for throttle valve drive -G188

8 4 pin connector

- ♦ For lambda probe (after catalytic converter) -G130 and lambda probe heating -Z29 (brown)
- ♦ Fitting location
 => Fig. **43**



9 4 pin connector

- ◆ For lambda probe (before catalytic converter) -G39 and lambda probe heating -Z19 (black)
- ◆ Fitting location
=> Fig. 43

10 3 pin connector

- ◆ For engine speed sender -G28 (grey)
- ◆ Fitting location
=> Fig. 43

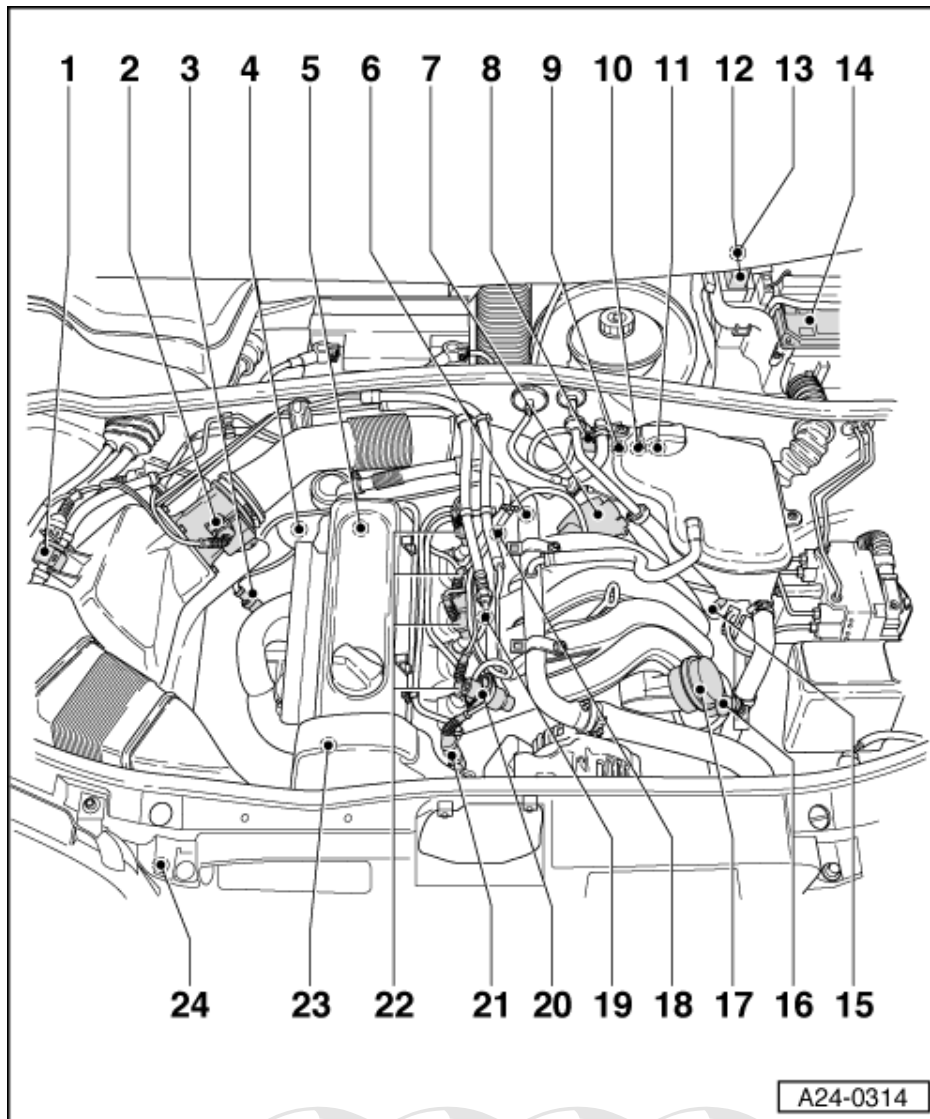
11 3 pin connector

- ◆ For knock sensor 1 -G61 (green)
- ◆ Fitting location
=> Fig. 43

12 Secondary air pump relay -J299

- ◆ Located in electronics box in plenum chamber (left side)
- ◆ Fitting location
=> Fig. 45 .

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13 Current supply relay -J363 (terminal 15) for engine control unit

- ◆ Located in electronics box in plenum chamber (left side)
- ◆ Fitting location
 => Fig 45.

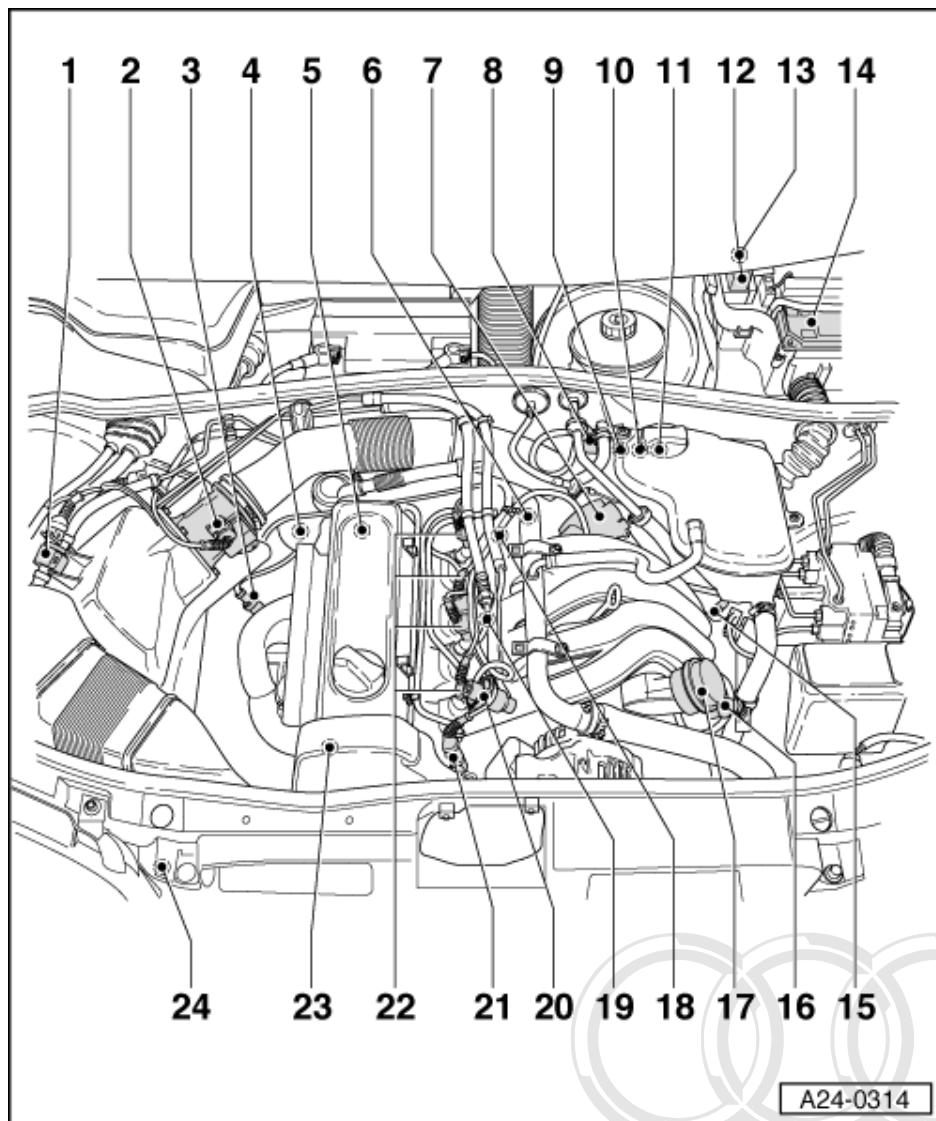
14 Engine control unit -J361

- ◆ Located in electronics box in plenum chamber (left side)
- ◆ Fitting location
 => Fig 45.

15 Secondary air inlet valve -N112

16 Intake manifold change-over valve -N156

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17 Vacuum unit for intake manifold change-over function

18 Engine speed sender -G28

19 Knock sensor 1 -G61

20 Fuel pressure regulator

21 3 pin connector

- ♦ For phase sensor (Hall sender) -G40
- ♦ Black

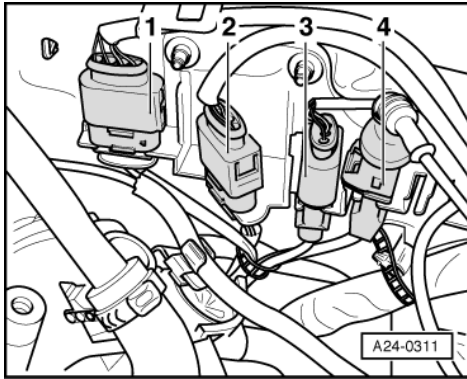
22 Injectors (N30...N33)

23 Phase sensor (Hall sender) -G40

- ♦ Beneath camshaft sprocket

24 Secondary air pump motor -V101

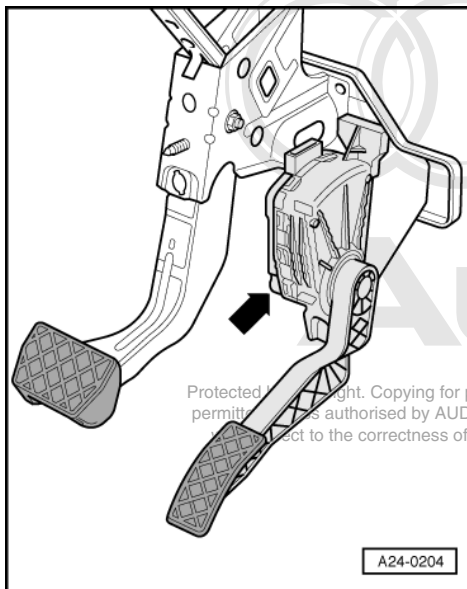
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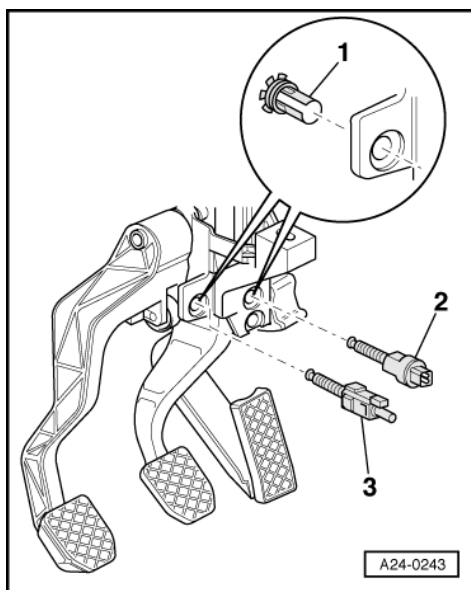
-> Fig.1 Fitting location of connectors

The following connectors are located underneath the coolant expansion tank:

- 1 - For lambda probe 2, (after catalytic converter) and heating (brown)
- 2 - For lambda probe 1, (before catalytic converter) and heating (black)
- 3 - For engine speed sender -G28 (grey)
- 4 - For knock sensor 2 -G61



-> Fig.2 Fitting location of accelerator position sender -G79 and accelerator pedal position sender -2- -G185



-> Fig.3 Fitting location of brake light switch -F, brake pedal switch -F47 and clutch pedal switch -F36

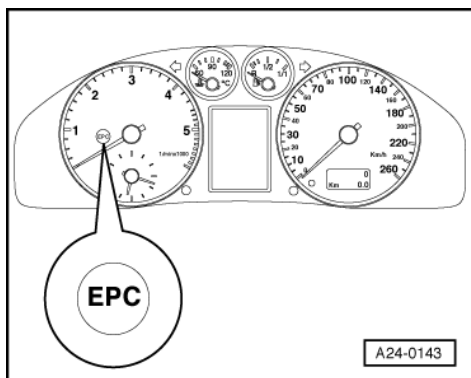
- 1 - Clip
- 2 - Clutch pedal switch -F36
- 3 - Brake light switch -F, Brake pedal switch -F47

Note:

To ensure a secure fitting, the switches may be installed only once.

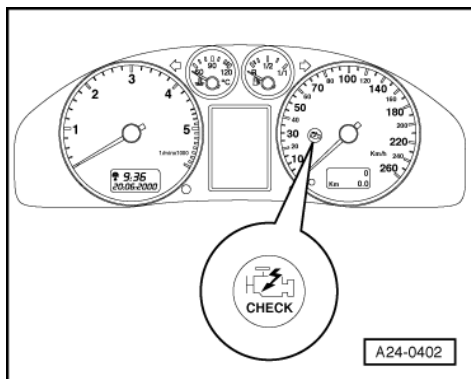
Adjusting switch:

=> Running gear, Front-wheel drive and four-wheel drive; Repair group 46

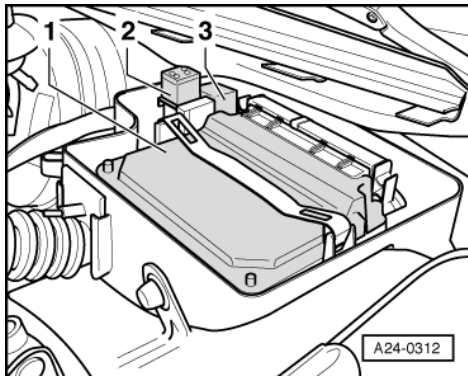


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-> Fig.4 Fitting location of electronic throttle control warning lamp -K132



-> Fig.5 Exhaust emissions warning lamp -K83 (MIL)



-> Fig.6 Fitting location of engine control unit,

Secondary air pump relay -J299

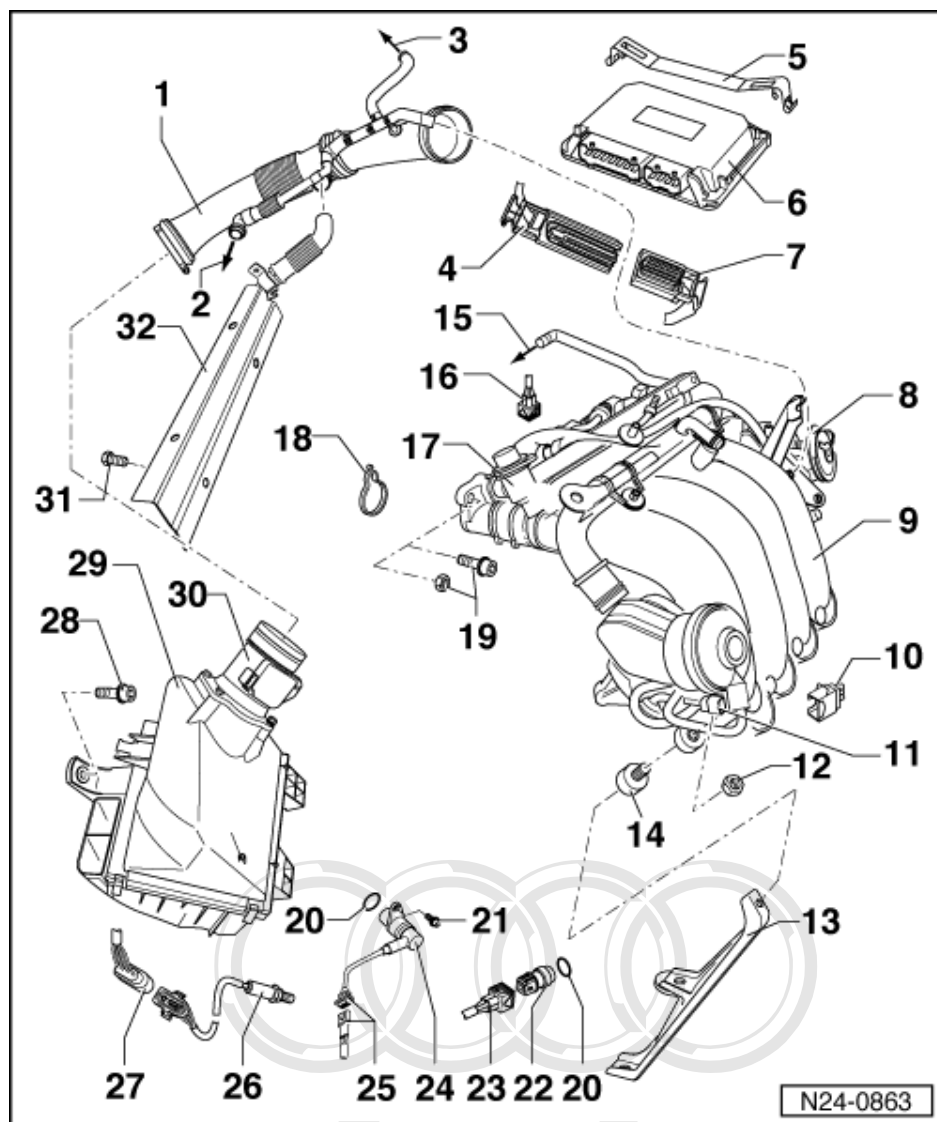
Power supply relay for engine control unit

- 1 - Engine control unit -J361
- 2 - Secondary air pump relay -J299
- 3 - Current supply relay for engine control unit -J363

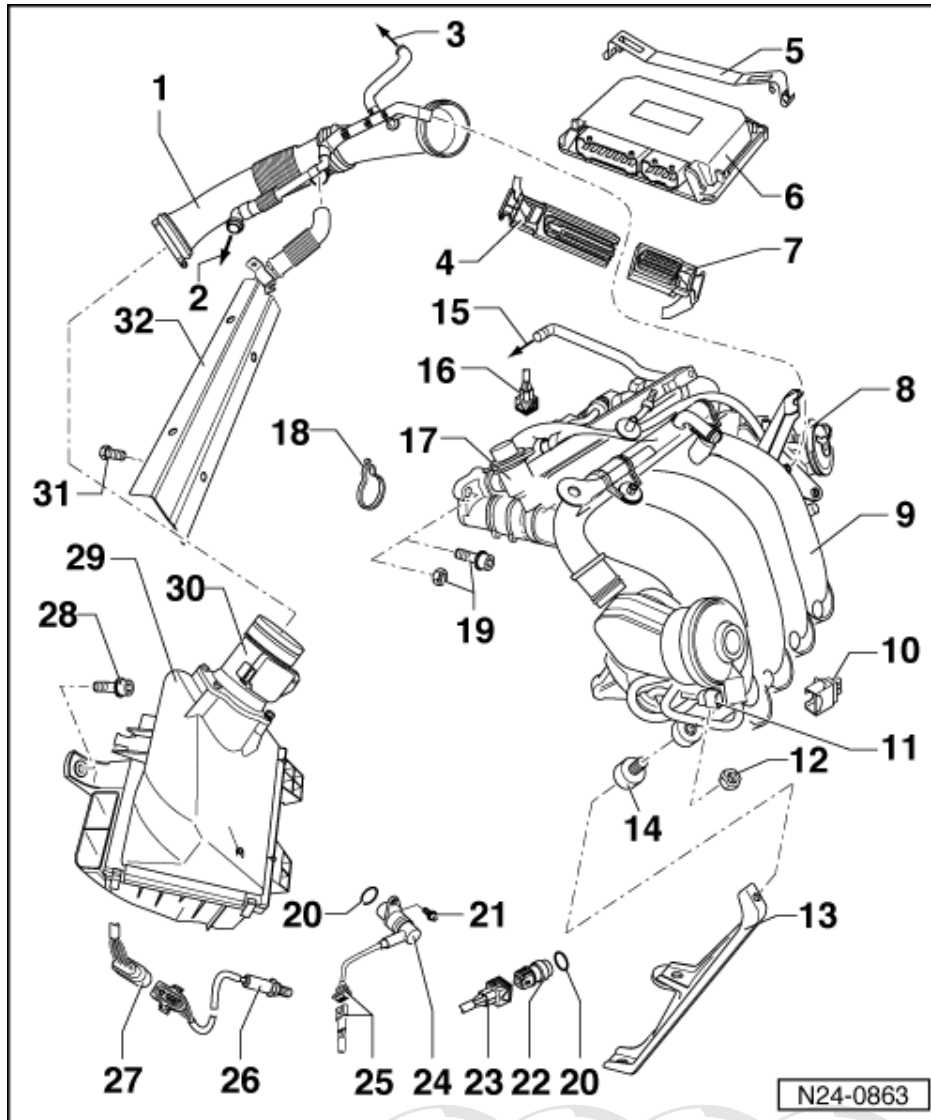


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1.6 - Servicing injection system

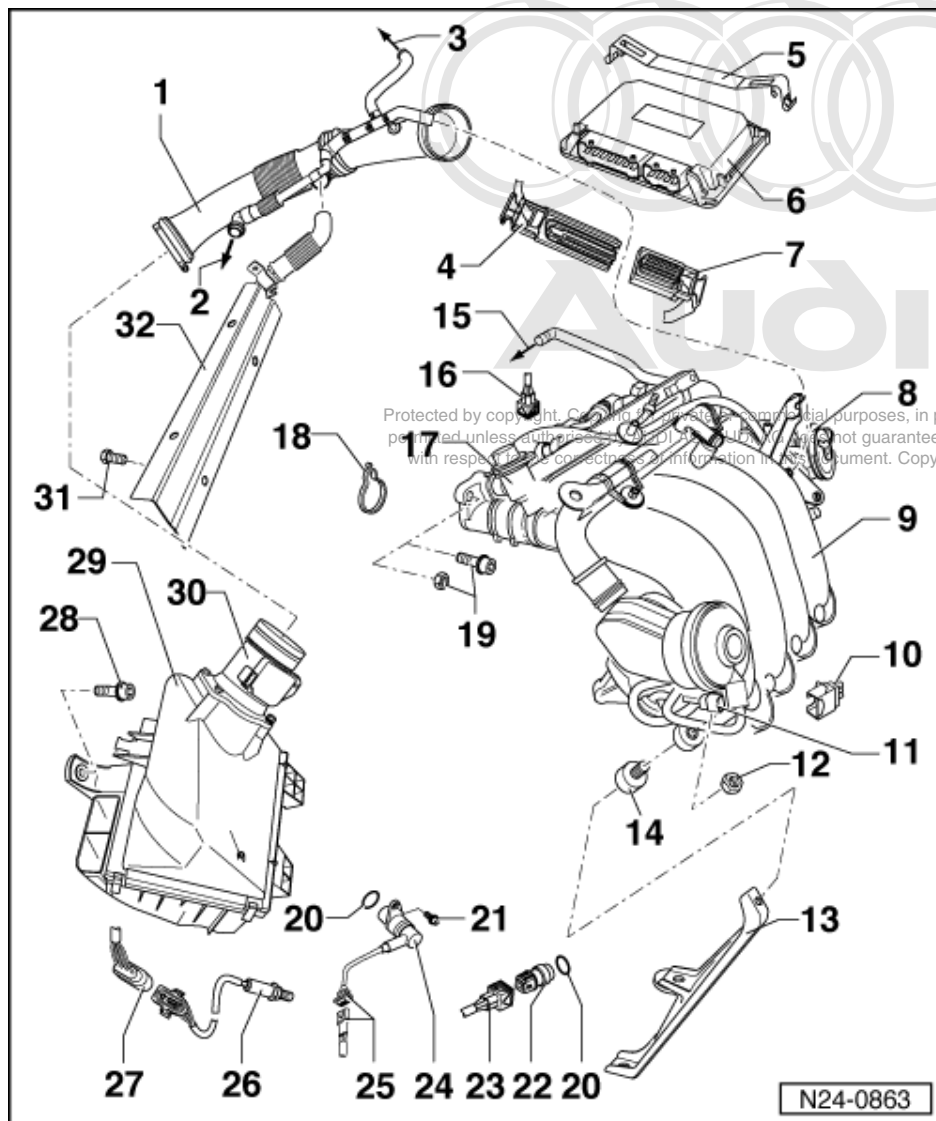


- 1 Intake hose
- 2 To cylinder head cover
- 3 To activated charcoal filter solenoid valve (N80)
- 4 Connector, 81-pin
 - ♦ For engine control unit
 - ♦ Only disconnect or connect with ignition switched off
 - ♦ Release to disconnect
- 5 Securing plate
 - ♦ For engine control unit



- 6 Engine control unit**
 ♦ Fitting location: In protective housing, plenum chamber, left
- 7 Connector, 40 pin**
 ♦ For engine control unit
 ♦ Only disconnect or connect with ignition switched off
 ♦ Release to disconnect
- 8 Throttle valve control part (J338)**
- 9 Intake manifold**

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10 Connector

- ◆ Black, 2-pin
- ◆ For twin path intake manifold change-over valve (N156)

11 Intake manifold change-over valve (N156)
12 10 Nm
13 Support

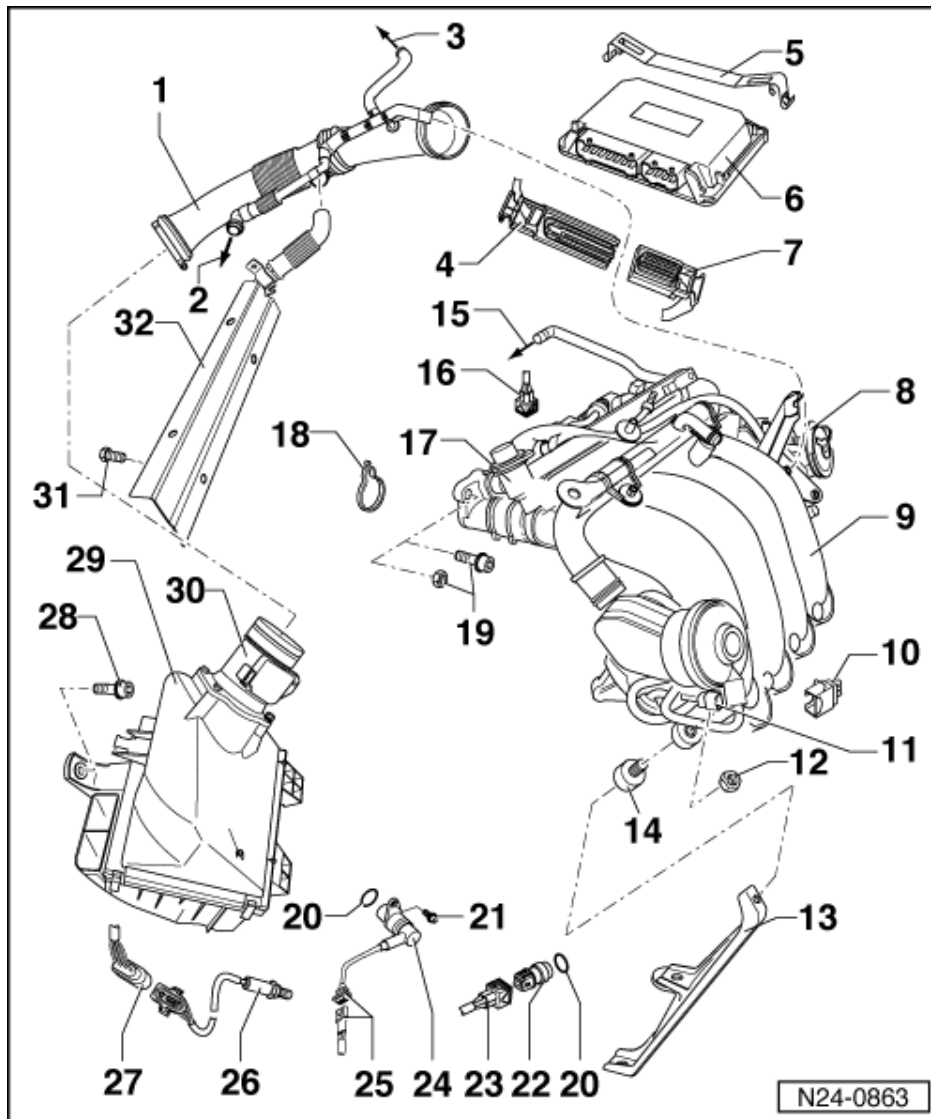
- ◆ Between intake manifold and compact bracket

14 Bonded rubber mounting
15 To connection

- ◆ On cylinder head

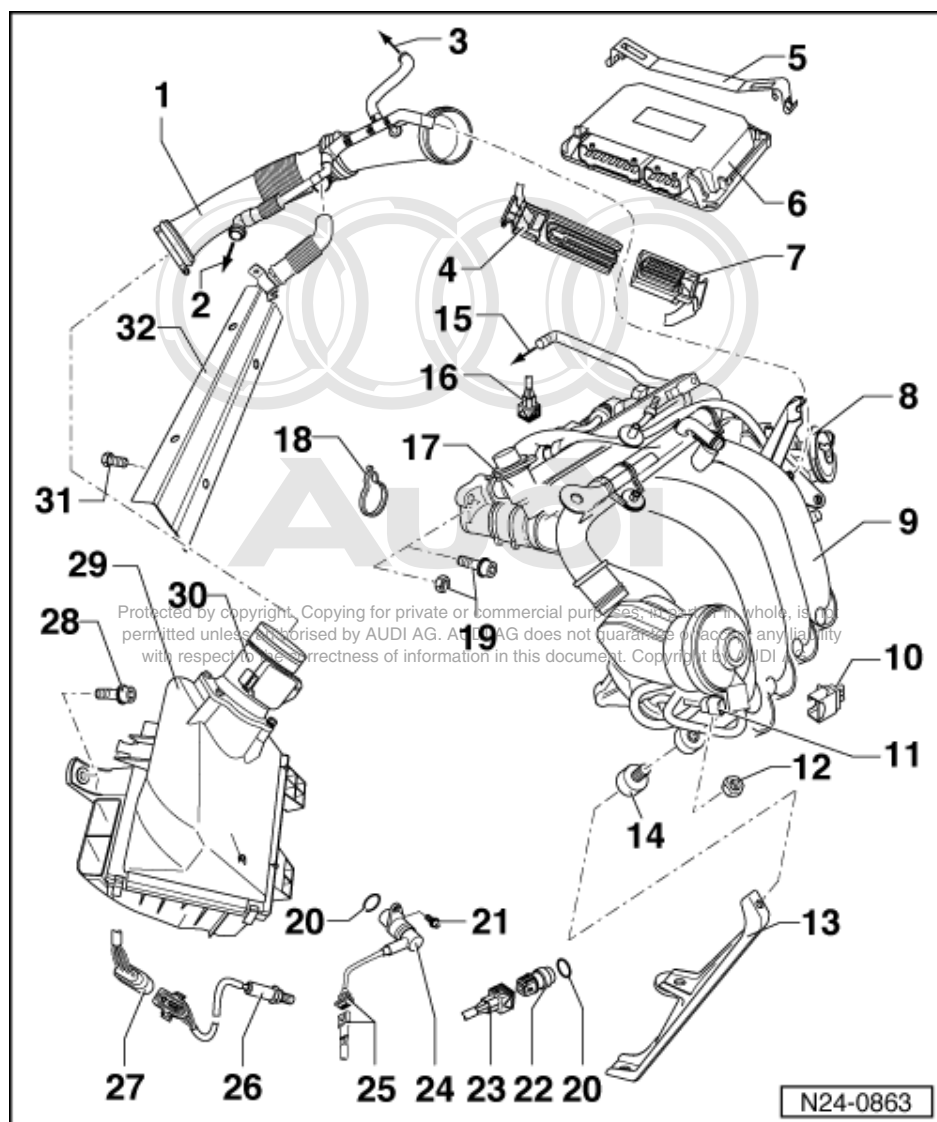
16 Connector

- ◆ Black, 2-pin
- ◆ For injector (N30...N33)



- 17 Fuel rail
- 18 Seal
 - ♦ Renew
- 19 20 Nm
- 20 O ring
 - ♦ Renew if damaged
- 21 10 Nm
- 22 Coolant temperature sender (G62)
 - ♦ If necessary release pressure in cooling system before removing
- 23 Connector for coolant temperature sender

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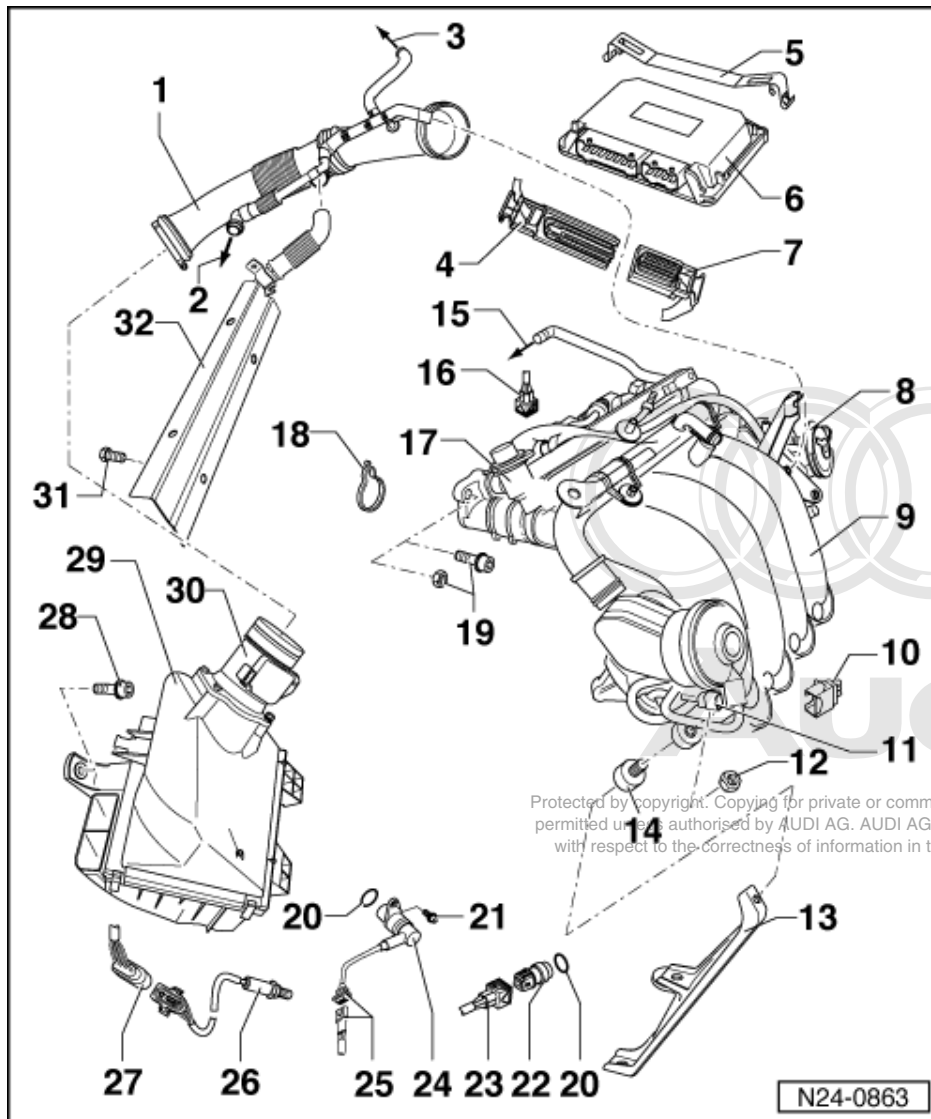
24 Engine speed sender (G28)

25 3 pin connector

- ◆ For engine speed sender
- ◆ Grey
- ◆ Secured to the bulkhead on left (below expansion tank)

26 Lambda probe before catalytic converter and lambda probe after catalytic converter; lambda probe after catalytic converter is not illustrated.

- ◆ Fitting location: front pipe
- ◆ 50 Nm
- ◆ Grease only the threads with "G5"; "G5" must not get into the slots on the probe body



27 4-pin connector

- ◆ Brown for lambda probe and lambda probe heating after catalytic converter
- ◆ Black for lambda probe and lambda probe heating before catalytic converter
- ◆ Secured to the bulkhead on left (below expansion tank)

28 20 Nm

29 Air cleaner

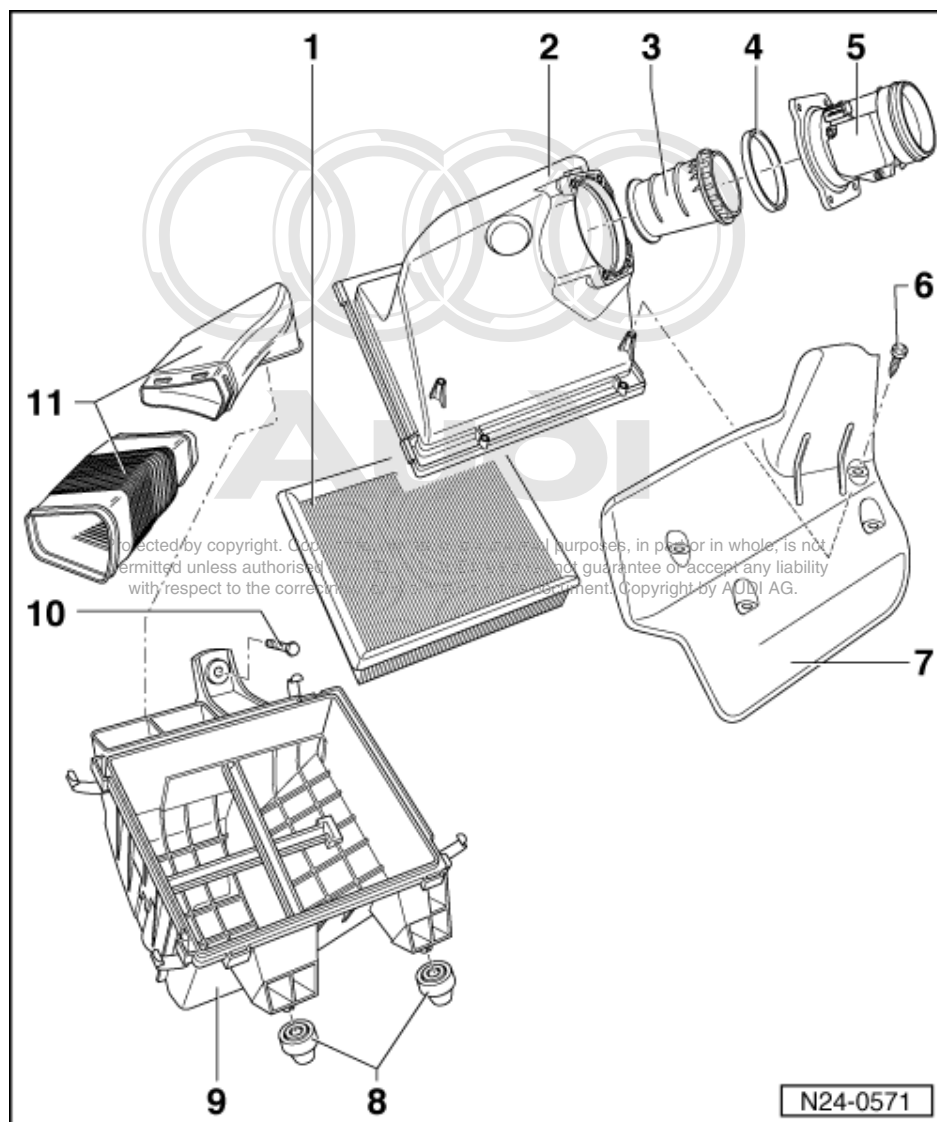
30 Air mass meter (G70) with intake air temperature sender (G42)

31 20 Nm

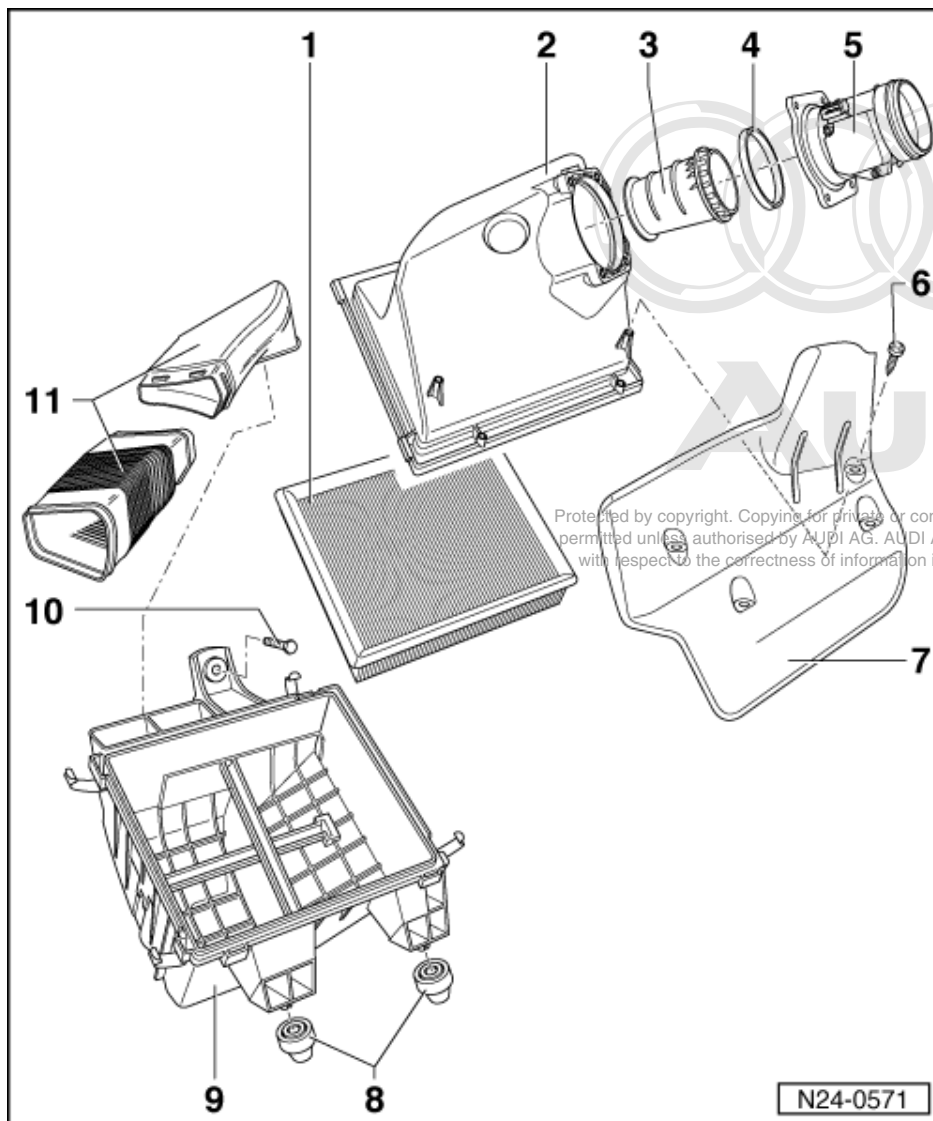
32 Resonator



1.7 - Dismantling and assembling air cleaner



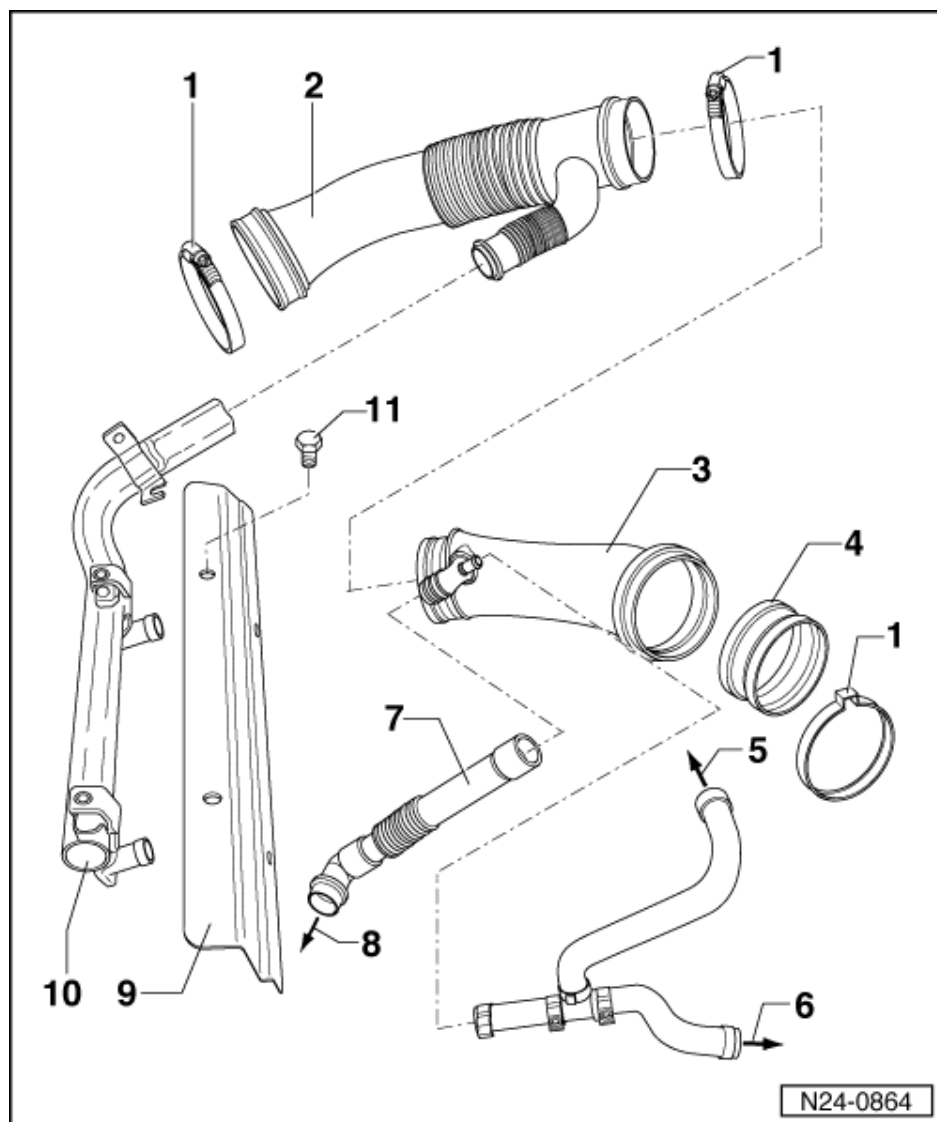
- 1 Filter element
- 2 Air cleaner upper part
- 3 Air duct
- 4 Gasket
 - ♦ Renew if damaged
- 5 Air mass meter (G70)
 - ♦ With intake air temperature sender (G42)
 - ♦ Tighten securing bolts to 6 Nm
- 6 2 Nm
- 7 Heat shield



- 8 Packing
- 9 Air cleaner lower part
- 10 20 Nm
- 11 Air ducting
 - ♦ To lock carrier



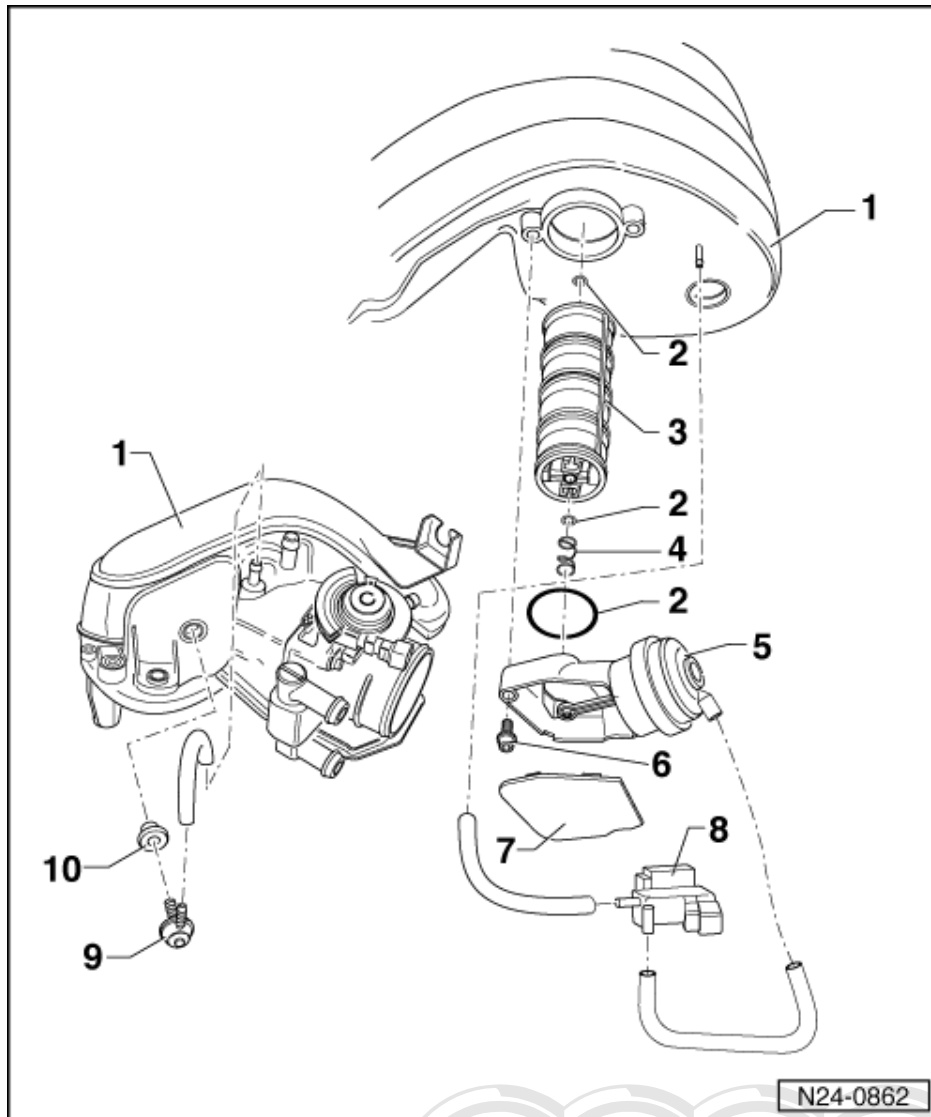
1.8 - Dismantling and assembling intake hose



- 1 Hose clip
- 2 Intake hose
- 3 Connecting hose
- 4 Gasket
 - ♦ Renew if damaged
- 5 To activated charcoal filter solenoid valve
- 6 To throttle valve control part
- 7 Crankcase breather pipe
- 8 To cylinder head cover
- 9 Heat shield
- 10 Resonator
- 11 10 Nm

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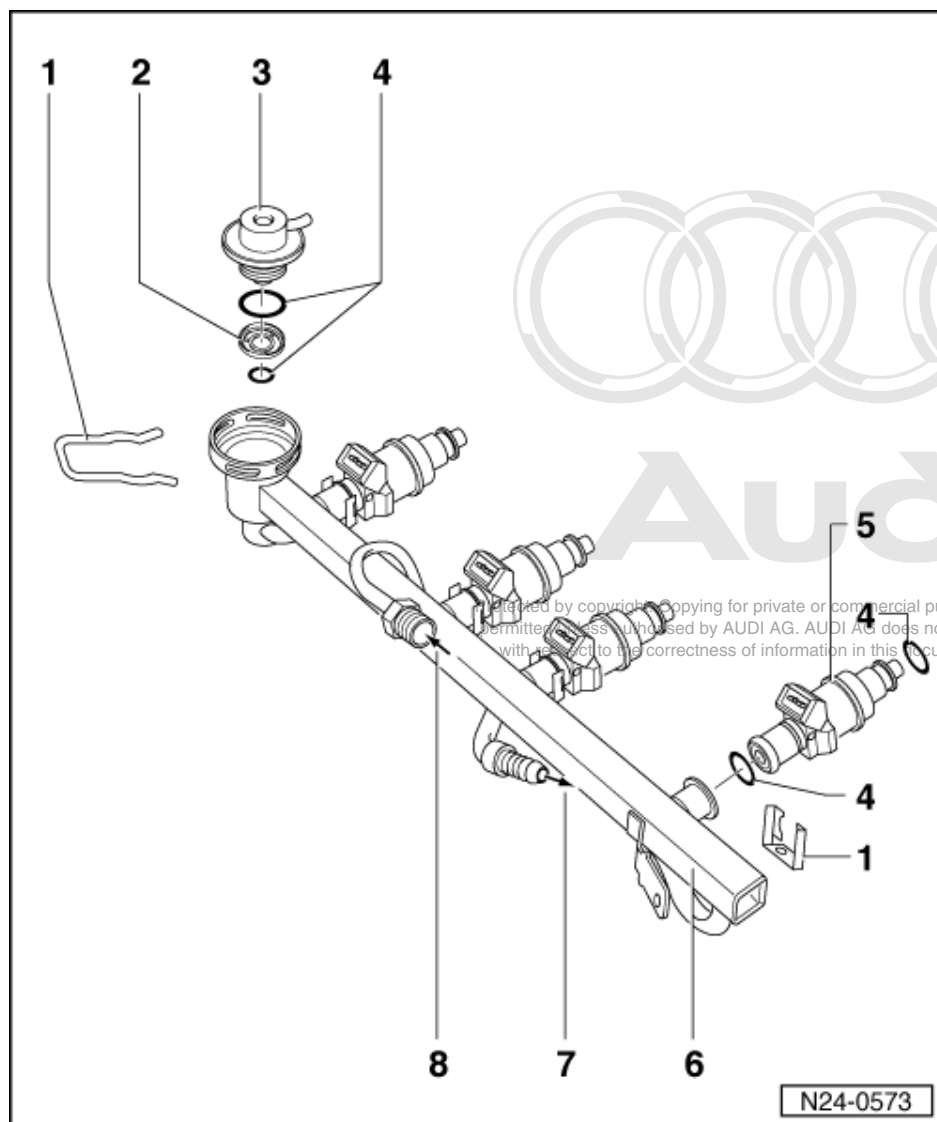
1.9 - Removing and installing parts of intake manifold change-over



- 1 Intake manifold
- 2 Seal
 - ♦ Renew if damaged
- 3 Change-over barrel
- 4 Spring
- 5 Vacuum control element
- 6 10 Nm
- 7 Cover
- 8 Intake manifold change-over valve (N156)
- 9 Non-return valve
 - ♦ Installation position: Grey side faces intake manifold
- 10 Rubber grommet

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1.10 - Dismantling and assembling fuel rail



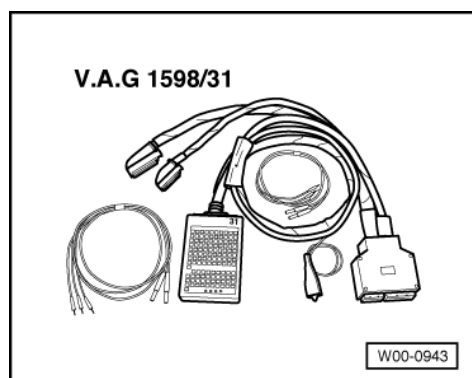
- 1 Retaining clip
 - ♦ Check securely seated
- 2 Strainer
- 3 Fuel pressure regulator
- 4 O ring
 - ♦ Renew if damaged
- 5 Injectors (N30...N33)
- 6 Fuel rail
- 7 Return flow connection
- 8 Supply connection

1.11 - Wiring and component check with test box V.A.G 1598/31

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.).

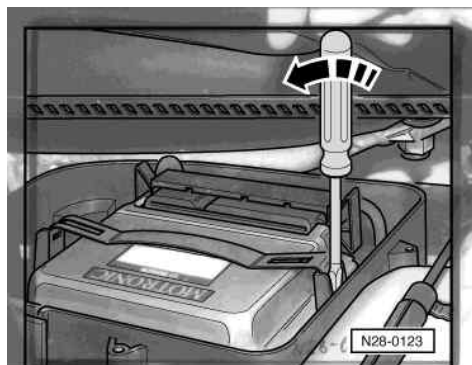
Special tools and workshop equipment required

- ♦ V.A.G 1598/31

Work sequence

- Switch off ignition.
- Remove plenum chamber cover.
- Remove cover for electronics box in plenum chamber.

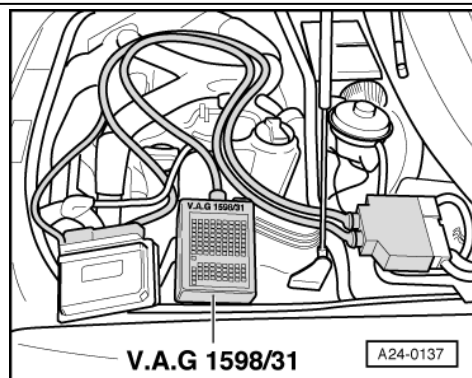
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- -> Carefully lever off the retainer bar with a screwdriver -arrow-.
- Release catches and unplug control unit connectors.

Warning!

To prevent damage to the electronic components, switch to the respective measuring range before connecting the measuring cable and observe the test prerequisites.





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

Perform the following operations after reconnecting engine control unit:

- Interrogate fault memory and erase if necessary => Page 8 .

All models

Note:

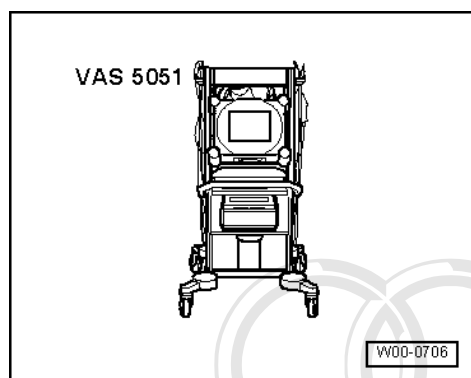
During the initial learning phase of the basic setting operation for the engine the idling may be slightly rough and the engine may pull a little unevenly.

1.12 - Procedure after voltage supply open circuit

Note:

During the initial learning phase of the basic setting operation for the engine the idling may be slightly rough and the engine may pull a little unevenly.

Special tools and workshop equipment required



- ♦ VAS 5051 and VAS 5051/1
- or
- ♦ V.A.G 1551 and V.A.G 1551/3 A

Work sequence

Perform the following operations after voltage supply open circuit:

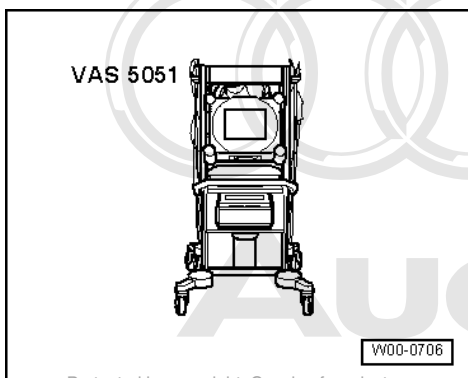
- Interrogate fault memory and erase if necessary => Page 8
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1.13 - Renewing engine control unit

Note:

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

Special tools and workshop equipment required



- ♦ VAS 5051 and VAS 5051/1

or

- ♦ V.A.G 1551 and V.A.G 1551/3 A

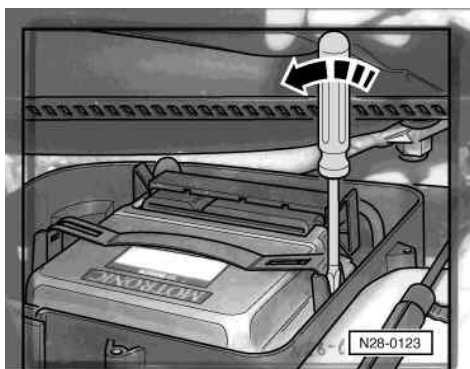
Removing

- Connect the vehicle diagnostic, test and information system VAS 5051 (or fault reader V.A.G 1551). Select engine electronics control unit by entering address word "01" => Page 5; when doing this the ignition must be on.

-> The display on fault reader V.A.G 1551 will show the control unit identification, as in this example.

3B0906018A 1.6L/2V SIMOS3 G00HS0002
 Coding 08011 WSC 12345

- Always start by calling up and printing out the control unit identification => Page 7 .
- Check the coding against the list of coding variants => Page 24 .
- Switch off ignition.
- Remove plenum chamber cover.
- Remove cover for electronics box in plenum chamber.



- -> Carefully lever off the retainer bar with a screwdriver -arrow-.
- Release catches and unplug control unit connectors.
- Take out engine control unit.

Installing

Install in reverse sequence; note the following points:

**Note:**

During the initial learning phase of the basic setting operation for the engine the idling may be slightly rough and the engine may pull a little unevenly.

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

- Perform adaption of immobilizer to engine control unit:

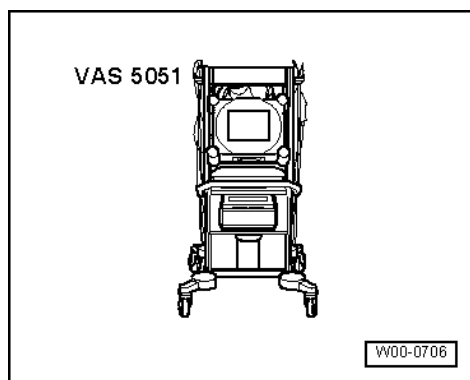
=> Electrical System; Repair Group 01; Self-diagnosis of electronic immobilizer; Adaptation procedure when engine control unit is replaced Self-diagnosis of electronic immobilizer Adaptation procedure when engine control unit is replaced

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- Check the notes on coding a new engine control unit=>Page 24 .
- Interrogate and if necessary erase the fault memory=>Page 8 .
- Perform adaption of throttle valve control part -J338=>Page 128 .
- Perform adaption of EGR valve=>Page 60 .
- On vehicles with cruise control (identifiable by controls on steering column), activate the cruise control via the engine control unit.

=> Electrical system; Repair group 01; Self-diagnosis of cruise control system (CCS); Testing cruise control system (CCS) Self-diagnosis of cruise control system (CCS) Testing cruise control system (CCS)

1.14 - Performing adaption of EGR (exhaust gas recirculation) valve



Special tools and workshop equipment required

- ♦ VAS 5051 and VAS 5051/1
- or
- ♦ Fault reader V.A.G 1551 with V.A.G 1551/3 A

Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 5 .)
When doing this the ignition must be switched on.

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

- Enter "04" to select "Basic setting" and confirm with Q key.

-> Indicated on display:

Basic setting Q
Enter display group number xxx

- Enter "074" for Display Group 074 and confirm entry with Q key.
- Check display values for EGR valve in display zone 4.

	Display zones			
	1	2	3	4
Display group 074: Adaption of EGR valve				
Display	x,x V	x,x V	xxx %	---
Indicates	Zero position	Maximum limit	Duty cycle	Adaption status
Range			0...100 %	ADP. runs ADP OK ADP ERROR
Specification	0.3...1.2 V	3.0...4.8 V	0...100 %	ADP OK
Note	If readout does not match specification, check EGR valve for dirt or obstructions/foreign bodies.			If readout does not match specification, check EGR valve => 4-Cylinder engine (2-valve), Mechanics; Repair group 26

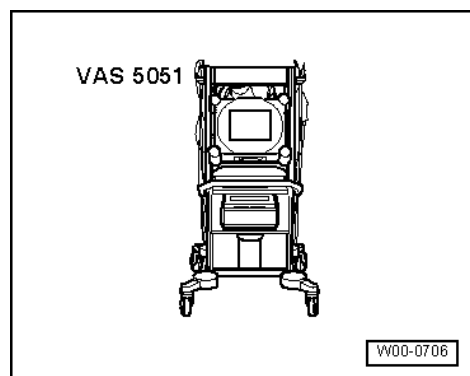
Note on display zone 4:

The abbreviation "ADP" in display zone 4 stands for "Adaption"

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1.15 - Testing idling speed

Special tools and workshop equipment required



- ♦ VAS 5051 and VAS 5051/1
- or
- ♦ Fault reader V.A.G 1551 with V.A.G 1551/3 A

Requirements for test:

- Exhaust system free of leaks
- Coolant temperature at least 80 °C
- Electrical consumers switched off (radiator fan must not run during the test)
- Air conditioner switched off
- No pressure gauge connected

**Notes:**

- ♦ The idling speed cannot be adjusted.
- ♦ The idling speed is tested during the basic setting of the engine.
- ♦ During the basic setting of the engine, the solenoid valve for the activated charcoal filter (ACF valve -N80) is closed and the air conditioner compressor is automatically switched off.

Test sequence

- Interrogate fault memory =>Page 8 . The fault memory must be clear. If necessary, rectify any faults and erase the fault memory. Switch off the engine, then start up again. Take vehicle for a test drive and interrogate the fault memory again to make sure it is clear.
- Run the engine at idling speed.

Warning!

The electric radiator fan should not be running.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

- Enter "04" to select "Basic setting" and confirm with Q key.

-> Indicated on display:

Introduction of basic setting Q
Enter display group number XXX

- Enter "056" for Display Group 056 and confirm entry with Q key.

-> Indicated on display:

Basic setting 56
1 2 3 4

- Check whether the engine speed shown in display zone 1 (actual engine speed) is within the specified tolerance range.

	Display zones			
	1	2	3	4
Display Group 056: Idling speed stabilisation with engine idling at normal operating temperature				
Display	xxx rpm	xxx rpm	x.x %	X X X X X
Indicates	Engine speed (actual)	Engine speed (specified)	Idling speed control - torque change	Operating status
Specification	700-960 rpm	Display shows a theoretical engine speed calculated by the engine control unit.	x.x %	0 0 0 0 0
Note	If readout does not match specification =>Page 63			Relevance of figures => Page 63

Notes:

- ♦ The value shown in display zone 1 is the actual engine speed.
- ♦ The value shown in display zone 2 (specified engine speed) is a theoretical value calculated by the engine control unit.
- ♦ When the engine is idling the engine control unit tries constantly to adjust the actual engine speed so that it matches the specified value.
- ♦ This means that the actual engine speed when idling should always be approximately the same as the specified engine speed.

- ◆ Display zones 3 and 4 provide additional information which is not relevant when checking the idling speed.

If the specification is obtained:

- Press =>key.

-> Indicated on display (function selection):

Rapid data transfer HELP
 Select function XX

If the specification is not attained:

- Interrogate fault memory again =>Page 8 .

If the idling speed is too high or too low and there are no faults recorded in the fault memory, carry out the following tests (marked with dots):

- Test for unmetered air in the intake system =>Page 82 .
- Perform adaption of EGR valve=>Page 60 .
- Solenoid valve for activated charcoal filter constantly open
Test =>Page 122 .
- Perform adaption of throttle valve control part =>Page 128 .

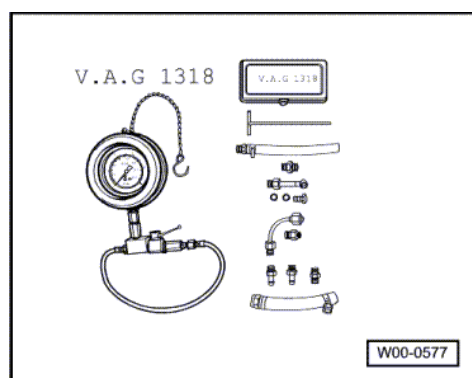
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Relevance of figures in 5-digit readout for Display Group 056, display zone 4:

x	x	x	x	x	Display zone 4
				0	Air conditioner compressor 0 = air conditioner compressor off 1 = air conditioner compressor on
			0		Display always reads "0"
		0			Display always reads "0"
	0				Display always reads "0"
0					Display always reads "0"

1.16 - Checking system pressure, fuel pressure regulator and holding pressure

Special tools and workshop equipment required



- ◆ V.A.G 1318
- ◆ V.A.G 1318 with V.A.G 1318/11, V.A.G 1318/12 and V.A.G 1318/13



Note:

The fuel pressure regulator regulates the fuel pressure according to the intake manifold pressure. This ensures that the drop in pressure at the injectors remains the same throughout all engine speed and engine load ranges.

Requirements for test:

- Fuel pump relay OK. Testing => Page **72**.
- Fuel pump OK. Testing:

=> Fuel supply, Petrol engines; Repair group 20; Fuel supply, Front-wheel drive and four-wheel drive Fuel supply, Front-wheel drive and four-wheel drive

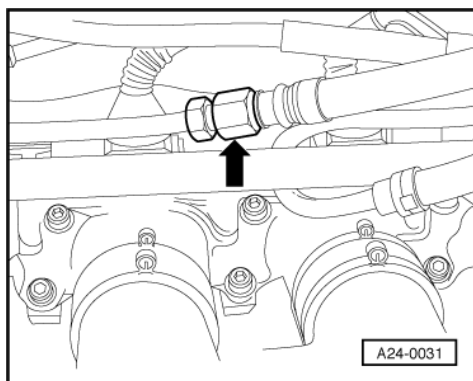
- Fuel filter OK
- Battery voltage not less than 11 V

Warning

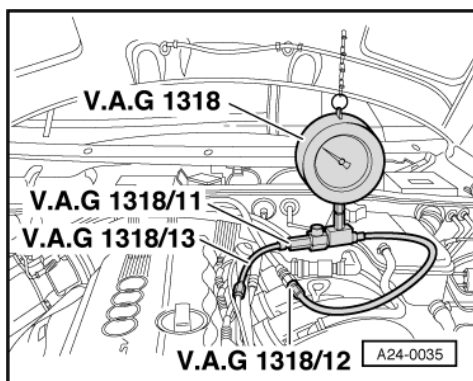
Fuel system is under pressure. Before opening the system place a cloth around the connection. Then release pressure by carefully loosening the connection.

Testing system pressure

- Briefly open fuel tank filler cap (to release pressure).
- Remove engine cover panels.



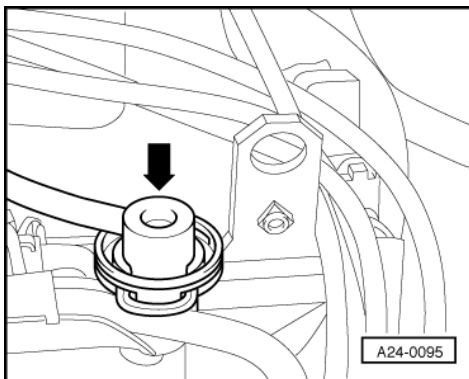
- -> Open the union -arrow- and catch escaping fuel with a cloth.
- Connect pressure gauge V.A.G 1318 into fuel supply pipe using adapters 1318/11, 1318/12 and 1318/13.



- -> Open cut-off valve on pressure gauge (valve handle points in direction of flow).
- Start the engine and run at idling speed.
- Measure fuel pressure.
 - Specification: approx. 3.5 bar



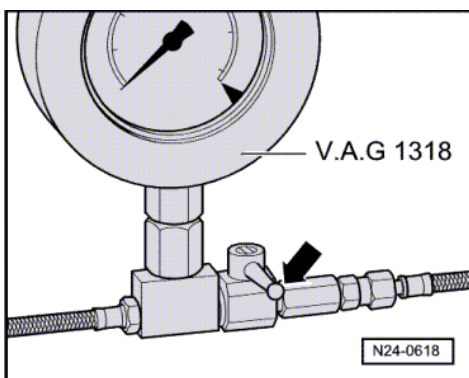
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- -> Disconnect vacuum hose from fuel pressure regulator.
 - The fuel pressure should rise to approx. 4.0 bar.
- Switch off ignition.
- Check leak-tightness and holding pressure by watching the drop in pressure on the pressure gauge.
 - After 10 minutes there should still be a pressure of at least 2.5 bar.

If the holding pressure drops below 2.5 bar:

- Start the engine and run at idling speed.



- -> Allow pressure to build up, then switch off ignition and at the same time close cut-off valve on pressure gauge V.A.G 1318 (valve handle at right angles to direction of flow -arrow-).
- Observe pressure drop on gauge.

If the pressure does not drop:

- Check fuel pump non-return valve.

If the pressure drops again:

- Open cut-off valve on pressure gauge (valve handle points in direction of flow).
- Start the engine and run at idling speed.
- Allow the pressure to build up, then switch off the ignition. At the same time pinch the return hose (with blue marking) firmly together.

If the pressure does not drop:

- Renew fuel pressure regulator.

If the pressure drops again:

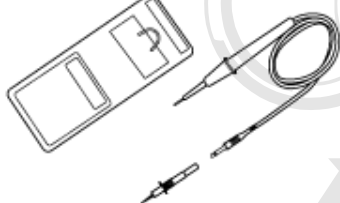
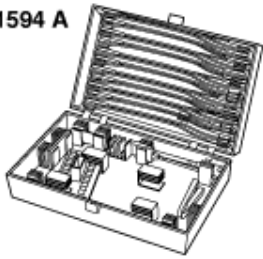
- Check pipe connections, O-rings on fuel manifold and injectors for leaks.
- Check pressure gauge for leaks.
- Re-connect the vacuum hose to the fuel pressure regulator.



Note:

Before removing the pressure gauge, release the fuel pressure by opening the cut-off valve. When doing this hold a container under the connection.

1.17 - Testing injectors

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

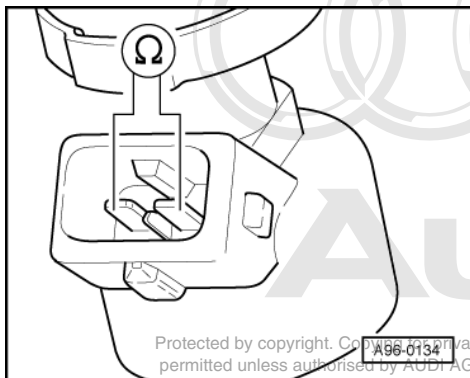
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Special tools and workshop equipment required

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

Testing internal resistance

- Remove engine cover panels.
- Remove plug connector from the injector which is to be tested.



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- -> Connect multimeter to valve (resistance measurement range)
- Specification: 14 ... 17 ω (at room temperature)

If the specification is not attained:

- Renew the injector.

If the specification is obtained:

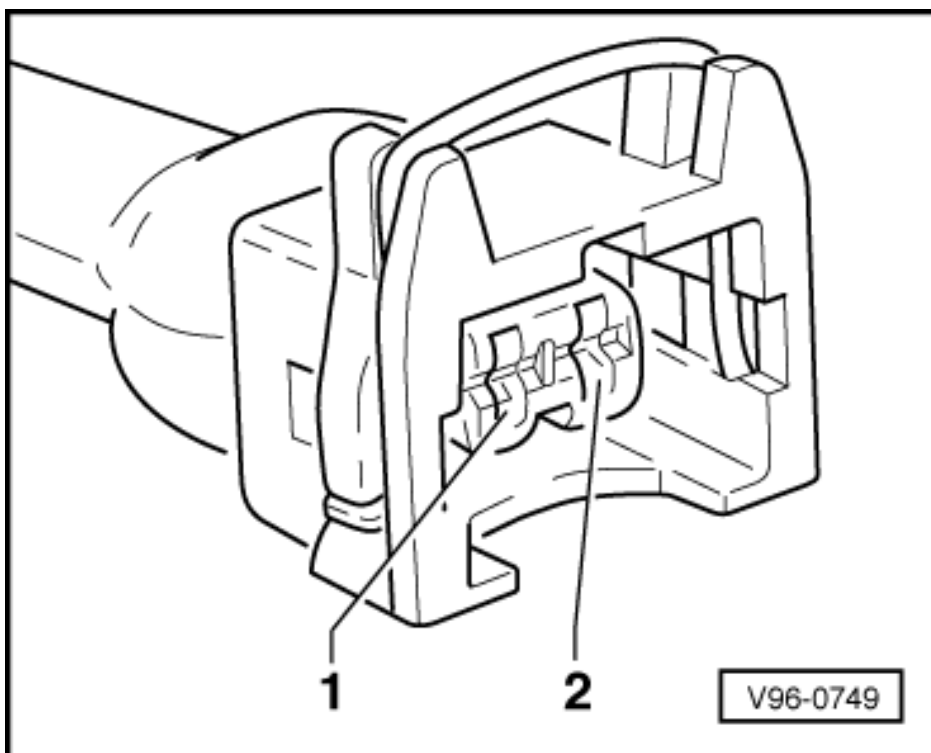
Checking voltage supply

Requirements for test:

- Fuel pump relay OK. Testing => Page 72 .
- Fuse for injectors OK.

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

- Remove plug connector from the injector which is to be tested.

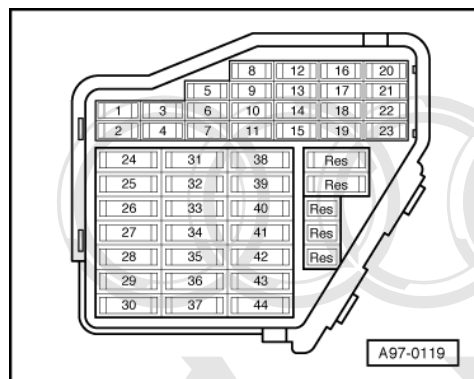


- -> Connect voltage tester V.A.G 1527 B as follows:

Connector Contact	Measure against
1	Engine earth

- Operate starter for a few seconds (the engine can be allowed to start). The diode test lamp should light up.

If the LED does not light up:



- -> Test for open circuit in wiring between contact 1 and fuse for injectors:

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

- Rectify any open circuits.

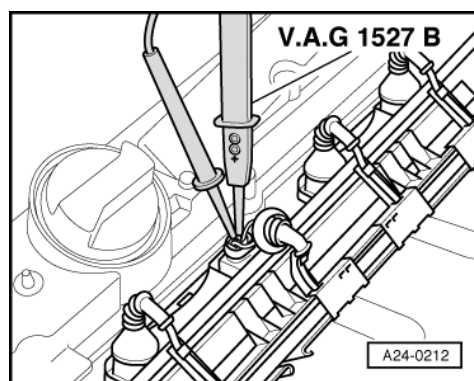
If the LED lights up:

- Test activation of injectors.

Checking activation

Test requirement:

- Internal resistance of injector OK.
- Slide back rubber sleeve on connector for injector but do not unplug the connector.



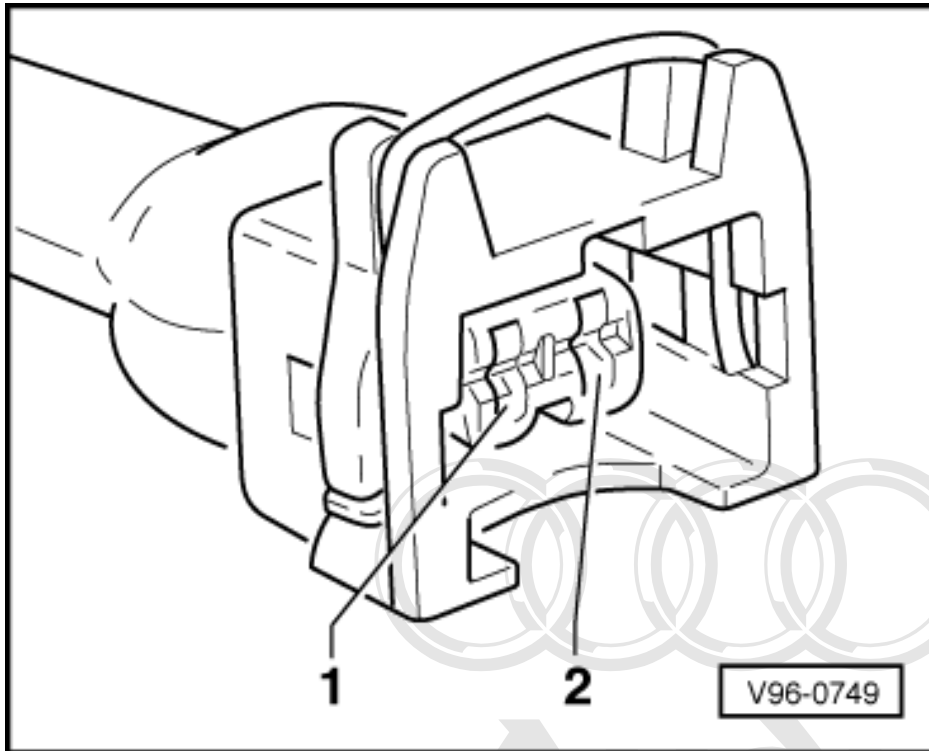
- -> Connect voltage tester V.A.G 1527 B between contact 2 (signal) and contact 1 (positive).
- Operate the starter briefly. (The engine can be allowed to start.)
 - The LED should flash.

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.

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.
=> Page **56** .



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

Cylinder	Connector for injector Contact	Test box V.A.G 1598/31 Socket
1	2	88
2	2	87
3	2	85
4	2	86

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Resistance in wiring: max. 1.5 Ohm

- Rectify short circuit or open circuit if necessary.

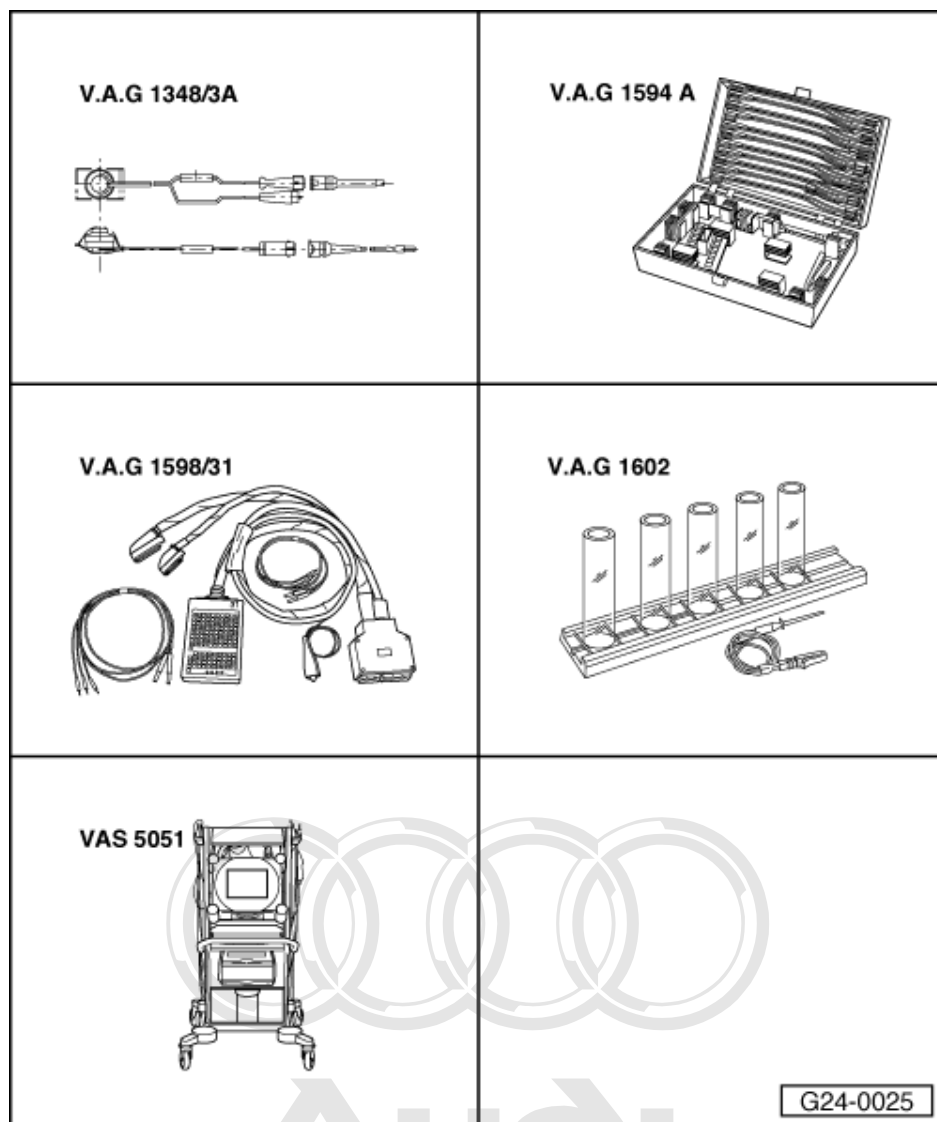
=> Current flow diagrams, Electrical fault finding and fitting locations binder

If the wiring is OK:

- Fit a new engine control unit => Page **58** .



1.18 - Checking injection quantity, leak-tightness and spray pattern of injectors



Special tools and workshop equipment required

- ♦ V.A.G 1348/3A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/31
- ♦ V.A.G 1602
- ♦ VAS 5051 with VAS 5051/1

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

Test requirement:

- Fuel pressure OK. Testing => Page 63 .

Test sequence

- Remove fuel rail (together with injectors) from intake manifold. Do not disconnect the fuel hoses.
- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page 56 .

- Bridge contacts 1 and 80 on the test box using test leads from adapter set V.A.G 1594 A. (This creates an earth connection to one side of the fuel pump relay coil.)

Testing for leaks

- Switch ignition on.

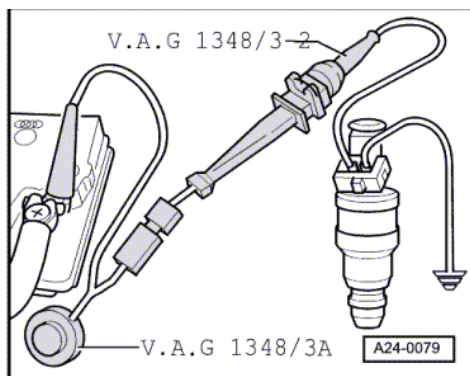
Note:

After the ignition is switched on the fuel pump will run continuously even when the engine has not been started. This is because the fuel pump relay is connected to positive via the central electrics unit when the ignition is switched on and to earth via the bridge connection in the test box.

- Check injectors for leaks (visual check). When the fuel pump is running, only 1 or 2 drops should escape per minute from each injector.
- If a greater amount of fuel escapes, switch off the fuel pump (turn off ignition) and replace the faulty injector following the notes on => Page 71.

Checking injection quantity

- Place the injector which is to be tested into a measuring glass from injection quantity tester V.A.G 1602.



- -> Connect one of the injector contacts to engine earth using test lead and crocodile clamp from V.A.G 1594 A.
- Connect second injector contact to positive using remote control V.A.G 1348/3 A, adapter cable V.A.G 1348/3-2 and auxiliary cable.
- Switch ignition on.
 - The fuel pump should run.
- Activate remote control V.A.G 1348/3A for 30 seconds.
- Carry out measurement on all injectors.
- Once all four injectors have been actuated, place measuring glasses on a level surface.
 - Specification for each injector: 85...105ml
- If the measured value for one or more of the injectors is outside the tolerance range, switch off the fuel pump (by turning off ignition) and replace the defective injector.

Note:

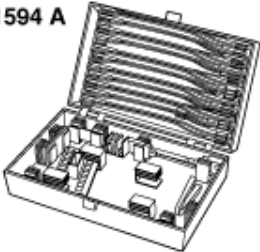
When checking the injection quantity, also check the spray pattern. The spray pattern should be the same for all the injectors.

- Install injectors together with fuel rail, noting the following points.
 - Renew the O-rings at all opened connections. (When renewing the front O-ring, make sure not to remove the plastic cap from the injector head. The O-ring must be pulled off over the plastic cap.)
 - Moisten the O-rings with clean engine oil.
 - Make sure that the injectors are installed in the correct positions.
 - Check to make sure that the retainer clamps are properly seated.



- Position fuel rail together with injectors (properly secured) against intake manifold and press into place evenly all round.

1.19 - Testing fuel pump relay -J17 and activation

V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598/31 	
	G24-0020

Special tools and workshop equipment required

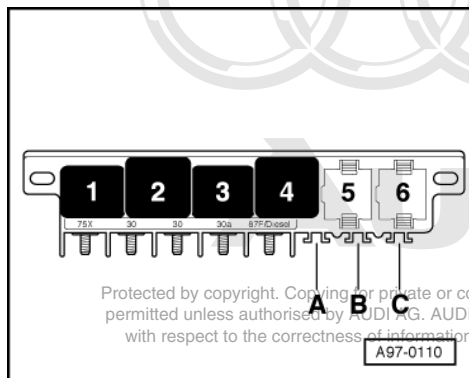
- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/31

The fuel pump and some of the injection system components receive their voltage supply via fuel pump relay -J17.

Fuel pump relay -J17 will only close if the engine is turning over. In other words, the relay is only earthed (via the engine control unit) when the engine control unit is receiving engine revolution impulses.

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Note:



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

Test requirement:

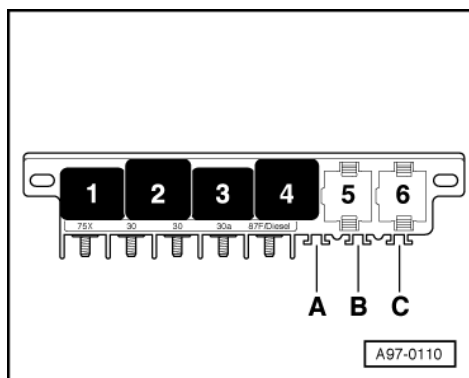
- Battery voltage not less than 11 V

Testing operation of fuel pump relay

- Remove storage compartment on driver's side.

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

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 5 .)
- When doing this the ignition must be switched on.
- Start final control diagnosis => Page 20 and activate fuel pump relay.



- -> The fuel pump relay should pick up and the fuel pump should start at intervals. (Relay is located in relay position 4 in central electrics on left of driver's footwell).

A - If the relay does not pick up:

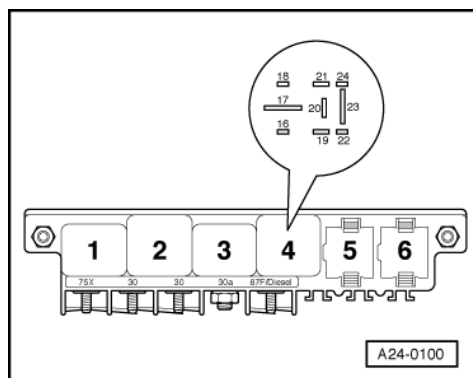
- Test voltage supply to fuel pump relay => Page 74 .
- Test activation of fuel pump relay => Page 74 .

B - If the relay picks up but the fuel pump does not run:

- Test voltage supply to fuel pump and other components (via fuel pump relay) =>Page 76 .



Testing voltage supply to fuel pump relay



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

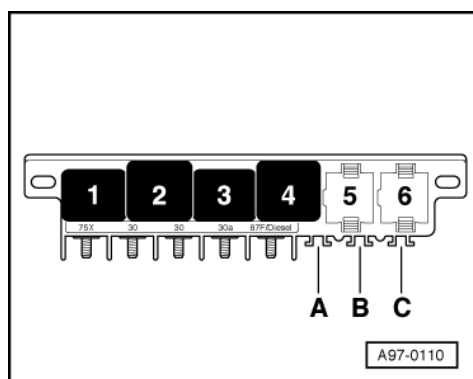
If the specification is not obtained:

- Replace central electrics unit

Testing activation of fuel pump relay

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- 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.
=> Page 56 .
- Bridge contacts 1 and 80 on the test box using test leads from adapter set V.A.G 1594 A.



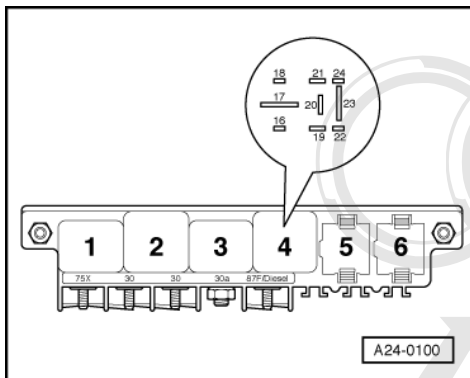
- Switch ignition on.
 - -> The fuel pump relay should pick up. (Relay is located in relay position 4 in central electrics on left of driver's footwell).

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

- Fit a new engine control unit => Page 58 .

If the relay does not pick up:

- Disconnect fuel pump relay.



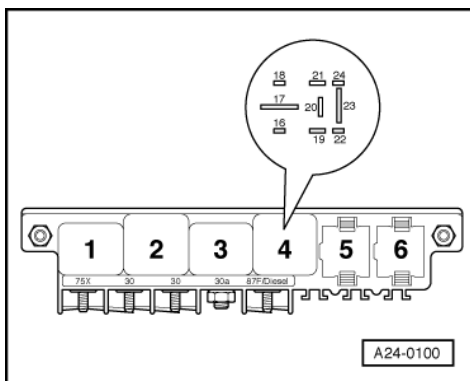
- -> Connect multimeter (voltage measurement range) between earth and contact 19 on relay panel.
- Specification: approx. battery voltage

If the specification is not obtained:

- Check the wiring.

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

If the specification is obtained:



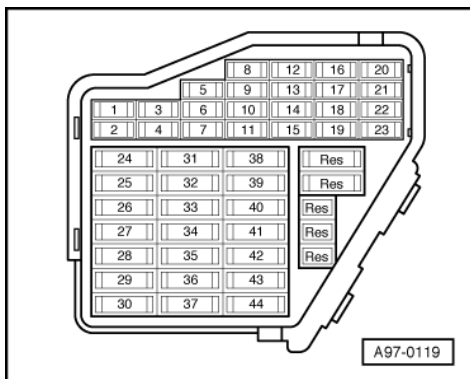
- -> Test for open circuit and short to positive or earth in the following wiring connections:

Central electrics on left of driver's footwell, relay position 4 Contact	Test box V.A.G 1598/31 Socket
16	80

Resistance in wiring: max. 1.5 Ohm

- Rectify any open/short circuit as necessary.

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





If no fault is found:

- Fit a new fuel pump relay -J17.
- Reconnect the engine control unit.

Testing voltage supply to fuel pump and other components

- -> Remove fuse Nos. S228, S229, and S234 from fuse holder (at socket positions 28, 29 and 34).
- Start final control diagnosis (=> Page 20) and activate ACF solenoid valve 1 (-N80).
- For each of the following fuse positions in the fuse holder, connect the multimeter (voltage measurement range) between earth and one of the fuse contacts:

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Fuse	Specification (for one contact)
S228	Approx. battery voltage
S229	Approx. battery voltage
S234	Approx. battery voltage

If the specifications are not obtained:

- Repeat the test on the other fuse contact.

If the specifications are again not attained:

- Check wiring

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

If no fault is found:

- Fit a new fuel pump relay -J17.
- Refit fuses.

1.20 - Checking control unit voltage supply

Note:

The engine control unit is supplied with voltage (+) at contact 3 when the ignition is switched on (voltage supply via relay). By means of this relay the engine control unit maintains the voltage supply at contact 3 for about another 25 seconds after the ignition is switched off.

In addition, contact 62 is supplied directly with voltage (terminal 15) from the central electrics unit.

The earth connection of the engine control unit is made via contacts 1 and 2.

Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

- ♦ Fault reader V.A.G 1551 or vehicle system tester V.A.G 1552 with cable V.A.G 1551/3
- ♦ Test box V.A.G 1598/31
- ♦ Hand multimeter V.A.G 1526 or multimeter V.A.G 1715
- ♦ Adapter set V.A.G 1594
- ♦ Current flow diagram

Check conditions

- The battery voltage must be at least 11.5 V.
- Fuses for engine control unit must be OK.

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

- Alternator OK, checking:

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

Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551). Select engine electronics control unit by entering the address word "01" => Page 5 ; when doing this the engine must be running at idling speed.
- If engine does not start, carry out test with ignition switched on.

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

- Press keys 0 and 8 for the function "Read measured value block" and confirm entry with Q key.

-> Indicated on display:

Read measured value block	HELP
Input display group number XXX	

- Press keys 0, 0 and 4 for "Display group number 4" and confirm entry with Q key.

-> Indicated on display:
(1...4 = Display zones)

Read measured value block 4			
1	2	3	4

- Read off figure displayed in display zone 2.

Specification: at least 11.5 V

- Press the ➡key.
- Press keys 0 and 6 for the "End data transfer" function and confirm input with the Q key.
- Switch off ignition.

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.
=> Page 56 .

Testing voltage supply for Simos control unit current supply relay (J363)

Fitting location: see Fitting locations overview =>Page 36 .

- Switch ignition on.
- Measure supply voltage using multimeter and test leads from V.A.G 1594 between sockets 1 and 3 of test box:

Specification: at least 11.5 V

If the specification is not attained:

- Test wiring and earth connection to current supply relay (J363) according to current flow diagram:

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

If wiring is OK:

- Replace current supply relay.

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Checking voltage supply (terminal 15)

- Measure supply voltage using multimeter and test leads from V.A.G 1594 between sockets 2 and 62 of test box:
- Switch on ignition.

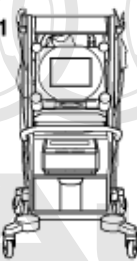
Specification: at least 11.5 V

If the specification is not attained:

- Check wiring to fuse carrier and earth connection of engine control unit using current flow diagram:

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

1.21 - Testing air mass meter -G70

V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598/31 	VAS 5051 
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Note:

The intake air temperature sender -G42 is incorporated in the air mass meter. Therefore sender -G42 is no longer a separate engine component.

Special tools and workshop equipment required

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

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

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
- Fuse for air mass meter OK

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

Testing operation

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 5 .)
- When doing this the engine must be idling.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

- Enter "04" to select "Basic setting" and confirm with Q key.

-> Indicated on display:

Introduction of basic setting Q
Enter display group number XXX

- Enter "002" to select Display Group 002 and confirm entry with Q key.

-> Indicated on display:

Basic setting 2
1 2 3 4

- Check display values for engine load.

	Display zones			
	1	2	3	4
Display Group 002: Intake air mass at idling speed with engine at normal operating temperature				
Display	xxx rpm	xxx %	xx.x ms	xxx.x g/s
Indicates	Engine speed	Load	Avg. injection period	Air mass
Specification	700...960 rpm	15 ... 35 %	1.0....5.0 ms	1.8...5.0 g/s
Note	---	---	If readout does not match specification, see table for display zone 3 => Page 80	
			If readout does not match specification, see table for display zone 4 => Page 80	

If the specification is obtained:

- Press =>key.

-> Indicated on display (function selection):



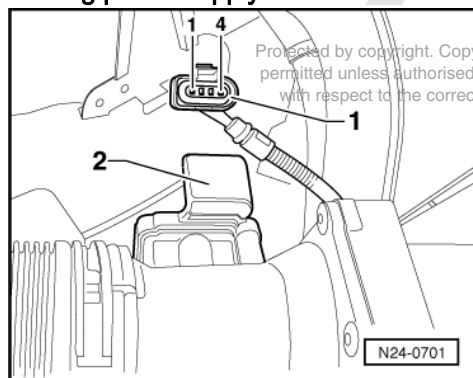
Rapid data transfer HELP
Select function XX

Reading Display Group 002

Display zone 3	Possible cause of fault	Fault remedy
Less than 1.0 ms	- Lower values can only occur when vehicle is on overrun	
More than 5.0 ms	- Load on engine due to ancillaries	- Eliminate load (air conditioner, power steering, alternator)
	- Rough idling (engine not running on all cylinders)	- Test spark plugs Test injectors => Page 66
	- Throttle valve control part -J338 defective	- Test throttle valve control part => Page 128

Reading Display Group 002

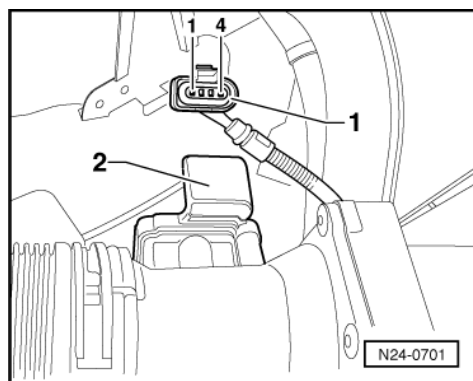
Display zone 4	Possible cause of fault	Fault remedy
Less than 1.8 g/s	- Large quantity of unmetered air (air leak) between intake manifold and air mass meter	- Check intake system for leaks (unmetered air) => Page 80
	- Voltage supply to air mass meter or wiring to	
	- engine control unit	
More than 5.0 g/s	- Load on engine due to ancillaries	- Eliminate load (air conditioner, power steering, alternator)
	- Voltage supply to air mass meter or wiring to	
	- engine control unit	- Test voltage supply and wiring => Page 80

Testing power supply to air mass meter

- Test fuse for air mass meter.

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

- -> If fuse is OK, disconnect 4-pin connector -1- from air mass meter -2-.
- Connect multimeter to measure voltage on connector contacts 3 and engine earth.
- Start engine and run at idling speed.



Specification: 11...15V.

Note:

The air mass meter is supplied with voltage via the fuel pump relay.

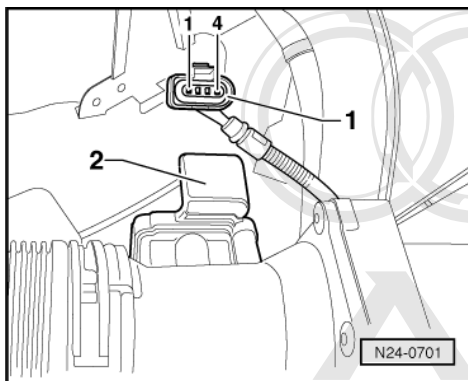
- Switch off ignition.
- -> If multimeter indicates zero voltage, test for open circuit and short to earth in wiring between fuse and contact 3 on connector. If necessary, repair wiring.

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

- If the fuse and the wiring are OK but the multimeter still does not indicate any voltage, test the fuel pump relay => Page 72 .
- If the power supply is OK, test the signal wire.

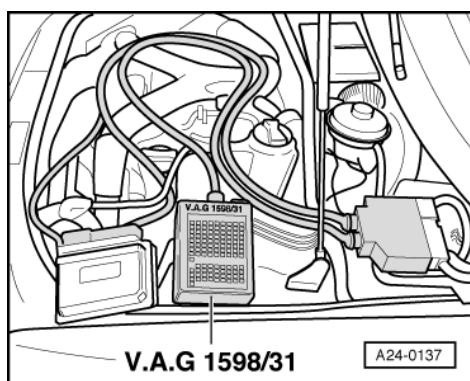
Testing wiring for air mass meter

Note:



The wiring test also tests the signal wire.

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page 56 .
- -> Test wiring from plug connector on air mass meter...



- -> ... to engine control unit for open circuit and short to positive or earth. Rectify if necessary.

Plug connector for air mass meter G70	Test box V.A.G 1598/31 or control unit connector
1	10



Plug connector for air mass meter G70	Test box V.A.G 1598/31 or control unit connector
2	11

Resistance in wiring: max. 1.5 Ohm

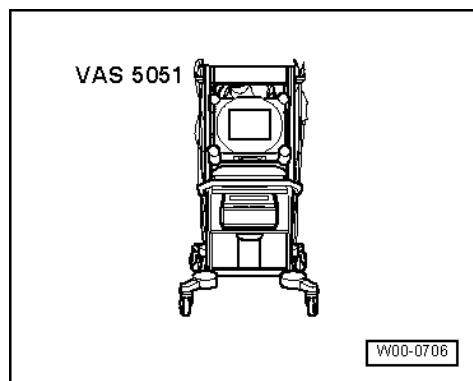
- Rectify any open/short circuit as necessary.

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

- If the wiring is OK, fit a new air mass meter -G70.

1.22 - Checking intake air system for leaks (unmetered air)

Special tools and workshop equipment and additional materials required:



- ♦ VAS 5051 with VAS 5051/1

or

- ♦ V.A.G 1551 and V.A.G 1551/3 A
- ♦ Engine leak detector spray G 001 800 A1

Notes:

- ♦ The vacuum in the intake system will cause the leak detector spray to be drawn in with the outside air. The leak detector spray reduces the ignitability of the mixture. This leads to a drop in engine speed and to a significant increase of the CO content.
- ♦ The safety precautions listed on the container must be adhered to.

Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 5 .)
When doing this the engine must be idling.

-> Indicated on display:

Rapid data transfer	HELP
Select function xx	

- Enter "08" to select the function "Read measured value block" and confirm entry with Q key.

-> Indicated on display:

Read measured value block	Q
Enter display group number xxx	

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- Enter "001" to select Display Group 001 and confirm entry with Q key.

-> Indicated on display:
(1...4 = Display zones)

Read measured value block	1
1 2 3 4	

- Note engine speed in display zone 1.
- Systematically spray parts of the intake system with engine leak detector spray.

If the engine speed does not change:

- Press the =>key.

-> Indicated on display (function selection):

Rapid data transfer	HELP
Select function XX	

If the engine speed drops:

- Press the =>key.
- Enter "06" to select the function "End output" and confirm entry with Q key.
- Switch off ignition.
- Check sprayed areas of intake system for leaks and rectify if necessary.

Testing integral vacuum reservoir in intake manifold for leaks (supplies vacuum for intake manifold change-over function, etc.)

- Run engine at idling speed for several minutes. Make sure that the hoses and hose connectors for -N156 (intake manifold change-over valve) are in good condition (all parts properly fitted and airtight).
- Perform test of intake manifold change-over function. This test also serves to check for leaks in the integral vacuum reservoir => Page 116

1.23 - Testing intake air temperature sender -G42

Note:

The intake air temperature sender (G42) is integrated into the air mass meter. Therefore the sender is no longer a separate engine component

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551). Select engine electronics control unit by entering the address word "01" => Page 5 ; when doing this the engine must be running at idling speed.

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

- Press keys 0 and 8 for the function "Read measured value block" and confirm entry with Q key.

-> Indicated on display:

Read measured value block	Q
Enter display group number XXX	

- Press keys 0, 0 and 4 for "Display group number 4" and confirm entry with Q key.

-> Indicated on display:
(1...4 = Display zones)

Read measured value block 4
1 2 3 4

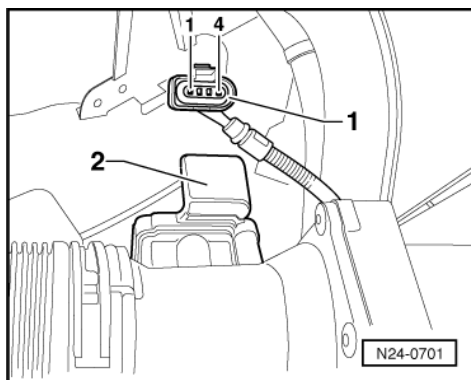


	Display zones			
	1	2	3	4
Display Group 4: Intake air temperature with engine idling				
Display	xxx rpm	xx.xxx Volt	xxx.x °C	xxx.x °C
Indicates	Engine speed	Battery voltage	Coolant temperature	Intake air temperature
Specification	700...960 rpm	12.000...14.500 V	80.0...110.0 °C	Between ambient temperature and 50 °C
Note				If the display shows a temperature that differs excessively from surrounding temperature, test wiring => Page 84

Testing wiring

- Switch off ignition.

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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.
=> Page 56 .
- -> Pull 4 pin connector -1- off air mass meter -2-.
- Test for open circuit and short to positive or earth in the following wiring connections:

4-pin connector on wiring harness, socket	Test box V.A.G 1598/31, socket
2	11
4	44

Resistance in wiring: max. 1.5 Ohm

- Rectify any open/short circuit as necessary.

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

- Test for short circuit between wires:

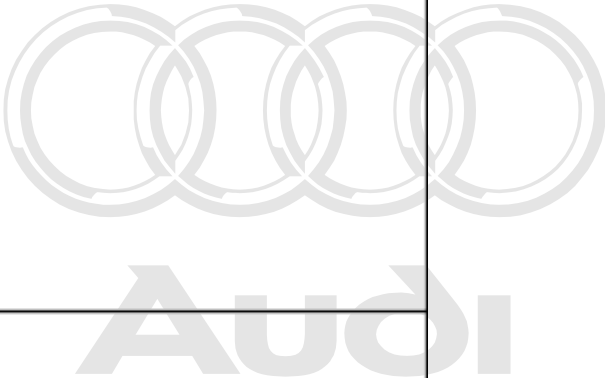
4-pin connector on wiring harness, socket	Test box V.A.G 1598/31, socket
2	44

Specification: infinity Ohm (no connection)

If no wiring fault is detected:

- Replace air mass meter (G70) together with intake air temperature sender (G42).

1.24 - Testing coolant temperature sender -G62

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
- ♦ VAS 5051 with VAS 5051/1

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

Fitting location of sender and connector
 => Page **36**.

Test requirement:

- Engine cold

**Test sequence**

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551). Select engine electronics control unit by entering the address word "01" => Page 5 ; when doing this the engine must be running at idling speed.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

- Enter "08" to select the function "Read measured value block" and confirm entry with Q key.

-> Indicated on display:

Read measured value block Q
Enter display group number XXX

- Enter "004" to select Display Group 004 and confirm entry with Q key.

-> Indicated on display:

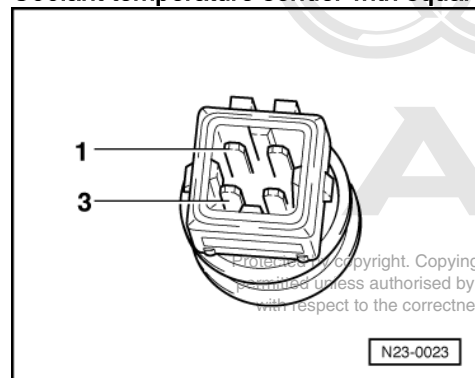
Read measured value block 4
1 2 3 4

- Check readout for coolant temperature sender in display zone 3.

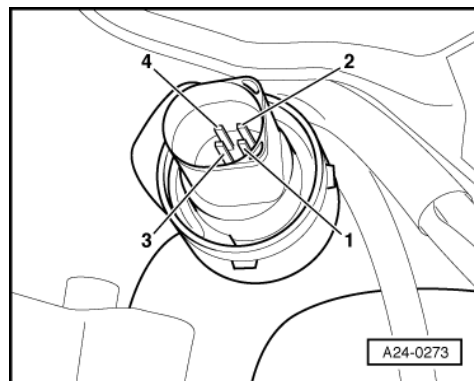
	Display zones			
	1	2	3	4
Display Group 004: Coolant temperature with engine idling				
Display	xxxx rpm	xx.x V	xxx.x °C	xxx.x °C
Indicates	Engine speed	Battery voltage	Coolant temperature	Intake air temperature
Specification	xxxx rpm	12.0...15.0 V	Temperature should rise steadily	Between ambient temperature and 120 °C

If display zone 3 shows an implausible value:

- Unplug connector on coolant temperature sender.

Coolant temperature sender with square plug:

- -> Connect multimeter (resistance measurement range) between contacts 1 and 3 on the sender.

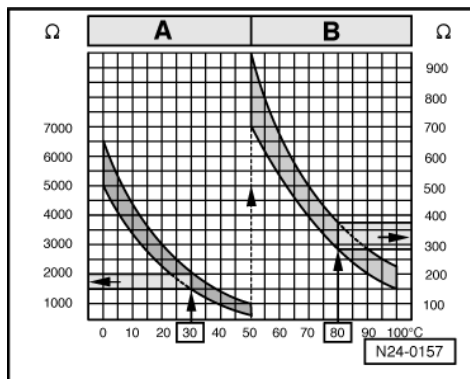


Coolant temperature sender with oval plug:

- -> Connect multimeter (resistance test range) between contacts 3 and 4 on the sender.

All models

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



-> Examples:

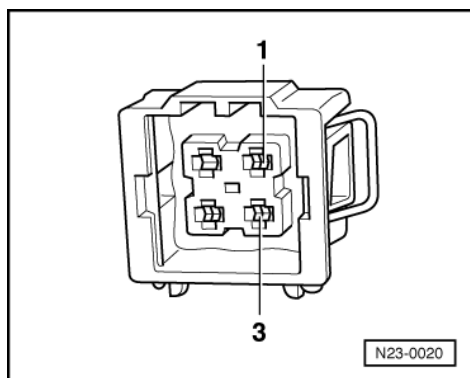
- ◆ 30 °C corresponds to a resistance from 1500...2000 ω
- ◆ 80 °C corresponds to a resistance from 275...375 ω

If the specification is not attained:

- Fit a new coolant temperature sender.

If the specification is obtained:

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page 56 .



Coolant temperature sender with square plug:

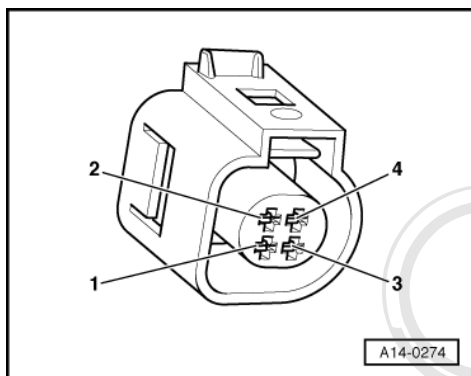
- -> Test for open circuit and short to positive or earth in the following wiring connections:

Connector Contact	Test box V.A.G 1598/31 Socket
1 (Signal)	104

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3	83
---	----

Coolant temperature sender with oval plug:



- -> 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	83
4 (signal)	104

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All models

- Test for short circuits between the two wires.
- Rectify any open/short circuit as necessary.

If no fault is detected:

- Fit a new engine control unit => Page 58 .

2 - Testing lambda control

2.1 - Testing lambda control

2.2 - Function of lambda control (before catalytic converter)

Notes:

The lambda probe compares the oxygen content in the air with the residual oxygen content in the exhaust gas and sends a voltage signal to the control unit.

The voltage signal for "Mixture too rich" (low residual oxygen) is between about 0.7 and 1.1 V (based on reference earth).

The voltage signal for "Mixture too lean" (high residual oxygen) is between about 0.0 and +0.3 V.

The transition from "rich" to "lean" is accompanied by a voltage jump from between 0.7 and 1.1 V to between -0.1 and +0.3 V (based on reference earth) and vice versa ($\lambda = 1.0$).

Because of the sharp voltage jump the lambda control cannot maintain a constant ideal mixture composition of $\lambda = 1.0$. The system fluctuates continuously between "slightly too lean" and "slightly too rich".

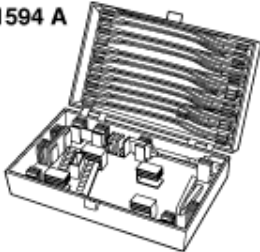
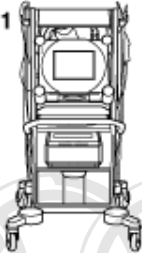
Note:

The "reference earth" is the earth connection from the engine control unit.

If the voltage does not change or only changes slowly the following faults are possible:

- ◆ Slots or holes in probe head are blocked.
- ◆ Lambda probe has been subjected to excessive thermal stress.
- ◆ Contact resistance in signal wire or earth wire.
- ◆ Lambda probe too cold; lambda probe heating not working.
- ◆ Lambda probe damaged by contact spray or similar product. (The contact spray is drawn into the probe via the fine cavities in the electrical wiring as a result of temperature fluctuations and capillary effect.)
- ◆ Lambda probe damaged by silicone vapours. (The engine draws in traces of any silicone-based sealants that may have been used. The silicone does not burn and damages the lambda probe.)

2.3 - Testing lambda probe and lambda control (before catalytic converter)

V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598/31 	VAS 5051 
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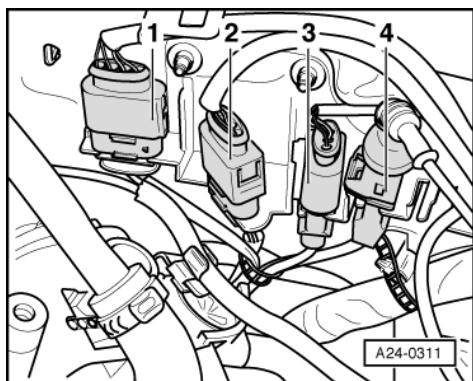
Special tools and workshop equipment required

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

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

Note:



- ♦ -> The 4-pin connector -2- (black) for the lambda probe (before catalytic converter) -G39 and lambda probe heating -Z19 is located underneath the coolant expansion tank

Requirements for test:

- Take the car for a test drive and do not erase the fault memory.
- Coolant temperature at least 80 °C

Testing operation

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 5 .)
When doing this the engine must be idling.

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

- Enter "04" to select "Basic setting" and confirm with Q key.

-> Indicated on display:

Introduction of basic setting	Q
Enter display group number XXX	

- Enter "030" to select Display Group 030 and confirm entry with Q key.

-> Indicated on display:

Basic setting 30
1 2 3 4

- Check lambda probe status in display zone 1.

Note:

The "lambda probe status" display indicates the status of the lambda control and lambda probes.

	Display zones			
	1	2	3	4
Display Group 030: Lambda probe status				
Display	X X X	XXX		
Indicates	Lambda probe status Bank 1, probe 1	Lambda probe status Bank 1, probe 2		
Range	0 = off 1 = on	0 = off 1 = on		
Specification	1 1 1	1 1 1/0		
Note	If readout does not match specification => Page 91 .			

Relevance of 3-figure display in Display Group 030

X	X	X	Display zone 1
		1	Lambda control active
	1		Lambda probe condition
1			Status of lambda probe heating

Note:

The first digit in this three-digit display (heating) fluctuates between 0 and 1.

Alternatively "0" can also be indicated at idling speed (no load) for lambda control Bank 1, probe 2.

Testing lambda probe learned values and lambda control

- Press C key.
- Enter "032" to select Display Group 032 and confirm entry with Q key.

-> Indicated on display:

Basic setting 32

1

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- Check readouts for lambda control in display zones 1 and 2.

	Display zones			
	1	2	3	4
Display Group 032: Lambda learned values				
Display	xx.x %	xx.x %		
Indicates	Lambda learned value, Bank 1, Probe 1 at idling speed (additive)	Lambda learned value, Bank 1, Probe 1 at part throttle (multiplicative)		
Range	-25.0...25.0 %	-25.0...25.0 %		
Specification	-10.0...10.0 % (slight fluctuation possible)	-10.0...10.0 % (slight fluctuation possible)		
Note	If the specification is not attained =>Page 92			

- Press C key.
- Enter "033" to select Display Group 033 and confirm entry with Q key.

-> Indicated on display:



Basic setting 33

1 2 3 4

- Check readouts for lambda control in display zones 1 and 2.

	Display zones			
	1	2	3	4
Display Group 033: Lambda control				
Display	xx.x %	x.xxx V		
Indicates	Lambda control Bank 1	Lambda probe voltage Bank 1		
Range	-25.0...25.0 %	0.000...1.000 V		
Specification	Between -10.0 and 10.0 % the readout should fluctuate by at least 2 %	Between 0.000 and 1.000 V the voltage should fluctuate by about 0.3 V		
Note	If readout does not match specification =>Further notes, Page 92	If readout does not match specification =>Reading Display Group 033, Page 93		

Further notes

If the readout in display zone 1 does not match the specification, or if the readout does not fluctuate by at least 2 %:

- Take car for a test drive to free lambda probe of any deposits, then repeat the test.

If the readout in display zone 1 still does not match the specification even after the test drive, or if the readout still does not fluctuate by at least 2 %:

- Test the basic voltage => Page 93
- Test the lambda probe heating => Page 102
- Check the lambda probe (before the catalytic converter) for ageing => Page 95

Reading Display Group 032

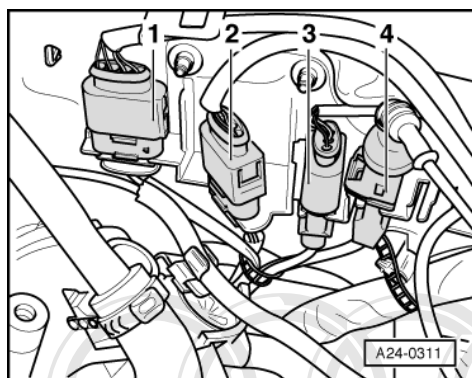
Display zone 1 / 2	Possible cause of fault	Fault remedy
Lambda learned values between -10.0 and -25.0 %	- Air leak in intake system	- Check intake system for leaks and eliminate unmetered air => Page 82
	- Oil dilution	- Change oil or drive car at moderate to high speeds on out-of-town roads
	- High oil consumption	
	- Air mass meter defective	- Test air mass meter => Page 78
	- Solenoid valve for activated charcoal filter sticking in open position	- Test solenoid valve for activated charcoal filter => Page 122
	- Fuel pressure too high	- Test fuel pressure regulator => Page 63
	- Injector does not close	- Test injectors => Page 66
	- Lambda probe heating defective - Lambda probe defective	- Test lambda probe heating => Page 102

Reading Display Group 032

Display zone 1 / 2	Possible cause of fault	Fault remedy
Lambda learned values between 10.0 and 25.0 %	- Unmetered air in intake tract	- Check intake system for leaks and eliminate unmetered air => Page 82
	- Fuel pressure too low	- Test fuel pressure regulator => Page 63
	- Air mass meter defective	- Test air mass meter => Page 78
	- Lambda probe heating defective - Lambda probe defective	- Test lambda probe heating => Page 102
	- Injector not opening or only opening partially	- Test injectors => Page 66
	- Solenoid valve for activated charcoal filter sticking	- Test solenoid valve for activated charcoal filter => Page 122

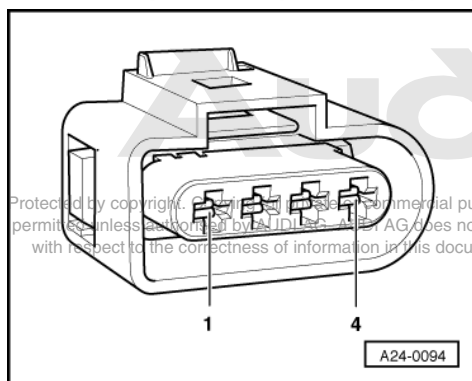
Reading Display Group 033

Display zone 2	Possible cause of fault	Fault remedy
Approx. 0.450 V (constant)	- Open circuit in wire 4 between lambda probe and control unit - Open circuit in wire 3 between lambda probe and control unit	- Test basic voltage => Page 93 - Test lambda probe (before catalytic converter) => Page 94
More than 1.100 V	- Short to positive in wire 4 between lambda probe and control unit	
Less than 0.150 V	- Short to earth in wire 4 between lambda probe and control unit	



Testing basic voltage

- -> Unplug 4-pin connector -2- (black) for lambda probe (before catalytic converter) -G39.



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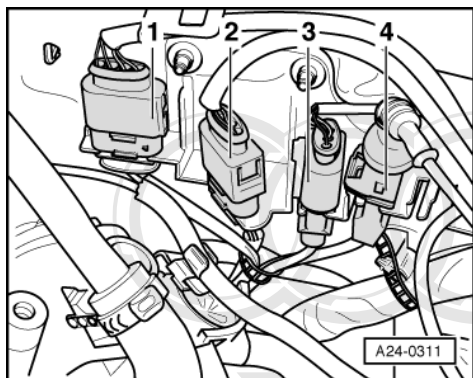
- -> Connect multimeter (voltage measurement range) between contacts 3 and 4.
- Switch ignition on.
 - Specification: 0.400 ... 0.500 V
- Switch off ignition.

If the specification is not obtained:

- Test lambda probe wiring.

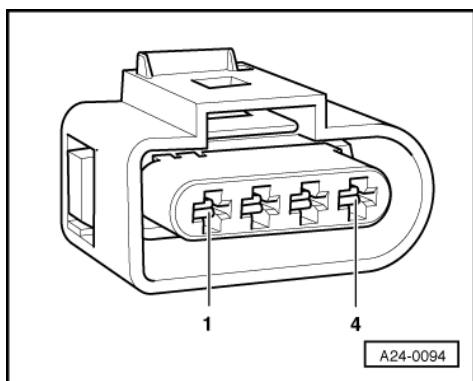
If the specification is obtained:

- Replace the lambda probe (before catalytic converter) -G39.



Testing lambda probe wiring

- -> Unplug 4-pin connector -2- (black) for lambda probe (before catalytic converter) -G39.
 - Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
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- => Page 56



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

Connector Contact	Test box V.A.G 1598/31 Socket
3	31
4	14

Resistance in wiring: max. 1.5 Ohm

- Rectify any open circuits.

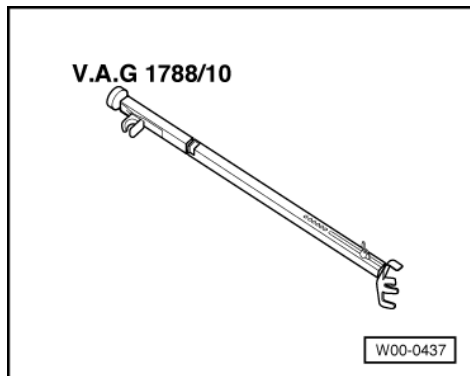
=> Current flow diagrams, Electrical fault finding and Fitting locations binder

- Test for short circuits between the wires.

If the wiring is OK:

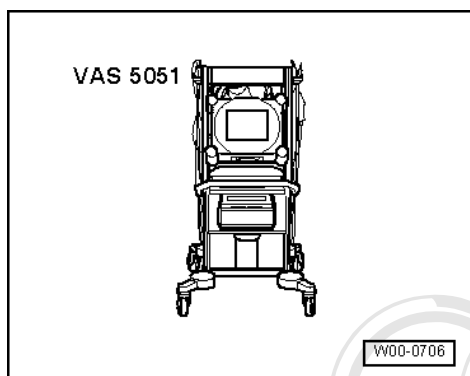
- Fit a new engine control unit => Page 58 .

2.4 - Testing lambda probe (before catalytic converter) for ageing



Special tools and workshop equipment required

- ♦ -> V.A.G 1788/10 Engine speed adjuster



- ♦ VAS 5051 and VAS 5051/1
- or
- ♦ V.A.G 1551 and V.A.G 1551/3 A

Test requirement:

- Coolant temperature at least 80 °C => Display group 004, Display zone 3.

Test sequence

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- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551). Select engine electronics control unit by entering the address word "01" => Page 5 ; when doing this the engine must be running at idling speed.

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	



- Enter "04" to select "Basic setting" and confirm with Q key.

-> Indicated on display:

Introduction of basic setting Q
Enter display group number XXX

- Enter "034" for Display Group 034 and confirm entry with Q key.

-> Indicated on display:

System in basic setting 34
1 2 3 4

- Set engine speed at between 3000 and 4000 rpm using the speed regulator V.A.G 1788/10.
- Continue the test as soon as "Test ON" appears in display zone 4.

Note:

This process can take a few minutes.

	Display zones			
	1	2	3	4
Display group 034: Diagnosis of lambda probe ageing				
Display	xxxx rpm	xxx °C	x.x s	---
Indicates	Engine speed	Exhaust temperature	Cycle duration of lambda probe (before catalytic converter)	Status of diagnosis
Range	0...6500	70...850 °C	0...5.0 sec.	Test OFF Test ON B1-P1 O.K. B1-P1 n. O.K.
Specification	3000...4000 rpm	Higher than 250 °C	0.0...5.0 sec.	B1-P1 O.K.
Note			If specification is not attained, refer to Page 96	

Note on display zone 2:

Value calculated from engine speed and engine load.

Note on display zones 3 and 4:

The cycle duration of the lambda probe indicates the time between two voltage pulses (e.g. rich - lean - rich). It is therefore a means of evaluating lambda probe ageing (i.e. the condition of the lambda probe). If the indicated cycle duration is exceeded, "B1-P1 n. OK" will appear in display zone 4.

Further notes

If the readout in display zone 3 or 4 does not match the specification:

- Take car for a test drive to free lambda probe of any deposits, then repeat the test.

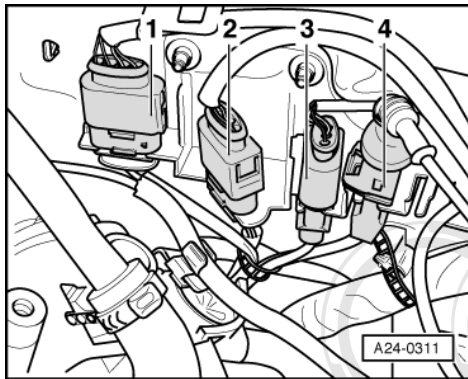
If the readout in display zone 3 or 4 still does not match the specification even after the test drive:

- Replace the lambda probe 1 (before catalytic converter) -G39.

2.5 - Testing lambda probe and lambda control (after catalytic converter)

Note:

The lambda control after (i.e. downstream of) the catalytic converter governs the lambda control before the catalytic converter and regulates variations in the control values.

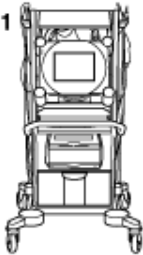


The lambda probe after the catalytic converter also corrects slight variations in the fuel mixture (e.g. by enriching the mixture). It does this by holding the lambda control before the catalytic converter for a specified period of time (delay period) at the richest or leanest state.

-> The 4-pin connector -1- (brown) for the lambda probe (after the catalytic converter) -G130 and lambda probe heating -Z30 is located underneath the coolant expansion tank.

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V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598/31 	V.A.G 1788/10 
VAS 5051 	G24-0024

Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/31
- ♦ V.A.G 1788/10
- ♦ VAS 5051 with VAS 5051/1

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

Requirements for test:

- Take the car for a test drive and do not erase the fault memory.
- Coolant temperature at least 80 °C => Display group 004, Display zone 3.

Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 5). When doing this the engine must be idling.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

- Enter "04" to select "Basic setting" and confirm with Q key.

Note:

During the basic setting the activated charcoal filter solenoid valve (ACF valve -N80) is closed and the air conditioner compressor is switched off.

-> Indicated on display:

Introduction of basic setting Q
Enter display group number XXX

- Enter "043" for Display Group 043 and confirm entry with Q key.

-> Indicated on display:

System in basic setting 43
1 2 3 4

- Raise engine speed to about 3000 rpm and maintain this speed until display zone 2 indicates a temperature well above 250°C. Release accelerator pedal so that engine runs at idle speed.
- Press and hold brake pedal (brake pedal remains depressed during the complete test cycle)

The engine control unit will raise the engine speed automatically to about 1400 rpm a few seconds after the brake pedal is depressed. Then after some seconds display zone 4 indicates "Test ON".

Note:

This process can take a few minutes.

	Display zones			
	1	2	3	4
Display group 043: Diagnosis of lambda probe ageing (lambda probe after catalytic converter)				
Display	xxxx rpm	xxx °C	x.x V	---
Indicates	Engine speed	Exhaust temperature	Lambda probe voltage lambda probe (after catalytic converter)	Status of diagnosis
Range	0...6500	70...850 °C	0...1.0 V	Test OFF Test ON B1-P2 O.K. B1-P2 n. O.K.
Specification	approx. 1400 rpm	Higher than 250 °C	0.0...0.95 V	B1-P2 O.K.
Note			If specification is not attained, refer to =>Page 100	

Note on display zone 2:

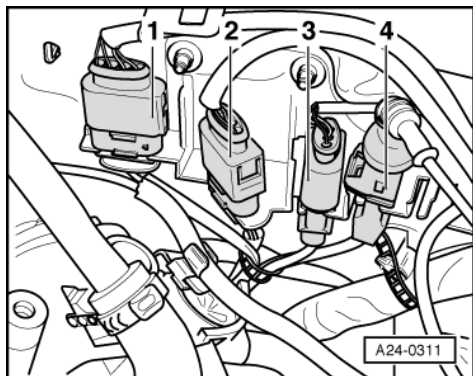
Value calculated from engine speed and engine load.

Reading Display Group 037

Display zone 3	Possible cause of fault	Fault remedy
Approx. 0.450 V (constant)	- Open circuit in wire 4 between lambda probe and control unit	- Test basic voltage => Page 100
	- Open circuit in wire 3 between lambda probe and control unit	

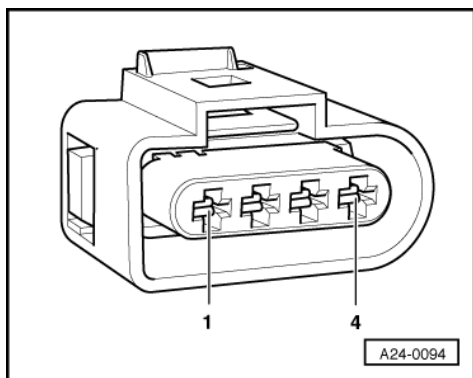


Display zone 3	Possible cause of fault	Fault remedy
More than 1.100 V	- Short to positive in wire 4 between lambda probe and control unit	- Test wiring of lambda probe (after the catalytic converter) => Page 101
Less than 0.150 V	- Short to earth in wire 4 between lambda probe and control unit	



Testing basic voltage

- -> Unplug 4-pin connector -1- (brown) for lambda probe (after catalytic converter) -G130.



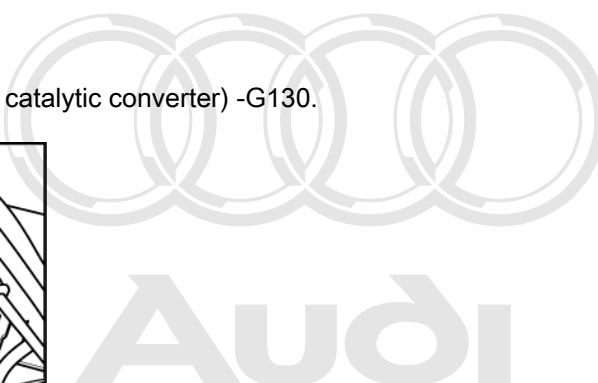
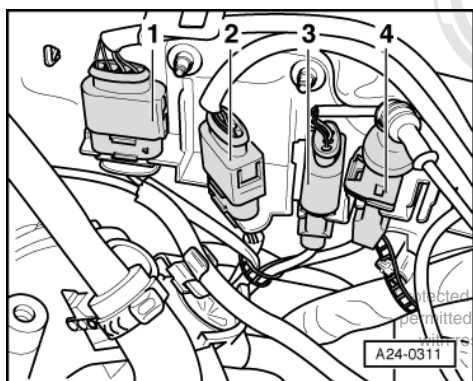
- -> Connect multimeter (voltage measurement range) between contacts 3 and 4.
- Switch ignition on.
 - Specification: 0.400 ... 0.500 V
- Switch off ignition.

If the specification is not obtained:

- Test lambda probe wiring
 - => Page 101 .

If the specification is obtained:

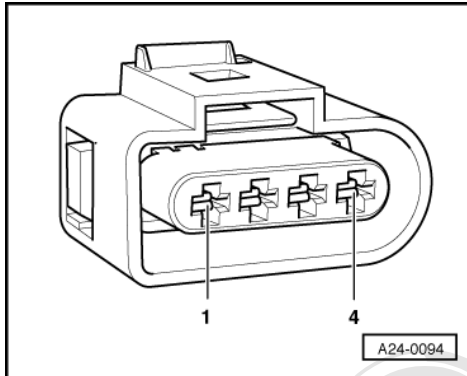
- Replace the lambda probe (after catalytic converter) -G130.



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Testing lambda probe wiring

- Unplug 4-pin connector -1- (brown) for lambda probe (after catalytic converter) -G130.
 - Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
- => Page 56 .



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

Connector Contact	Test box V.A.G 1598/31 Socket
3	35
4	16

Resistance in wiring: max. 1.5 Ohm

- Rectify any open circuits.

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

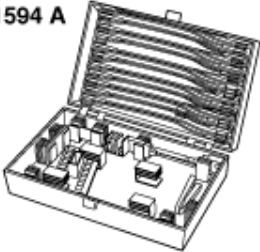
- Test for short circuits between the wires.
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If the wiring is OK:

- Fit a new engine control unit => Page 58 .



2.6 - Testing lambda probe heating -Z19 and -Z29 at lambda probes (before and after catalytic converter)

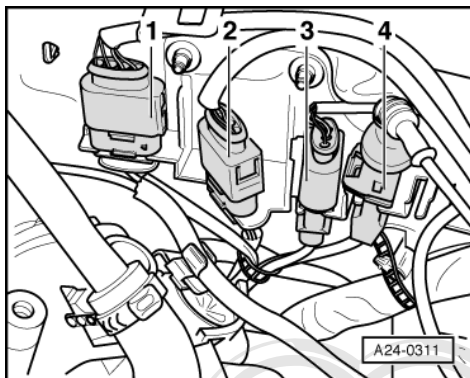
V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598/31 	
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Special tools and workshop equipment required

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

Requirements for test:

- Coolant temperature at least 80 °C

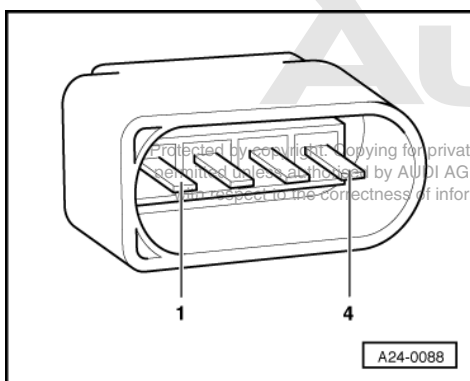


- Fuse for lambda probe heating OK

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

Test sequence

- -> Unplug 4-pin connector -2- (black) for lambda probe (before catalytic converter) -G39.
- Unplug 4-pin connector -1- (brown) for lambda probe (after catalytic converter) -G130.



- -> Connect multimeter (resistance measurement range) between contacts 1 and 2 of each connector.
- Specification: 1 ... 5 Ω (at room temperature)

Note:

The resistance will increase sharply at higher temperatures.

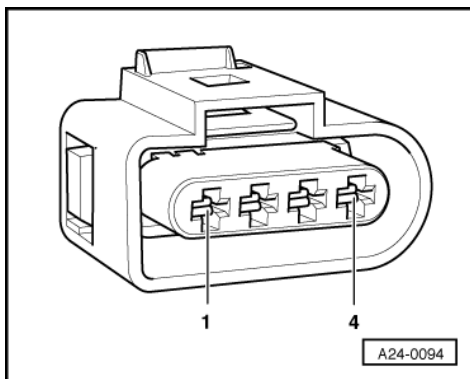
If the specification is not attained:

- Renew the relevant lambda probe.

If the specification is obtained:

- Test voltage supply for lambda probe heating
- => Page 103.

Testing voltage supply for lambda probe heating





- -> Connect multimeter (voltage measurement range) between contacts 1 (positive) and 2 (earth).
- Start the engine.
 - Specification: approx. battery voltage (may fluctuate)

Notes:

- ♦ At certain points during operation, the engine control unit intervenes by constantly connecting and disconnecting the earth connection for lambda probe heating. For this reason the voltage displayed on the tester may fluctuate.
- ♦ If required, observe Display Group 041, display zones 2 and 4 in the "Read measured value block" function to find out when the engine control unit is switching the lambda probe heating on and off.

If no voltage is present:

- Connect multimeter (voltage measurement range) as follows:

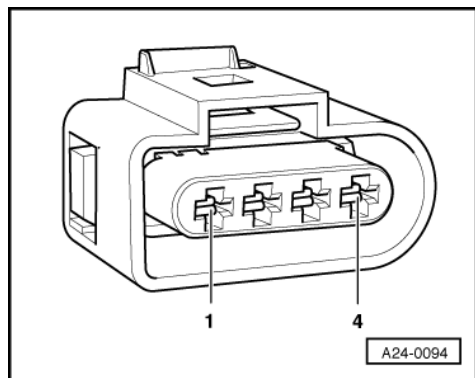
Connector Contact	Measure against
1 (positive)	Vehicle earth

- Operate starter briefly.
 - Specification: approx. battery voltage

If there is still no voltage reading:

- Test for open circuit in wiring connection between fuel pump relay and contact 1 on connector via fuse:

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



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If the voltage supply is OK:

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

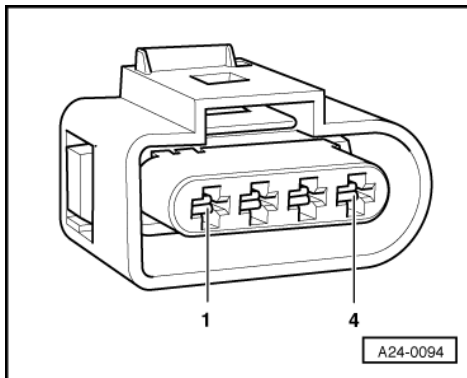
Connector Contact	Measure against
2 (switched earth connection from engine control unit)	Battery positive

- Start the engine.
 - Specification: approx. battery voltage (may fluctuate)
- Switch off ignition.

If no voltage is present:

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

=> Page 56 .



- -> Test for open circuits in the following wiring connection:

Lambda probe heating -Z19 for lambda probe (before catalytic converter):

Connector Contact	Test box V.A.G 1598/31 Socket
2	4

Lambda probe heating -Z29 for lambda probe (after catalytic converter):

Connector Contact	Test box V.A.G 1598/31 Socket
2	5

Resistance in wiring: max. 1.5 Ohm

- Rectify any open circuits.

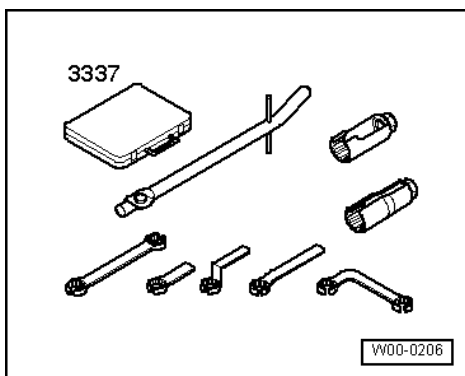
=> Current flow diagrams, Electrical fault finding and Fitting locations binder

If the wiring connection is O.K. but the lambda probe heating still has no earth connection:

- Fit a new engine control unit => Page 58 .

2.7 - Removing and installing lambda probe

Special tools, workshop equipment and other materials required

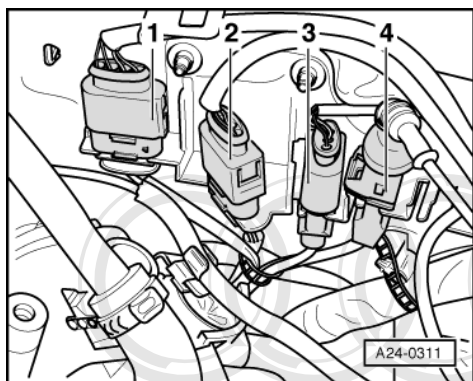


♦ Ring spanner set 3337



- ♦ High-temperaturepaste G 052 112 A3

Work sequence



- -> Unplug 4-pin connector for lambda probe and move wiring clear.

- 1 - (brown) for lambda probe (after catalytic converter) -G130
- 2 - (black) for lambda probe (before catalytic converter) -G39

- Unscrew lambda probe using special tool 3337.

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When installing, note the following points:

Notes:

- ♦ The screw thread on the lambda probe is coated with a special paste. This paste must not be allowed to penetrate the openings on the probe.
- ♦ Tightening torque: 55 Nm.
- ♦ When installing, the lambda probe wire must be secured in exactly the same position as before in order to avoid contact between the wire and the exhaust pipe.

3 - Testing secondary air system

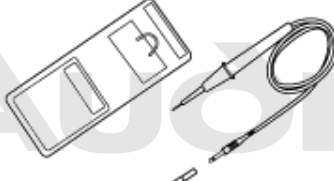
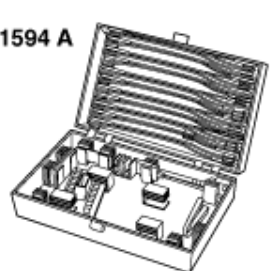
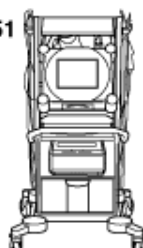
3.1 - Testing secondary air system

The secondary air system is designed to enable the catalytic converter to heat up and reach its operating temperature more quickly after a cold start.

Principle of operation

Due to the extra mixture enrichment during the cold-start phase, an increased amount of unburnt hydrocarbons is carried in the exhaust gas. The secondary air system improves the afterburning (oxidation) process in the catalytic converter, and in this way reduces toxic emissions. The heat generated by oxidation accelerates the "light off" of the catalytic converter and significantly improves exhaust gas quality while the engine is still cold.

3.2 - Testing secondary air inlet valve -N112

V.A.G 1526 A 	V.A.G 1527 B 
V.A.G 1594 A 	V.A.G 1598/31 
VAS 5051 	G24-0023

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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

or

- ◆ V.A.G 1551 with V.A.G 1551/3 A

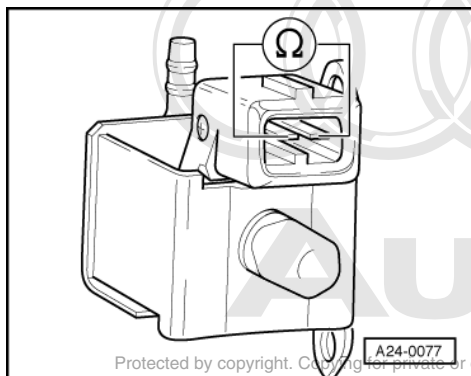
Fitting location => Fitting locations overview, Page **36**

Test requirement:

- Final control diagnosis performed =>Page **20** .

Testing internal resistance

- Unplug connector from secondary air inlet valve -N112.

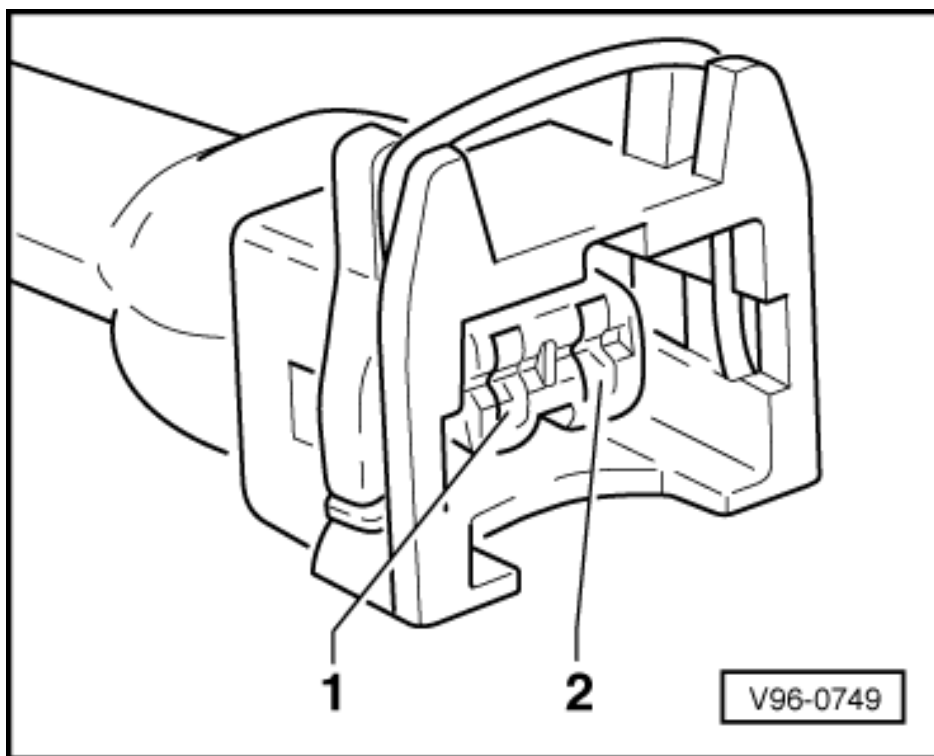


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- -> Connect multimeter to valve (resistance measurement range).
- Specification: 25 ... 35 ω
- If the reading does not match the specification, renew secondary air inlet valve -N112.

Checking voltage supply

- Unplug connector from secondary air inlet valve -N112.



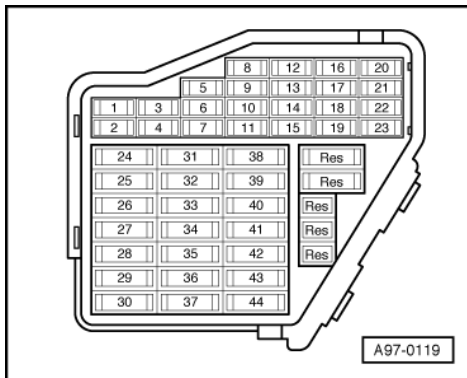
- -> Connect voltage tester V.A.G 1527 B as follows:

Connector Contact	Measure against
1	Engine earth

- Operate starter briefly.
- The LED should light up.

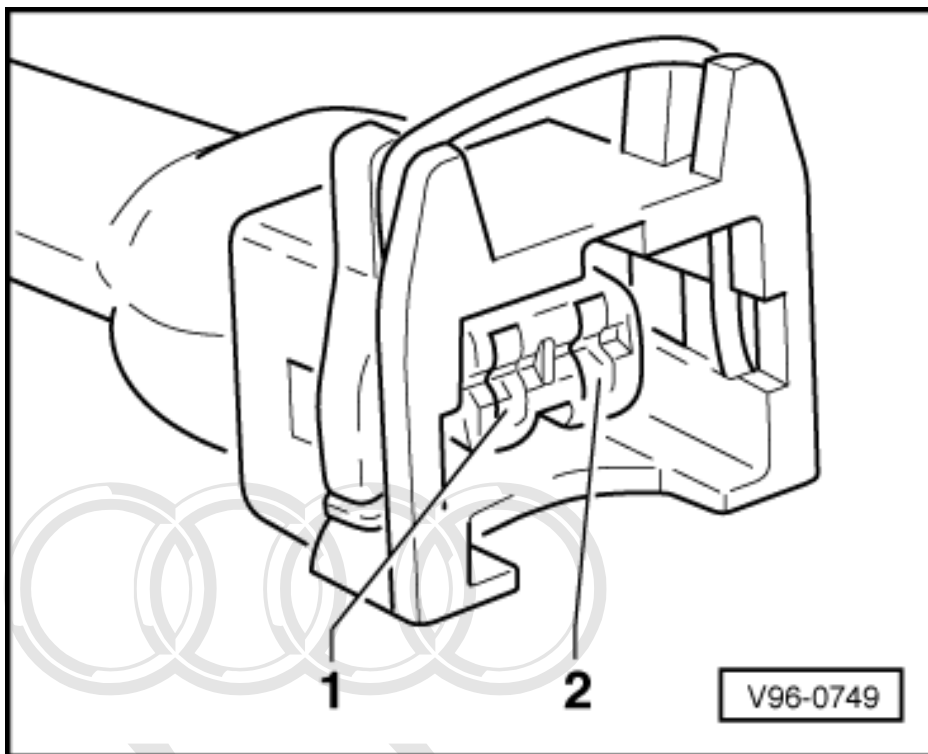
If the LED does not light up:

- Carry out the following tests (marked with dots):



- -> Test fuse for secondary air inlet valve

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



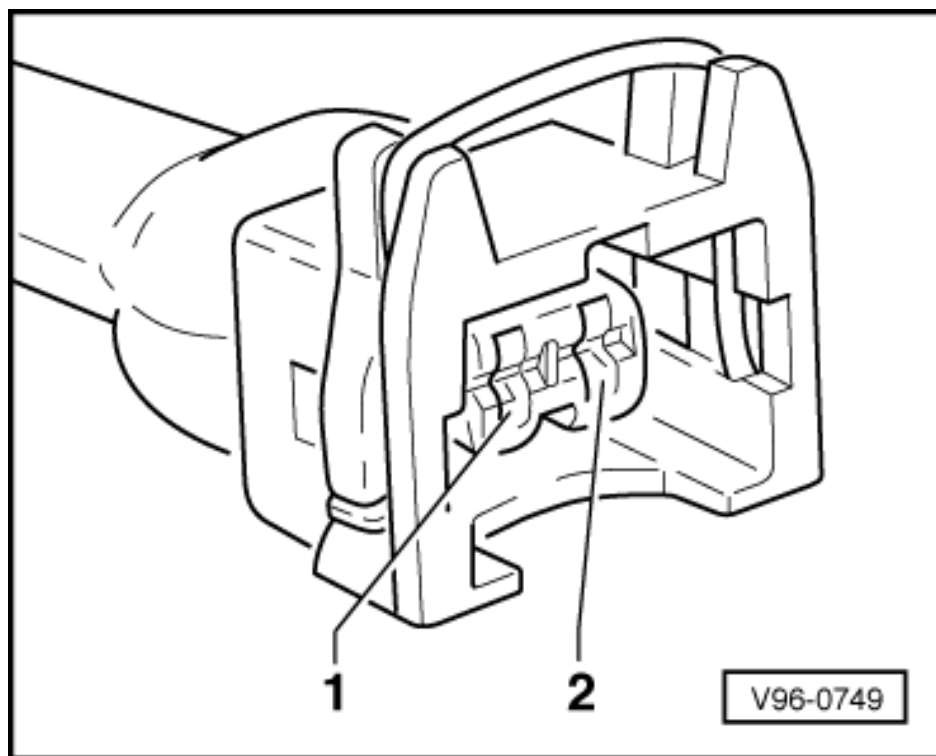
- -> Test for open circuit in wiring from contact 1 of connector to fuel pump relay via fuse:

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

- **Test fuel pump relay => Page 72**

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Testing activation



- -> Connect voltage tester V.A.G 1527 B between contacts 1 and 2 using auxiliary cables from V.A.G 1594 A.
- Connect fault reader V.A.G 1551
=> Page 5 .
- Start final control diagnosis and select secondary air inlet valve -N112.
=> Page 20 .

-> Indicated on display:

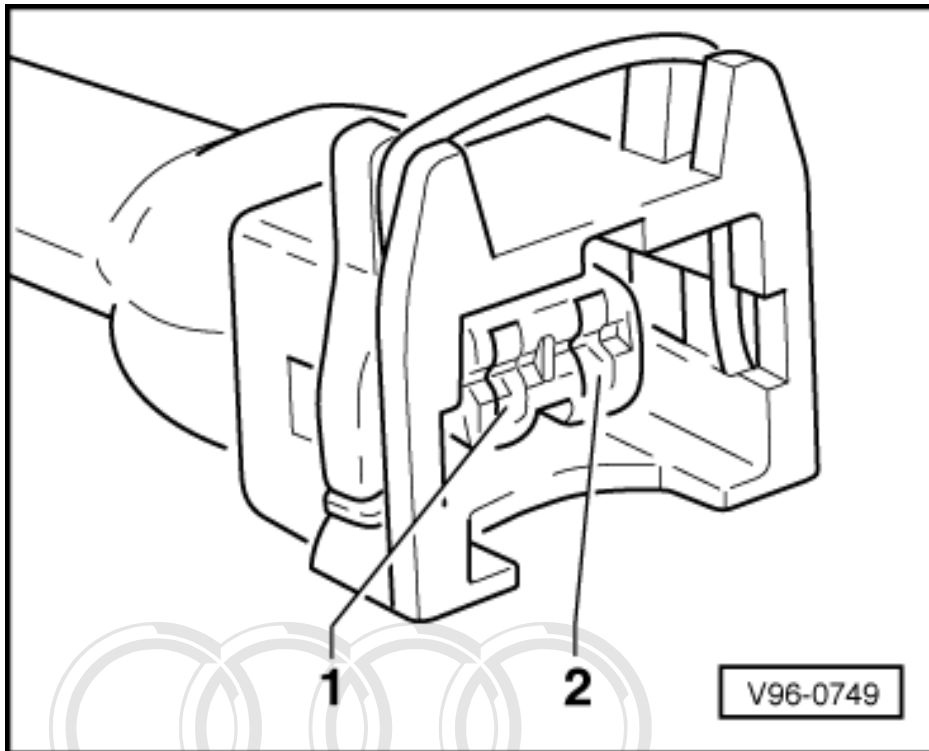
Final control diagnosis
Secondary air inlet valve -N112

- The LED should flash.

If the LED lamp does not flash or lights up continuously:

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page 56 .

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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
2	71

Resistance in wiring: max. 1.5 Ohm

- Rectify any open/short circuit as necessary.

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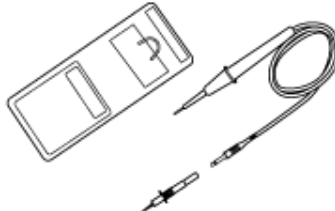
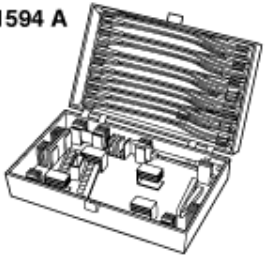
=> **Current flow diagrams, Electrical fault finding and Fitting locations binder**

If the wiring is OK:

- Fit a new engine control unit => Page **58** .



3.3 - Testing secondary air pump relay -J299 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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G24-0022	

Special tools and workshop equipment required

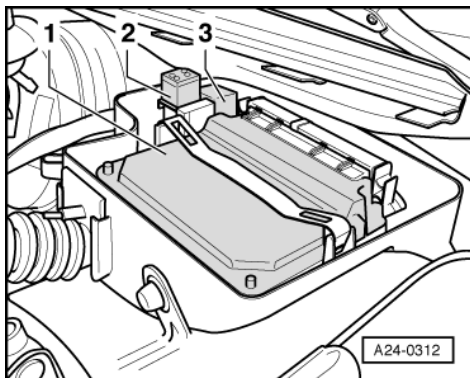
- ♦ V.A.G 1526 A
- ♦ V.A.G 1527 B
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/31

Fitting location => Fitting locations overview, Page **36**

- Start final control diagnosis and select secondary air pump relay -J299
=> Page **20** .

Important note:

The secondary air pump relay is only activated for approx. 10 seconds, so it may be necessary to start final control element diagnosis several times (switch ignition off and back on again).



- -> The secondary air pump relay should pick up and secondary air pump motor -V101 should run. (Relay is located in relay position 2 in 3-way relay carrier in electronics box on left side of plenum chamber).

A - If the relay does not pick up:

- Test voltage supply of secondary air pump relay => Page 113 .
- Test activation of secondary air pump relay => Page 114 .

B - If the relay picks up but the secondary air pump motor does not run:

- Test voltage supply of secondary air pump motor =>Page 115 .

Testing voltage supply of secondary air pump relay

- Disconnect secondary air pump relay.
- Connect multimeter (voltage test range) as follows:

3-way relay carrier (electronics box in plenum chamber) socket position 2: contact	Test against
8	Engine earth

- Specification: approx. battery voltage

Note:

The contact cells of the relay carrier in which the contacts are located are numbered on the relay carrier.

If the specification is not obtained:

- Carry out the following tests (marked with dots):
- Test fuse for secondary air pump relay.

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

- Test for open circuit in wiring from battery + (terminal 30) to secondary air pump relay -J299 (located in relay position 2 of 3-way relay carrier in electronics box in plenum chamber.)

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

- Connect multimeter (voltage measurement range) as follows:

3-way relay carrier (electronics box in plenum chamber) socket position 2: contact	Test against
4	Engine earth

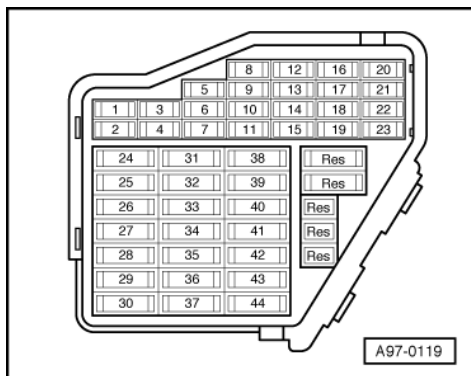
- Operate starter briefly.



- Specification: approx. battery voltage

If the specification is not obtained:

- Carry out the following tests (marked with dots):



- -> Test fuse No. S234 (in fuse box, socket 34).

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

- Test for open circuit in wiring from secondary air pump relay -J299 (contact 4) to fuel pump relay.

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

Note:

The contact cells of the relay carrier in which the contacts are located are numbered on the relay carrier.

Testing activation of secondary air pump relay

- Switch off ignition.
- Disconnect secondary air pump relay.
- Connect voltage tester V.A.G 1527 B as follows:

3-way relay carrier (electronics box in plenum chamber) socket position 2: contact	Test against
6	Battery positive

- Start final control diagnosis and select secondary air pump relay -J299
=> Page 20 .
 - The LED should light up for about 10 seconds.

If the LED does not light up:

- 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.
=> Page 56 .

Note:

The contact cells of the relay carrier in which the contacts are located are numbered on the relay carrier.

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

3-way relay carrier (electronics box in plenum chamber) socket position 2: contact	Test box V.A.G 1598/31 socket
6	72

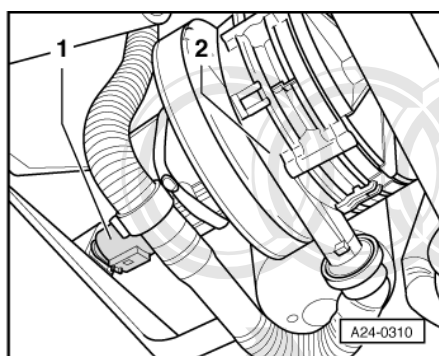
Resistance in wiring: max. 1.5 Ohm

- Rectify any open/short circuit as necessary.

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

If no fault is found:

- Fit a new secondary air pump relay -J299.



Testing voltage supply to secondary air pump motor

Note:

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The secondary air pump motor is located behind the engine noise insulation (right side in direction of travel).

-1-: Connector for secondary air pump motor;

-2-: Secondary air pump motor.

- Unplug connector from secondary air pump motor -V101.
- Connect voltage tester V.A.G 1527 B between contacts 1 and 2.
- Start final control diagnosis and select secondary air pump relay -J299
=> Page 20.
- The LED should light up for about 10 seconds.

If the LED does not light up:

- Carry out the following tests (marked with dots):
- Test for open circuit in wiring from connector for secondary air pump motor -V101 to secondary air pump relay -J299 (located in 3-way relay carrier in electronics box in plenum chamber, socket position 2)

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

- Test for open circuit in wiring from connector for secondary air pump motor -V101 to earth connection in engine compartment harness

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

If no fault is found, replace secondary air pump relay:

If the LED lights up, but the secondary air pump does not start with connector plugged in (start final control diagnosis again):

- Renew secondary air pump motor -V101.

4 - Testing intake manifold change-over function

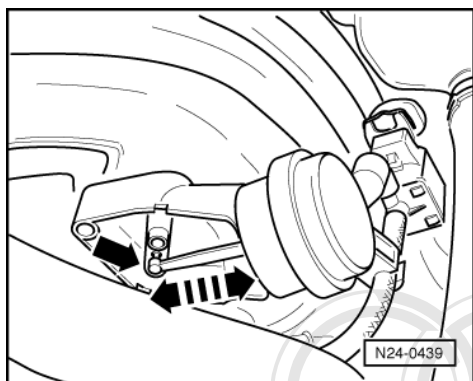
4.1 - Testing intake manifold change-over function

This test should only be carried out if the engine is losing power.

The operation of the intake manifold change-over valve is dependent on the engine load and engine speed.

Testing function

- Run engine at idling speed for 2 or 3 minutes (to build up a vacuum which is required to operate the intake manifold change-over function).



- With engine not running and ignition switched on, start final control diagnosis and select intake manifold change-over valve -N156
=>Page 20 .

-> The vacuum unit for the intake manifold change-over valve should pull and release alternately (until vacuum supply in integral vacuum reservoir is used up). When the engine is not running, the vacuum is sufficient for approx. 4 change-overs. Location of vacuum unit (vacuum actuator): =>Page 120)

If the change-over is not taking place, carry out the following tests:

- Test intake manifold change-over valve -N156 (perform final control diagnosis => Page 119).
- Make sure that vacuum hoses are properly connected and free of blockages and leaks.
- Make sure that change-over mechanism can move freely (actuate linkage by hand).

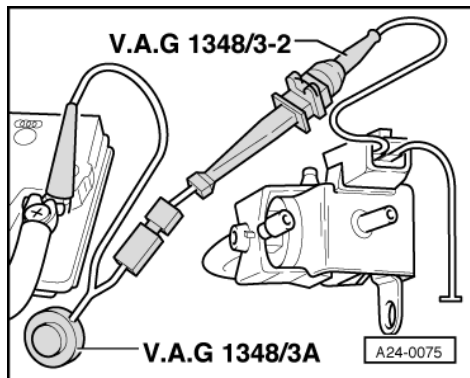
Testing vacuum system

- Run engine at idling speed for 2 or 3 minutes (to build up a vacuum which is required to operate the intake manifold change-over function).

Note:

The vacuum reservoir is part of the intake manifold and cannot be renewed separately.

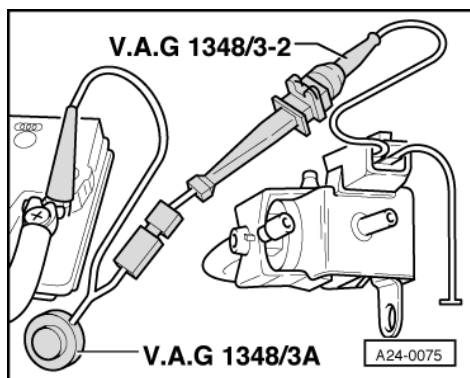
- Switch off ignition.
- Unplug 2-pin connector from intake manifold change-over valve.



- -> Connect one of the contacts on solenoid valve to engine earth using test cable and crocodile clamp from V.A.G 1594.
- Connect second contact on solenoid valve to positive via remote control V.A.G 1348/3A using adapter lead V.A.G 1348/3-2 and auxiliary cable.
- Operate remote control V.A.G 1348/3A for 2 or 3 minutes. During this time the vacuum unit should remain in the pulled-in position.

If the vacuum unit returns to rest position, test the vacuum unit as follows:

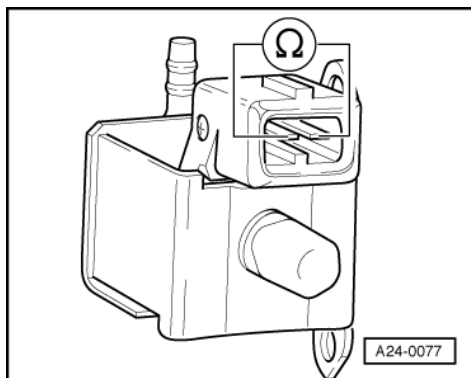
- Disconnect vacuum hoses from vacuum unit for intake manifold change-over valve.
- Connect hand pump V.A.G 1390 to vacuum unit.
- Operate hand pump and observe change-over action.
- Test vacuum unit for leaks. (The vacuum unit should not return to rest position until the hand pump is vented to atmosphere.)
- If necessary, fit a new vacuum unit.



- If the vacuum unit does not pull, check to ensure clear passage through -N156 as follows:
- -> Connect one of the contacts on -N156 to engine earth using test cables and crocodile clamp from V.A.G 1594.
- Connect second contact on -N156 to positive via remote control V.A.G 1348/3A using adapter lead V.A.G 1348/3-2 and auxiliary cable.
- Operate remote control V.A.G 1348/3A.
- Check to ensure clear passage through valve (disconnect vacuum hoses and blow through).
- If necessary, fit a new intake manifold change-over valve.

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4.2 - Checking intake manifold change-over valve



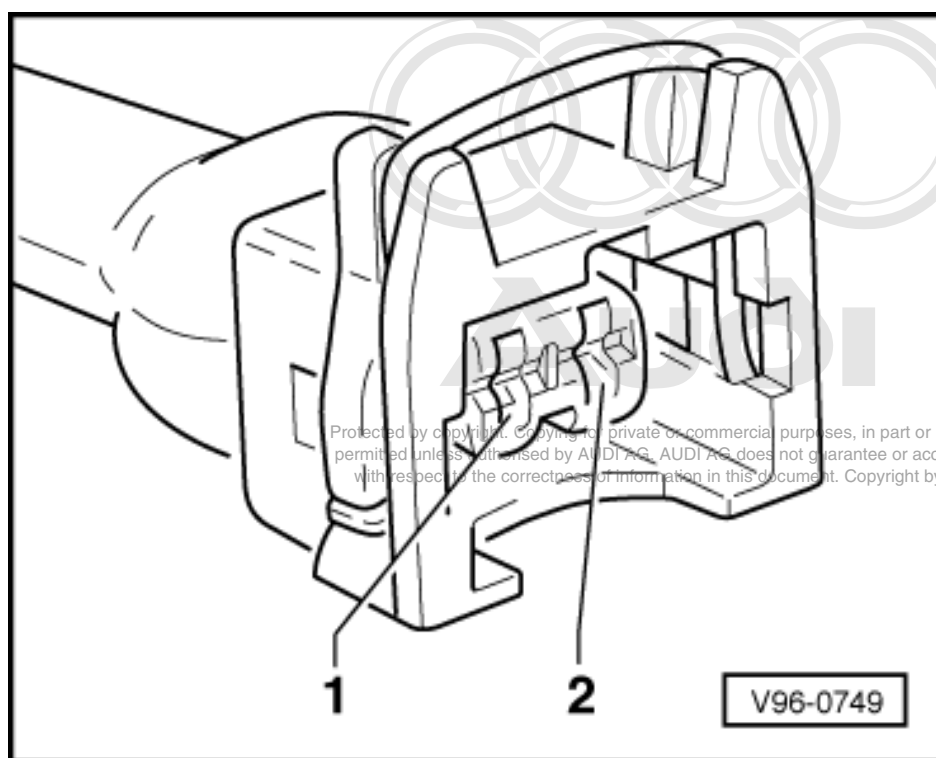
Electrical test of intake manifold change-over valve

-N156

Fitting location => Page **120** .

- Unplug connector on intake manifold change-over valve.
- -> Measure resistance at intake manifold change-over valve.
- Specification: 25 ... 35 ohm

If the value is not as specified, fit a new valve.



Testing power supply to intake manifold change-over valve

-N156

- -> Unplug connector for intake manifold change-over valve.
- Connect diode test lamp V.A.G 1527 between engine earth and contact 1 (positive) on connector using cables from adapter set V.A.G 1594.

- Operate starter briefly (the engine can be allowed to start).

Specification: the diode test lamp should light up.

If the diode test lamp does not light up, carry out the following tests:

- Test fuse for -N156.
- Test for open circuit in wiring between fuse and contact 1 on connector for intake manifold change-over valve using current flow diagram.

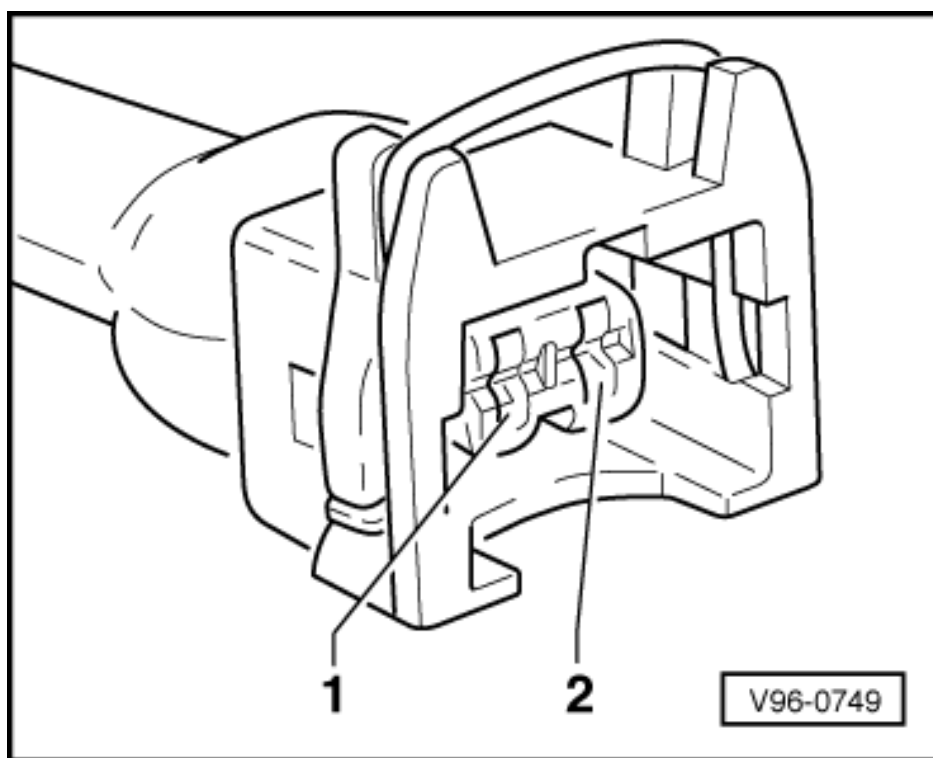
=> Current flow diagrams, Electrical fault finding and Fitting locations binder

Specification: max. 1 Ohm

- Test fuel pump relay and activation => [Page 72](#)

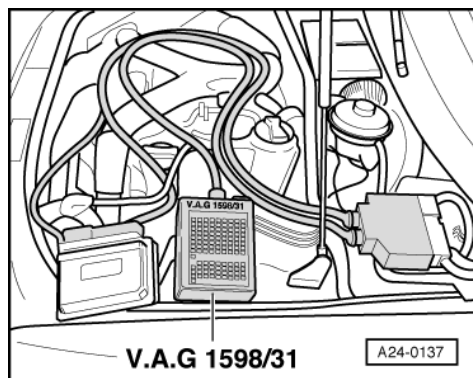
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Testing activation of intake manifold change-over valve



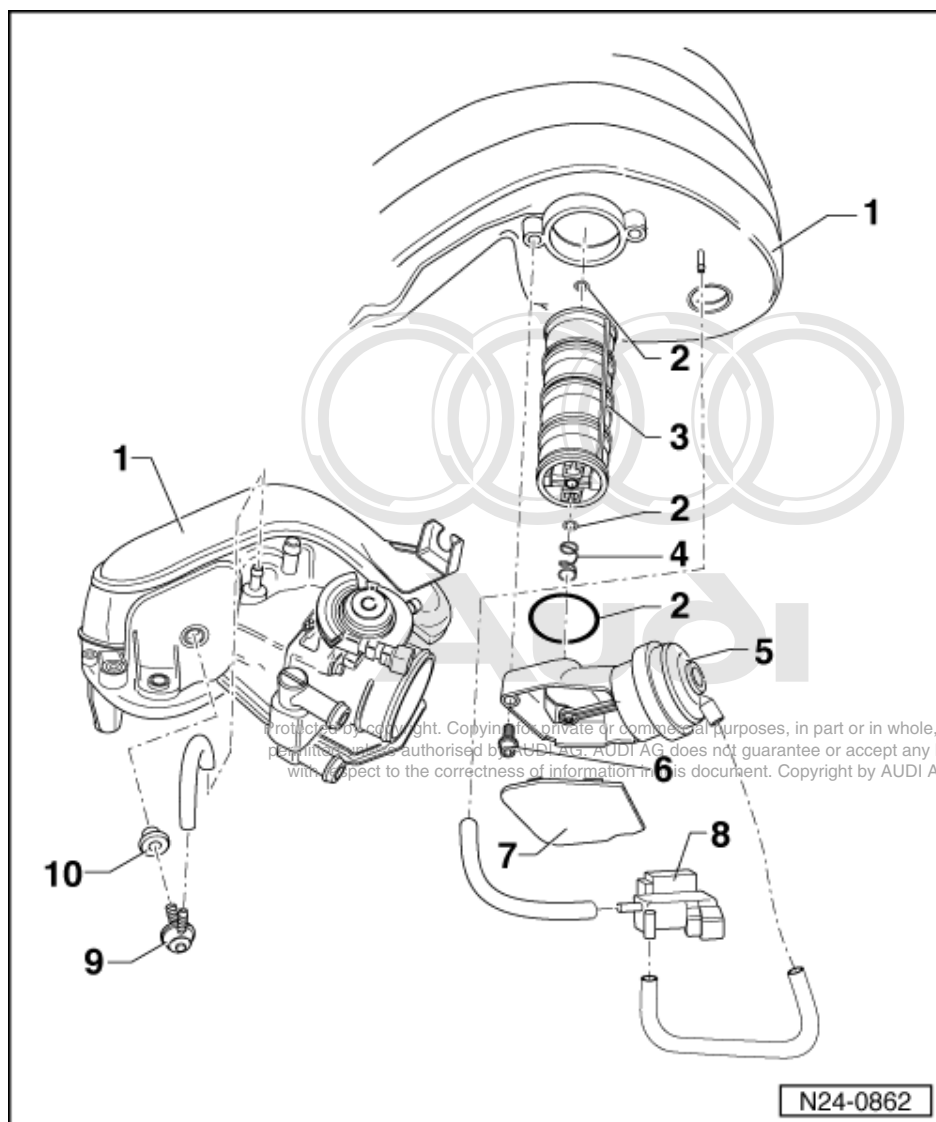
- -> Connect diode test lamp V.A.G 1527 between contacts 1 (positive) and 2 (activation signal from engine control unit) on connector for intake manifold change-over valve using cables from adapter set V.A.G 1594.
- Start final control diagnosis => [Page 20](#). The diode test lamp should flash when the intake manifold change-over valve is being activated.
- If the diode test lamp does not flash or lights up continuously, connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself => [Page 56](#).
- If the diode test lamp lights up continuously, test for short to earth in wiring between contact 2 on connector for intake manifold change-over valve and socket 117 on test box.
- If the diode test lamp does not flash, test for open circuit or short to positive in wiring between contact 2 on connector for intake manifold change-over valve and socket 117 on test box.

Specification: max. 1 Ohm



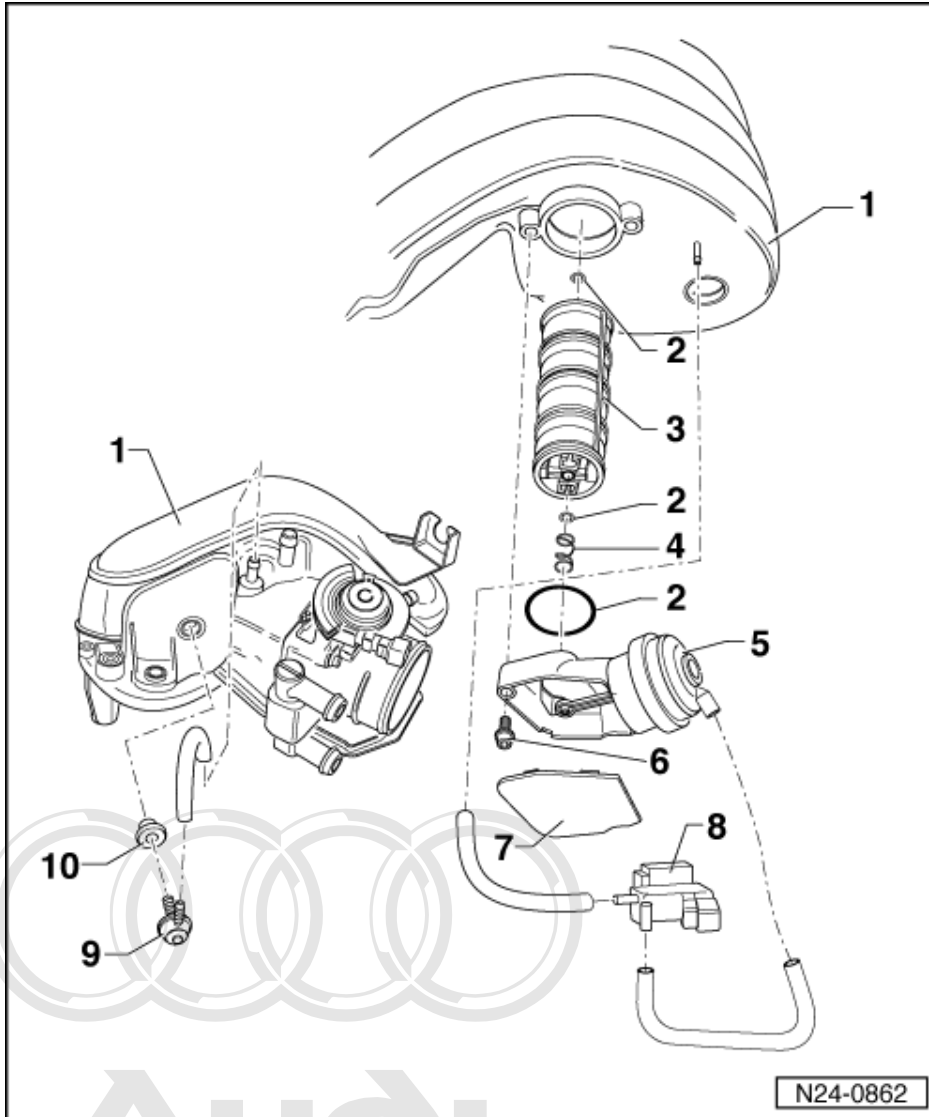
- -> If necessary, rectify open circuit or short to earth.
- If there is no open circuit and no short circuit, fit a new engine control unit
=> Page **58**.

4.3 - Removing and installing parts of intake manifold change-over



- 1 Intake manifold
- 2 Seal
 - ♦ Renew if damaged

- 3 Change-over barrel
- 4 Spring
- 5 Vacuum control element
- 6 10 Nm
- 7 Cover
- 8 Intake manifold change-over valve (N156)
 - ♦ Resistance: 25...35 ω



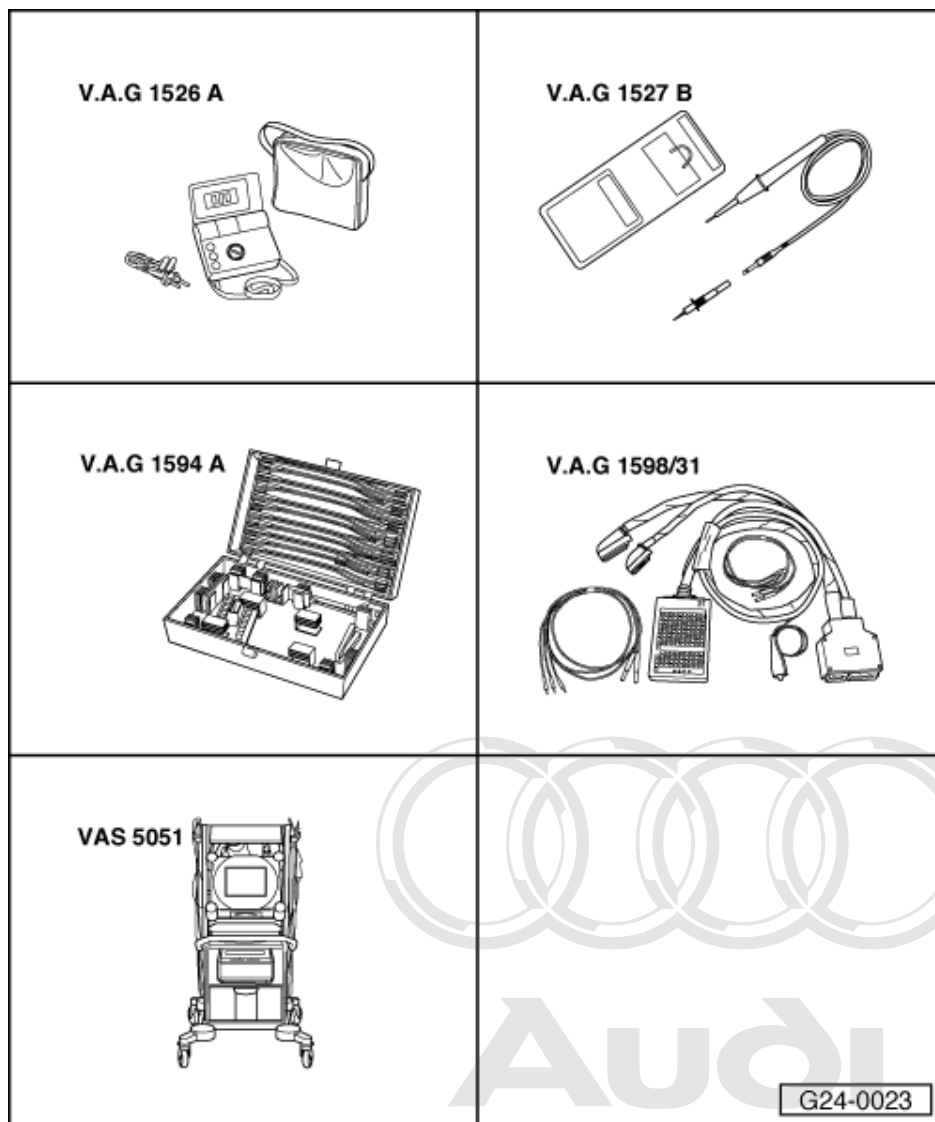
- 9 Non-return valve
 - ♦ Installation position: Grey side faces intake manifold
- 10 Rubber grommet

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5 - Testing fuel tank breather

5.1 - Testing fuel tank breather



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5.2 - Testing solenoid valve 1 for activated charcoal filter -N80

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

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

Testing for leaks

ACF solenoid valve -N80 remains closed when it is not receiving any current.

- Disconnect hoses from ACF valve but leave the electrical connector plugged in.
- Connect an auxiliary hose to one of the connections on the ACF valve.
- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 5 .)
- When doing this the ignition must be switched on.
- Start final control diagnosis and select solenoid valve for activated charcoal filter -N80 =>Page 20 .

-> Indicated on display:

Final control diagnosis
ACF solenoid 1 -N80

The valve should click...

...and should open and close (test by blowing into auxiliary hose).

If the valve does not open and close properly:

- Renew activated charcoal filter system solenoid valve -N80.

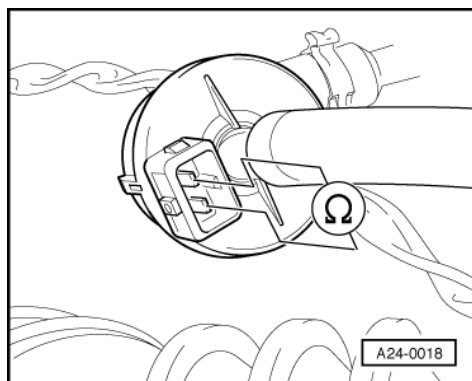
If the valve does not click:

- Test internal resistance of ACF valve

Testing internal resistance

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- Unplug connector on ACF valve.



- -> Connect multimeter to valve (resistance measurement range)
- Specification: 22 ... 30 Ω

If the specification is not attained:

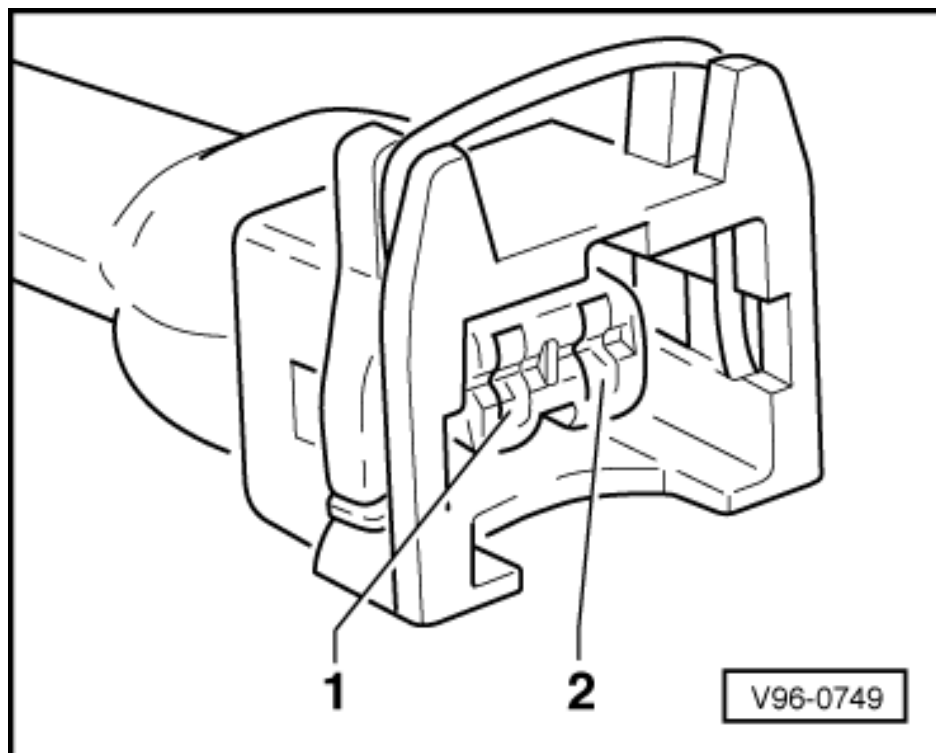
- Renew activated charcoal filter system solenoid valve -N80.

If the specification is obtained:

- Test voltage supply => Page 123 .

Testing voltage supply

- Unplug connector on ACF valve.



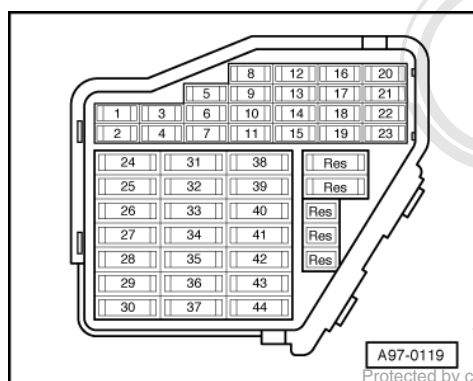
- -> Connect voltage tester V.A.G 1527 B as follows:

Connector Contact	Measure against
1	Engine earth

- Operate the starter briefly. (The engine can be allowed to start.)
- The LED should light up.

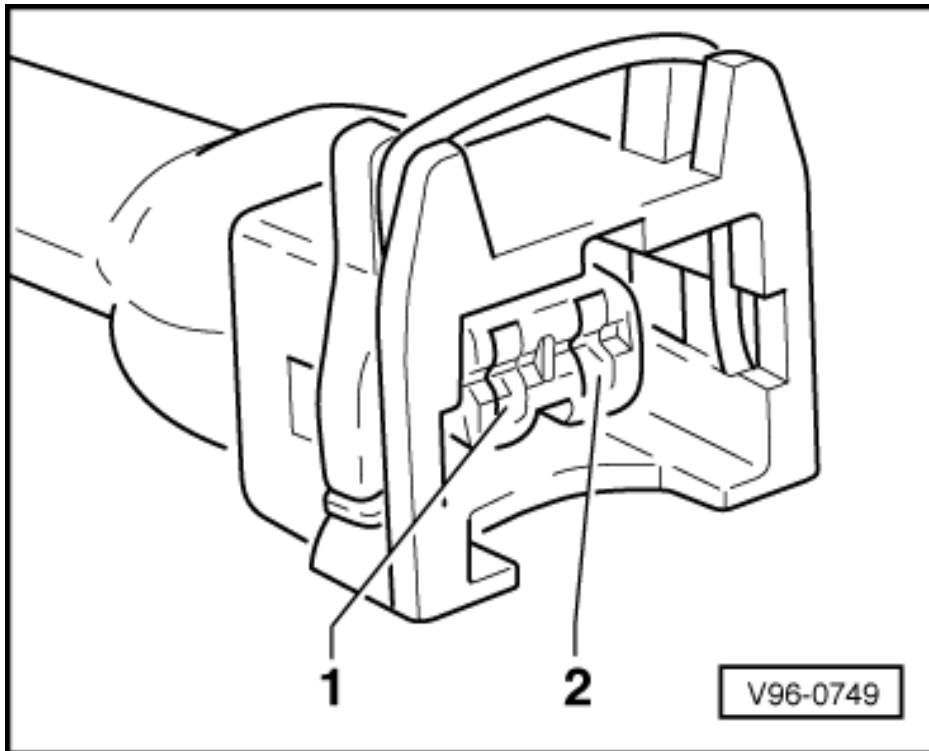
If the LED does not light up:

- Carry out the following tests (marked with dots):



- -> Fuse for solenoid valve 1 or ACF (activated charcoal filter) OK.

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



- -> Test for open circuit in wiring from contact 1 of connector to fuel pump relay via fuse:

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

- Rectify any open circuits.

If no fault is found:

- Test fuel pump relay => Page 72 .

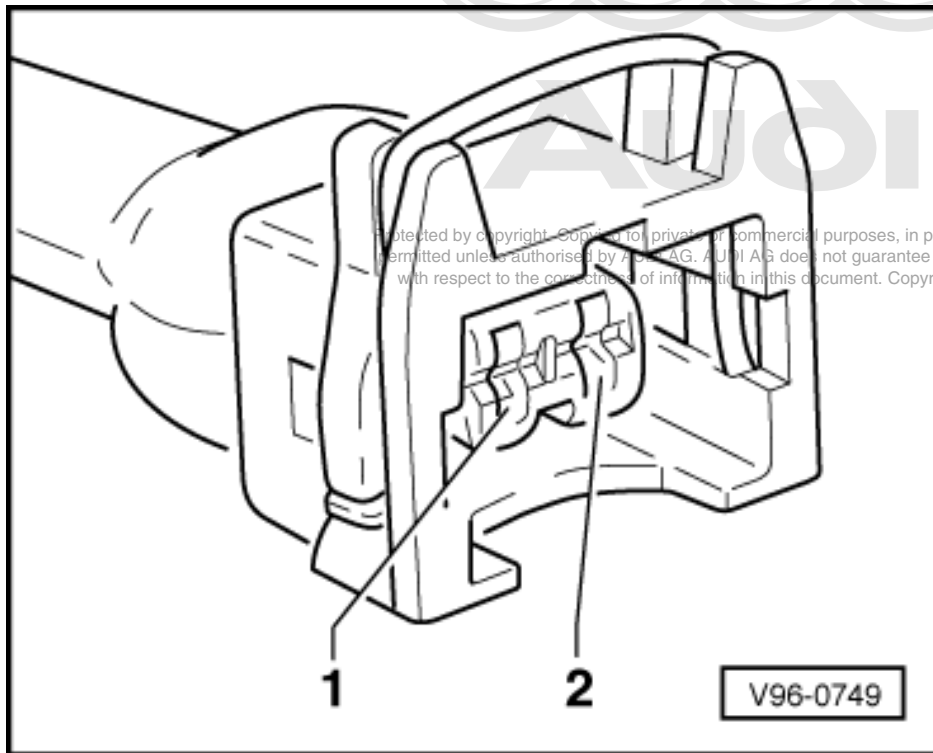
If the LED lights up:

- Test activation.



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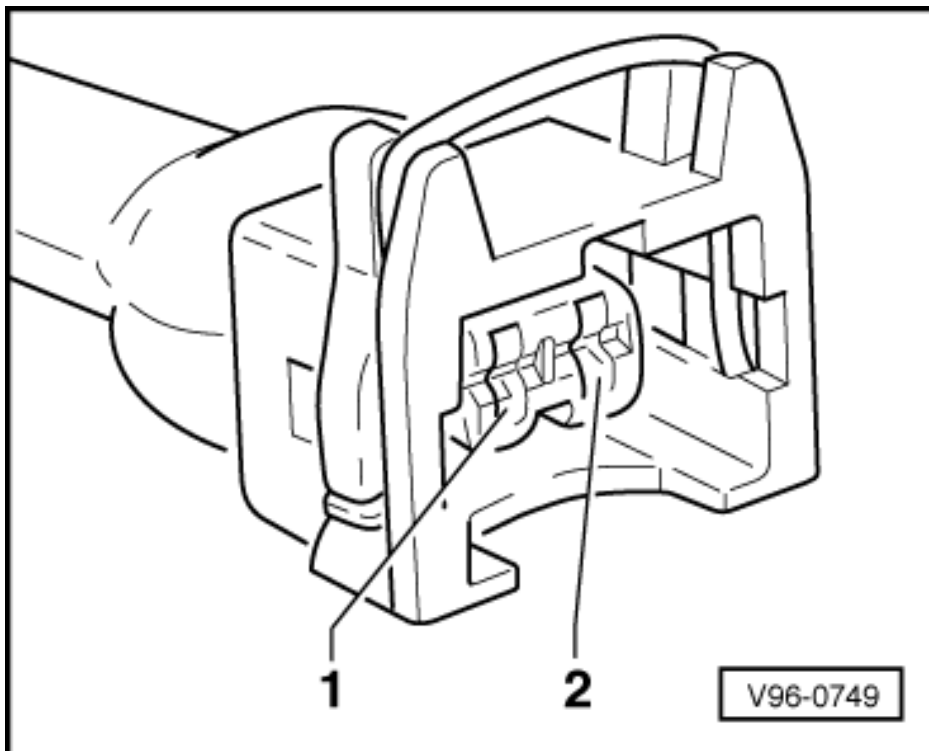
Checking activation



- -> Connect voltage tester V.A.G 1527 B to contact 1 (positive) and contact 2 of the connector.
- Start final control diagnosis and select solenoid valve for activated charcoal filter -N80 =>Page 20 .
 - The LED should flash.

If the LED lamp does not flash or lights up continuously:

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page 56 .



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

Connector Contact	Test box V.A.G 1598/31 Socket
2	61

Resistance in wiring: max. 1.5 Ohm

- Rectify short circuit or open circuit if necessary.

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

If the wiring is OK:

- Fit a new engine control unit => Page 58.

6 - Testing electronic engine power control (electronic throttle)

6.1 - Testing electronic engine power control (electronic throttle)

6.2 - Operation of electronic throttle system

With the electronic throttle the throttle valve is not operated by a cable connected to the accelerator pedal. There is no mechanical link between the accelerator and the throttle valve.

The position of the accelerator pedal is communicated to the engine control unit by two accelerator position senders (variable resistors, both fitted in a single housing) which are connected to the accelerator pedal.



The accelerator position (as determined by the driver) is one of the main input values for the engine control unit.

The throttle valve is actuated by a servomotor (throttle valve positioner) in the throttle valve control part over the full range of engine speeds and load conditions.

The throttle valve positioner actuates the throttle valve according to the commands it receives from the engine control unit.

After selecting display group 62 (either in mode 04 "Basic setting" or 08 "Reading measured value block") the engine control unit controls the throttle valve positioner exactly according to the commands it receives from the accelerator pedal position sender. This is also the case in display group 60 in mode "Reading measured value block" as well as in the basic setting after the automatic adaption of the throttle valve control part.

When the engine is running (i.e. under load) the engine control unit can open and close the throttle valve freely (i.e. independently of the signals being sent by the accelerator position sender).

For example, the throttle valve might already be fully open even though the accelerator is only pressed down half way. This has the advantage of preventing throttling losses at the throttle valve.

Under certain engine load conditions there is also a significant reduction in harmful emissions and noticeably improved fuel consumption.

The electronic throttle is not simply a combination of two or three components, but rather a complete system comprising all the elements that together determine the position of the throttle valve and also control and monitor it. For example, the accelerator position sender, throttle valve control part, EPC warning lamp, engine control unit etc.

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6.3 - Testing throttle valve control part -J338

The housing for the throttle valve control part contains the following components:

- ♦ Throttle valve drive -G186.
(This is an electric motor that is operated by the engine control unit. The motor has to overcome spring pressure in order to open the throttle valve.)
- ♦ Angle sender 1 for throttle valve drive -G187
- ♦ Angle sender 2 for throttle valve drive -G188

Notes:

- ♦ If the throttle valve control part is renewed, perform adaption of exhaust gas recirculation valve=>Page 60.
- ♦ The housing for the throttle valve control part must not be opened.
- ♦ The angle senders are potentiometers with variable resistance. They inform the engine control unit of the position of the throttle valve and are completely independent of each other (redundant functions).
- ♦ It is not possible to adjust the potentiometers mechanically. Adjustments can be made using vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 (in basic setting mode, function 04).

6.4 - Performing adaption of throttle valve control part

The adaption process enables the engine control unit to learn the different positions of the throttle valve with the ignition switched on and the engine not running. These positions are stored in the control unit. The feedback signal indicating the position of the throttle valve comes from the two angle senders for throttle valve drive.

The adaption process must always be performed if the throttle valve control part -J338 or the engine control unit is replaced.

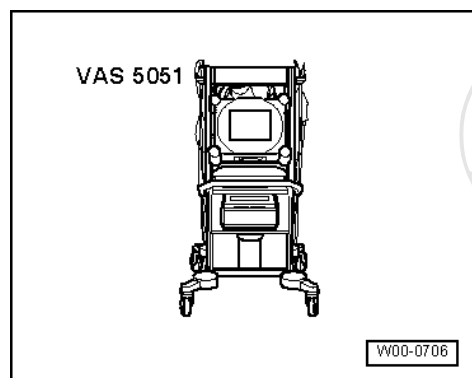
The learning process (adaption process) is carried out:

- ◆ By selecting "Basic setting" (function 04), Display Group 60 with the ignition switched on.
- ◆ Automatically if the ignition is switched on for at least 4 seconds without operating the starter or depressing the accelerator, and if the engine control unit registers a "learning requirement". (In this case, however, there is no way of knowing whether the adaption process was successful or not.) The engine control unit will register a learning requirement if the previously stored voltage readings from the angle senders do not correspond (within a certain tolerance range) to the new voltage readings.

Note:

The engine will not start while the automatic adaption process is being performed.

Special tools and workshop equipment required



- ◆ VAS 5051 and VAS 5051/1

or

- ◆ V.A.G 1551 and V.A.G 1551/3 A

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Test conditions for adaption of throttle valve control part

- No faults stored in fault memory
=> Page 8, Interrogating fault memory
 - Engine not running; ignition switched on
 - Accelerator not depressed
 - Coolant temperature between 5°C and 105°C
 - Intake air temperature above 5°C
 - Power supply to engine control unit more than 11 V
- Testing =>Page 76

Work sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 5 .)
- When doing this the ignition must be switched on.

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

- Enter "04" to select "Basic setting" and confirm with Q key.

-> Indicated on display:

Introduction of basic setting	Q
Enter display group number XXX	

- Enter "060" for Display Group 060 and confirm entry with Q key.

-> Indicated on display:



System in basic setting 60
1 2 3 4

When the Q key is pressed the current supply to the throttle valve positioner will be disconnected.

In this condition the throttle valve is pulled into an "emergency running" or default position by a spring in the throttle valve control part. The values supplied by the two angle senders for this position are stored in the engine control unit.

The throttle valve is then opened by a predetermined amount. As soon as it reaches this position the current supply to the throttle valve positioner is again disconnected. The spring should then close the throttle valve mechanically to the previously learned default position within a specified period of time (spring test).

The throttle valve positioner then closes the throttle valve and the values supplied by the angle senders in the throttle valve control part are stored in the engine control unit.

If the engine control unit disconnects the current supply to the throttle valve positioner while the vehicle is being driven, the result will be an increase in idling speed with fluctuating engine rpm (hunting) and very slow throttle response.

- Check readout for throttle valve control part (display zone 4).

	Display zones			
	1	2	3	4
Display Group 060: Adaption of throttle valve control part				
Display	xx %	xx %	---	---
Indicates	Throttle valve angle (angle sender 1)	Throttle valve angle (angle sender 2)	Learning stage counter	Adaption status
Range	0 ... 100 %	0 ... 100 %	x...x	ADP. runs ADP. O.K. ADP. ERROR
Specification	5.9...92.2 %	95.1...8.7 %	0	ADP O.K.
Note				If readout does not match specification, see note => Page 130

Note on display zone 3:

During adaption display zone 3 indicates various numbers, which represent the actual adaption status. It is not of principal importance what the learning stage counter (display zone 3) displays during the adaption period, but that the specification "ADP O.K." is indicated in display zone 4 after the adaption process.

Note on display zone 4:

The abbreviation "ADP" in display zone 4 stands for "Adaption".

Note:

If the adaption process is interrupted by the control unit, the cause could be one of the following:

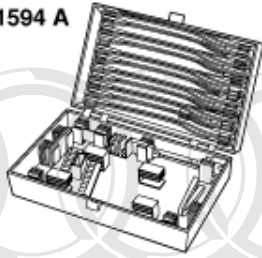
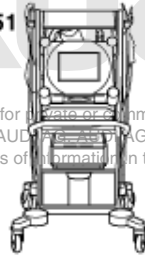
- ♦ All test conditions must be met
=>Page 129 .
- ♦ The engine was started during the adaption process.
- ♦ The throttle valve is unable to close completely (e.g. because of dirt).
- ♦ Connectors have become detached, are not engaged properly or connector contacts are corroded or bent.
- ♦ Battery voltage too low (less than 8 V).
- ♦ Throttle valve control part or wiring is defective.

- ♦ Distortion of throttle valve housing (check bolts).
- End the engine basic setting by pressing the⇒ key.

-> Indicated on display (function selection):

Rapid data transfer HELP
Select function XX

6.5 - Testing angle senders for throttle valve drive

V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598/31 	VAS 5051 
G24-0021	

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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
 - ♦ VAS 5051 with VAS 5051/1
- or
- ♦ V.A.G 1551 with V.A.G 1551/3 A



The angle senders for throttle valve drive (-G187 and -G188) inform the engine control unit of the position of the throttle valve. Both angle senders are located in the throttle valve control part.

Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 5 .)
When doing this the ignition must be switched on.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

- Enter "08" to select the function "Read measured value block" and confirm entry with Q key.

-> Indicated on display:

Read measured value block Q
Enter display group number XXX

- Enter "062" for Display Group 062 and confirm entry with Q key.

-> Indicated on display:

Read measured value block 62
1 2 3 4

- Check display values for electronic throttle potentiometer voltages.

	Display zones			
	1	2	3	4
Display Group 062: Electronic throttle potentiometer voltages				
Display	xx %	xx %	xx %	xx %
Indicates	Throttle valve angle (angle sender 1)	Throttle valve angle (angle sender 2)	Accelerator position sender	Accelerator position sender 2
Range	0 ... 100 %	0 ... 100 %	0 ... 100 %	0 ... 100 %
Specification	5.9...92.2% (at idling speed: 5.9...15.2%) (at full throttle: 84.0...92.2 %)	95.1...8.7 % (at idling speed: 84.2...95.1%) (at full throttle: 8.7...15.4 %)	12...97 %	4...49 %

Note:

The engine control unit converts the voltage readings from the angle senders into percentages of 5 V and displays them as percentages. (A supply voltage of 5 V is equivalent to 100%.)

- Observe display zones 1 and 2.
- Slowly depress accelerator to full throttle position.

The percentage value in display zone 1 should rise steadily (but without covering the full tolerance range between 5.9 and 92.2 %).

The percentage value in display zone 2 should decrease steadily (but without covering the full tolerance range between 95.1 and 8.7 %).

Notes:

- ♦ The reason why the value in display zone 1 rises and the value in display zone 2 falls is because the potentiometers (angle senders) in the throttle valve control part work in opposite directions.
- ♦ The percentage value for the first potentiometer increases as the voltage rises towards 5 V because the voltage at this potentiometer increases as the throttle valve opens.

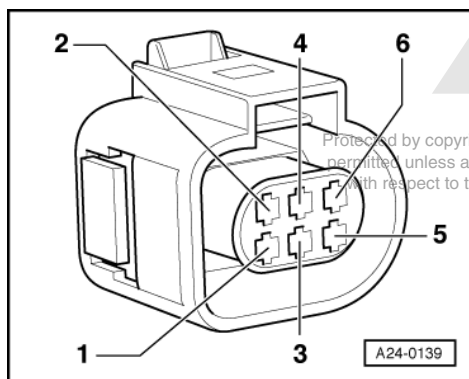
- ♦ The percentage value for the second potentiometer decreases as the voltage drops away from 5 V and towards 0 V because the voltage at this potentiometer decreases as the throttle valve opens.

If the display values do not appear as described:

- Test voltage supply and wiring to throttle valve control part =>Page 133 . Pay particular attention to the connectors, which may have corroded, or may be loose or not properly engaged.
- Test accelerator position senders
=>Page 135 .

Testing voltage supply to throttle valve control part

- Unplug connector from throttle valve control part.
- Switch ignition on.



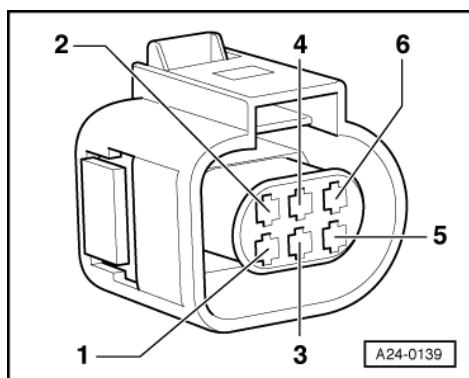
- -> Connect multimeter (voltage measurement range) as follows:

Connector Contact	Specification
2 + earth	approx. 5 V
2 + 6	approx. 5 V

If the specifications are not obtained:

- Test wiring between engine control unit and throttle valve control part => Page 133 . During this process the signal wiring and the wiring of the throttle valve positioner are tested as well.

Testing wiring



- -> Unplug connector from throttle valve control part.
- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page 56 .
- Test for open circuit and short to earth or positive in the following wiring connections:



Connector Contact	Test box V.A.G 1598/31 Socket
1	90
2	97
3	119
4	92
5	121
6	91

- Rectify any open/short circuit as necessary.

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

If no fault is detected:

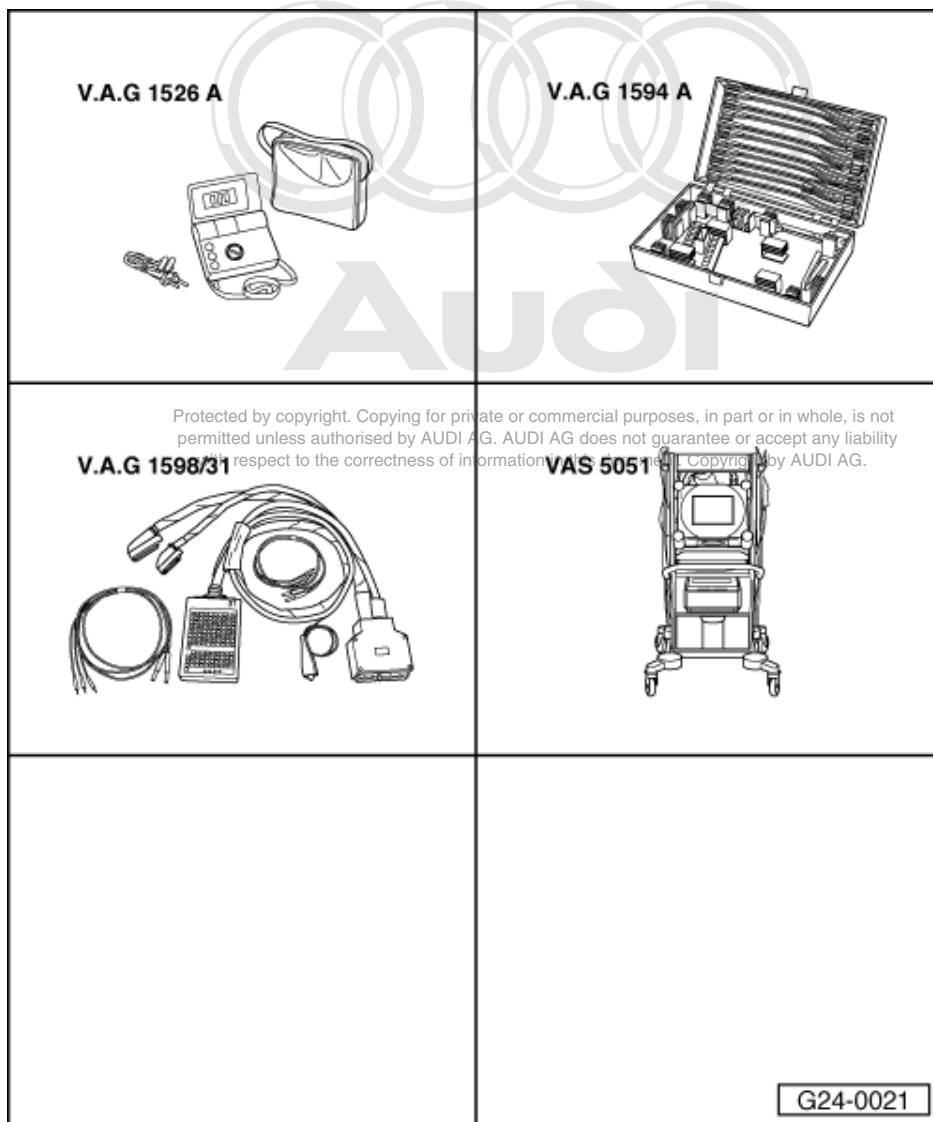
- Fit a new throttle valve control part.
- If the throttle valve control part is renewed, perform adaption of exhaust gas recirculation valve=>Page 60 .



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7 - Testing accelerator position senders

7.1 - Testing accelerator position senders



Special tools and workshop equipment required

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

or

- ◆ V.A.G 1551 with V.A.G 1551/3 A

Accelerator position senders -G79 and -G185 are located on the accelerator pedal. Both senders inform the engine control unit of the driver's throttle requirement (pedal position), but each functions completely independently of the other (redundancy principle). Both senders are located in a single housing.

Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 5 .)



When doing this the ignition must be switched on.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

- Enter "08" to select the function "Read measured value block" and confirm entry with Q key.

-> Indicated on display:

Read measured value block Q
Enter display group number xxx

- Enter "062" for Display Group 062 and confirm entry with Q key.

-> Indicated on display:

Read measured value block 62
1 2 3 4

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- Check display values for electronic throttle potentiometer voltages.

	Display zones			
	1	2	3	4
Display Group 062: Electronic throttle potentiometer voltages				
Display	xx %	xx %	xx %	xx %
Indicates	Throttle valve angle (angle sender 1)	Throttle valve angle (angle sender 2)	Accelerator position sender	Accelerator position sender 2
Range	0 ... 100 %	0 ... 100 %	0 ... 100 %	0 ... 100 %
Specification	5.9...92.2 %	95.1...8.7 %	12...97 % (at idling speed 8...18%)	4...49 % (at idling speed 3...13%)

Note:

The engine control unit converts the voltage readings from the angle senders into percentages of 5 V and displays them as percentages. (A supply voltage of 5 V is equivalent to 100%.)

- Observe display zones 3 and 4.
- Slowly depress accelerator to full throttle position.

The percentage value in display zone 3 should rise steadily between 12 and 97 % but without covering the full range of values.

The percentage value in display zone 4 should also rise steadily but without covering the full range of values (in this case 4...49 %).

Note:

The value shown in display zone 3 should always be about twice as high as the value shown in display zone 4.

If the display values do not appear as described:

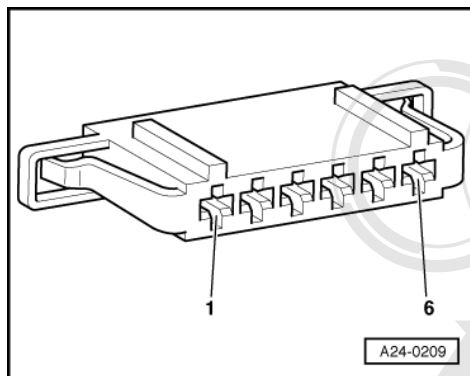
- Check whether connector of accelerator pedal position has become detached, is not properly engaged or if the contacts of the connector are corroded.
- Test voltage supply and wiring to accelerator position senders
=>Page 136 .

Testing voltage supply to accelerator position senders

- Remove storage compartment on driver's side.

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

- Unplug connector for accelerator position sender.



- Switch ignition on.
- -> Test supply voltage according to current flow diagram.

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If supply voltage is OK:

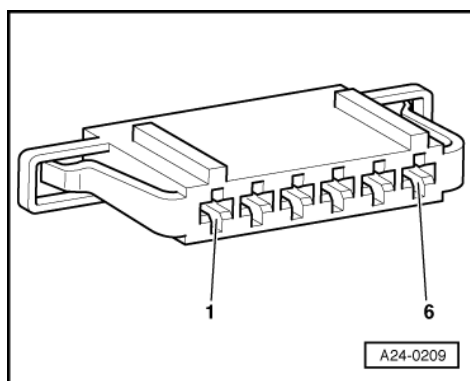
- Test the signal wiring => Page **137** .

If supply voltage is not OK:

- Test wiring between engine control unit and accelerator position senders => Page **137** .

Testing signal wiring and wiring connections between accelerator position senders and engine control unit

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page **56** .



- -> 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	19
2	18
3	50
4	51
5	45



6	64
---	----

- Rectify any open/short circuit as necessary.

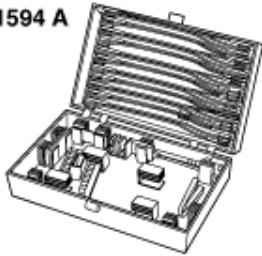
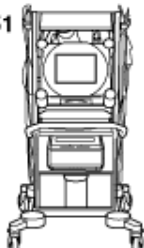
=> Current flow diagrams, Electrical fault finding and Fitting locations binder

If no fault is detected:

- Renew accelerator position senders.

=> Fuel supply system, Petrol engines; Repair group 20; Servicing accelerator mechanism Servicing accelerator mechanism

7.2 - Testing brake light switch -F and brake pedal switch -F47

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

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

Because the injection system operates with an accelerator pedal sender (potentiometer) which may be defective, the engine is throttled back for reasons of safety when the brakes are applied. To do this the control unit requires signals from the brake light switch and also the brake pedal switch. This means that if the brakes are operated when the accelerator pedal is held at a constant position the engine speed is immediately reduced. Incorrectly adjusted switches may lead to unrequired regulating action.

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01"=>Page 5 .
When doing this the ignition should be switched on.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

- Press keys 0 and 8 for the function "Read measured value block" and confirm entry with Q key.

-> Indicated on display:

Read measured value block
Enter display group number XXX

- Press keys 0, 6 and 6 to select "Display Group 66" and confirm entry with Q key.

-> Indicated on display:

Read measured value block 66
1 2 3 4

- Observe display in display zone 2.

	Display zones			
	1	2	3	4
Display Group 66: Signals to engine control unit with ignition on				
Display	xxx km/h	1 0 0 0	xxx km/h	1 0 0 0
Indicates	Actual speed	Switch positions	Specified speed	Switch positions for cruise control system
Range		off = 0 on = 1		off = 0 on = 1
Specification		1 0 0 0		
Note		Relevance of figures => Page 139		

- Depress brake pedal

Relevance of figures in 4-digit readout in display zone 2

x	x	x	x	Display zone 2
			X	Brake light switch 0 = Brake pedal not depressed 1 = Brake pedal depressed
		X		Brake pedal switch 0 = Brake pedal not depressed 1 = Brake pedal depressed



x	x	x	x	Display zone 2
	X			Clutch pedal switch 0 = Clutch pedal not depressed 1 = Clutch pedal depressed
X				Cruise control system (CCS) 0 = CCS deactivated 1 = CCS enabled

	Display zones			
	1	2	3	4
Display Group 66: Signals to engine control unit				
Display	xxx km/h	1 0 1 1	xxx km/h	0 0 0 0
Indicates	Actual speed	Switch positions	Specified speed	Switch positions for cruise control system
Range		off = 0 on = 1		off = 0 on = 1
Specification		1 0 1 1		
Note		Both readouts must change from 0 to 1.		

- Allow brake pedal to return slowly to its normal position.
- Both readouts should return from 1 to 0.

If one or both of the readouts does not change:

- Test voltage supply
=> Page 141 .

Testing voltage supply

- Remove storage compartment on driver's side.

=> General body repairs, Interior; Repair group 68; Dash panel; Removing driver's storage compartment Dash panel Removing driver's storage compartment

- Unplug 4-pin connector on brake pedal.
- Connect hand-held multimeter (voltage range) between the following sockets on the connector:
- Switch ignition off.

4-pin connector on wiring harness, socket	Specification
1 + earth	Battery voltage

- Switch ignition on.

4-pin connector on wiring harness, socket	Specification
3 + earth	Battery voltage

If specifications are met:

- Test wiring connections => Page 141

If specifications are not met:

- Test wiring connections from sockets 1 and 3 of connector for open circuit or short to earth.

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

- Rectify any open/short circuit as necessary.

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.
=> Page 56 .

Test the following wiring connections for open circuits and short to positive or earth:

4-pin connector on wiring harness, socket	Test box V.A.G 1598/31, socket
2	53
4	63

Resistance in wiring: max. 1.5 Ohm

- Rectify any open/short circuit as necessary.

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

If no open circuits are found in wiring:

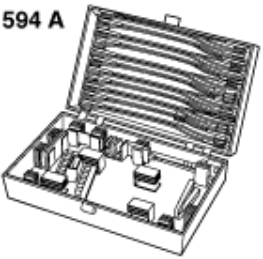
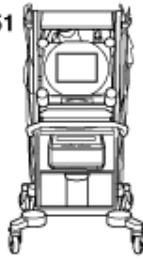
- Renew brake light switch / brake pedal switch.



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7.3 - Testing clutch pedal switch -F36

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V.A.G 1594 A 	V.A.G 1598/31 
VAS 5051 	

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

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

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.

Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 5 .)

When doing this the ignition must be switched on.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

- Press keys 0 and 8 for the function "Read measured value block" and confirm entry with Q key.

-> Indicated on display:

Read measured value block
Enter display group number XXX

- Press keys 0, 6 and 6 to select "Display Group 66" and confirm entry with the Q key.

-> Indicated on display:

Read measured value block 66
1 2 3 4

- Observe display in display zone 2.

	Display zones			
	1	2	3	4
Display group 66: Signals to engine control unit				
Display	xxx km/h	0 0 0 0	xxx km/h	0 0 0 0
Indicates	Actual speed	Switch positions	Specified speed	Switch positions for cruise control system
Range		off = 0 on = 1		off = 0 on = 1
Specification		0 0 0 0		
Note		Relevance of figures => Page 143		

- Depress clutch pedal

Relevance of figures in 4-digit readout in display zone 2

x	x	x	x	Display zone 2
			X	Brake light switch 0 = Brake pedal not depressed 1 = Brake pedal depressed
		X		Brake pedal switch 0 = Brake pedal not depressed 1 = Brake pedal depressed
	X			Clutch pedal switch 0 = Clutch pedal not depressed 1 = Clutch pedal depressed
X				Cruise control system (CCS) 0 = CCS deactivated 1 = CCS enabled

	Display zones			
	1	2	3	4
Display group 66: Signals to engine control unit				
Display	xxx /rpm	0 1 0 0	xxx km/h	0 0 0 0



	Display zones			
Indicates	Actual engine speed	Switch positions		Switch positions for cruise control system
Range		off = 0 on = 1		off = 0 on = 1
Specification		0 1 0 0		
Note		Readout must change from 0 to 1		

- Allow clutch pedal to return slowly to its normal position.
- Readout should return from 1 to 0.

If the readout does not change:

- Test voltage supply => Page 144 .

Testing voltage supply

- Remove storage compartment on driver's side.

=> General body repairs, Interior; Repair group 68; Dash panel; Removing driver's storage compartment Dash panel Removing driver's storage compartment

- Unplug 2-pin connector from clutch pedal.
- Switch on ignition.
- Connect hand-held multimeter (voltage range) between the following sockets on the connector:

2-pin connector on wiring harness, socket	Specification
2 + earth	Battery voltage

If specification is obtained:

- Test wiring connections => Page 144 .

If specification is not obtained:

- Test wiring from socket 2 of connector for open circuit and short to earth:

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

Testing wiring connection

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page 56 .

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Test the following wiring connections for open circuits and short to positive or earth.

2-pin connector on wiring harness, socket	Test box V.A.G 1598/31, socket
1	65

Resistance in wiring: max. 1.5 Ohm

- Rectify any open/short circuit as necessary.

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

If no open circuits are found in wiring:

- Renew clutch pedal switch.

8 - Testing auxiliary signals

8.1 - Testing auxiliary signals

8.2 - Checking engine speed signal

Note:

The signal is generated by engine speed sender -G28 and processed by the engine control unit.

To obtain engine speed, proceed as follows:

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01"=>Page 5 .
When doing this the ignition should be switched on.

-> Indicated on display:

Rapid data transfer	HELP
Enter address word XX	

- Test all control units for a missing rpm signal via the "Automatic test sequence."
- Press the 0 key twice to select "Automatic test sequence" function and confirm entry by pressing Q key.

No faults relating to a "missing engine speed signal" should be stored in any of the control units.

If one of the control units indicates a fault:

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- Test for open circuit or short circuit between engine control unit and the control unit concerned.

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

8.3 - Testing fuel consumption signal for on-board computer

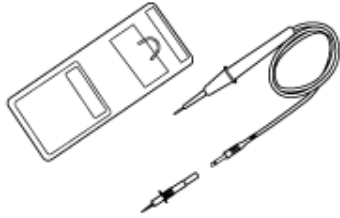
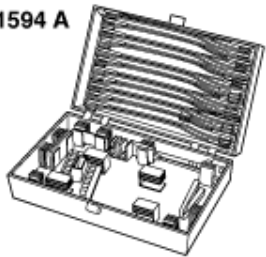
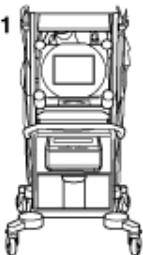
Notes:

- ♦ The fuel consumption is calculated by the engine control unit on the basis of the injection period, and the signal is transmitted to the on-board computer via contact 75 on the engine control unit.
- ♦ Testing fuel consumption signal

=> Electrical system; Repair group 90; Dash panel insert; Testing fuel consumption signal Dash panel insert
Testing fuel consumption signal



8.4 - Testing road speed signal

V.A.G 1526 A 	V.A.G 1527 B 
V.A.G 1594 A 	V.A.G 1598/31 
VAS 5051 	G24-0023

Note:

*In vehicles with ESP (Electronic stability program) the road speed signal is transmitted via the CAN data bus=>Page **152**.*

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

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

Notes:

- ♦ The road speed signal is generated by the road speed sender -G68 (on the gearbox) and is processed in the dash panel insert.

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- ♦ The processed signal goes to contact 9 on the engine control unit and is used for idling speed stabilisation and for the damping of load change jolts when changing gear.

Test requirement:

- Speedometer (including display) must be functioning properly.
Fault-finding:

=> Electrical system; Repair group 90; Dash panel insert; Testing road speed signal Dash panel insert Testing road speed signal

Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 5 .)
When doing this the engine must be idling.

Warning:
To avoid accident risks when road testing the vehicle with test equipment, always observe the relevant safety precautions =>

-> Indicated on display:

Rapid data transfer HELP
Select function XX

- Enter "08" to select the function "Read measured value block" and confirm entry with Q key.

-> Indicated on display:

Read measured value block Q
Enter display group number XXX

- Enter "005" for Display Group 005 and confirm entry with Q key.

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-> Indicated on display:

Read measured value block 5
1 2 3 4

- Take vehicle for a test drive and check whether the road speed appears in display zone 3.
- If the road speed does not appear:
- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page 56 .
- 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
9	=> Current flow diagrams, Electrical fault-finding and Fitting locations binder

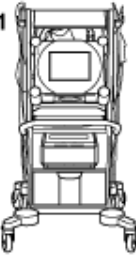
- Rectify short circuit or open circuit if necessary.

If the wiring is OK:

- Identify all systems receiving a speed signal input (e.g. radio, air conditioner, etc.), disconnect them from the dash panel insert one after the other and then repeat the test until the cause of the fault is located.



8.5 - Testing air conditioner compressor shut-off

V.A.G 1526 A 	V.A.G 1594 A  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 with respect to the correctness of information in this document. Copyright by AUDI AG.
V.A.G 1598/31 	VAS 5051 
	G24-0021

Special tools and workshop equipment required

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

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

Notes:

- ♦ The air conditioner compressor signal informs the engine control unit that the compressor will be switched on in 140 ms.
- ♦ The engine control unit can send a signal via the same wire to shut off the air conditioner compressor.
- ♦ The engine control unit will shut off the air conditioner compressor in the following circumstances:
 - Under heavy acceleration (full throttle in 1st gear)
 - In emergency running mode (back-up)
 - When the "Basic setting" function is started (function 04)

Requirements for test:

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

Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 5.)
When doing this the engine must be idling

-> Indicated on display:

Rapid data transfer HELP
 Select function XX

- Press keys 0 and 8 for the function "Read measured value block" and confirm entry with Q key.

-> Indicated on display:

Read measured value block
 Enter display group number XXX

- Press keys 0, 5 and 0 to select Display Group 50 and confirm entry with the Q key.

-> Indicated on display:

Read measured value block 50
 Enter display group number XXX

- Check air conditioner compressor shut-off (display zone 4).

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	Display zones			
	1	2	3	4
Display Group 50: Signals to engine control unit				
Display	xxx rpm	xxx rpm	OFF	Compr. OFF
Indicates	Actual engine speed (true value)	Specified engine speed (theoretical value)	Air conditioner requirement	A/C compressor status
Range			OFF ON	Compr. OFF Compr. ON
Specification			OFF	Compr. OFF
Note				

- Switch on the air conditioner by pressing the "Auto" button. The compressor should run (display zone 4).
- Set air conditioner to maximum hot/cold air output (display zone 3).

	Display zones			
	1	2	3	4
Display Group 50: Signals to engine control unit				
Display	xxx rpm	xxx rpm	ON	Compr. ON
Indicates	Actual engine speed (true value)	Specified engine speed (theoretical value)	Air conditioner requirement	A/C compressor status
Range			OFF ON	Compr. OFF Compr. ON
Specification			ON	Compr. ON



	Display zones			
Note				

- Switch off compressor by pressing ECON button on A/C operating and display unit.

Specification for display zone 4: the display should change from "Compr. ON" to "Compr. OFF" (compressor shut-off).

If the readout in display zone 4 is not as described:

- 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.
=> Page 56 .

Test the following wiring connection for open circuit and/or short to positive or earth.

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

Wiring resistance: not more than 1.5 ohm

- Rectify any open/short circuit as necessary.
- If there are no faults in the wiring, test operation of air conditioner.

=> Air conditioner; Repair group 01; Self-diagnosis of air conditioner

8.6 - Testing fuel level signal wiring

Notes:

- ♦ The fuel level signal is transmitted to the engine control unit via the dash panel insert.
- ♦ The processed signal goes to contact 12 of the engine control unit and serves to determine the cause of certain detected faults (such as misfiring).
- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page 56 .
- Test for open circuit and short to positive or earth in wiring between contact 12 of test box and dash panel insert.

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

8.7 - Testing crash signal

The crash signal ("Crash switch-off triggered") is transmitted to the engine control unit by the airbag control unit.

If the airbag control unit transmits the crash signal to the engine control unit (in case of an accident or if a final control diagnosis for the airbag system is carried out), the engine control unit switches off the fuel pump. The engine stops but can be restarted immediately (e.g. to move the vehicle out of the danger zone).

If the fault reader indicates "Crash signal from airbag control unit, Implausible signal", this means the engine control unit cannot switch off the fuel pump in the event of an accident in which the airbags are triggered. In this

case the engine control unit cannot recognize the crash signal transmitted by the airbag control unit. One of the reasons might be a wiring fault between engine control unit and airbag control unit.

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

=> Page **56** .

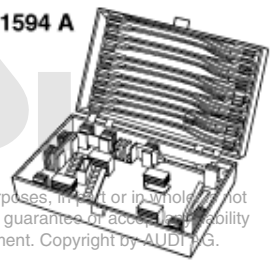
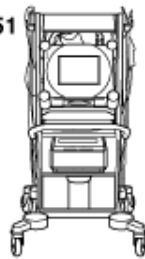
Test for open circuit and short to positive or earth in the following wiring connection.

Test box V.A.G 1598/31 Socket	Airbag control unit, contact
52	=> Current flow diagrams, Electrical fault-finding and Fitting locations binder

Wiring resistance: not more than 1.5 ohm

- Rectify short circuit or open circuit if necessary.
- => Current flow diagrams, Electrical fault finding and Fitting locations binder
If wiring is O.K.: interrogate fault memory in airbag control unit..

8.8 - Testing data exchange between control units on data bus

V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598/31 	VAS 5051 
G24-0021	



Special tools and workshop equipment required

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

or

- ♦ V.A.G 1551 with V.A.G 1551/3 A

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 "Test CAN data bus" (i.e. test data exchange between engine control unit, gearbox control unit, ABS control unit and/or dash panel insert).

- Check that multi-pin connectors for control units are properly seated.
- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551). Select engine electronics control unit by entering the address word "01" => Page 5 ; when doing this the engine must be running at idling speed.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

- Press keys 0 and 8 for the function "Read measured value block" and confirm entry with Q key.

-> Indicated on display:

Read measured value block
Enter display group number XXX

- Press keys 1, 2 and 5 to select "Display Group 125" and confirm entry with Q key.

-> Indicated on display:

Read measured value block 125
1 2 3 4

	Display zones			
	1	2	3	4
Display group 125: CAN data bus messages				
Display		ABS 1	Combi 1	
Indicates		CAN data bus ABS control unit	CAN data bus Dash panel insert	
Range		1 = OK 0 = not OK	1 = OK 0 = not OK	
Specification		ABS 1	Combi 1	
Note		If the specification is not obtained for one of the control units, perform automatic test sequence		

Automatic test sequence

- Press key 0 twice for address word "Automatic test sequence" and confirm entry with Q key. The V.A.G 1551 transmits all known address words one after the other.

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. The V.A.G 1551 will then transmit the next address word.

-> The automatic test sequence has ended when the following appears on the display:

V.A.G - SELF-DIAGNOSIS HELP
 1 - Rapid data transfer*
 2 - Flash code output*

If faults have been stored relating to the "Data bus drive" or to data transmission: "No message from"

- Check part Nos. and codings to make sure that the vehicle is fitted with the correct control unit versions (engine, ABS control units etc.).

If the correct control units are installed:

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

If the multi-pin connectors are properly seated:

- Test the CAN data bus system.

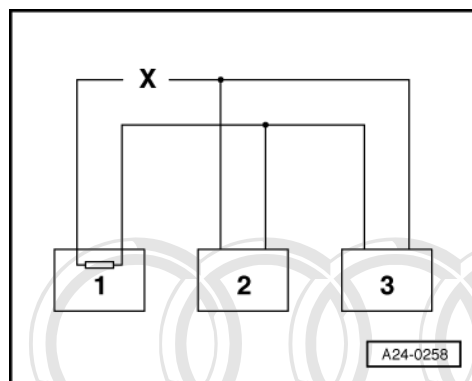
Testing a "two-wire bus system"

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

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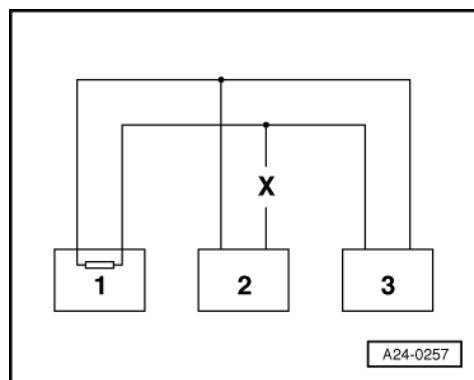
Control unit	Faults present in fault memory:
3	- No message from control unit 1

- 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

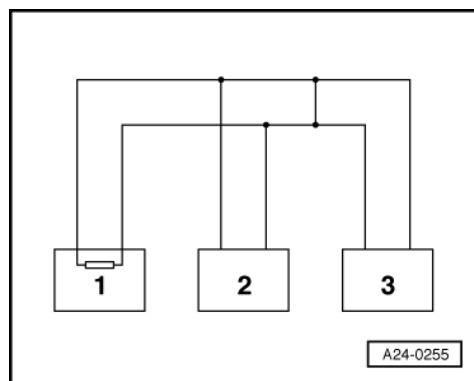
- Switch off ignition.
- Disconnect the control units which are linked by the bus wires and check whether there is an open circuit in one of the bus wires

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

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

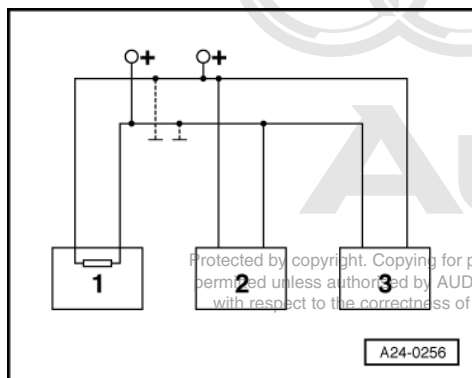
Example 3:

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 between the bus wires



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

- -> Check the bus wires for short to positive and short to earth.

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 fault reader V.A.G 1551. Switch on the ignition and erase the fault memory of the control unit which has just been connected. End output from fault reader 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 - Ignition system

1 - Testing ignition system

1.1 - Testing ignition system

1.2 - General notes on ignition system

- ♦ The engine control unit is equipped with self diagnosis.
- ♦ For trouble-free operation of the electrical components a voltage of at least 11.5 V is necessary.
- ♦ During some of the tests it is possible that the control unit will detect and record a fault. The fault memory must therefore be interrogated and if necessary erased when all tests and repair work have been completed.
- ♦ After completing fault finding, repairs or component tests, it is possible that the engine will start, run for a short period and then cut out. If this happens it may be that the immobilizer is blocking the engine control unit. In such cases the fault memory must be interrogated and if necessary the control unit must be adapted.

1.3 - Safety precautions

To prevent injuries to persons and/or damage to the fuel injection and ignition system, note the following points:

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

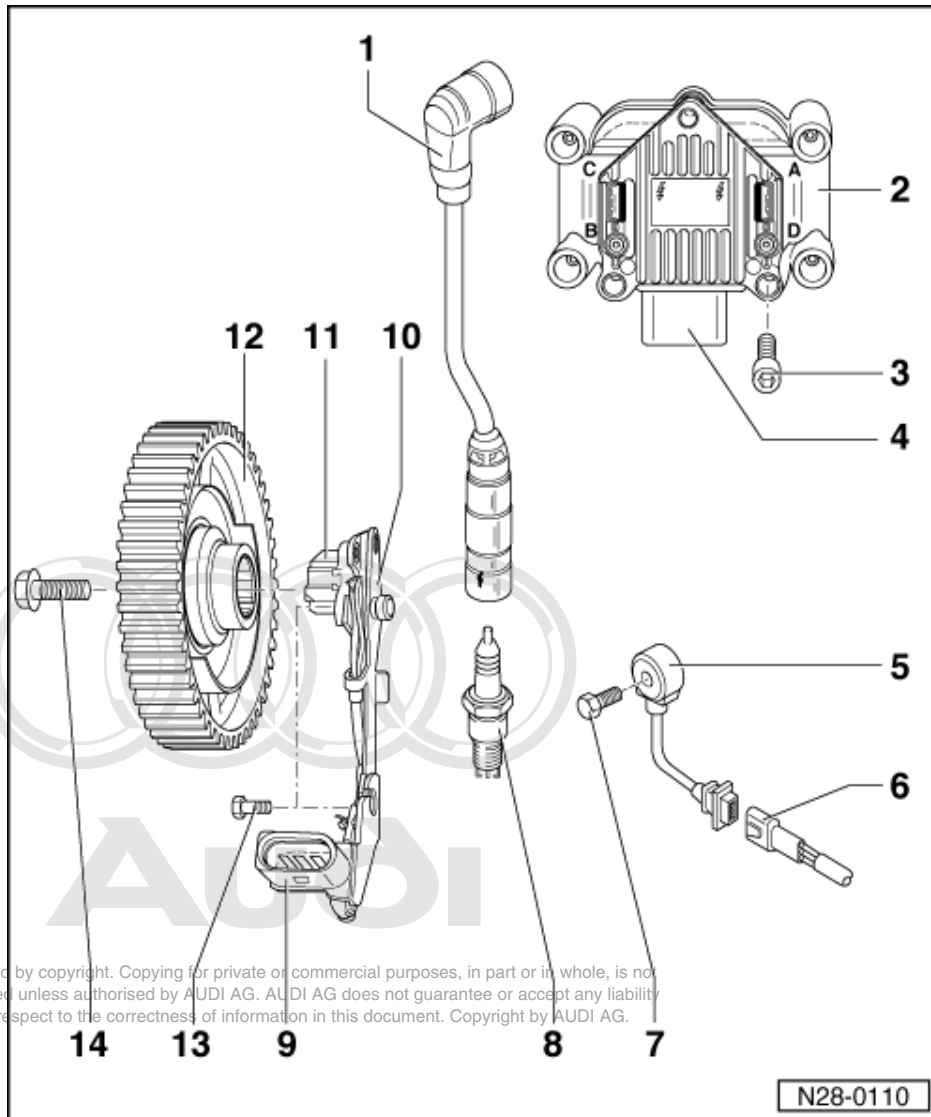
1.4 - Technical data for ignition system

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Engine code letters	ANA (1.6 ltr. / 74 kW engine) ALZ (1.6 ltr. / 75 kW engine)
Idling speed 1) Not adjustable - controlled by the idling speed stabilisation	700...960 rpm
Engine speed limiter - shuts off injectors	approx. 6500 rpm
Ignition timing is determined by the control unit. Ignition timing cannot be adjusted.	
Ignition system	Twin-spark ignition system with two ignition coils
Spark plug connectors	Resistance approx. 5 kw
Firing order	1-3-4-2

- 1) For updates, see Exhaust Emissions Test

1.5 - Components of ignition system



1 H.T. cable

- ♦ With suppression connector and spark plug connector
- ♦ Check for continuity

2 Ignition coils (N, N128)

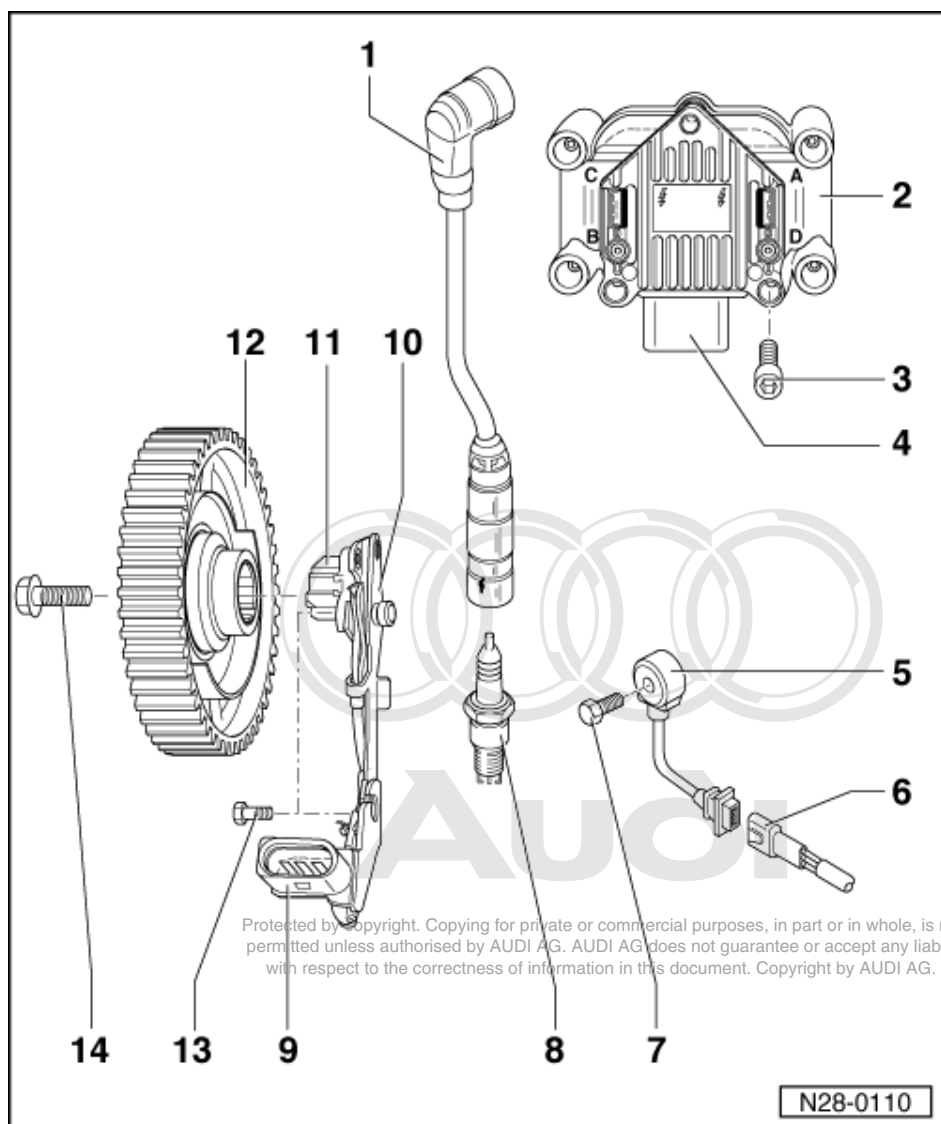
- ♦ Marked for H.T. cables:
 - A = Cylinder 1
 - B = Cylinder 2
 - C = Cylinder 3
 - D = Cylinder 4
- ♦ With output stage (N122)

3 10 Nm

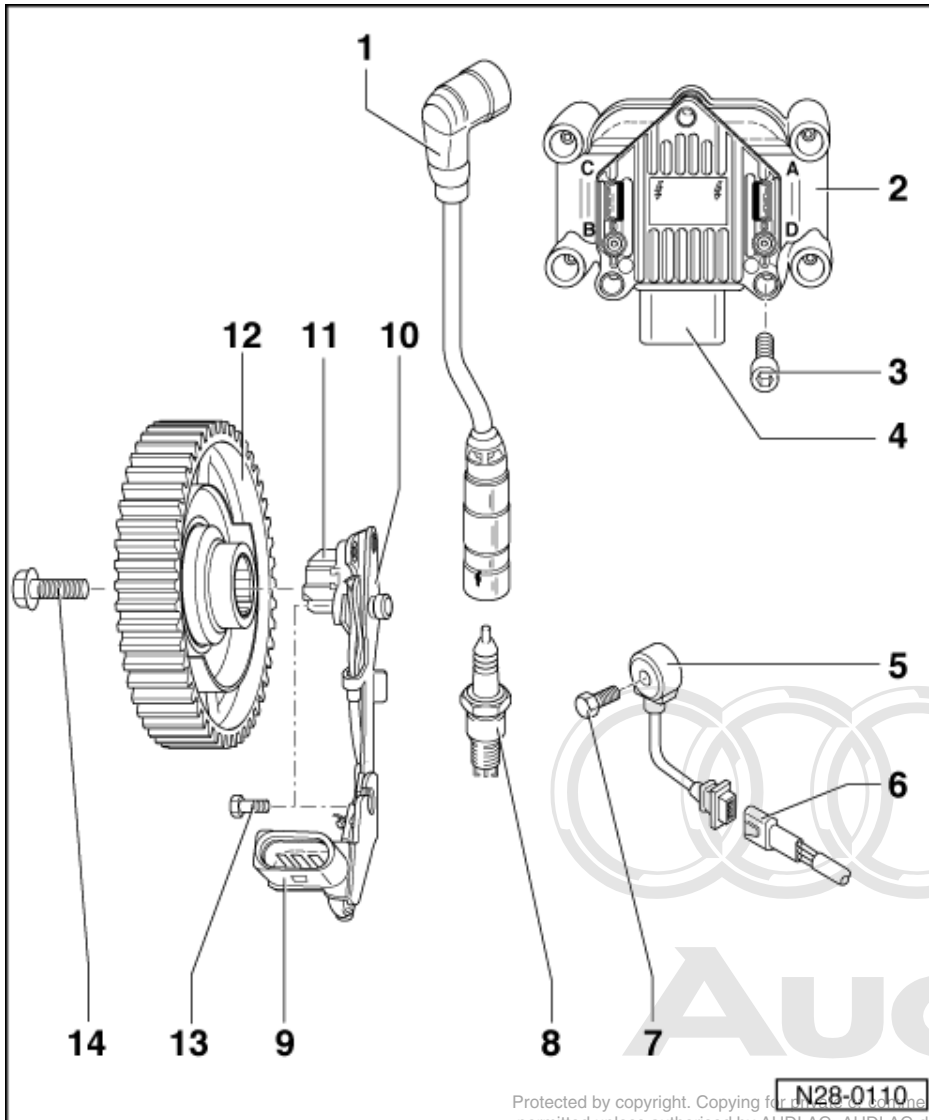
4 Connector

- ♦ 4 pin

5 Knock sensor 1 (G61)



- 6 **3 pin connector**
 - ◆ Secured to the bulkhead on left (below expansion tank)
- 7 **20 Nm**
 - ◆ Tightening torque influences the function of the knock sensor
- 8 **Spark plug, 30 Nm**
- 9 **Connector**
 - ◆ 3 pin, for Hall sender (G40)
- 10 **Bracket**
 - ◆ For Hall sender
- 11 **Hall sender (G40)**



12 Camshaft sprocket

- ♦ With rotor for Hall sender
- ♦ Removing and installing:

=> Repair group 15; Servicing valve gear Servicing valve gear

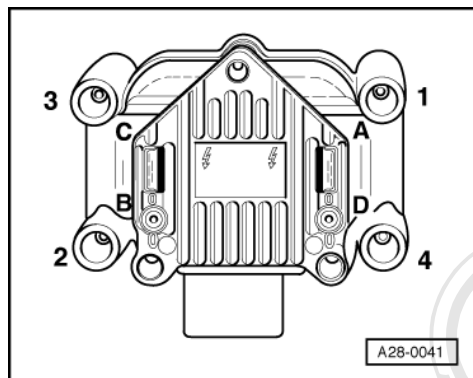
13 10 Nm

14 100 Nm

- ♦ Counter-hold with 3036 to loosen and tighten



1.6 - Designation of ignition coil terminals



- -> The diagram shows the ignition coil with its high voltage terminals. From this diagram you can check whether the spark plug leads are connected to the ignition coil in the correct order. This also prevents wrong connections when replacing spark plug leads:

Ignition output "A" of ignition coil => Cylinder 1

Ignition output "B" of ignition coil => Cylinder 2

Ignition output "C" of ignition coil => Cylinder 3

Ignition output "D" of ignition coil => Cylinder 4

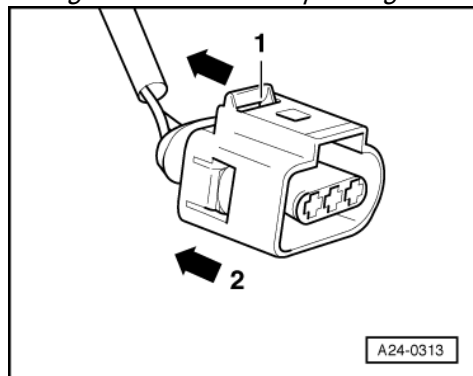
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1.7 - Testing twin-spark ignition system with two ignition coils

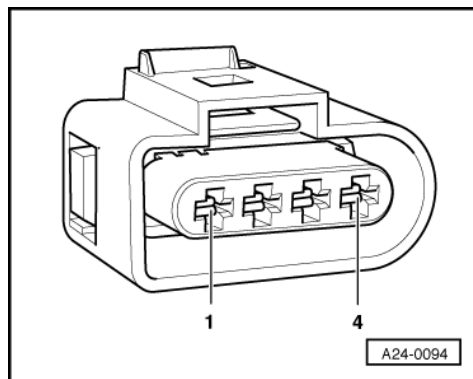
Fitting location => Page 36 .

Note:

The ignition coils and output stage are combined as a single component and cannot be renewed separately.



- -> Unplug connector from ignition coil. To do this, first press locking clip -1- in direction of arrow, then the complete connector in direction of arrow -2-. The procedure for a 4-pin connector (installed in vehicle) is the same as for a 3-pin connector (shown in this diagram).



Testing earth connection to output stage

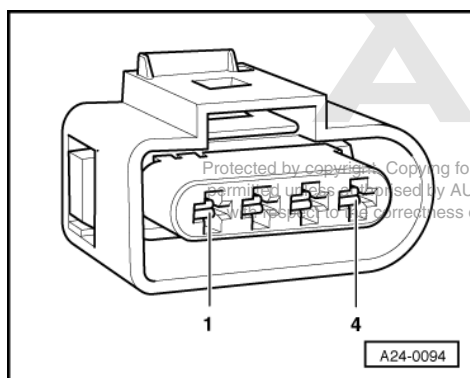
- -> Connect diode test lamp V.A.G 1527 between battery positive terminal and contact 4 (earth) of the connector. The diode test lamp should light up.
- If the diode test lamp does not light up, test wiring between earth and contact 4 on 4-pin connector and rectify any open circuits.

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

Testing power supply to ignition coils

Test conditions

- Fuse for ignition coils OK
- Unplug 4-pin connector from ignition coils =>Page 160 .
- Switch ignition on.



- -> Connect diode test lamp V.A.G 1527 between engine earth and contact 2 (positive) of the connector.

Specification: the diode test lamp should light up.

- If the result is not as specified, test wiring using current flow diagram. Rectify any faults and if necessary replace the fuse.

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

Testing activation

- Unplug the connectors from all four injectors (to prevent injection from occurring without ignition).
- Connect diode test lamp V.A.G 1527 between engine earth and contact 1 of the 4-pin connector for the ignition coil.
- On cars with manual gearbox, make sure that the gearstick is in neutral when carrying out the following step.
- Have a second person operate the starter for a few seconds and check the diode test lamp. The diode test lamp should flash.
- Connect diode test lamp V.A.G 1527 between engine earth and contact 3 of the 4-pin connector for the ignition coil.
- Have a second person operate the starter for a few seconds and check the diode test lamp. The diode test lamp should flash.
- If the diode test lamp does not flash, test for open circuit or short to positive or earth in wiring between engine control unit and 4-pin connector for ignition coil using current flow diagram. (Connecting test box V.A.G 1598/31 to wiring harness for engine control unit =>Page 56 .)
- Rectify any open circuits or short circuits.

Contact on 4-pin connector for output stage	Contact on control unit connector
1	112
3	113

- If no open circuits or short circuits are found, fit a new engine control unit
=> Page **58**.
- If the ignition wires, the power supply to the ignition coils and the output stage activation are OK but there is still no ignition spark, fit new ignition coils with output stage.
- To do this, remove securing bolts for coolant tank and place tank to one side.
- Remove throttle valve control part (seal off coolant hoses).
- Renew ignition coils with output stage.

Notes:

- ♦ Installation is carried out in the reverse sequence.
- ♦ Renew seals and gaskets.
- ♦ Tightening torque for securing bolts on ignition coil with output stage and on throttle valve control part: 10 Nm.
- ♦ After installation, perform adaption of throttle valve control part
=>Page **128**.

1.8 - Testing engine speed sender -G28

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Note:

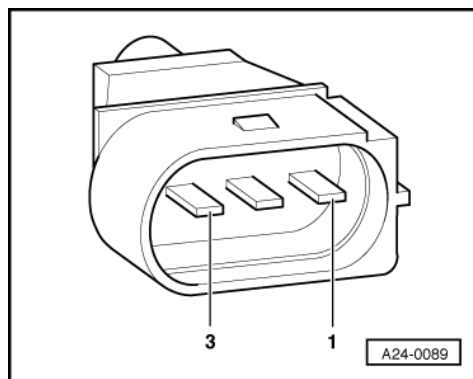
- ♦ The engine speed sender is a combined speed sender and reference mark sender.
- ♦ The engine can run without a signal from the -G28. It is also possible (with considerable difficulty) to start the engine without a signal from the -G28 (emergency running function).

Testing engine speed sender

Fitting location of sender and connector

=> Page **36**.

- Before carrying out the test, make sure that the sender is correctly installed and firmly seated.
- Unplug connector for engine speed sender (grey connector).



- -> Connect hand-held multimeter V.A.G 1526 (resistance test range) to contacts 2 and 3 on connector for engine speed sender using test lead from V.A.G 1594.

Specification: approx. 730...1000 ω

Note:

The resistance value for the engine speed sender is based on a temperature of 20 °C.

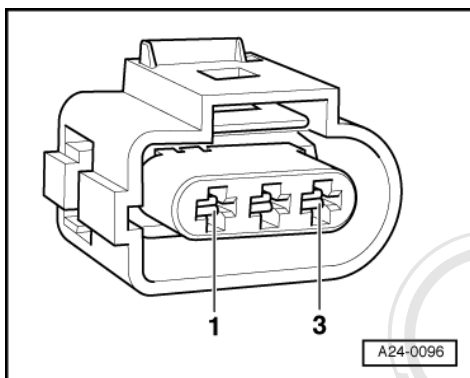
- If the value does not match the specification, fit a new engine speed sender.
- If the value does match the specification, connect hand-held multimeter (resistance measurement range) to contacts 2 and 1 (earth) and to contacts 3 and 1 (earth).

Specification: $\infty\omega$ (open circuit) in each test

- If the value does not match the specification, fit a new engine speed sender.

Notes:

- ◆ To do this, remove securing bolts for coolant tank and place tank to one side.
- ◆ Remove intake manifold support between sump and intake manifold. (Tightening torque when re-installing: 23 Nm)
- ◆ Remove engine speed sender.
- If the value does match the specification, test the wiring between the sender connector and the engine control unit.



- Connect test box V.A.G 1598/31 to wiring harness for engine control unit. Do not connect to the engine control unit itself.
=> Page 56 .
- -> Test screening, earth wire and signal wire for short circuit and open circuit according to current flow diagram.

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

- If no open circuits or short circuits are found, fit a new engine control unit =>Page 58 .

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1.9 - Testing knock sensor control limit

If the fault message "Knock sensor - control limit reached" is recorded in the fault memory, the following tests must be carried out. See also: Measured value block 20=>Page 163 .

	Possible cause of fault	Fault remedy
Fault message relating to all cylinders	- Poor fuel quality	- Change to higher quality fuel => Owner's Manual
	- Wrong tightening torque on knock sensor	- Loosen knock sensor, then tighten to 20 Nm
	- Knock sensor defective	- Test knock sensor => Page 164
	- Corrosion on connector	- Check connectors
	- Loose components on engine	- Secure loose components
Fault message relating to one cylinder	- Mechanical engine fault	- Test compression pressure
	- Loose components on engine	- Secure loose components

Measured value blocks: Retardation of ignition timing

Display group 20 -Ignition- Knock control



▪ Whilst driving						
Read measured value block 20 ⇒				▪ Indicated on display		
xx.x° b. TDC	x.xx° b. TDC	xx.x° b. TDC	xx.x° b. TDC			
1	2	3	4	▪ Display zones	Specification	Evaluation
				Cyl. No. 4: retardation of ignition timing by knock control	0...12 °CA	⇒ Page 164
				Cyl. No. 3: retardation of ignition timing by knock control	0...12 °CA	⇒ Page 164
				Cyl. No. 2: retardation of ignition timing by knock control	0...12 °CA	⇒ Page 164
				Cyl. No. 1: retardation of ignition timing by knock control	0...12 °CA	⇒ Page 164

Note:

The values indicated in display zones 1 to 4 show the actual amount of ignition retardation effected by the knock control at each cylinder. The retardation of ignition timing is indicated in degrees of crankshaft angle (°CA). The units "b TDC" shown in the display can be disregarded.

Evaluating display groups 20 - Retardation of ignition timing

Appears on display	Possible fault cause	Fault elimination
All cylinders greater than 12 °CA	- Knock sensor defective	- Check knock sensors ⇒ Page 164
	- Connector corroded	
	- Knock sensor incorrectly tightened	- Loosen knock sensor and tighten to 20 Nm
	- Ancillary components on engine loose	- Tighten ancillary components
	- Poor fuel quality	- Change type of fuel
One cylinder differs significantly from the others	- Connector corroded	- Check knock sensors ⇒ Page 164
	- Engine damaged	- Check compression pressures: ⇒ Repair group 15; Removing and installing cylinder head; Checking compression pressure
	- Ancillary components on engine loose	- Tighten ancillary components

1.10 - Testing knock sensor

Fitting locations overview ⇒ Page 36

Notes:

- ♦ It is extremely important to keep to the tightening torque of 20 Nm to ensure the knock sensors perform perfectly.
- ♦ The knock sensor might misinterpret vibrations of loose components as knocking. Therefore check that engine ancillaries are securely mounted.
- ♦ Only gold-plated contacts may be used when servicing the knock sensor connector contacts.

Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

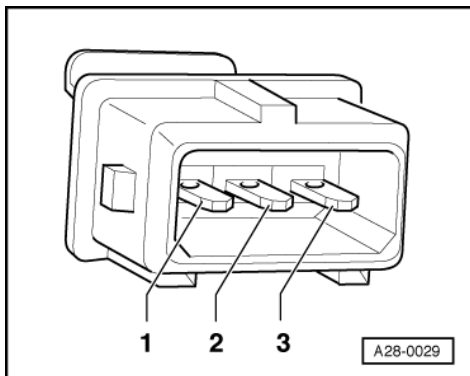
- ♦ Test box V.A.G 1598/31
- ♦ Hand multimeter V.A.G 1526 or multimeter V.A.G 1715
- ♦ Adapter set V.A.G 1594

- ♦ Current flow diagram

Test conditions

- Self diagnosis has detected a fault on the knock sensor.

Testing knock sensor wiring

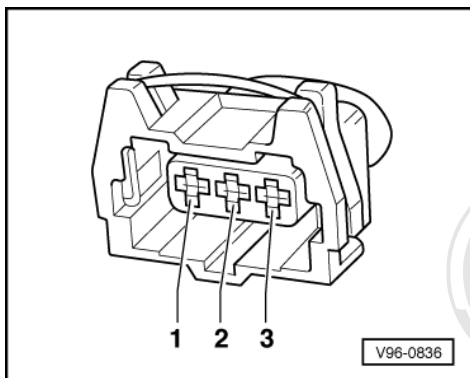


- Unplug knock sensor connector in engine compartment.
- -> Test for short circuits between all three contacts in the knock sensor connector. There must be no connection between any of the wires.
- If there is a connection between the contacts, fit a new knock sensor.

Testing wiring from knock sensors to engine control unit

- Connect test box V.A.G 1598/31 to wiring harness for engine control unit
=> Page 56.
- Test for open circuit and for short to positive/earth or between wires in the wiring between the knock sensor and engine control unit using the current flow diagram.

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



-> Identification of contacts in plug connector:

Signal wire	Earth wire	Screening
1	2	3

- Test continuity of signal wire of knock sensor 1 (-G61) from contact 1 on connector in engine compartment to socket 109 on test box.

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Specification: max. 1 ω .

- Test continuity of earth wire of knock sensor 1 (-G61) from contact 2 on connector in engine compartment to socket 101 on test box.

Specification: max. 1 ω .

- Test continuity of screening on wiring for knock sensor 1 (-G61) between contact 3 on connector in engine compartment and socket 100 of test box.

Specification: max. 1 ω .

- If the values do not match the specifications, rectify the short circuit or open circuit.

If no fault is detected:

- Loosen knock sensor and tighten again to 20 Nm.
- Carry out test drive.

Observe relevant safety precautions => Page 35 .

During the road test the following operating conditions must be fulfilled:

- The coolant temperature must exceed 80 °C .
- When the temperature is reached, the operating conditions: idling, part throttle, enrichment, full throttle, and overrun must be attained several times.
- At full throttle the speed must exceed 3500 rpm.
- Again interrogate fault memory of engine control unit.

If the fault is still present:

- Replace knock sensor -G61.

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1.11 - Checking Hall sender -G40

Fitting location of Hall sender => Page 36 .

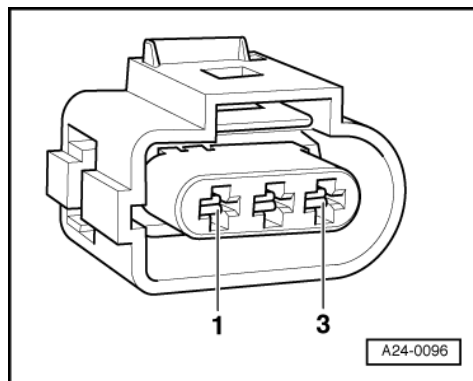
Notes:

- ♦ The Hall sender is located beneath the camshaft sprocket.
- ♦ If no Hall sender signal is received, the knock sensor signals can no longer be assigned to the cylinders. If this happens, the knock control system is deactivated and the ignition timing is slightly retarded in order to prevent knocking.
- ♦ Even if no Hall sender signal is received, the engine will continue to run and can also be re-started. The reason for this is as follows:
 - The fact that the control unit is out of phase by one crankshaft revolution does not have any noticeable effect on the injection system.
 - The fuel is injected upstream of the closed inlet valve instead of while the inlet valve is open. This has only a minor influence on the quality of the air/fuel mixture.
 - With the twin-spark ignition system an ignition spark is produced for each cylinder after every crankshaft revolution, and not after alternate revolutions as is normally the case.
- Unplug connector from Hall sender.

Note:

The connector contacts are numbered on the back of the connector.

- Switch ignition on.



- -> Connect hand-held multimeter V.A.G 1526 (voltage test range) between contact 1 (positive) and contact 3 (earth) on Hall sender connector. Make sure not to bend the contacts.

Specification: 4.5 ... 5.5 V

- -> Connect hand-held multimeter V.A.G 1526 (voltage test range) between contacts 2 and 3 (earth) on Hall sender connector. Make sure not to bend the contacts.

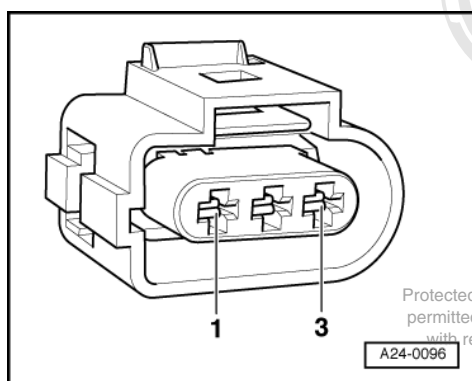
Specification: 4.5 ... 5.5 V

- If the values are as specified, fit a new Hall sender.

Note:

The Hall sender receives its power supply from the engine control unit.

- If the values are not as specified, test wiring between the Hall sender and engine control unit as follows:
- Switch off ignition.



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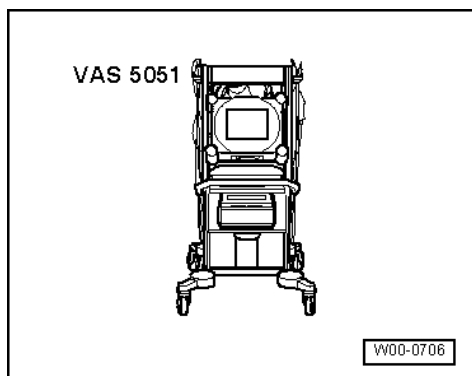
- Connect test box V.A.G 1598/31 to wiring harness for engine control unit
=> Page 56 .
- -> Test wiring from Hall sender...

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

- If the wiring is OK but the voltage readings are not as specified, fit a new engine control unit=>Page 58 .

1.12 - Checking misfiring recognition

Special tools and workshop equipment required



- ♦ VAS 5051 and VAS 5051/1



or

- ♦ V.A.G 1551 and V.A.G 1551/3 A

Test sequence

- Connect vehicle diagnostic, testing and information system VAS 5051 (or fault reader V.A.G 1551) and select engine electronics control unit by entering address word "01" (=> Page 5 .)
When doing this the engine must be idling.

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

- Enter "08" to select the function "Read measured value block" and confirm entry with Q key.

-> Indicated on display:

Read measured value block	Q
Enter display group number xxx	

- Enter "014" for display group 014 and confirm with Q key.

-> Indicated on display:

Read measured value block 14
1 2 3 4

- Check display values for misfiring recognition

	Display zones			
	1	2	3	4
Display Group 014: Misfiring recognition				
Display	xxxx rpm	xxx %	xxx	---
Indicates	Engine speed	Load	Total No. of misfires	Misfiring recognition
Range	0 ... 6500 rpm	15 ... 100 %		activated not activated
Specification	700 ... 960 rpm	15 ... 40 %	0 ... 5	activated
Note	---	---	If readout does not match specification (number of misfires more than 5): , see "Reading display zone 3" => Page 168	

If the specification is obtained:

- Press =>key.

-> Indicated on display (function selection):

Rapid data transfer	HELP
Select function XX	

Reading Display Group 003

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Display zone 3	Possible cause of fault	Fault remedy
Higher than 5	- Spark plug defective - Spark plug connector defective - Ignition coil defective - Output stage for ignition coil defective	- Test spark plugs, ignition wiring and connectors - Test twin spark ignition system with two ignition coils => Page 160

Display zone 3	Possible cause of fault	Fault remedy
	- Injector defective	- Check injectors => Page 66

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