

Audi 80 1992 ➤

KE Motronic injection and ignition system (4-valve)

Engine ID	ACE	6A							
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Edition 12.1991



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List of Workshop Manual Repair GroupsList of Workshop Manual
Repair GroupsList of Workshop Manual Repair Groups
Audi 80 1992 ➤

KE Motronic injection and ignition system (4-valve)
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Repair Group

01 - Self-diagnosis

25 - 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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01 - Self-diagnosis

1 - Self-diagnosis

1.1 - Self-diagnosis

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1.2 - Technical data of self-diagnosis

- ◆ Data are transmitted between control unit and vehicle diagnostic, testing and information system VAS 5051/ fault reader V.A.G 1551 in "Rapid data transfer" mode.
- ◆ The fault memory is designed as a non-volatile memory but is dependent on power supply. Disconnecting the permanent positive supply erases the fault memory of the engine control unit.

1.3 - Safety precautions

Pay attention to the following if testers and measuring instruments have to be used in the course of a test drive on vehicles fitted with front passenger's airbag.

Attention:

- ◆ Always attach testers and measuring instruments to back seat and have them operated from there by a second person.
- ◆ If testers and measuring instruments were to be operated from front passenger's seat, person sitting there could suffer injury in the event of an accident due to triggering of front passenger's airbag.

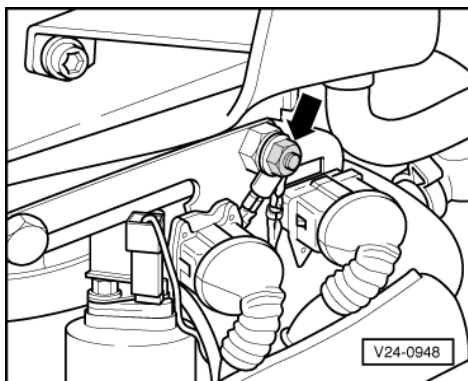
1.4 - Connecting vehicle diagnostic, testing and information system VAS 5051/ fault reader V.A.G 1551 and selecting functions

Test requirements:

- Vehicle supply voltage OK
- Fuses OK

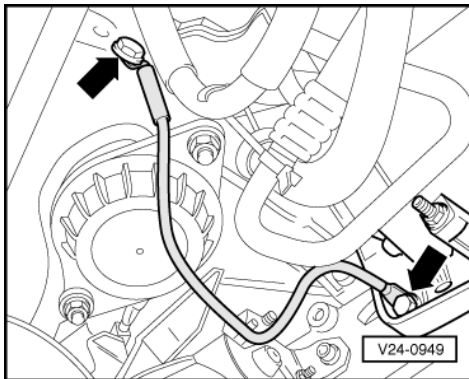
=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

- Fuel pump relay OK; checking => Page 38
- Earth connections checked

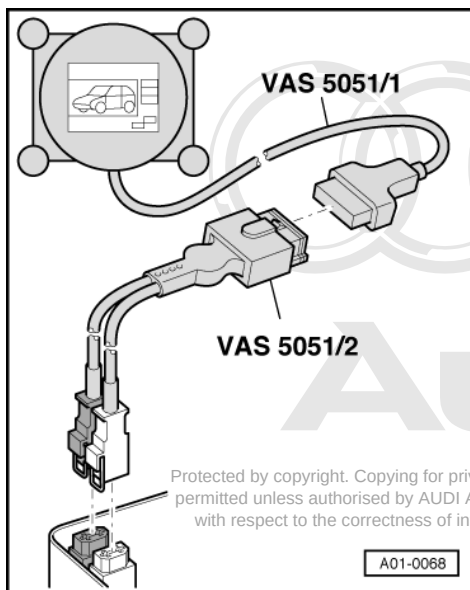




- Prior to fault memory interrogation, final control diagnosis, engine basic setting, wiring check and component replacement, check following earth connections for corrosion and poor contact:
 - ♦ -> Earth attachment point at intake manifold on left -arrow-.



- ♦ -> Battery earth strap and earth strap between engine and longitudinal member -arrows- (viewed from underside of vehicle)
- Repair faulty earth connections.
- Detach cover from relay plate with fuse box in plenum chamber.



- -> Use diagnostic wire VAS 5051/1 and diagnostic adapter VAS 5051/2 to connect up vehicle diagnostic, testing and information system VAS 5051. Alternatively, use can be made of diagnostic wire V.A.G 1551/1 to connect up fault reader V.A.G 1551.

Attention:
Heed safety precautions => Page **1**.

Note:

The following description refers solely to implementation of self-diagnosis using fault reader V.A.G 1551.

Proceed in line with equipment operating instructions if use is made of vehicle diagnostic, testing and information system VAS 5051.

- With ignition switched off, attach black connector to black diagnostic connection.

-> Indicated on display:

V.A.G SELF-DIAGNOSIS HELP
 1 - Rapid data transfer 1)
 2 - Flash code output1)

- 1) Displayed alternately

Note:

If display remains blank, check power supply for black diagnostic connector => Page 23.

- Attach white connector to white diagnostic connection (blue connector is not used).

Depending on desired function=>"Available functions" table, Page 4 :

- Switch on ignition.
- or
- Start engine.
- Switch on printer of fault reader by pressing Print key. Lamp in key must light.
- Press key 1 for "Rapid data transfer".

-> Indicated on display:

Rapid data transfer HELP
 Enter address word XX

Note:

Address word 00 implements automatic test sequence, i.e. the fault memories of all vehicle systems with self-diagnosis capability are interrogated by way of rapid data transfer.

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

-> Fault reader V.A.G 1551 displays control unit identification, e.g.:

8A0907404G 2.0 l R4 MK 4-valve
 D00 □
 Code 00

Note:

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

Control unit identification (example)

- 8A0 907 404 G Part No.; Assignment
 => Parts List

- 2.0l Engine capacity

- R4 Engine design (4-cyl. in-line engine)

- MK Injection and ignition system

- 4-valve 4 valves

- D00 Data level (software version) of control unit

- Code 00 Control unit code=>Page 17

- Press = key.
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-> Indicated on display (function selection):

Rapid data transfer HELP
 Select function XX

**Notes:**

- ♦ Control unit identification can be displayed again after entering function "01" for "Interrogating control unit version" and providing confirmation with Q key.

Rapid data transfer HELP
No control unit response

-> If adjacent display appears:

- Press HELP key for printout of possible causes of trouble.

Rapid data transfer HELP
L-wire not switched to earth

Check wiring of white diagnostic connector => Page 23 .

Rapid data transfer HELP
L-wire not switched to positive

Vehicles with KE Motronic self-diagnosis only: Check earth connections of engine control unit => Page 141 .

Rapid data transfer HELP
K-wire not switched to earth

Rapid data transfer HELP
K-wire not switched to positive

Rapid data transfer
Fault in communication link

-> If adjacent display appears at the start of or during the program, faults have occurred and data exchange between fault reader V.A.G 1551 and engine control unit is no longer possible.

- After eliminating possible causes of trouble, enter "01" again for address word "Engine electronics" => Page 1 .

Available functions

Vehicle diagnostic, testing and information system VAS 5051/ fault reader V.A.G 1551		Ignition on, engine stopped	Engine idling	Vehicle in operation	Page
Address words					
01	Engine electronics	yes	yes	yes	1
00	Automatic test sequence	yes	yes	yes	3
Functions					
01	Interrogating control unit version	yes	yes	yes	1
02	Interrogating fault memory	yes	yes	yes	5
03	Final control diagnosis	yes	no	no	13
04	Basic setting	no	yes	no	16
05	Erasing fault memory	yes	yes	yes	5
06	End of output	yes	yes	yes	6
08	Reading measured value block	yes	yes	yes	18

2 - Interrogating and erasing fault memory

2.1 - Interrogating and erasing fault memory

- Perform test drive. Conditions:
 - Duration at least 5 minutes
 - Coolant temperature at least 80 ° C
 - Engine speed greater than 3000 rpm
 - Accelerator briefly floored
- Leave engine running on completion of test drive.

Note:

If engine will not start, crank it with starter for at least 5 seconds and then always leave ignition switched on.

- Connect vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "address word" 01 => Page 1 .

-> Indicated on display:

Rapid data transfer HELP
 Select function XX

- Enter "02" for "Interrogating fault memory" function and confirm with Q key.

-> Indicated on display:

No faults detected

- Press =>key.

Note:

In the event of problems not detected by self-diagnosis:

=> Binder "Fault-finding, Engine"

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-> Indicated on display:

X faults detected

The stored faults are consecutively displayed and printed out, provided that printer is on.

- Use fault table to locate and eliminate faults printed out=>Page 6 .
- Press =>key.

-> Indicated on display:

Rapid data transfer HELP
 Select function XX

- Enter "05" for "Erasing fault memory" function and confirm with Q key.

Notes:

-> If adjacent display appears:

Attention:
 Fault memory not interrogated

Sequence of operations not precisely observed.

- Interrogate fault memory.



Fault memory is also not erased under the following conditions:

- ♦ Ignition switched off following fault memory interrogation
- ♦ Static fault not rectified

-> Indicated on display:

Rapid data transfer
 Fault memory erased

- Press ➡key.
- Interrogate fault memory again after performing repair work.

Note:

This erases faults stored during fault elimination e.g. on account of connectors being unplugged.

- Perform test drive. Conditions:
 - Duration at least 5 minutes
 - Coolant temperature at least 80 ° C
 - Engine speed greater than 3000 rpm
 - Accelerator briefly floored
- Enter "00" for address word "Automatic test sequence" and confirm with Q key.

End of output

-> Indicated on display:

Rapid data transfer HELP
 Select function XX

- Enter "06" for "End output" function and confirm with Q key.

-> Indicated on display:

Rapid data transfer HELP
 Enter address word XX

- Switch off ignition and unplug diagnostic connector.

2.2 - Fault table

Notes:

- ♦ The fault table is arranged according to the 5-digit fault codes on the left.
- ♦ Before replacing components found to be defective, use current flow diagram to check wiring and connectors to these components as well as earth connections. This is particularly important if faults are output as being "sporadic" (SP).
- ♦ The first time a fault occurs, it is stored as being static. If the fault no longer occurs after a certain period, it becomes a sporadic fault. Sporadic faults which no longer occur after 5 engine starts are automatically erased.
- ♦ Sporadic faults are faults which only occur intermittently .
- ♦ If engine is switched off between performing test drive and interrogating fault memory, all stored faults are displayed as being "sporadic". If faults only occur intermittently or if fault memory is not erased after fault elimination, such faults are displayed as being "sporadic faults". This is indicated by "/SP" on right of V.A.G 1551 display.

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00281 Road speed sender -G68 No signal	Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability for the correctness or completeness of information in this document. - Speedometer-G21 defective		Use current flow diagram to perform fault-finding

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
	- Speedometer sender -G22 defective		- Check speedometer sender -G22 => Electrical System; Repair Group 90; Checking components of dash panel insert; Checking vehicle-speed sender signal at dash panel wiring harness Checking components of dash panel insert; Checking vehicle-speed sender signal at dash panel wiring harness
	- Open circuit in wiring		- Check vehicle speed signal => Page 116
	- Signal input in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 36

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00514 Ignition timing sender -G4 No signal	- Firing point sender - -G4 incorrectly installed		- Check installation position of -G4: Clamping lugs must face ignition distributor
	- Open circuit in wiring or short to earth between -G4 and engine control unit		- Check -G4 =>Page 136 Eliminate open circuit in wiring/short circuit
	- -G4 defective		- Perform visual inspection
	- Spark plugs, spark plug connector, ignition cables, distributor cap or distributor rotor defective		
	- Signal input in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 36

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00515 Hall sender -G40 No signal	- Power supply/earth supply for -G40 defective	- Engine will not start	- Check -G40 =>Page 146
	- Open circuit in wiring or short to earth between -G40 and engine control unit		- Eliminate open circuit in wiring/short circuit
	- -G40 defective		- Replace engine control unit =>Page 36
	- Signal input in engine control unit defective (control unit defective)		

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00516 Idling switch -F60			



Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
Open circuit/short to positive	- Throttle valve sticking - -F60 defective	- Idling speed increases on cold starting and decreases as engine temperature rises	- Check idling-speed switch => Page 53
	- Open circuit in wiring or short to positive between -F60 and engine control unit		- Eliminate open circuit in wiring/short circuit
	- Throttle cable setting - Floor covering pressing on accelerator pedal	- Engine cuts out on actuating clutch in overrun phase	- Adjust throttle cable => Fuel Supply System - Petrol Engines; Repair Group 20; Servicing accelerator mechanism; Adjusting throttle cable Servicing accelerator mechanism; Adjusting throttle cable
	Continued ▼		

Output on printer of V.A.G 1551 00516	Possible cause of trouble (Fault 00516 continued)	Possible effects	Fault remedy
Idling switch -F60 Short to earth	- Short to earth between -F60 and engine control unit		- Check idling-speed switch => Page 53 Eliminate short circuit
	- Moisture in connector of -F60 - -F60 defective		
	- Signal input in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 36

Output on printer of V.A.G 1551 00517	Possible cause of trouble	Possible effects	Fault remedy
Full throttle switch -F81 Short to earth	- Short to earth between -F81 and engine control unit		- Check full throttle switch => Page 53 Eliminate short circuit
	- Moisture in connector of -F81 - -F81 defective		
	- Signal input in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 36

Output on printer of V.A.G 1551 00520	Possible cause of trouble	Possible effects	Fault remedy
Air mass/flow meter -G70/-G19 Open circuit/short to earth1) Open circuit/short to positive1)	- Open circuit in wiring or short to positive between -G19 and engine control unit	Engine hunts	- Check air-flow meter potentiometer -G19 => Page 58 Eliminate open circuit in wiring/short circuit
	- Earth supply for -G19 defective		
	- Air-flow meter potentiometer -G19 defective		

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
	- Unmetered air in intake system		- Check intake system for leaks (unmetered air) => Page 65

1) One of these displays will appear in addition to the component concerned.

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00522 Coolant temperature sender -G62 Open circuit/short to positive1) Open circuit/short to earth1)	- Open circuit in wiring or short to positive/earth between -G62 and engine control unit - Fault in earth supply to -G62 - Moisture/corrosion in connector - -G62 defective - Signal input in engine control unit defective (control unit defective)	- Cold starting problems - Engine running problems during warm-up	- Check coolant temperature sender =>Page 138 Eliminate open circuit in wiring/short circuit - Replace engine control unit =>Page 36

1) One of these displays will appear in addition to the component concerned.

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00524 Knock sensor 1 -G61 No signal	- Knock sensor 1 -G61 loose - Corrosion due to moisture in connector - Open circuit in wiring or short to positive between -G61 and engine control unit - Short circuit between -G61 and earth or to screen - -G61 defective - Signal input in engine control unit defective (control unit defective)	- High fuel consumption - Loss of power	- Tighten knock sensor to 20 Nm - Check -G61 => Page 144 - Eliminate open circuit in wiring/short circuit - Replace engine control unit =>Page 36

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00525 Lambda probe -G39 No signal	- Open circuit/short to earth or screen in Lambda probe signal wire	- Emissions not OK - Lambda control switches to open-loop control	- Read measured value block, display zone 6 =>Page 19 Eliminate open circuit in wiring/short circuit



Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
	- No Lambda probe heater -Z19 function		- Check Lambda-probe heater -Z19 => Page 106
	- -G39 defective		- Check Lambda probe -G39 and Lambda control =>Page 104

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00533 Idling speed regulation Adaption limit not reached 1)	- Basic setting of throttle valve	- Idling speed too high	- Basic setting of throttle valve => Page 64
Adaption limit exceeded 1)	- Ignition point incorrectly set		- Check ignition point => Page 128
	- Activated charcoal filter solenoid valve -N80 leaking, permanently open		- Check activated charcoal filter solenoid valve -N80 for leaks => Page 110
	- Unmetered air in intake system		- Check intake system for leaks (unmetered air) => Page 65
	- Voltage of air-flow meter potentiometer -G19 outside tolerance		- Check air-flow meter potentiometer -G19 => Page 58
	- Vehicles with air conditioner: No air-conditioner compressor shutoff signal		- Check air-conditioner compressor shutoff => Page 115

1) One of these displays will appear in addition to the component concerned.

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00535 First knock regulation Control limit exceeded	- Poor fuel grade (less than 91 RON)	- Slight loss of power	- Fill tank with fuel with at least 95 RON
	- Knock sensor 1 -G61 loose	- Max. speed not reached	- Tighten knock sensor to 20 Nm
	- Open circuit in screen wiring of knock sensor 1 -G61		- Check -G61 => Page 144 Eliminate open circuit in wiring
	- Abnormal engine running noise (ancillaries loose) due to mechanical damage, e.g. bolted joints unfastened, ruptured bolts or cracked/ruptured component holders on engine Continued ▼		- Eliminate mechanical damage

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00535 First knock regulation	(Fault 00535 continued)		

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
Control limit exceeded	- Knock control in engine control unit defective (engine control unit defective)		- Replace engine control unit =>Page 36
	- Ignition point advanced too far		- Check and if necessary adjust ignition point => Page 128
	- Engine pinging, knocking (e.g. oil combustion with defective piston/inadequate injection quantity)		- Check compression pressure => 4-cyl. Injection Engine (4-Valve), Mechanics; Repair Group 15; Removing and installing cylinder head; Checking compression pressure 91

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00537 Lambda control Control limit exceeded	- CO content not in specified range	- Soot deposits on spark plugs - CO upstream of catalytic converter greater than - 1.2 % by vol.	- Read measured value block, display zone 7 =>Page 19
	- Short circuit in Lambda-probe signal wire - -G39 defective		- Check Lambda probe and Lambda control =>Page 104 Eliminate short circuit
	- Cold start valve -N17 leaking		- Check cold start valve - N17 => Page 43
	- Fuel system pressure too low		- Check fuel system pressure => Page 86
	- Activated charcoal filter solenoid valve -N80 leaking, permanently open Continued ▼		- Check activated charcoal filter solenoid valve -N80 for leaks => Page 110

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00537 Lambda control Control limit exceeded	(Fault 00537 continued)		
	- Unmetered air at mixture control unit		- Check intake system for leaks (unmetered air) => Page 65
	- Earth supply between engine control unit, contact 35 and intake manifold		- Check earth supply => Page 143
00540 Knock sensor 2 -G66 No signal	=> Knock sensor 1 -G61 Fault code 00524	=> Knock sensor 1 -G61 Fault code 00524	=> Knock sensor 1 -G61 Fault code 00524

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00587			



Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
Adjustment limit mixture regulation Adaption limit exceeded	- Idling speed setting not OK		- Check idling speed, CO content and ignition point => Page 80
	- Earth supply between engine control unit, contact 35 and intake manifold		- Check earth supply => Page 143
	- Unmetered air in intake system		- Check intake system for leaks (unmetered air) => Page 65
	Continued ▼		

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00587 Adjustment limit mixture regulation Adaption limit not reached	(Fault 00587 continued)		- Check idling speed, CO content and ignition point => Page 80
	- Idling speed setting not OK		- Check cold start valve -N17 => Page 43
	- Cold start valve -N17 leaking		- Check activated charcoal filter solenoid valve -N80 for leaks => Page 110
	- Activated charcoal filter solenoid valve -N80 leaking, permanently open		- Check injector => Page 91
	- Injector not closing		

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
01257 Idling stabilisation valve -N71 Short to positive 1) Open circuit/short to earth 1)	Open circuit in wiring or short to earth/positive between -N71 and engine control unit	Engine hunts	- Check -N71 => Page 49 Eliminate open circuit in wiring/short circuit
	- -N71 defective		- Replace engine control unit => Page 36
	- Signal output in engine control unit defective (control unit defective)		

1) One of these displays will appear in addition to the component concerned.

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
17978 Engine control unit blocked	- Fault in immobilizer system	- Engine will not start (cuts out after one second)	- Interrogate immobilizer fault memory => Electrical System; Repair Group 01; Self-diagnosis; Interrogating fault memory Self-diagnosis; Interrogating fault memory

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
	- No adaption of immobilizer control unit to engine control unit		- Perform control unit adaption => Electrical System; Repair Group 01; Self-diagnosis; Adaption on replacement of engine control unit Self-diagnosis; Adaption on replacement of engine control unit
	- Open circuit in wiring between immobilizer and engine control units		- Eliminate open circuit in wiring => "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
65535 Control unit defective	- Earth connections to engine control unit	- Engine will not start	- Use current flow diagram to check earth connection
	- Fuse S27 defective		- Check fuse
	- Internal fault in control unit	- Engine running problems - Engine cuts out	- Replace engine control unit => Page 36

3 - Final control diagnosis

3.1 - Final control diagnosis

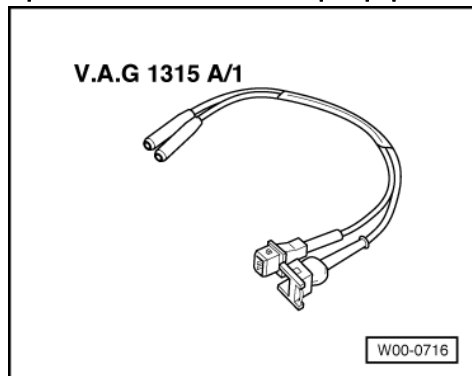
Notes:

- ◆ Final control diagnosis can only be performed with engine stopped and ignition switched on.
- ◆ Final control diagnosis is terminated if engine is started or an engine speed pulse is detected.
- ◆ The control elements are checked acoustically or by means of touch.
- ◆ During final control diagnosis the individual control elements are actuated until → key is pressed to select next control element. Exception: Cold start valve -N17 is only actuated for 10 seconds.
- ◆ Final control diagnosis function checks pressure regulator -N73 by measuring its current. For measurement of this current, differential pressure regulator has to be prepared for checking => Page 14 .
- ◆ To repeat final control diagnosis, switch ignition off and on again.

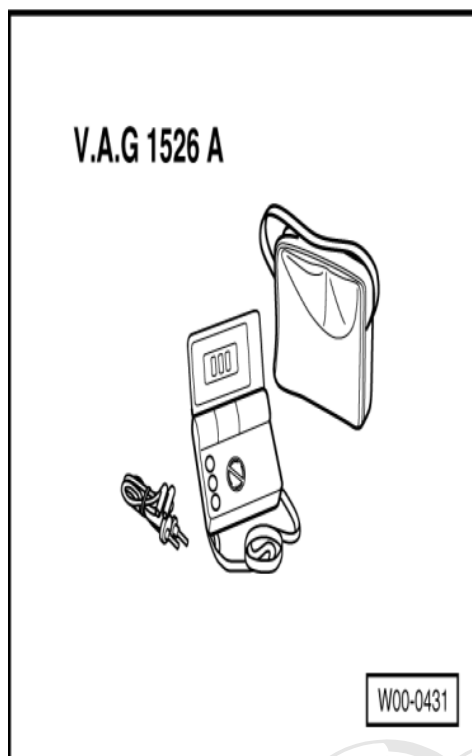


3.2 - Preparing differential pressure regulator for current measurement

Special tools and workshop equipment required

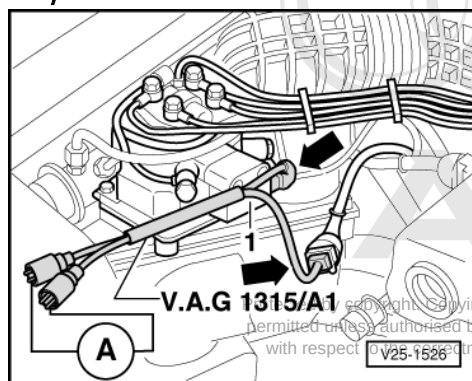


- ♦ Test lead V.A.G 1315A/1



- ♦ V.A.G 1526 A

Requirement:



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- Differential pressure regulator OK; checking => Page 62

Sequence of operations

- Unplug connector from differential pressure regulator.
- -> Set multimeter to 200 mA measuring range and connect it up with test lead V.A.G 1315 A/1 between differential pressure regulator -1- and its connector -arrows-.

3.3 - Implementing final control diagnosis

Requirement:

- Idling-speed switch and full throttle switch OK; checking=>Page 54

The final control diagnosis function actuates the following components in the stated sequence:

Actuation sequence
1 Pressure regulator -N73
2 Activated charcoal filter solenoid valve -N80
3 Idling-speed stabilisation valve -N71
4 Cold start valve -N17

- Connect vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "address word" 01 => Page 1 .
Engine must not be running.

-> Indicated on display:

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Rapid data transfer
Select function XX

- Enter "03" for "Final control diagnosis" function and confirm with Q key.

-> Indicated on display:

Final control diagnosis
Pressure regulator -N73

- Read off differential pressure regulator current on multimeter.
 - Specification: 0 ... 100 mA fluctuating

If reading does not match specification:

- Check differential pressure regulator => Page 62 .
- Press =>key.

-> Indicated on display:

Final control diagnosis
Activated charcoal filter solenoid valve
-N80

Valve must click.

If valve does not click:

- Check activated charcoal filter solenoid valve -N80 => Page 109 .
- Press =>key.

-> Indicated on display:



Final control diagnosis
Idling-speed stabilisation valve -N71

Idling-speed stabilisation valve must click.

If valve does not click:

- Check idling-speed stabilisation valve -N71 => Page 49 .
- Press =>key.

-> Indicated on display:

Final control diagnosis
Cold start valve -N17

Valve must click for 10 seconds.

Note:

Press => key at the latest when cold start valve has been actuated

2 - 3 times.

If valve does not click:

- Check cold start valve -N17 => Page 43 .
- Press =>key.

-> Indicated on display (function selection):

Rapid data transfer
Select function XX

HELP
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4 - Basic setting

4.1 - Basic setting

The engine control unit implements the following as part of the basic setting function:

- ♦ Blocking of digital idling-speed stabilisation
- ♦ Closing of ACF valve

Test requirements:

- Coolant temperature at least 85 °C
- Engine speed less than 2000 rpm
- Electr. loads switched off (radiator fan must not run during test)
- Air conditioner switched off
- No faults stored in fault memory

Sequence of operations

- Connect vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "address word" 01 => Page 1 .
Engine must be idling.

-> Indicated on display:

Rapid data transfer
Select function XX

HELP

- Enter "04" for "Starting basic setting" function and confirm with Q key.

-> Indicated on display:

Basic setting Q
Enter display group number XXX

- Enter "000" for "Display group number 000" and confirm with Q key.

-> The display for display group number 000 is presented in 10 display zones; explanatory notes => Page 17.

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

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Note:

Provided that printer is switched on, current display can be printed out on record slip by pressing PRINT key.

- If readings match specifications in all display zones, press =>key and end output => Page 6 .

Display group 000

System in basic setting 0										=>	Indicated on display	Specification	Corresponds to
1	2	3	4	5	6	7	8	9	10				
											Display zone not used		
											Operating status => Page 20	5	
											Vehicle-speed signal	0	
											Lambda adaption	78 ... 228	-10 ... +10 mA
											Lambda control (must fluctuate)	0 ... 255	
											Idling-speed stabilisation status integrator; ignore	0 ... 255	
											Idling-speed stabilisation basic air adaption	0 ... 24 or 232 ... 255	
											Engine speed	34 ... 41	800 ... 1000 rpm
											Engine load; ignore	25 ... 70	
											Coolant temperature	56 ... 39	+ 85 ... 100 °C

The individual measured values are evaluated where appropriate as part of the "Reading measured value block" function => Page 18 .

5 - Encoding control unit

5.1 - Encoding control unit

Note:

-> Control unit must be encoded if the control unit identification feature displays a code which does not correspond to the vehicle concerned.



8A0907404G 2.0 l R4 MK 4-valve
 D00 ☐
 Code 00

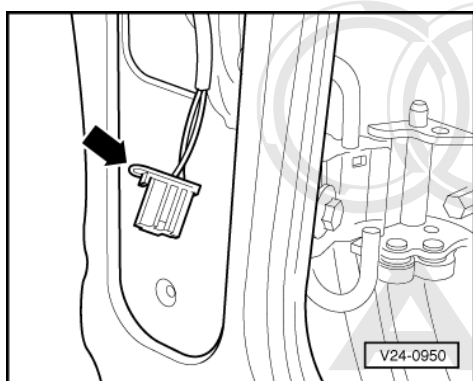
Encoding alternatives

Code	For vehicles	Bridge between contacts of encoding connector
00	With manual gearbox	None

If corresponding code is not displayed:

- Remove lower right A-pillar trim.

=> General Body Repairs, Interior; Repair Group 70; Trim; Removing and installing lower right A-pillar trim Trim
 Removing and installing lower right A-pillar trim



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- > All contacts of encoding connector ~~arrow~~ must be open.
- If necessary, remove bridge between contacts of encoding connector.
- With vehicle diagnostic, testing and information system VAS 5051/ fault reader V.A.G 1551 still connected, call up control unit identification again after entering function "01" for "Interrogating control unit version" and providing confirmation with Q key.

-> Fault reader V.A.G 1551 displays control unit encoding, e.g.:

8A0907404G 2.0 l R4 MK 4-valve
 D00 ☐
 Code 00

If corresponding code is not displayed:

- Check wiring of encoding connector => Page 27 .

6 - Reading measured value block**6.1 - Reading measured value block****Test requirements:**

- Coolant temperature at least 85 °C
- Accelerator pedal not pressed
- Electr. loads switched off (radiator fan must not run during test)
- Air conditioner switched off

- No faults stored in fault memory

Sequence of operations

- Connect vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "address word" 01 => Page 1 .
Engine must be idling.

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

- Switch on printer of fault reader by pressing Print key. Lamp in key must light.
- Enter "08" for "Reading measured value block" function and confirm with Q key.

-> Indicated on display:

Reading measured value block	Q
Enter display group number XXX	

- Enter "000" for "Display group number 000" and confirm with Q key.

-> Indicated on display for display group 000:

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

Notes:

- ◆ The measured values are presented in decimal form for display group number 000.
- ◆ Provided that printer is switched on, current display can be printed out on record slip.
- If readings match specifications in all display zones, press =>key and end output => Page 6 .
- If readings do not match specifications in display group 000 => test table, Page 20 .

Display group 000

Reading measured value block ➡										Indicated on display	Specification	Corresponds to
1	2	3	4	5	6	7	8	9	10	Ignition timing (ignore; not to be used for adjusting ignition)		
										Sum total of operating status values => Page 20	5	
										Vehicle-speed signal	0	
										Lambda adaption	78 ... 228	-10 ... +10 mA
										Lambda control (must fluctuate)	0 ... 255	
										Idling-speed stabilisation status integrator; ignore	0 ... 255	
										Idling-speed stabilisation basic air adaption	0 ... 24 or 232 ... 255	
										Engine speed	34 ... 41	800 ... 1000 rpm
										Engine load; ignore	25 ... 70	
										Coolant temperature	56 ... 39	+ 85 ... 100 ° C



Significance of operating status in display zone 9

Value	Operating status
1	Idling-speed switch closed
2	Full throttle switch closed
4	Vehicle with manual gearbox
8	Air-conditioner compressor on
64	Acceleration enrichment active (cold engine only)
128	Overrun shutoff active

Note:

Display shows summated engine-load operating statuses.

- ♦ Example for idling speed:
 Idling-speed switch closed 1
 Vehicle with manual gearbox + 4
 Sum total = 5

Test table: Display group 000

Display zone	Display on V.A.G 1551	Cause of trouble	Fault remedy
1	Deviation from tolerance range	- Coolant temperature sender -G62 defective - Fault in wiring between coolant-temperature sender -G62 and engine control unit	- Interrogate fault memory =>Page 138
2	...	Ignore	

Display zone	Display on V.A.G 1551	Cause of trouble	Fault remedy
3	Deviation from tolerance range	Intake system drawing in large quantities of unmetered air	Check intake system for leaks (unmetered air) => Page 5
		- Ignition point incorrectly set	- Check ignition point => Page 128
		- Throttle cable setting	- Adjust throttle cable => Fuel Supply System - Petrol Engines; Repair Group 20; Servicing accelerator mechanism; Adjusting throttle cable Servicing accelerator mechanism; Adjusting throttle cable
		- Basic setting of throttle valve	- Basic setting of throttle valve => Page 64
		- Idling-speed stabilisation valve - N71 sticking or stiff	- Perform final control diagnosis => Page 49
		- Activated charcoal filter solenoid valve -N80 leaking, permanently open	- Check activated charcoal filter solenoid valve -N80 for leaks => Page 110

Display zone	Display on V.A.G 1551	Cause of trouble	Fault remedy
4	Deviation from tolerance range	- Vacuum hose to or from idling-speed stabilisation valve -N71 leaking	- Interrogate fault memory =>Page 5
5	...	Ignore	
6	Display does not fluctuate	- Open circuit in wiring or short to earth/positive - Lambda probe defective	- Interrogate fault memory => Page 104

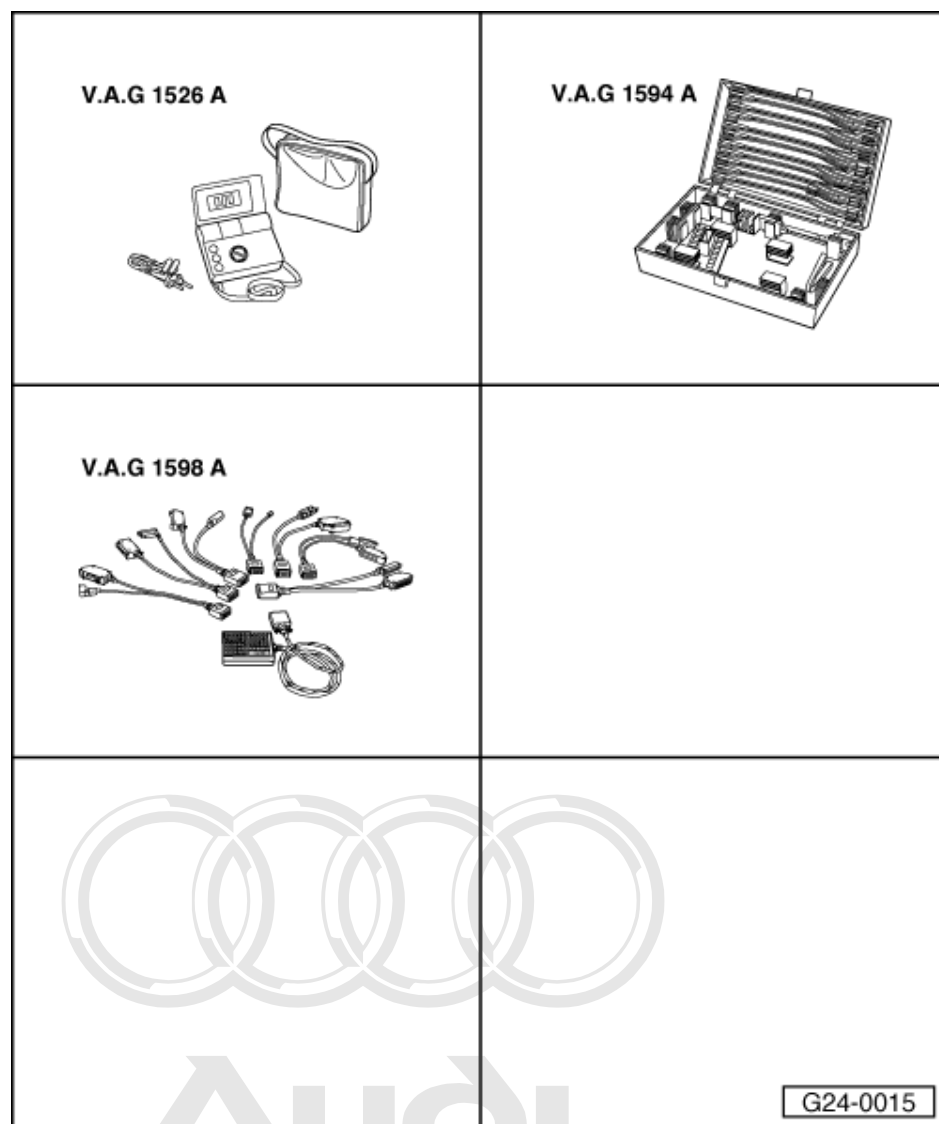
Display zone	Display on V.A.G 1551	Cause of trouble	Fault remedy
7	Deviation from tolerance range	- Injector defective	- Check injectors=>Page 91
		- Spark plug defective	- Check spark plugs
		- Large volume of unmetered air	- Eliminate cause
		- Earth supply between engine control unit, contact 35 and intake manifold	- Check earth supply between engine control unit, contact 35 and intake manifold => Page 143
		- Activated charcoal filter solenoid valve -N80	- Perform final control diagnosis =>Page 109
		- Lambda probe defective	- Interrogate fault memory => Page 104
		- Lambda probe heater -Z19 defective	- Check Lambda probe heater -Z19 => Page 106
		- Coolant temperature sender - G62 defective	- Interrogate fault memory =>Page 138

Display zone	Display on V.A.G 1551	Cause of trouble	Fault remedy
8	...	Ignore	
9	Less than/greater than 5	- Idling switch -F60/full throttle switch -F81 defective	- Check idling switch -F60 and full throttle switch -F81 => Page 54
		- Earth supply to engine control unit, contact 34	- Check earth supply to engine control unit, contact 34 => Page 141 onwards
10	...	Ignore	



7 - Checking wiring of diagnostic connectors

7.1 - Checking wiring of diagnostic connectors



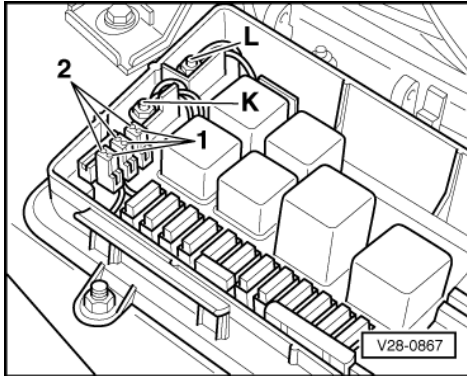
Special tools and workshop equipment required

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- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 A
- ♦ V.A.G 1598/3

Attention:
Switch off ignition before checking wiring.

7.2 - Checking power supply for "black" diagnostic connector



-> Installation position of diagnostic connectors: In relay plate with fuse box in plenum chamber

Contact assignment for "black" diagnostic connector:

- 1 - Earth
- 2 - Terminal 30 (fused via fuse 21)

- Connect up multimeter for voltage measurement as follows.

Black diagnostic connector Contact	Measure to
1	Battery positive
2	Body earth

- Specification: approx. battery voltage in each case

If readings do not match specifications:

- If necessary, eliminate open circuit in wiring/short circuit.

=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

7.3 - Checking wiring between "white" diagnostic connector and engine control unit

Note:

This check must be performed if one of the following displays appears on the connected fault reader V.A.G 1551.

-> Indicated on display:

Rapid data transfer
Fault in communication link

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or

Rapid data transfer HELP
K-wire not switched to earth



or

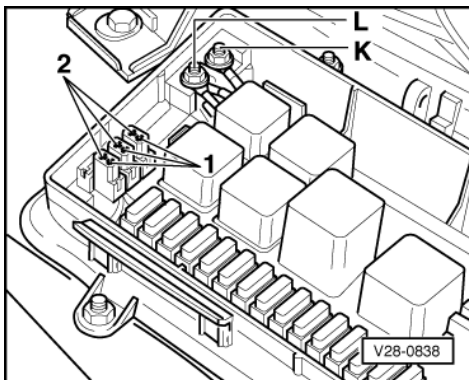
Rapid data transfer *HELP*
K-wire not switched to positive

or

Rapid data transfer *HELP*
L-wire not switched to earth

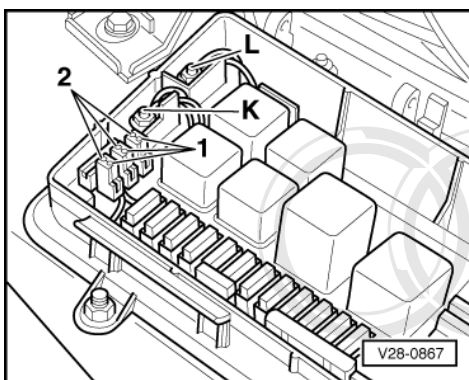
or

Rapid data transfer *HELP*
L-wire not switched to positive



Wiring connection between "white" diagnostic connector and engine control unit is routed via wiring junctions K and L.

-> Installation position of wiring junctions K and L: In relay plate with fuse box in plenum chamber



-> Installation position of wiring junctions K and L: In relay plate with fuse box in plenum chamber

Checking K and L-wire - vehicles with no immobilizer

Notes:

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- ◆ Determine wiring colour if wires with different cable colours are connected to wiring junction K.

=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

- ♦ If wires of the same colour are connected to wiring junction K, use test box V.A.G 1598 A (resistance measurement) to establish wire.

In this case proceed as follows for fault-finding purposes:

- Consecutively disconnect wires of other vehicle systems with self-diagnosis from wiring junction K.
- After unplugging connector to one vehicle system in each case, switch on ignition and then enter address word "01" for engine electronics again.

If engine control unit identification is then displayed:

- After switching on ignition, enter address word "00" for automatic test sequence to establish the control unit to which the disconnected wire determined belongs.
- Check diagnostic wire of disconnected control unit/replace control unit.

If control unit identification is still not displayed:

- Remove engine control unit and engage it in service position => Page 36 .
- With ignition switched off, use adapter V.A.G 1598/3 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 35 .
- Check for open circuit and short to earth/positive in the following wiring.

White diagnostic connector Contact	Wiring junction	Test box V.A.G 1598 A Socket
1	L	22
2	K	1

- If necessary, eliminate open circuit in wiring/short circuit.

=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

Note:

Proceed in the same manner to check L-wire.

Checking K and L-wire - vehicles with immobilizer

Wiring between "white" diagnostic connector and engine control unit is routed via wiring junction K in relay plate with fuse box and immobilizer control unit.

White diagnostic connector Contact	Wiring junction	Immobilizer control unit		Engine control unit Contact
		IN	OUT	
1	L	-	-	22
2	K	10	9	1

- Switch on ignition, press keys 2 and 5 for address word "Immobilizer" and confirm entry with Q key.

-> If immobilizer control unit identification appears on display of connected fault reader V.A.G 1551:

8D0953234 IMM0 AUZ9Z0R4010830 D66 Code 00000 WSC 00000

- Continue with test A => Page 26 .

If immobilizer control unit identification is not displayed:

- Continue with test B => Page 26 .

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**Test A**

- Check immobilizer control unit and wiring as follows.
- Switch off ignition.
- Unplug connector at immobilizer control unit -J362.

=> Electrical System; Repair Group 96; Servicing immobilizer; Removing and installing immobilizer control unit
Servicing immobilizer Removing and installing immobilizer control unit

- Use cable link to jumper contacts 9 and 10 in connector.
- Switch on ignition, press keys 0 and 1 for address word "Engine electronics" and confirm entry with Q key.

If engine control unit identification is displayed:

- Replace immobilizer control unit.

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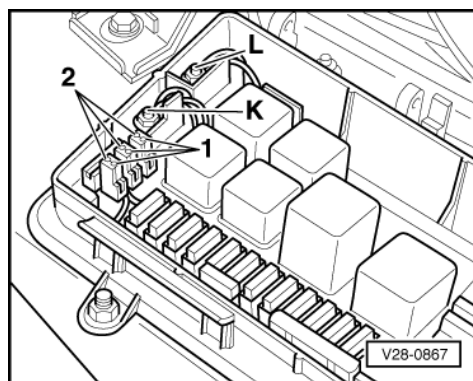
If engine control unit identification is not displayed:

- Use current flow diagram to check for open circuit or short to earth/positive in wiring between immobilizer control unit -J362 and engine control unit.

Test B

- Switch off ignition.

Note:



-> All the diagnostic wires of the various systems merge in the wiring junction K. A defective wire (short to earth or positive)/a defective control unit may also result in one of the fault messages listed.

- Disconnect all wires of vehicle systems with self-diagnosis from wiring junction K.
- Establish K-wire for immobilizer control unit -J362 and engine control unit and connect to wiring junction K.
- Switch on ignition and enter address word 25 for "Immobilizer" again.

-> If immobilizer control unit identification appears on display of connected fault reader V.A.G 1551:

8D0953234	IMMO	AUZ9Z0R4010830	D66
Code 00000		WSC 00000	

Fault is to be found in a different system with self-diagnosis capability

- Establish other systems with self-diagnosis capability, connect them to wiring junction K and perform testing.

If immobilizer control unit identification is not displayed:

- Unplug connector at immobilizer control unit -J362.

=> Electrical System; Repair Group 96; Servicing immobilizer; Removing and installing immobilizer control unit
Servicing immobilizer Removing and installing immobilizer control unit

- Use current flow diagram to check for open circuit or short to earth/positive in wiring between contact 10 of immobilizer control unit connector and wiring junction K.
- If necessary, eliminate open circuit in wiring/short circuit.

=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

- Replace immobilizer control unit if there is neither an open circuit in the wiring nor a short circuit.

7.4 - Checking wiring of encoding connector

The following test need only be performed if the correct code is not displayed by the fault reader V.A.G 1551 although encoding connector is not assigned.

- With ignition switched off, use adapter V.A.G 1598/3 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 35 .
- Check following wiring for short to earth/positive.

Encoding connector Contact	Test box V.A.G 1598 A Socket
5	20

- If necessary, eliminate short circuit.

=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

If wiring is OK, but fault reader V.A.G 1551 does not display correct code:

- Replace engine control unit => Page 36 .



25 - Mixture preparation, Injection

1 - Servicing KE Motronic injection system

1.1 - Servicing KE Motronic injection system

1.2 - Safety precautions

Attention:

Heed the following so as to avoid possible injury and/or the destruction of the injection and ignition system:

- ♦ Never touch/disconnect ignition cables with engine running or at cranking speed.
- ♦ Always switch off ignition before disconnecting and connecting ignition system wires (also applies to H.T. wires and measuring instrument leads).
- ♦ If engine is to be operated at cranking speed without it starting, e.g. for checking compression pressure, unplug connector from output stage at ignition coil and remove fuse 13. Interrogate fault memory on completion of work.
- ♦ Boost starting with rapid charger is only permitted for up to 1 minute at a maximum of 16.5 V.
- ♦ Always switch off ignition before washing engine.
- ♦ Always switch off ignition before disconnecting and connecting battery so as not to damage engine control unit.
- ♦ For connection of measuring instruments (e.g. voltage tester V.A.G 1527 B, portable multimeter V.A.G 1526 A), always make use of adapter set V.A.G 1594 A.

Pay attention to the following if testers and measuring instruments have to be used in the course of a test drive on vehicles fitted with front passenger's airbag.

Attention:

- ♦ **Always attach testers and measuring instruments to back seat and have them operated from there by a second person.**
- ♦ **If testers and measuring instruments were to be operated from front passenger's seat, person sitting there could suffer injury in the event of an accident due to triggering of front passenger's airbag.**

1.3 - Rules for cleanliness

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

- ♦ Carefully clean all joints and adjacent areas before disconnecting.
- ♦ Place parts removed on a clean surface and cover them over. Do not use fluffy cloths.
- ♦ Carefully cover or seal opened components if repairs are not to be performed immediately.
- ♦ Only install clean components:
Do not remove replacement parts from wrapping until immediately prior to installation.
Do not use parts that have been stored loose (e.g. in tool boxes).
- ♦ When system is open:
Do not work with compressed air if at all possible.
Do not move vehicle unless absolutely necessary.
- ♦ Unplugged connectors:
Protect against dirt and damp.

Only connect when dry.

1.4 - Technical data

Engine codes		6A (2.0 l / 101 kW engine) ACE (2.0 l / 103 kW engine)
Engine control unit	Part no.	=>Parts List
	Speed governing	approx. 7000 rpm
Idling-speed setting	Speed cannot be adjusted; regulated by idling speed stabilisation	800 ... 1000 rpm 1)
CO content	Check value	0.2 ... 1.2 % by vol.
Differential pressure regulator current		2.5 ± 2.5 mA
System pressure		6.1 ... 6.6 bar
Differential pressure	Differential pressure regulator connector unplugged	0.3 ... 0.5 bar below system pressure
	Differential pressure regulator connector attached	1.2 ... 1.5 bar below system pressure
Holding pressure	After 10 minutes	3.3 bar
	After 20 minutes	3.2 bar
Injectors	Spray pressure	3.7 ... 4.8 bar

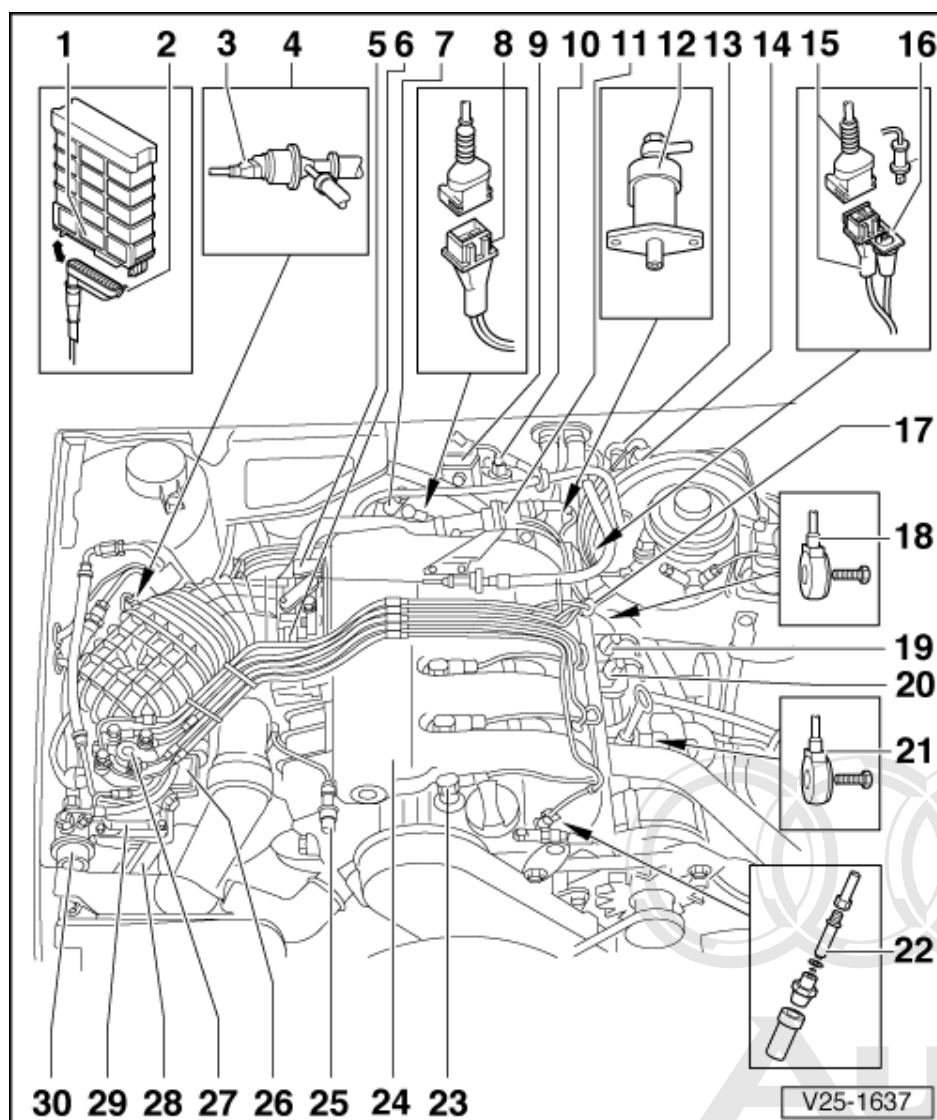
1) Current values:

=> Exhaust emission test binder

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1.5 - Exploded view of fitting locations

**1 KE Motronic control unit -J204**

- ◆ Between bulkhead and air duct in passenger's footwell
- ◆ Removing and installing=>Page 36

2 Connector

- ◆ For KE Motronic control unit
- ◆ Wait 30 seconds after switching off ignition before unplugging or attaching connector

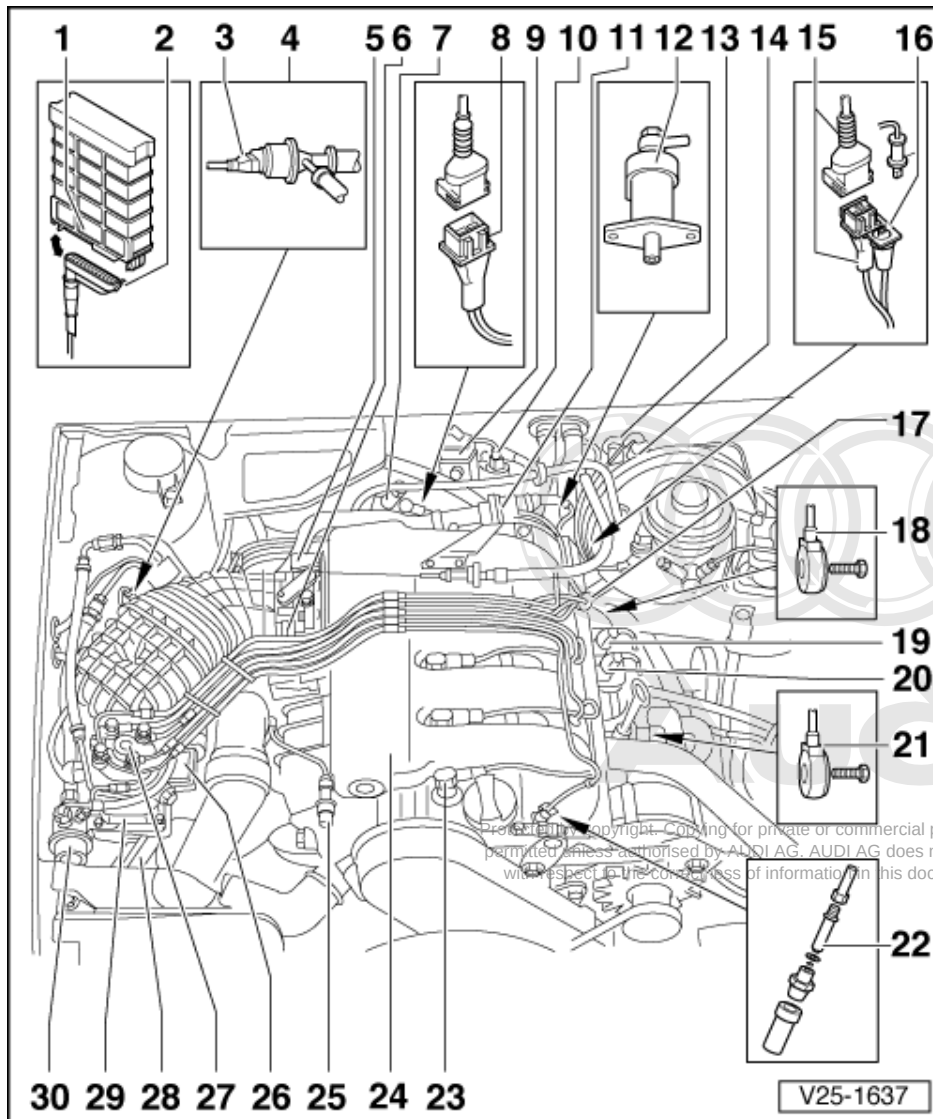
3 Connector

- ◆ For activated charcoal filter solenoid valve -N80

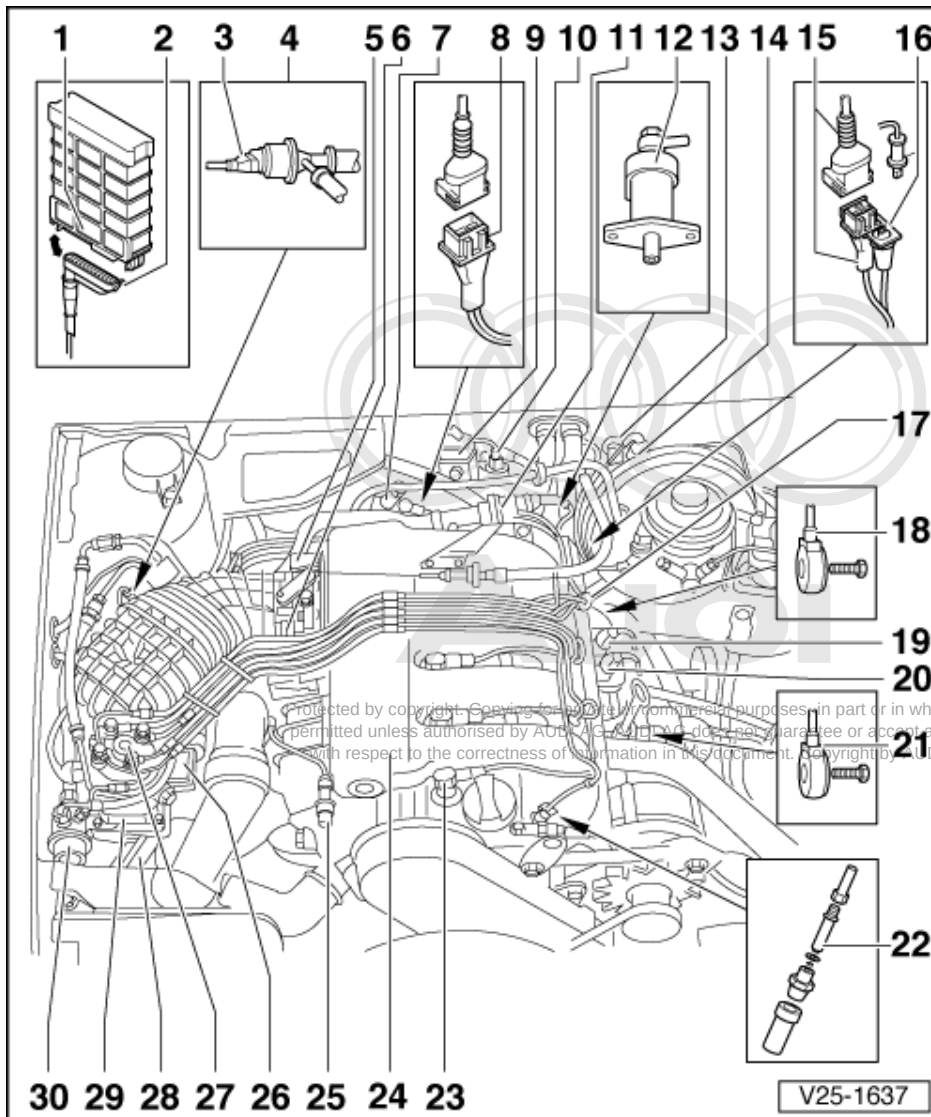
4 Activated charcoal filter solenoid valve -N80

- ◆ Checking =>Page 109

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- 5 Full throttle switch -F81
♦ Checking =>Page 53
- 6 Idling switch -F60
♦ Checking =>Page 53
- 7 Ignition distributor -O
♦ With Hall sender -G40
- 8 Coolant temperature sender -G62
♦ Resistance values => Page 138
- 9 Output stage for ignition transformer
♦ Checking => Page 132
♦ Cannot be replaced separately
- 10 Ignition transformer -N152
♦ Checking => Page 130
- 11 Idling-speed stabilisation valve -N71
♦ Checking => Page 49

**12 Cold start valve -N17**

- ◆ Checking => Page 43
- ◆ Bolt (10 Nm) to intake manifold
- ◆ Bolt on (15 Nm) fuel pipe

13 Connector

- ◆ Green
- ◆ For knock sensor 1 -G61

14 Connector

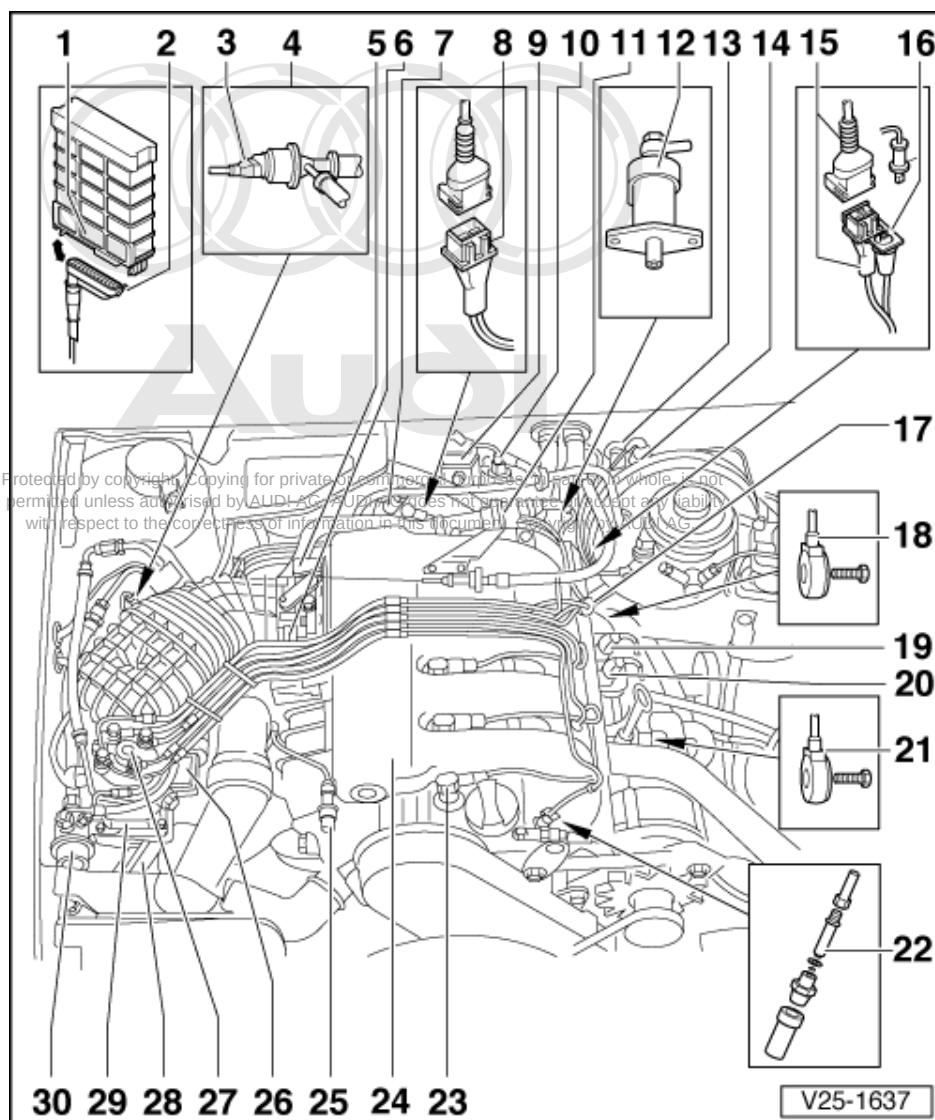
- ◆ Blue
- ◆ For knock sensor 2 -G66

15 Connector

- ◆ For Lambda-probe heating

16 Connector

- ◆ For Lambda probe -G39



17 Firing point sender -G4

- ♦ On ignition cable, cylinder 4
- ♦ Installation position: Clamping lugs face ignition distributor

18 Knock sensor 2 -G66

19 Connector

- ♦ For firing point sender -G4

20 Connector

- ♦ For engine speed sender -G28

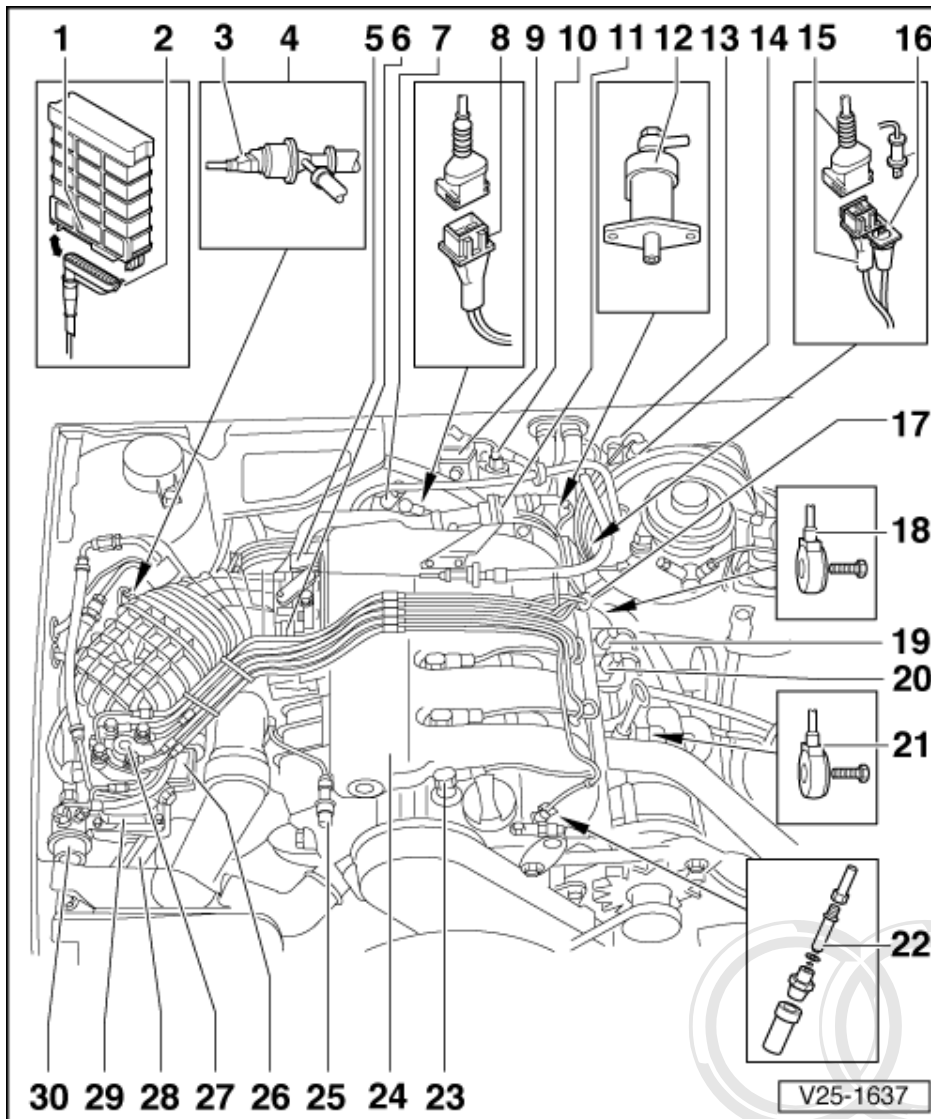
21 Knock sensor 1 -G61

22 Injector

- ♦ Checking => Page 91

23 Spark plug, 30 Nm

24 Intake manifold

**25 CO measurement pipe**

- ♦ With cap

26 Pressure regulator -N73

- ♦ Checking =>Page 62
- ♦ Checking system pressure, differential pressure and holding pressure
=> Page 86

27 Fuel distributor**28 Air cleaner**

- ♦ With control flap for intake-air preheating

29 Air-flow meter potentiometer -G19

- ♦ Checking =>Page 58

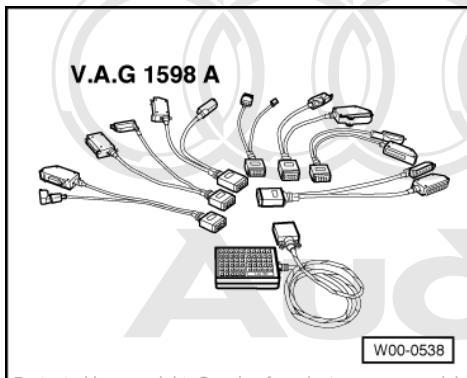
30 Fuel pressure regulator

- ♦ Checking system pressure, differential pressure and holding pressure
=> Page 86

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1.6 - Wiring and component check using test box V.A.G 1598 A

Special tools and workshop equipment required



- ◆ V.A.G 1598 A
 - ◆ V.A.G 1598/3
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Notes:

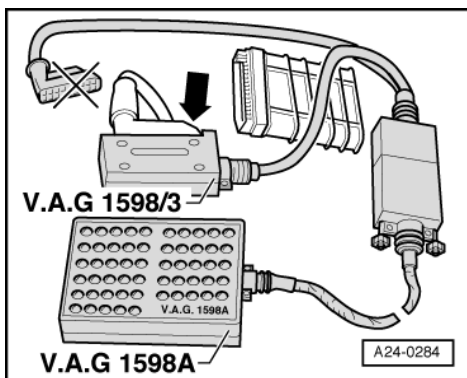
- ◆ Connector of engine control unit is only to be unplugged or attached 30 seconds after switching off ignition.
- ◆ Test box V.A.G 1598 A is not to be connected during diagnosis using fault reader V.A.G 1551.
- ◆ Use test leads from adapter set V.A.G 1594 A for connecting testers to test box.

Attention:

So as not to destroy electronic components, select required measuring range before connecting test leads and observe test conditions.

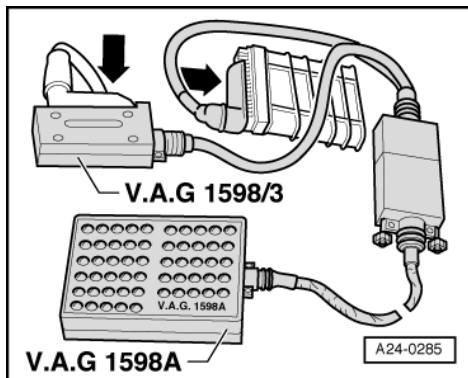
Sequence of operations

- Switch off ignition.
- Remove engine control unit and engage it in service position => Page 36 .



-> Checks at engine control-unit connector

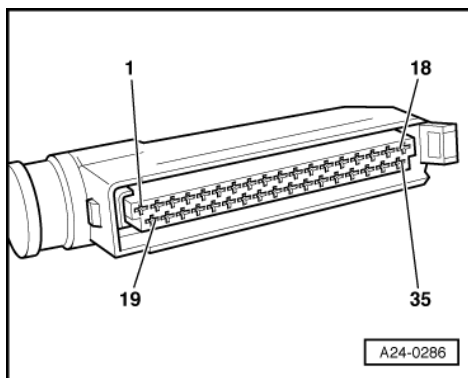
- Use adapter V.A.G 1598/3 to connect test box V.A.G 1598 A to engine control-unit connector only (not to control unit).



-> Checks with engine control unit connected

- Additionally connect test box V.A.G 1598 A to control unit using adapter V.A.G 1598/3.

Notes:



- ♦ -> Contact assignment at connector of engine control unit.
- ♦ Contact assignment is identical to socket assignment of test box V.A.G 1598 A.

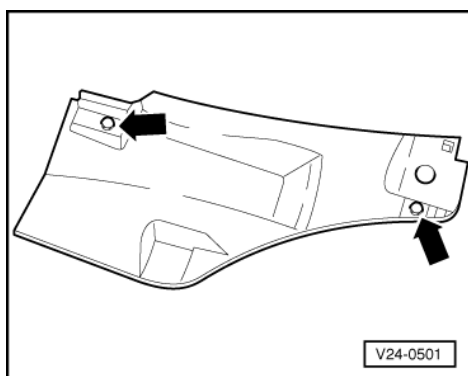
- Perform testing as described in appropriate repair operations.

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1.7 - Replacing engine control unit

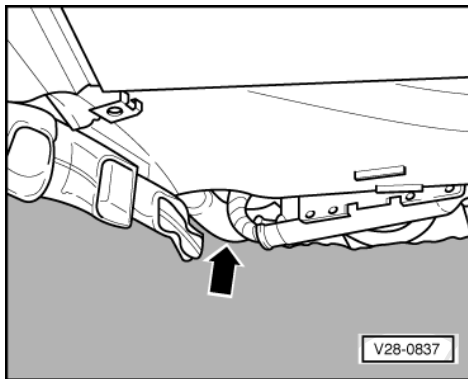
Fitting location => Exploded view of fitting locations - Page 30

Removing

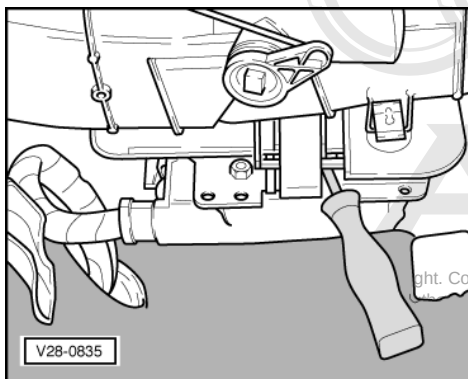


- Switch off ignition.

- -> Remove cover beneath glove box -arrows-.



- -> Pull off condensate hose -arrow- on vehicles with air conditioner.



- -> Insert screwdriver next to retainer between control-unit mounting plate and plastic slot.
- Turn screwdriver if necessary to disengage retainer tabs at mounting plate above retainer from plastic slot recess.
- Pull down control unit slightly and remove screwdriver.
- Pull down control unit 3 ... 4 cm. In this position, control unit engages in a second recess (service position).

Notes:

- ◆ In service position, test box V.A.G 1598 A can be connected with adapter V.A.G 1598/3 for measurement and test purposes to engine wiring harness.
- ◆ Connector of engine control unit is only to be unplugged or attached 30 seconds after switching off ignition.
- To release control unit, pull open clip and disconnect control-unit plug.

Note:

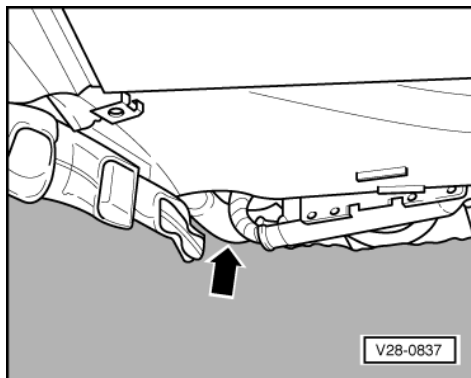
The following operations are only necessary if the control unit is to be completely removed.

- Unfasten catch as described and carefully pull control unit downwards out of slot.
- To remove control unit on vehicles with air conditioner, carefully press detached condensate drain hose aside so that side flange of control unit does not damage drain hose.

Installing

Notes:

- ◆ Connector of engine control unit is only to be unplugged or attached 30 seconds after switching off ignition.



- ♦ -> On vehicles with air conditioner, check whether condensate drain hose -arrow- has been connected before installing cover beneath glove box.

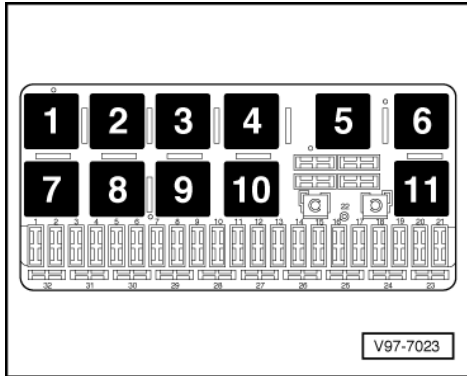
1.8 - Checking fuel-pump relay -J17 and actuation

V.A.G 1526 A 	V.A.G 1527 B
V.A.G 1594 A 	V.A.G 1598 A
	G24-0019

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 A
- ◆ V.A.G 1598/3

Note:



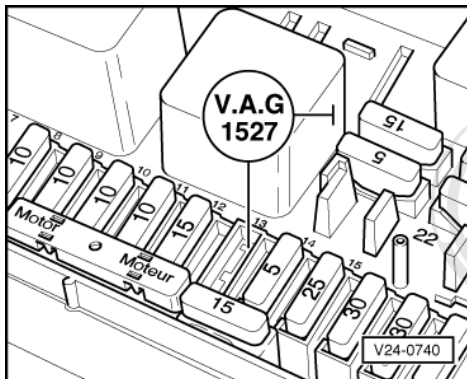
-> Fitting location of fuel-pump relay: On relay plate with fuse box in plenum chamber, position 10

Test requirement:

- Battery voltage at least 11 V

Checking operation of fuel-pump relay

- Detach cover from relay plate with fuse box in plenum chamber.



- -> Pull out fuse S13.
- Connect up voltage tester V.A.G 1527 B as follows.

Fuse S13	Measure to
Rear contact	Engine earth

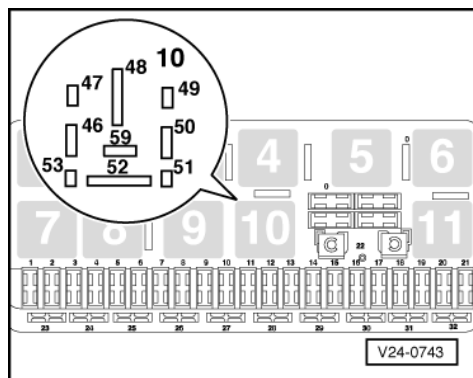
- Briefly operate starter.
 - Energisation of fuel-pump relay must be heard and felt; LED must light

If relay is not energised:

- Check actuation => Page 41 .

If relay is energised but LED does not light:

- Pull off fuel-pump relay.



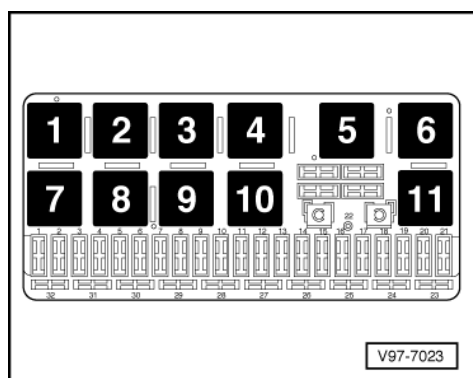
- -> Use current flow diagram to check for open circuit in the following connection.

Relay plate, position 10 Contact	Fuse
52	S13

- Replace relay plate if necessary.

If connection is OK:

- Replace fuel-pump relay -J17.
- Re-insert fuel-pump relay and fuse S13.



- -> Pull out auxiliary fuse S25.
- Connect up voltage tester V.A.G 1527 B with test leads from V.A.G 1594 A between earth and one of the two contacts for fuse S25.
- Briefly operate starter.
 - Energisation of fuel-pump relay must be heard and felt; LED must light

If relay is not energised:

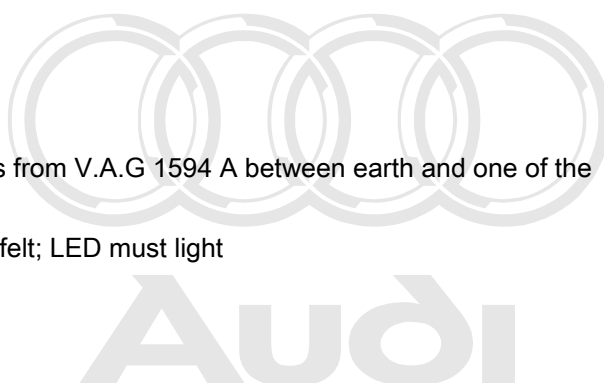
- Check actuation => Page 41 .

If relay is energised but LED does not light:

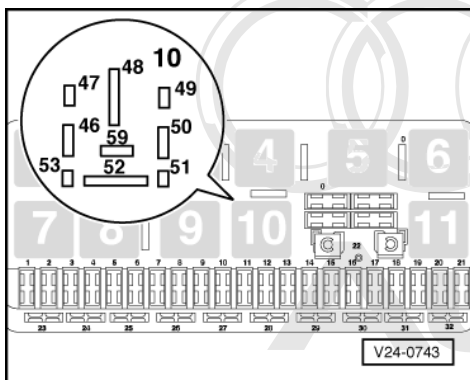
- Repeat test at other contact for fuse S25.

If LED still does not light:

- Pull off fuel-pump relay.



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- -> Use current flow diagram to check for open circuit in the following wiring.

Relay plate, position 10 Contact	Fuse
59	S25

- Eliminate open circuit in wiring if necessary.

If wiring is OK:

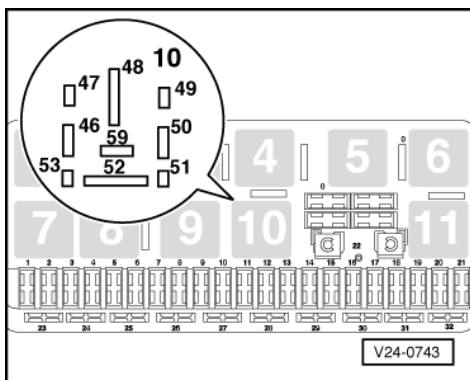
- Replace fuel-pump relay -J17.
- Re-insert fuel-pump relay and auxiliary fuse S25.

Checking power supply and actuation of fuel-pump relay

- Detach cover from relay plate with fuse box in plenum chamber.
- Pull off fuel-pump relay.

Checking power supply

- Switch on ignition.



- -> Connect up multimeter for voltage measurement as follows.

Relay plate, position 10 Contact	Specification
46 + 50	approx. battery voltage
48 + 50	approx. battery voltage

- Switch off ignition.

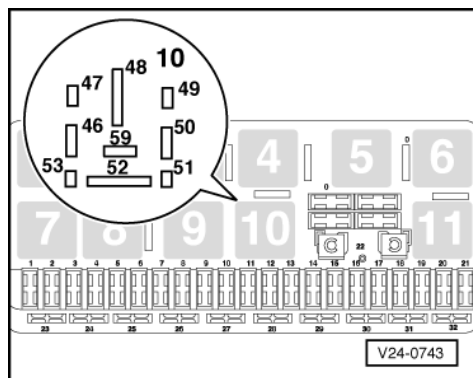


If readings do not match specifications:

- Check wiring.

=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

Checking actuation



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

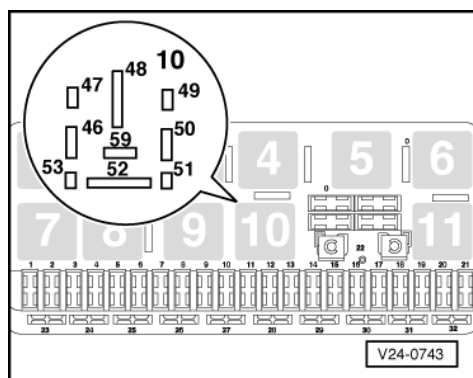
Relay plate, position 10	
Contact	Contact
46	47

- Switch on ignition.
 - LED must light for approx. 1 second
- Operate starter.
 - LED must light constantly during starting

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If LED does not light:

- With ignition switched off, use adapter V.A.G 1598/3 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 35 .



- -> Check for open circuit and short to earth/positive in the following wiring.

Relay plate, position 10 Contact	Test box V.A.G 1598 A Socket
47	12

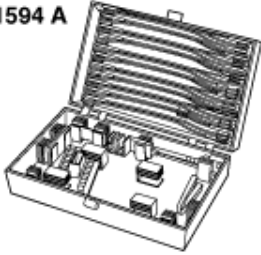
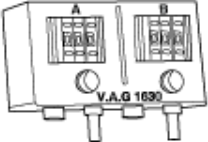
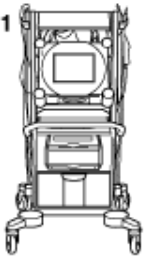
- If necessary, eliminate open circuit in wiring/short circuit.

=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

If no fault is found:

- Replace fuel pump relay -J17.

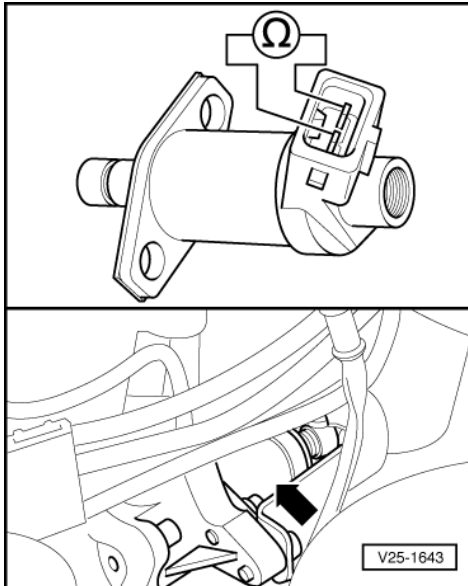
1.9 - Checking cold start valve -N17

V.A.G 1526 A 	V.A.G 1527 B 
V.A.G 1594 A 	V.A.G 1598 A 
V.A.G 1630 	VAS 5051  G24-0038

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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 A
- ♦ V.A.G 1598/3
- ♦ V.A.G 1630
- ♦ VAS 5051 with VAS 5051/1 and VAS 5051/2
- or
- ♦ V.A.G 1551 with V.A.G 1551/1



Fitting location => Exploded view of fitting locations - Page 30

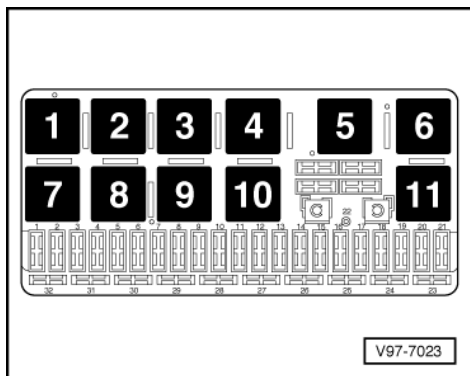
Checking internal resistance

- -> Unplug connector at cold start valve -arrow-.
- Connect up multimeter for resistance measurement to valve.
 - Specification: 8 ... 13 ω

If reading does not match specification:

- Replace cold start valve.

If cold start valve does not react during final control diagnosis:



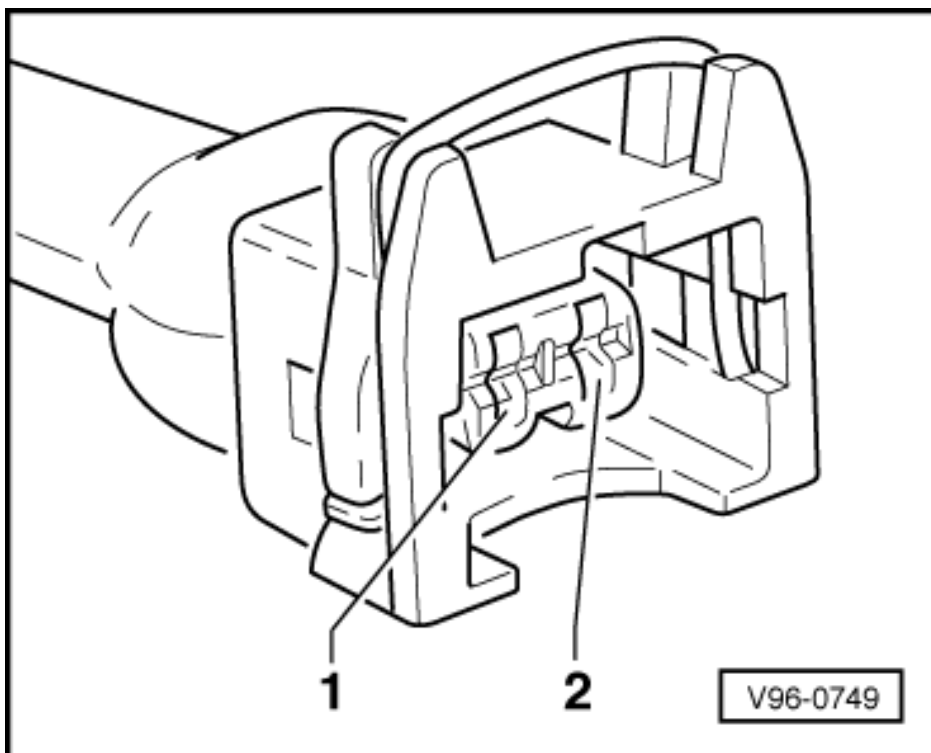
Checking power supply

Test requirement:

- -> Fuse S28 OK (in fuse box)
- Unplug connector at cold start valve.



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- -> Connect up multimeter for voltage measurement as follows.

Connector Contact	Measure to
1	Engine earth

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

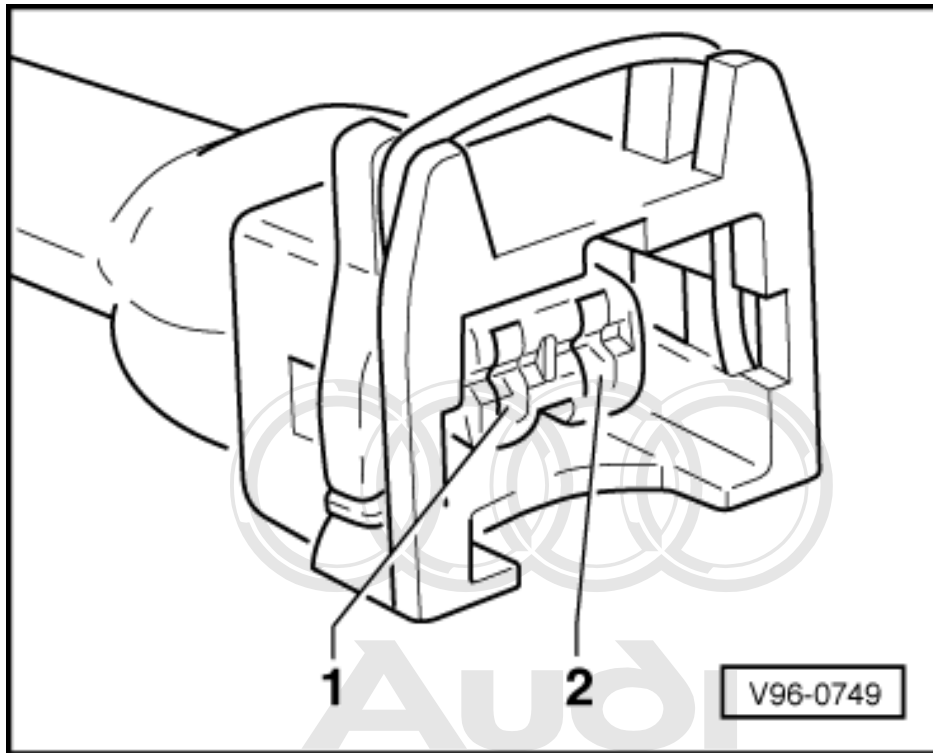
If reading does not match specification:

- Use current flow diagram to eliminate open circuit in wiring.

If reading matches specification:

- Check actuation.

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Checking actuation

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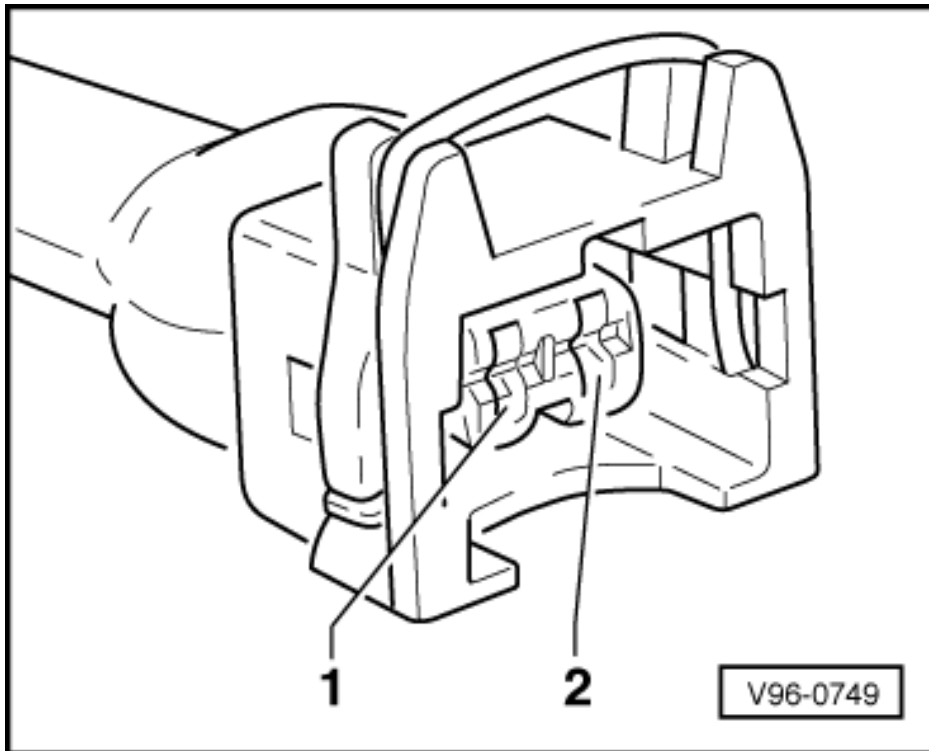
- -> Connect up voltage tester V.A.G 1527 B between contacts 1 and 2.
- Start final control diagnosis and actuate cold start valve -N17
=> Page 13 .
- LED must flash

If reading matches specification:

- Replace cold start valve.

If reading does not match specification:

- With ignition switched off, use adapter V.A.G 1598/3 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 35 .



- -> Check for open circuit and short to earth/positive in the following wiring.

Connector Contact	Test box V.A.G 1598 A Socket
2	16

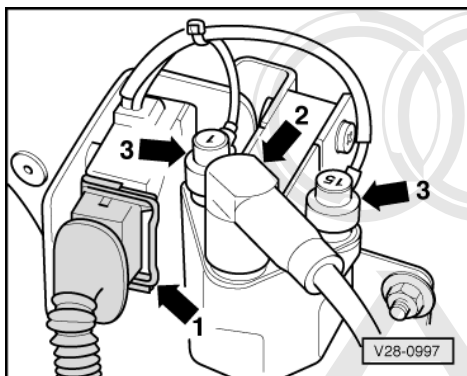
- If necessary, eliminate open circuit in wiring/short circuit.

=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

If wiring is OK and there is no actuation:

- Replace engine control unit => Page 36 .

Checking spray pattern, injection period and freedom from leaks of cold start valve



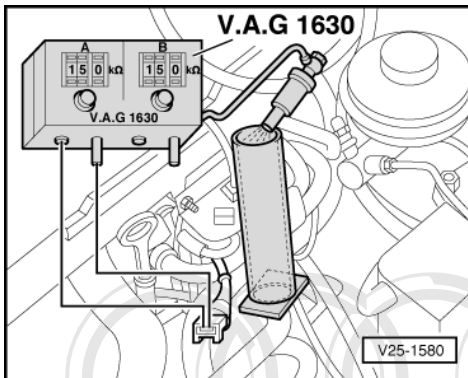
- -> Unplug connector -arrow 1- from output stage.

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- Pull off air intake elbow at throttle valve assembly.



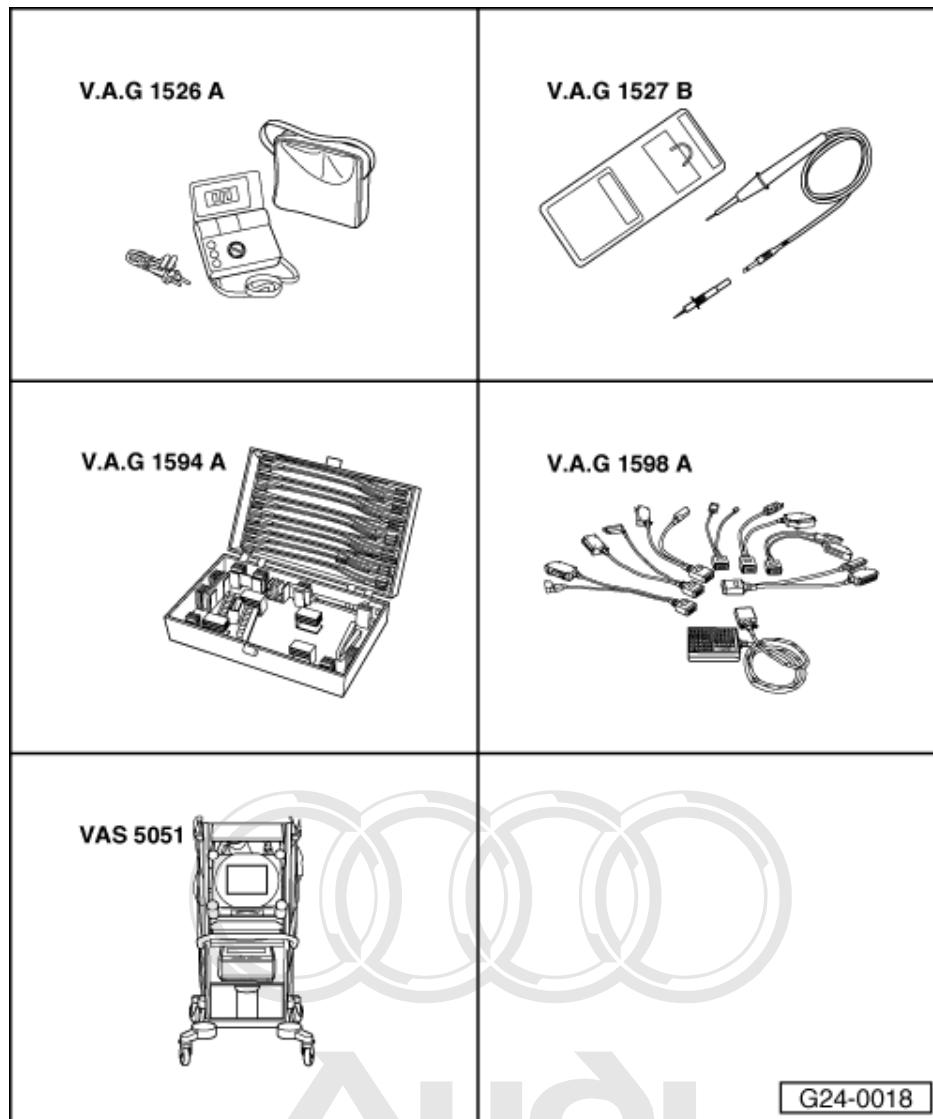
- Unplug connector at coolant temperature sender.



- -> Connect side A of digital potentiometer V.A.G 1630 to unplugged connector of coolant temperature sender.
- Set side A of V.A.G 1630 to 15 kΩ.
- Detach cold start valve with fuel pipe connected from intake manifold and hold valve over a graduated beaker.
- Operate starter.
 - Cold start valve spray must exhibit a pulsating, even conical pattern for approx. 8 s
- Dry off nozzle of cold start valve.
 - Cold start valve must not dribble within 1 minute; outside of cold start valve must also not become moist

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1.10 - Checking idling-speed stabilisation valve -N71



Special tools and workshop equipment required

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- ◆ V.A.G 1526 A
 - ◆ V.A.G 1527 B
 - ◆ V.A.G 1594 A
 - ◆ V.A.G 1598 A
 - ◆ V.A.G 1598/3
 - ◆ VAS 5051 with VAS 5051/1 and VAS 5051/2

or

- ◆ V.A.G 1551 with V.A.G 1551/1

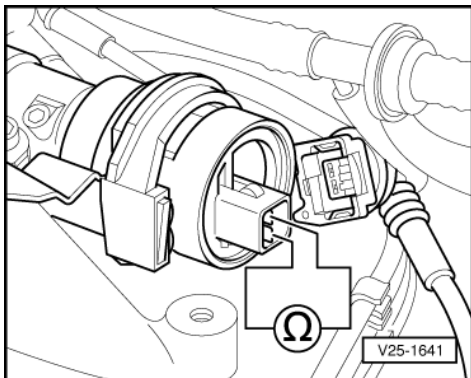
Fitting location => Exploded view of fitting locations - Page **30**

Checking internal resistance

- Switch off ignition.



- Unplug connector at idling-speed stabilisation valve.



- -> Connect multimeter to valve for resistance measurement.
- Specification: 4 ... 12 ω

Note:

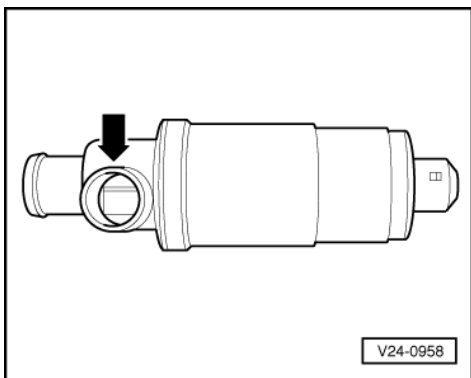
Resistance is in lower tolerance range at ambient temperature and upper tolerance range when engine is warm.

If reading does not match specification:

- Replace idling-speed stabilisation valve.

Mechanical checking

- Remove idling-speed stabilisation valve.



- -> Check for scoring of piston slide -arrow- (visual inspection).

Note:

To check freedom of movement, never use screwdriver or the like to move piston slide.

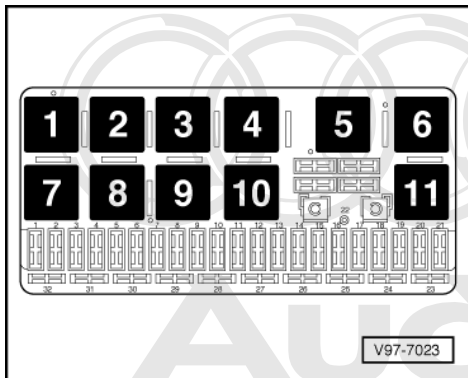
- Attach connector to removed idling-speed stabilisation valve.
- Switch on ignition.
- Start final control diagnosis and actuate idling-speed stabilisation valve -N71 => Page 13 .
- Check whether piston slide moves properly from stop to stop.

If scoring is found which impairs freedom of movement or if piston slide does not move freely (sticking, sluggish or not moving from stop to stop):

- Replace idling-speed stabilisation valve.

If idling-speed stabilisation valve does not react during final control diagnosis:

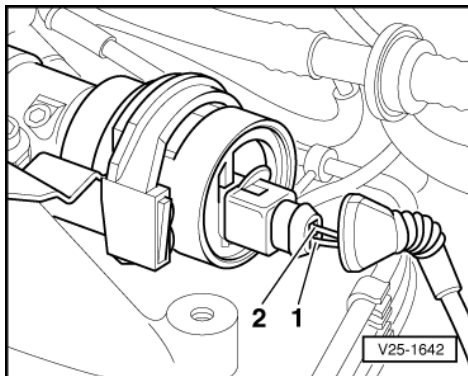
Checking power supply



Test requirement: 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.

- -> Fuse S28 OK (in fuse box)

- Push back rubber grommet of idling-speed stabilisation valve connector but leave connector attached.



- -> Connect up multimeter for voltage measurement as follows.

Connector Contact	Measure to
1	Engine earth

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

If reading does not match specification:

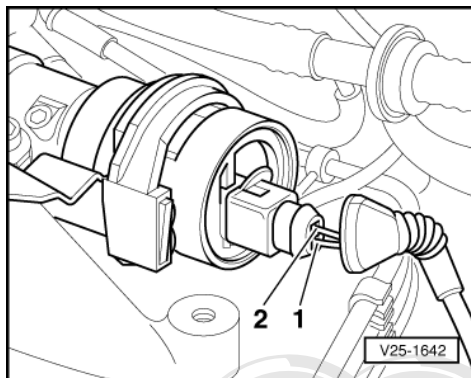
- Use current flow diagram to eliminate open circuit in wiring.

If reading matches specification:

- Check actuation.

Checking actuation

- Push back rubber grommet of idling-speed stabilisation valve connector but leave connector attached.



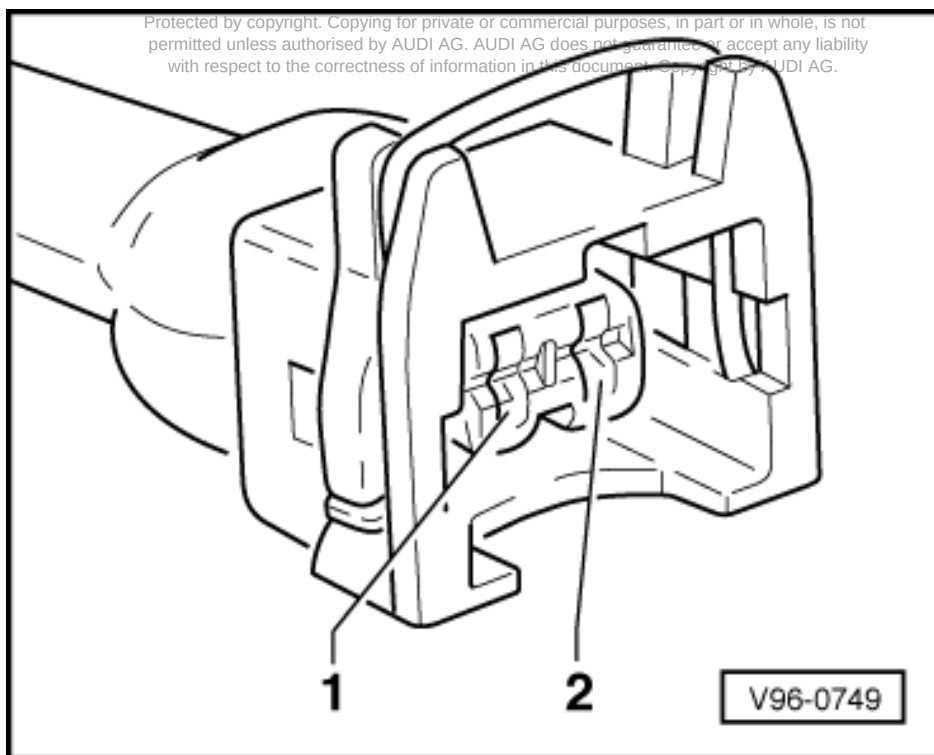
- -> Connect up voltage tester V.A.G 1527 B between contacts 1 and 2.
- Start final control diagnosis and actuate idling-speed stabilisation valve -N71 => Page 13 .
 - LED must flash

If reading matches specification:

- Replace idling-speed stabilisation valve.

If reading does not match specification:

- With ignition switched off, use adapter V.A.G 1598/3 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 35 .



- -> Check for open circuit and short to earth/positive in the following wiring.

Connector Contact	Test box V.A.G 1598 A Socket
2	17

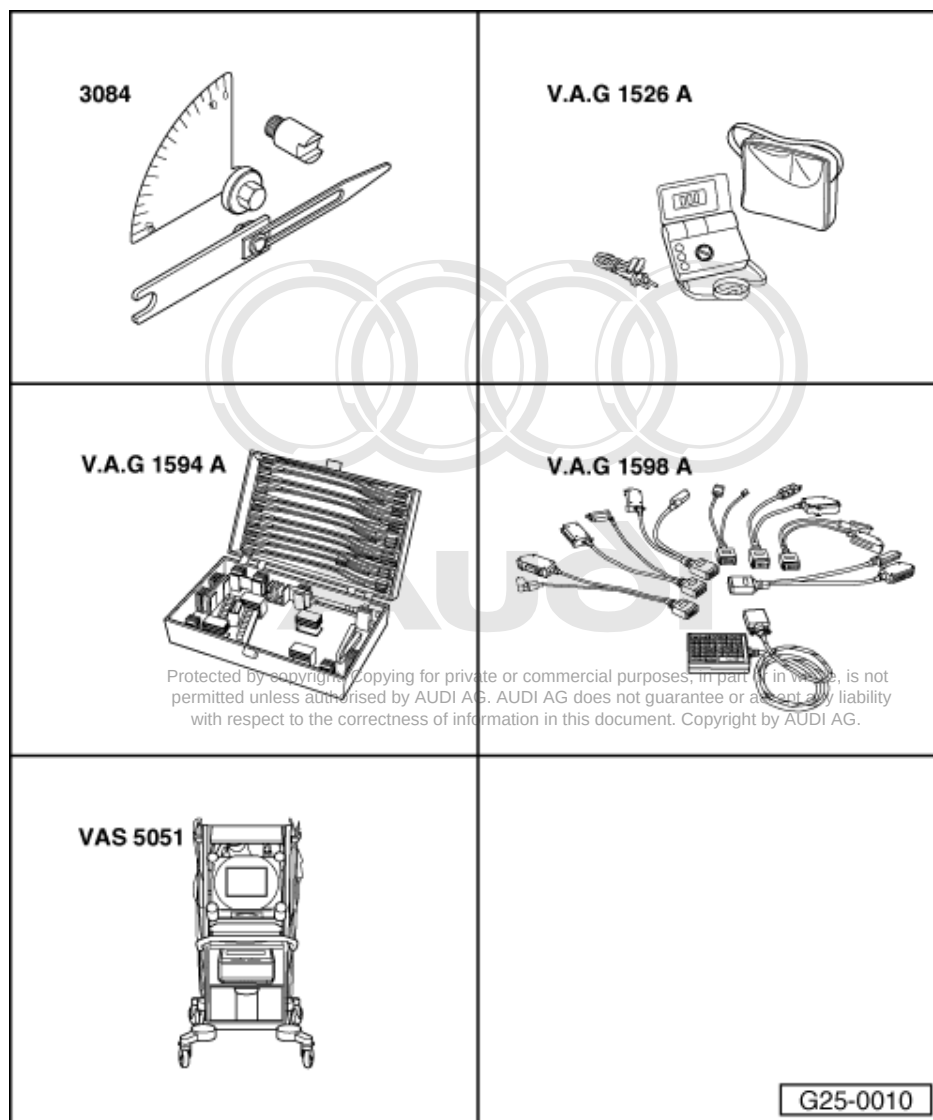
- If necessary, eliminate open circuit in wiring/short circuit.

=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

If wiring is OK and there is no actuation:

- Replace engine control unit => Page 36 .

1.11 - Checking and adjusting idling switch -F60 and full throttle switch -F81



Special tools and workshop equipment required

- ◆ Protractor 3084
- ◆ V.A.G 1526 A
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598 A
- ◆ V.A.G 1598/3
- ◆ VAS 5051 with VAS 5051/1 and VAS 5051/2

or

- ◆ V.A.G 1551 with V.A.G 1551/1
- ◆ Feeler gauge



Fitting location => Exploded view of fitting locations - Page 30

Note:

Idling switch -F60 and full throttle switch -F81 have a joint plug connection.

Test requirement:

- Basic setting of throttle valve OK; checking => Page 64

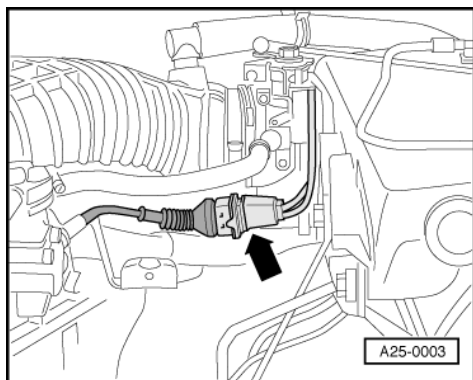
Test sequence

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

- > Read measured value block, display group 000, ignition on
=>Page 19 .
- Check display in zone 9.
 - Specification: 5
- Open throttle valve slightly.
 - Value must drop to 4
 - Air gap between throttle valve stop and adjusting screw
0.15 ... 0.50 mm (measured with feeler gauge)
- Press throttle lever into full throttle position.
 - Value must increase to 6

If display changes beforehand or afterwards:

- Adjust idling-speed switch => Page 56 .



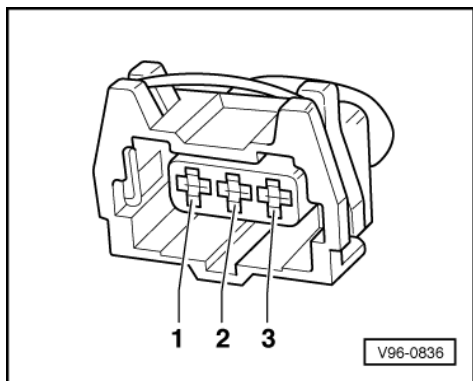
If display does not change:

Checking wiring

- -> Unplug connector at throttle valve switch -arrow-.

Note:

Idling switch -F60 and full throttle switch -F81 have a joint plug connection.



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- -> Connect up multimeter for voltage measurement as follows.

Connector Contact	Measure to
2	Battery positive

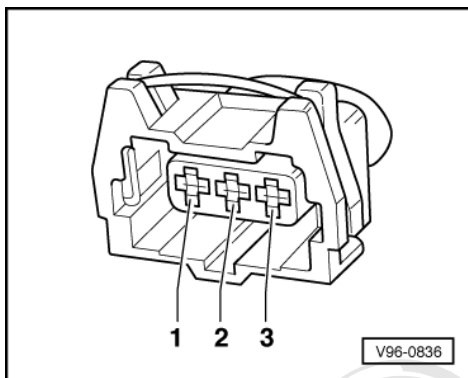
- Specification: approx. battery voltage

If reading does not match specification:

- Use current flow diagram to eliminate open circuit in wiring.

If reading matches specification:

- With ignition switched off, use adapter V.A.G 1598/3 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 35 .



- -> Check for open circuit and short to earth/positive in the following wiring.

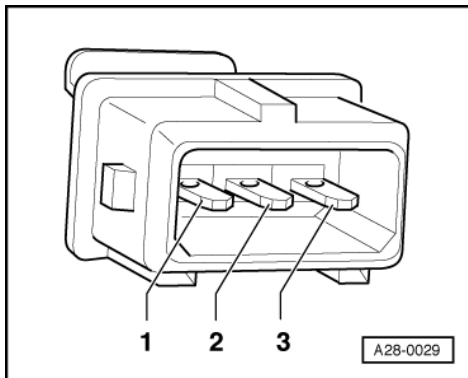
Connector Contact	Test box V.A.G 1598 A Socket
1	28
3	32

- If necessary, eliminate open circuit in wiring/short circuit.

=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

Adjusting idling switch -F60

- Remove throttle valve unit.



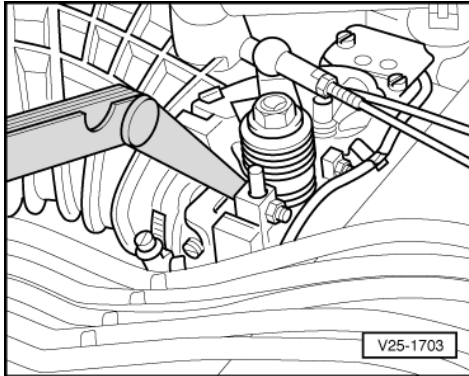
- -> Connect up multimeter for resistance measurement between contacts 1 and 2.



- Slacken off bolts of idling-speed switch and adjust switching point by moving switch in elongated holes.

Feeler gauge not inserted:

- Specification: 0 ω



-> Feeler gauge inserted 0.3 mm:

- Specification: $\infty \omega$ (no continuity)

If readings match specifications:

- Tighten bolts and secure with locking compound.

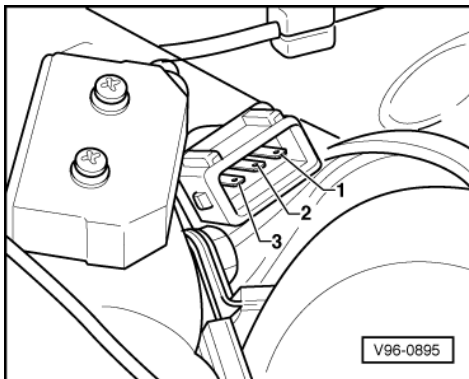
If readings do not match specifications:

- Replace and adjust idling switch -F60 and full throttle switch -F81.

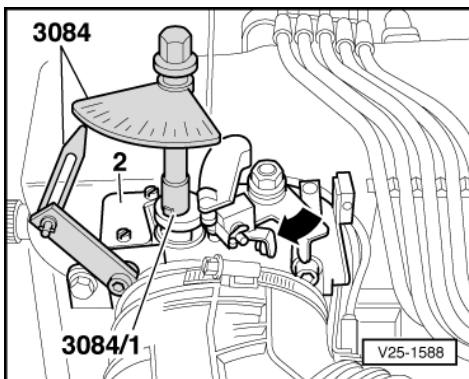
Note:

If fault is found in one switch, both switches always have to be replaced.

Adjusting full throttle switch -F81



- -> Connect up multimeter for resistance measurement between contacts 2 and 3.



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- -> Attach pointer for protractor 3084 to throttle valve unit.
- Open throttle valve and attach graduated disc for protractor 3084 with magnetic adapter 3084/1 to 2nd stage throttle shaft.
- Slacken off bolts of full throttle switch and adjust switching point by moving switch in elongated holes.
- Press throttle lever onto full throttle stop -arrow- and set graduated disc to "0".
- Close throttle valve by approx. 30° and slowly press it in direction of full throttle stop again until full throttle switch cuts in.
 - Specification: 0 ω
 - At switching point 10 ± 2° before full throttle stop

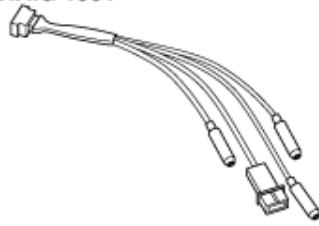
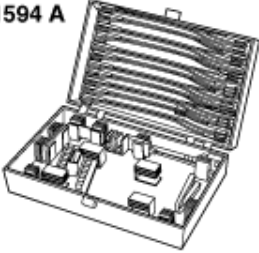
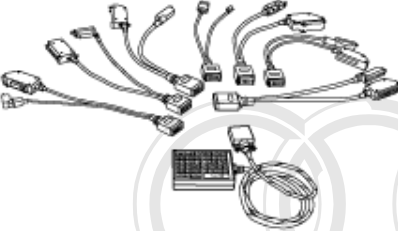
If reading matches specification:

- Tighten bolts and secure with locking compound.

If reading does not match specification:

- Replace and adjust idling switch -F60 and full throttle switch -F81.

1.12 - Checking air-flow meter potentiometer -G19

V.A.G 1501 	V.A.G 1526 A 
V.A.G 1594 A 	V.A.G 1598 A 
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Special tools and workshop equipment required

- ♦ V.A.G 1501
- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 A
- ♦ V.A.G 1598/3

Fitting location => Exploded view of fitting locations - Page **30**

Checking internal resistance

Test requirement:

- Sensor plate in rest position
- With ignition switched off, use adapter V.A.G 1598/3 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page **35**.
- Connect up multimeter for resistance measurement between sockets 23 and 26.
 - Specification: 4.5 ... 5.5 k Ω
- Connect up multimeter for resistance measurement as follows.

Test box V.A.G 1598 A Socket	Measure to
26	Engine earth

- Specification: 3.8 ... 4.2 k Ω

If readings do not match specifications:

- Use current flow diagram to eliminate open circuit in wiring.

If wiring is OK:

- Replace air-flow meter.

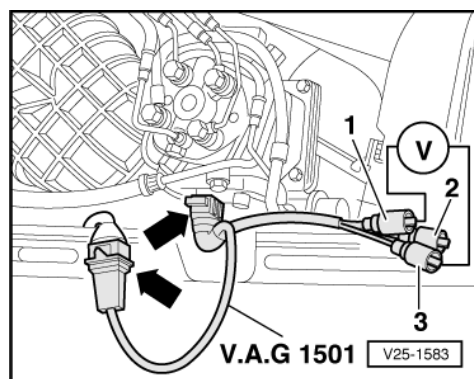
Note:

Air-flow meter potentiometer -G19 can only be replaced together with air-flow meter.

Checking potentiometer with engine running

Test requirements:

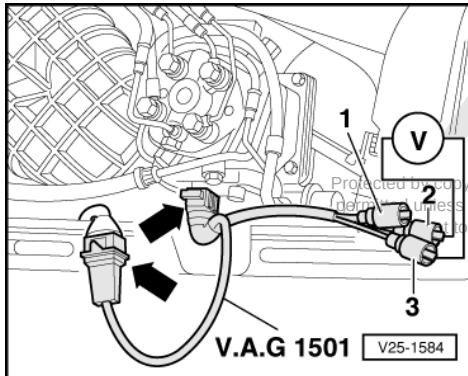
- Coolant temperature at least 85 °C
- Electr. loads switched off (radiator fan must not run during test)
- Air conditioner switched off



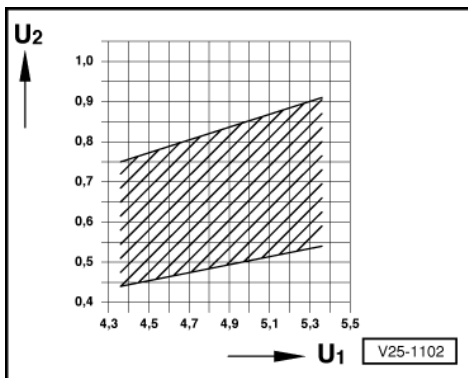
- Unplug connector at potentiometer.
- -> Connect up test lead V.A.G 1501 between air-flow meter potentiometer and connector.

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- Connect up multimeter for voltage measurement between contacts 1 and 3 of test lead V.A.G 1501.
- Switch on ignition.
 - Specification: 4.35 ... 5.35 V
- Read supply voltage (U1) off multimeter and note down value.



- Switch off ignition.
- -> Connect up multimeter for voltage measurement between contacts 2 and 3 of test lead V.A.G 1501.
- Start engine and let it idle for at least 2 minutes.
- Read output voltage (U2) off multimeter and note down value.



U1 - -> Supply voltage between contacts 1 + 3
 U2 - Output voltage at idling speed
 between contacts 2 + 3

- Compare output voltage (U2) allowing for supply voltage (U1).

If output voltage is below tolerance limit, there is a leak between air-flow meter and cylinder head.

- Check intake system for leaks (unmetered air) => Page 65 .

If output voltage is above tolerance limit, throttle valves are allowing too much air to pass through.

- Check whether throttle valves return to idle position. If necessary, replace throttle valve assembly.

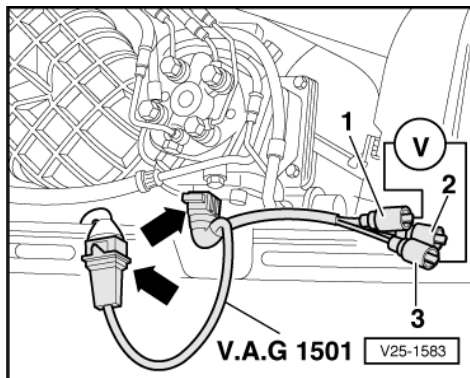
Checking and adjusting potentiometer with engine stopped

Notes:

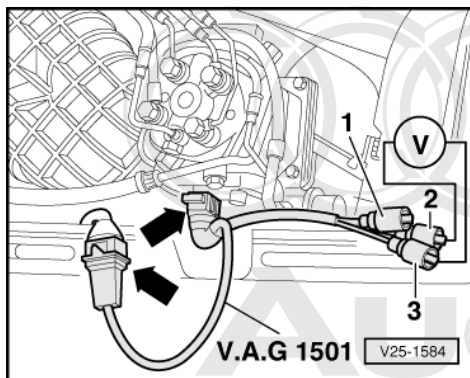
- ◆ Potentiometer is set highly precisely at the factory. The bolts are therefore secured with sealing compound/plugs.
- ◆ This test is only to be performed if prior checking failed to eliminate problem "High uneven idling" or fault 00520 "Air-mass meter/air-flow meter potentiometer -G70/-G19".

**Test requirements:**

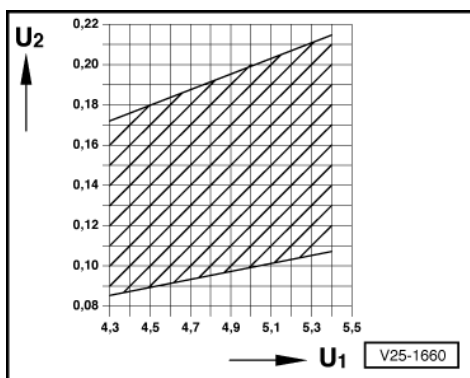
- Rest position and idle motion of sensor plate OK; checking
=> Page 96



- -> Test lead V.A.G 1501 connected up between air-flow meter potentiometer and connector.
- Connect up multimeter for voltage measurement between contacts 1 and 3 of test lead V.A.G 1501.
- Switch on ignition.
 - Specification: 4.35 ... 5.35 V
- Read supply voltage (U1) off multimeter and note down value.
- Switch off ignition.



- -> Connect up multimeter for voltage measurement between contacts 2 and 3 of test lead V.A.G 1501.
 - Switch on ignition.
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- Read output voltage (U2) off multimeter and note down value.

U1 - -> Supply voltage between contacts 1 + 3
U2 - Output voltage with engine stopped

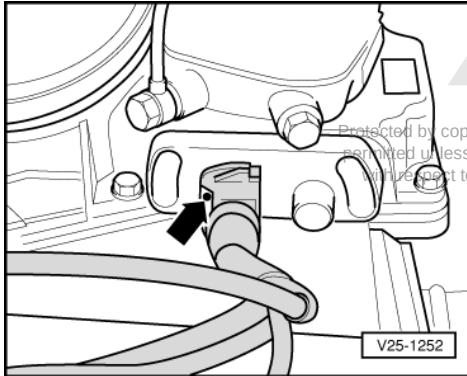
between contacts 2 + 3

- Compare output voltage (U2) allowing for supply voltage (U1).

If output voltage is slightly outside tolerance:

- Re-adjust potentiometer with trimming screw.

Re-adjusting potentiometer with trimming screw



- -> Carefully remove sealing compound over trimming screw -arrow-.
- Turn trimming screw at potentiometer until output voltage (U2) is in centre of tolerance range with allowance for supply voltage (U1).

Note:

Setting above centre range is desirable to combat problem "Engine speed too high with vehicle moving".

- Then seal trimming screw again with silicone adhesive sealing material.

If correction is not possible:

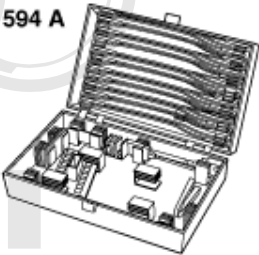
- Replace air-flow meter.

Note:

Air-flow meter potentiometer -G19 can only be replaced together with air-flow meter.



1.13 - Checking pressure regulator -N73

V.A.G 1526 A 	V.A.G 1594 A 
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V.A.G 1598 A 	
	G24-0015

Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 A
- ♦ V.A.G 1598/3

Fitting location => Exploded view of fitting locations - Page **30**

If reading did not match specification during final control diagnosis
=> Page **15** :

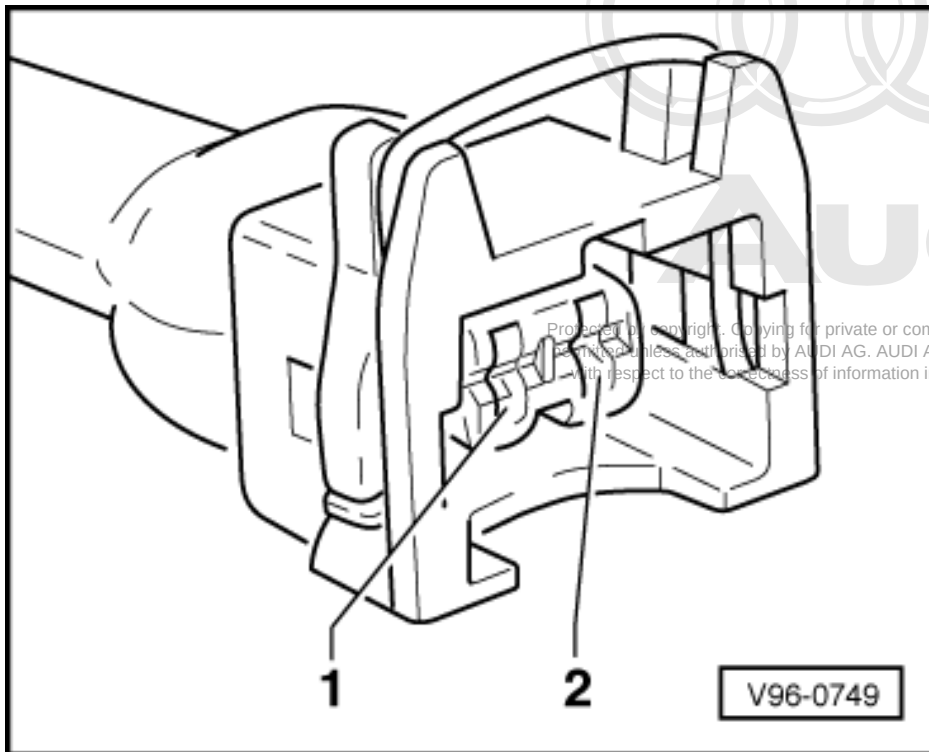
Checking internal resistance

- Unplug connector from differential pressure regulator.
- Connect up multimeter for resistance measurement to differential pressure regulator.
 - Specification: 15 ... 25 ω

If reading does not match specification:

- Check actuation.

Checking actuation



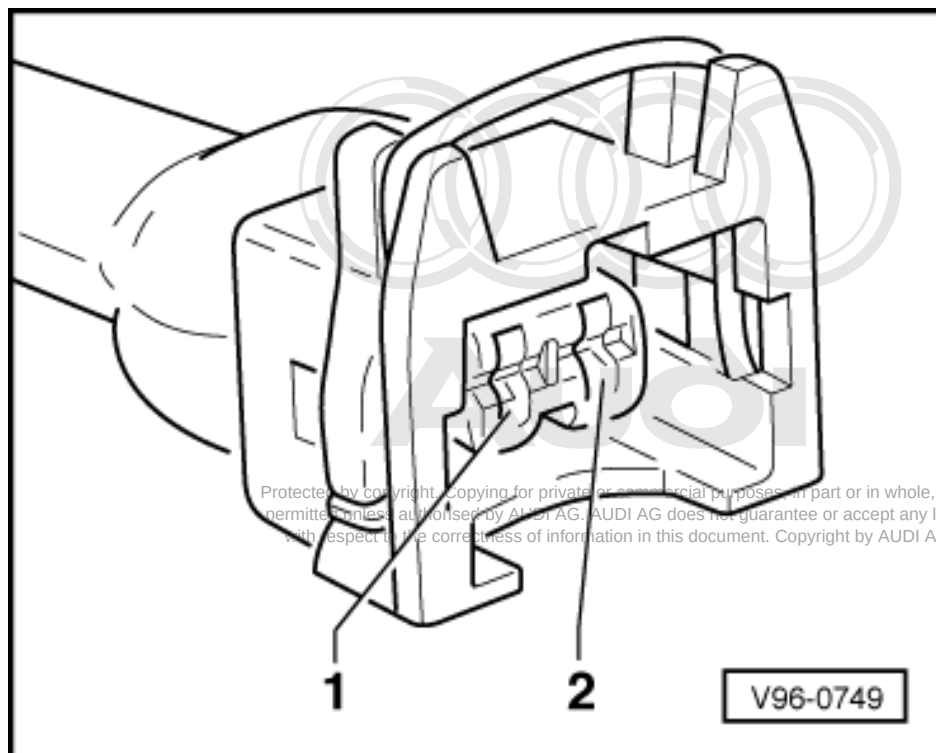
- -> Connect up multimeter for voltage measurement between contacts 1 and 2.
- Specification: 4.5 ... 5.0 V

If reading matches specification:

- Replace pressure regulator -N73.

If reading does not match specification:

- With ignition switched off, use adapter V.A.G 1598/3 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 35 .



- -> Check for open circuit and short to earth/positive in the following wiring.

Connector Contact	Test box V.A.G 1598 A Socket
1	4
2	5

- If necessary, eliminate open circuit in wiring/short circuit.

=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

If no fault is found in wiring:

- Replace engine control unit => Page 36 .

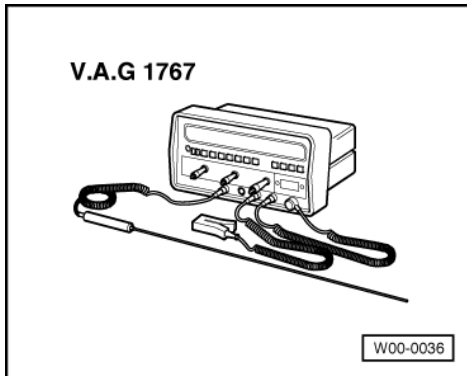
1.14 - Basic setting of throttle valve

Note:

Limiting screw is set at factory and is not to be altered. If screw has been turned inadvertently, throttle valve unit must be replaced.

1.15 - Checking intake system for leaks (unmetered air)

Special tools and workshop equipment required

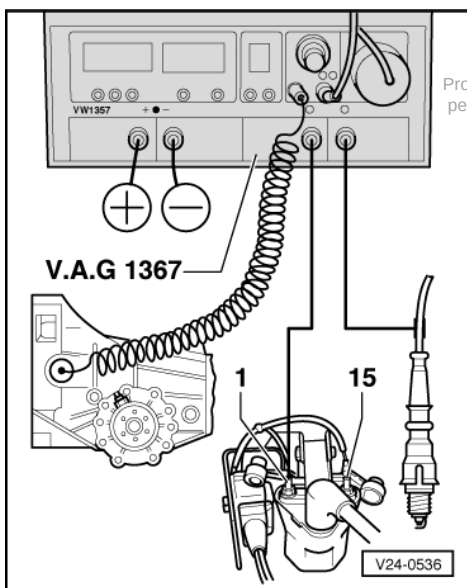


- ♦ Ignition tester V.A.G 1767 or V.A.G 1367 with clip-on trigger V.A.G 1367/8
- ♦ Engine leak detector spray G 001 800 A1

Notes:

- ♦ Due to the vacuum in the intake system, the leak detector spray is drawn in with the unmetered air. The spray reduces the ignition performance of the mixture, thus causing a drop in engine speed and a sharp increase in CO content.
- ♦ Always heed the safety instructions on the can.

Test sequence



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- -> With ignition switched off, connect up ignition tester V.A.G 1767 (or V.A.G 1367).

=> Operating instructions

- Start engine and let it idle.
- Read off idling speed on ignition tester V.A.G 1767 (or V.A.G 1367).
- Systematically apply engine leak detector spray to intake system components.

If engine speed does not change:

- Switch off ignition.

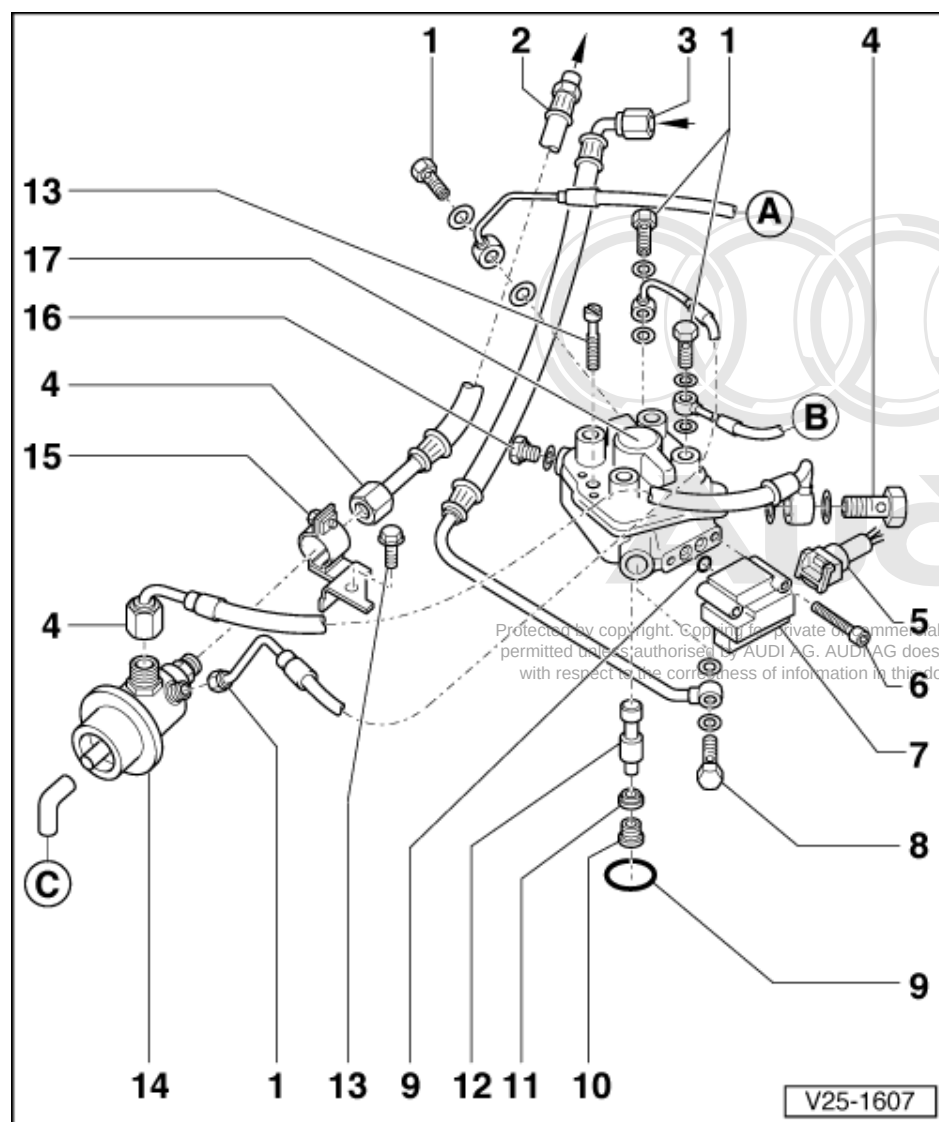


If engine speed decreases:

- Switch off ignition.
- Check sprayed section of intake system for leaks and rectify fault.

2 - Servicing fuel system

2.1 - Servicing fuel system

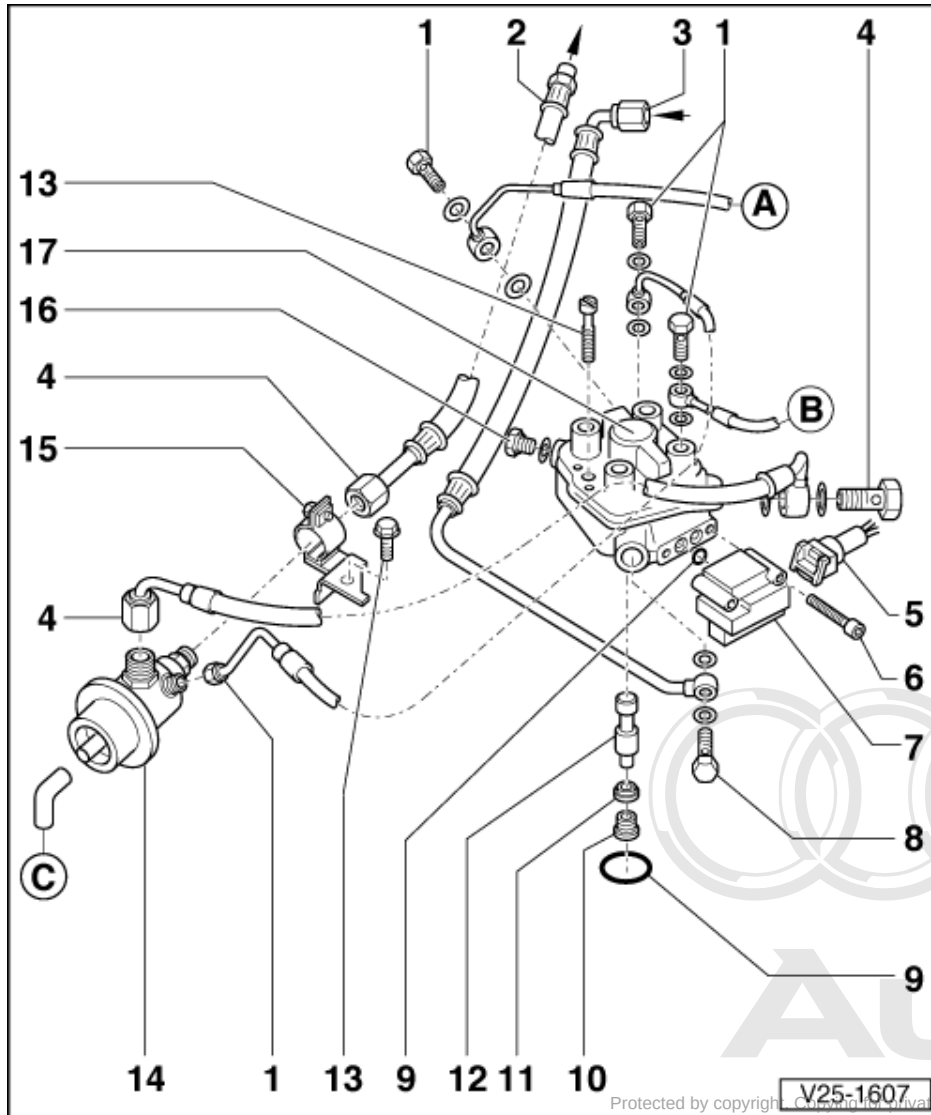


2.2 - Exploded view of fuel distributor

Part I

- A - => Page 74
- B - => Page 74
- C - => Page 70

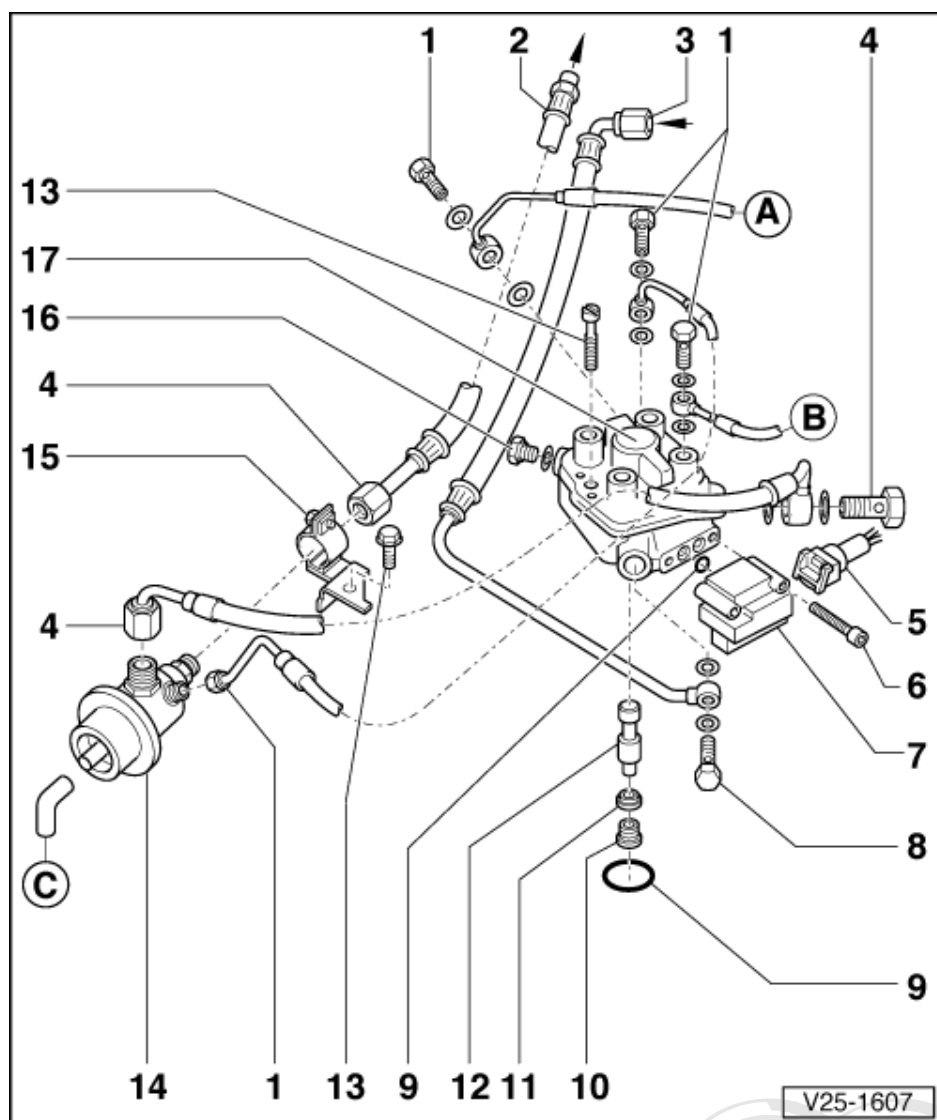
- 1 10 Nm
- 2 Fuel return pipe
 - ♦ To fuel tank
- 3 Fuel supply pipe
 - ♦ From fuel tank



- 4 20 Nm
- 5 Connector
 - ♦ For pressure regulator -N73
- 6 Bolt
 - ♦ Antimagnetic
- 7 Pressure regulator -N73
 - ♦ Checking =>Page 62
 - ♦ Checking system pressure, differential pressure and holding pressure
=> Page 86
- 8 20 Nm
 - ♦ In the event of engine running problems, screw in banjo bolt instead of minifilter
- 9 O-ring



- ◆ Replace



10 Stop bolt

- ◆ For control plunger
- ◆ Adjusting => Page 99

11 Sealing ring

- ◆ Installation position: Small diameter facing control plunger
- ◆ Only provides seal in rest position of sensor plate

12 Control plunger

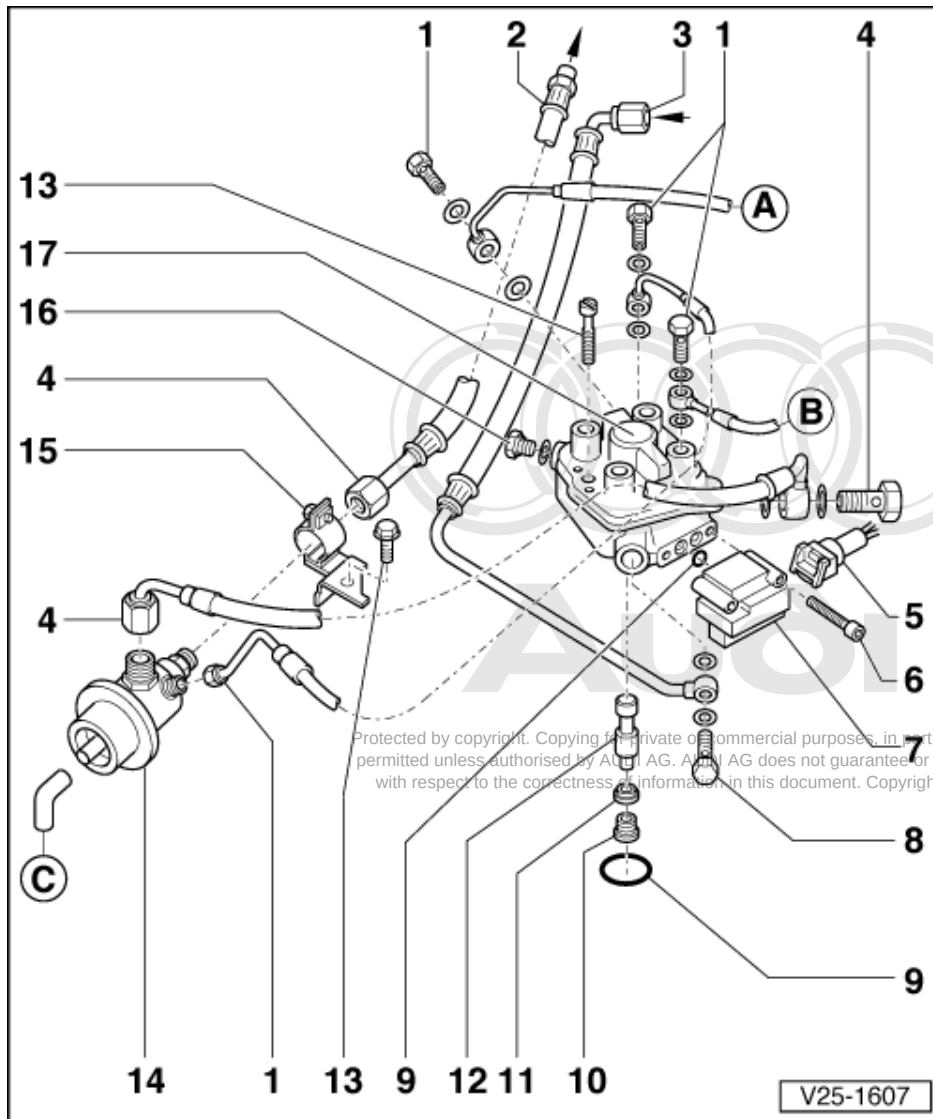
- ◆ Checking adjusting lever and control plunger => Page 95

13 3.5 Nm

14 Fuel pressure regulator

- ◆ Checking system pressure, differential pressure and holding pressure
=> Page 86

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15 Holder

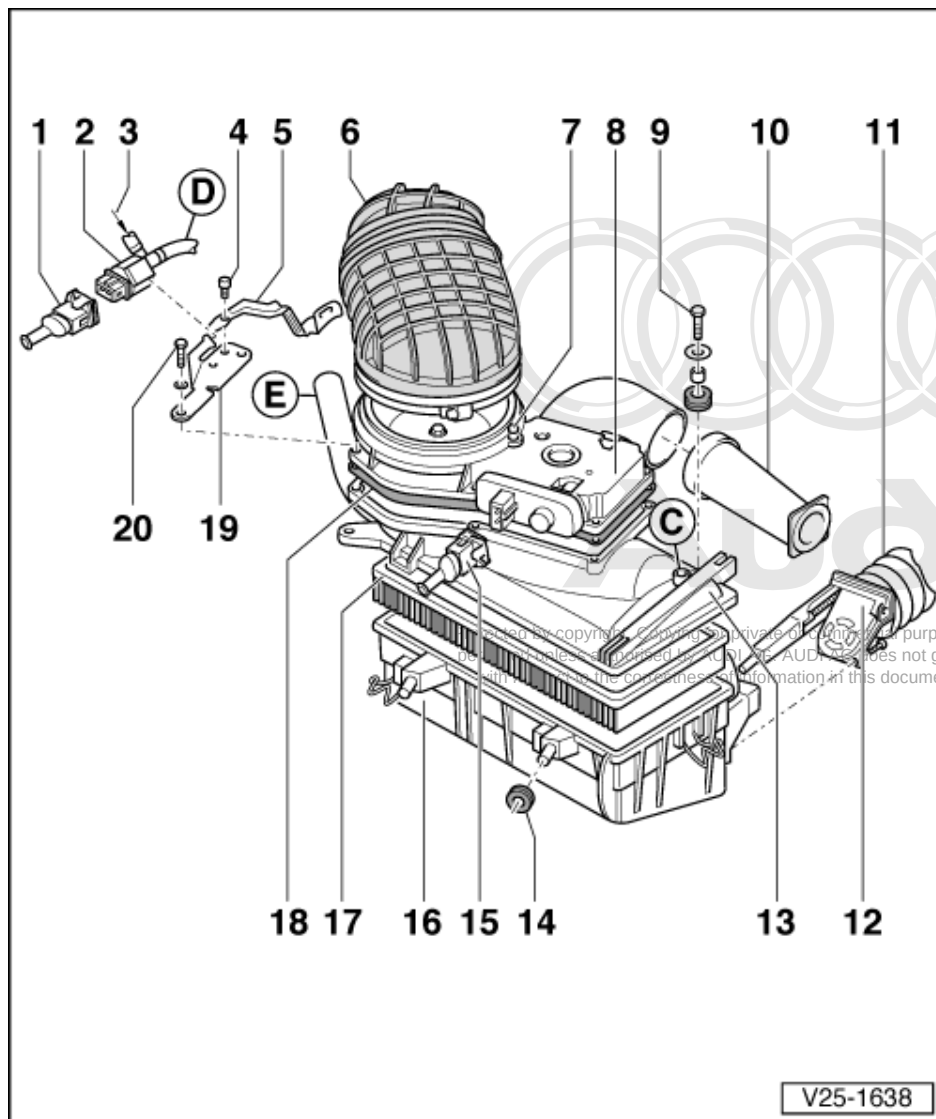
- ♦ For fuel pressure regulator
- ♦ Attached to air-flow meter

16 Screw plug, 10 Nm

- ♦ Measurement connection for pressure tests

17 Fuel distributor

- ♦ Checking => Checking idle injection tolerance, Page 93
- ♦ Following installation, check and if necessary adjust idle motion of sensor plate => Page 96



Part II

C - => Page 66

D - => Page 74

E - => Page 74

1 Connector

- ♦ Grey
- ♦ For activated charcoal filter solenoid valve -N80

2 Activated charcoal filter solenoid valve -N80

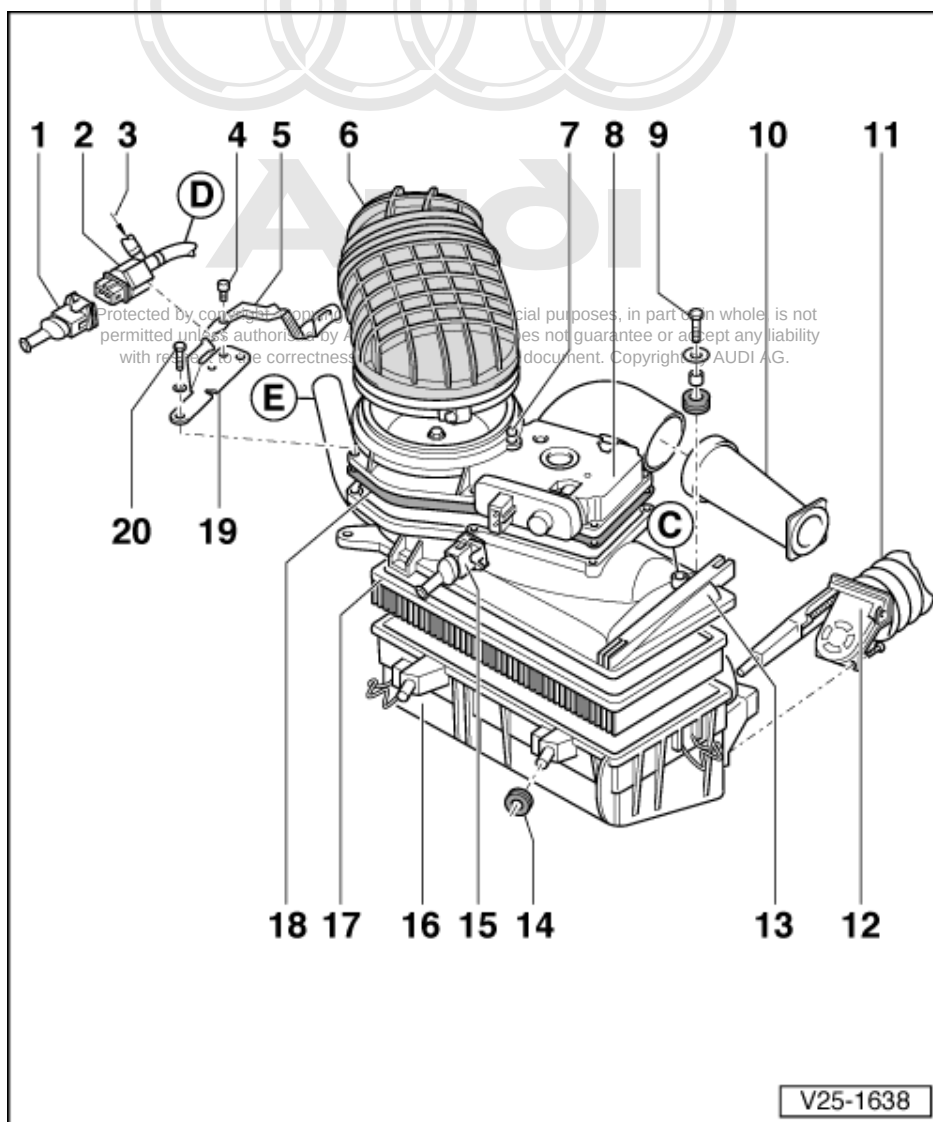
- ♦ Checking =>Page 109

3 From activated charcoal filter

4 10 Nm

5 Holder

- ♦ For air duct

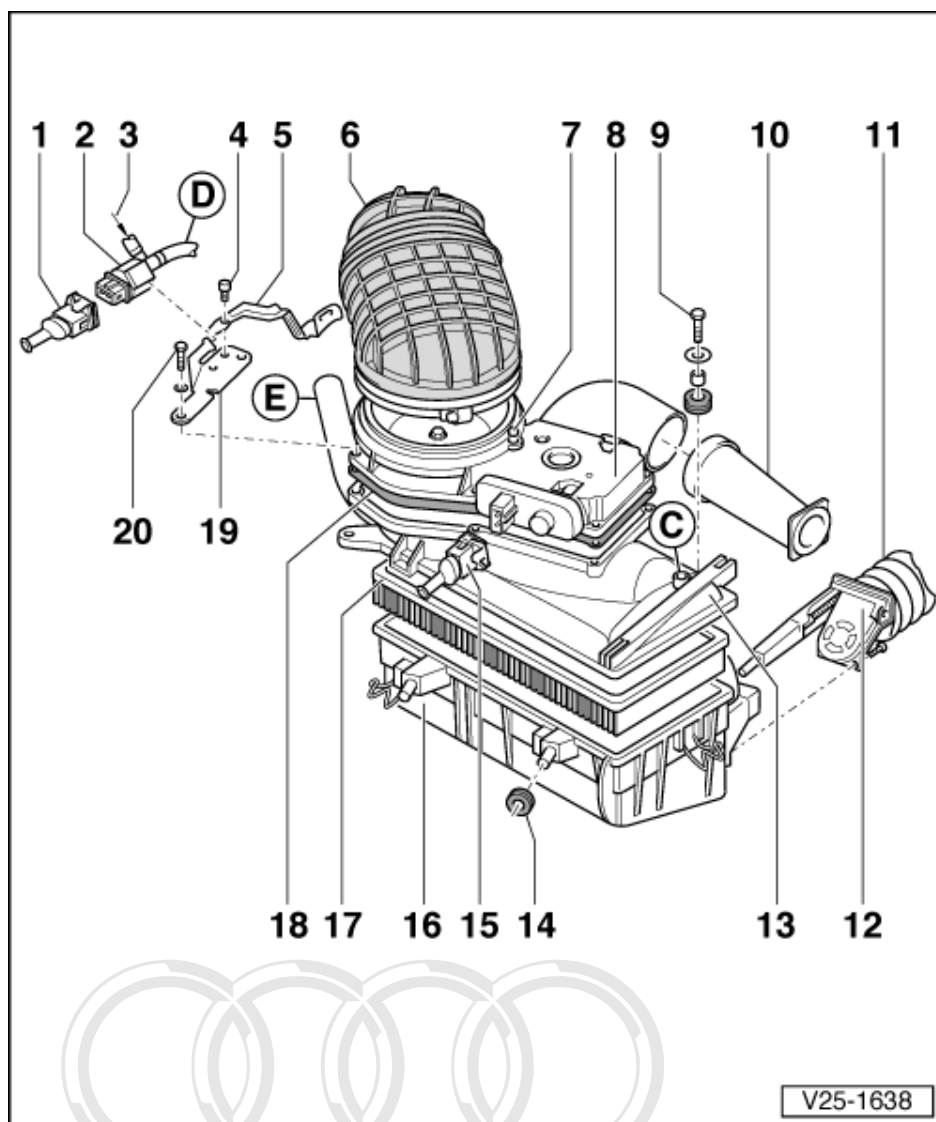
**6 Air intake elbow****7 Retaining plug**

- ♦ Take out prior to adjustment
- ♦ Checking idling speed and CO content=>Page 80

8 Air-flow meter

- ♦ Checking adjusting lever and control plunger => Page 95
- ♦ Checking and adjusting rest position and idle motion of sensor plate => Page 96
- ♦ Checking air-flow meter potentiometer für -G19=>Page 58

9 20 Nm

**10 Air duct**

- ♦ Pay attention to installation position

11 Hose

- ♦ To hot-air baffle at exhaust manifold

12 Air inlet connection

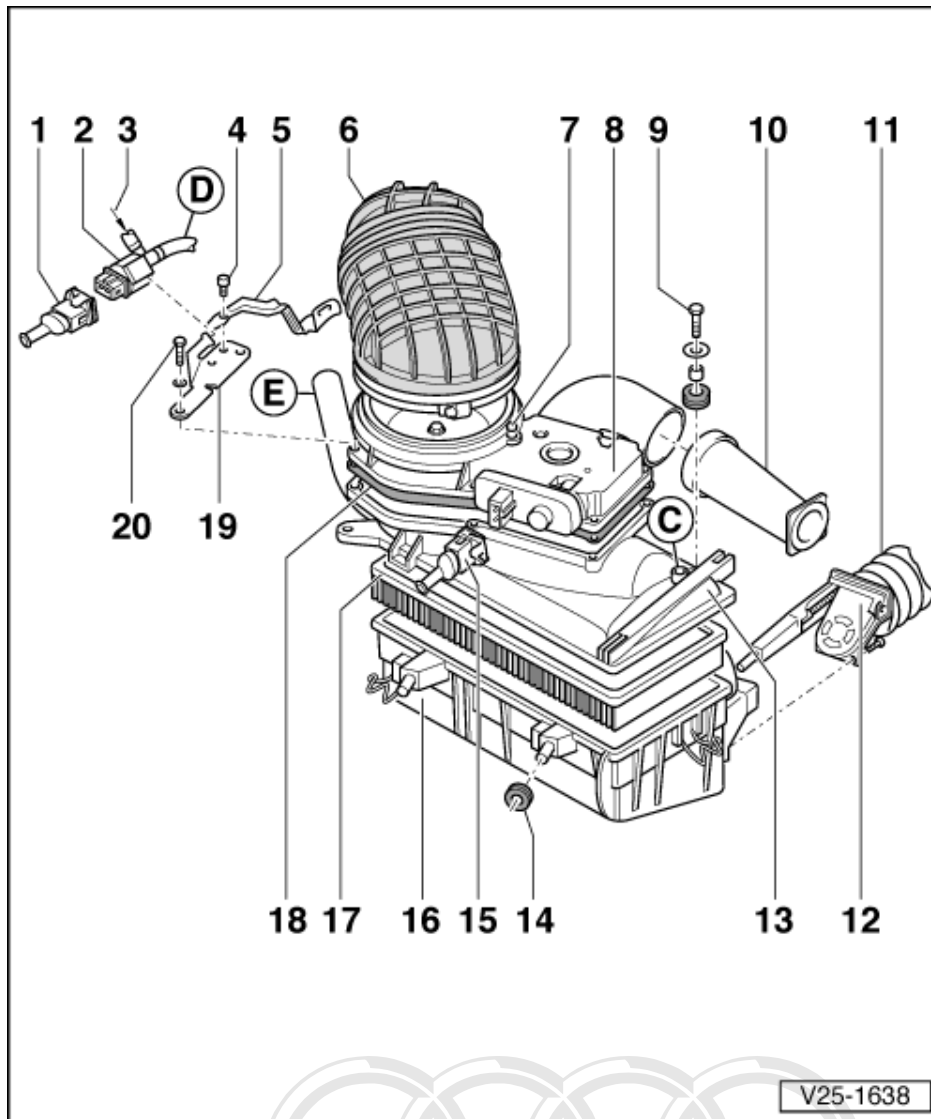
- ♦ With control flap and thermostat
- ♦ Check operation with refrigerant spray

Less than 0°C: Control flap completely open

Above +10°C: Control flap completely closed

13 Upper part of air cleaner**14 Rubber disc****15 Connector**

- ♦ For air-flow meter potentiometer -G19



16 Lower part of air cleaner

17 Filter element

- ♦ Replace

=> Maintenance

18 Gasket

- ♦ Replace

19 Holder

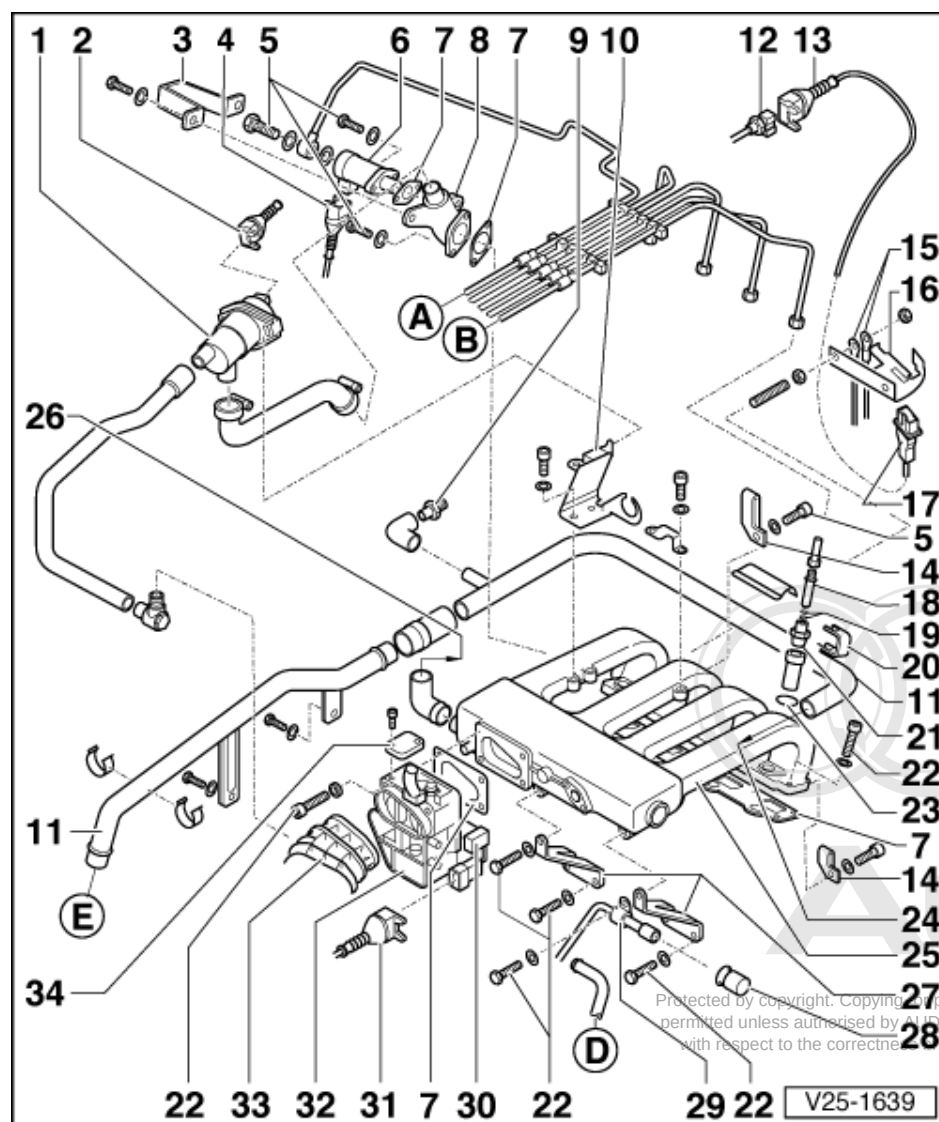
- ♦ For activated charcoal filter solenoid valve -N80

20 3.5 Nm

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2.3 - Removing and installing injection system components



A - => Page 66

B - => Page 66

D - => Page 70

E - => Page 70

1 Idling-speed stabilisation valve -N71

- ♦ Checking => Page 49

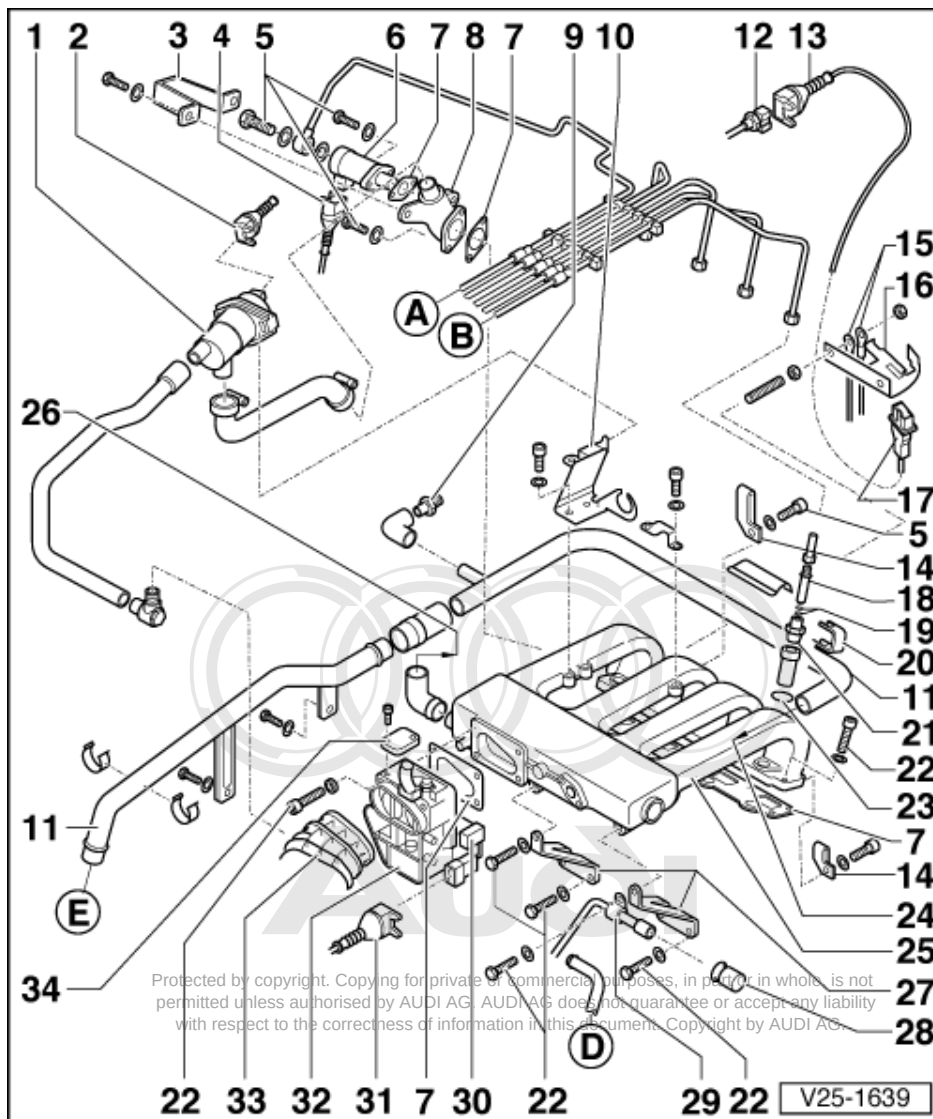
2 Connector

- ♦ For idling-speed stabilisation valve -N71

3 Protective bracket

4 Connector

- ♦ For cold start valve -N17



5 10 Nm

6 Cold start valve -N17

- ♦ Checking => Page 43
- ♦ Bolt (10 Nm) to intake manifold
- ♦ Bolt on (15 Nm) fuel pipe

7 Gasket

- ♦ Replace

8 Connection

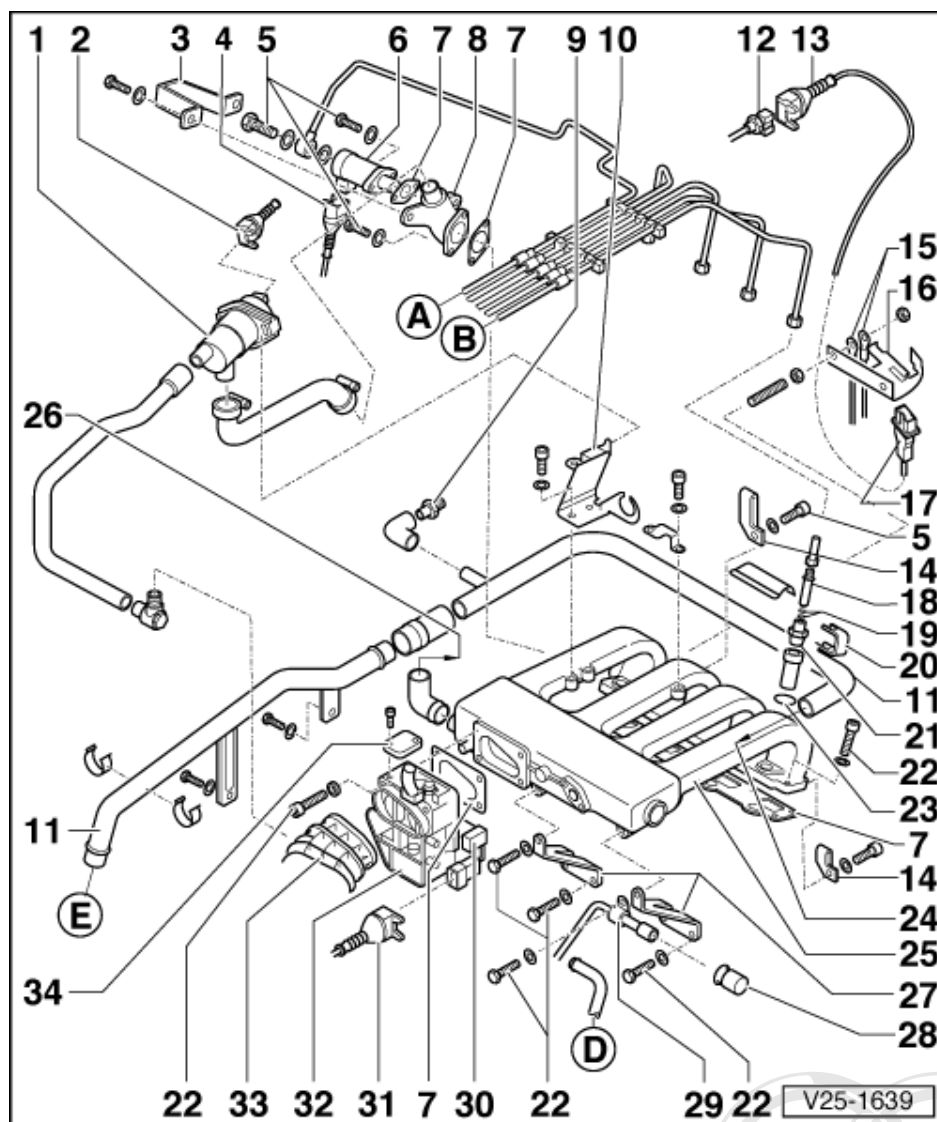
9 Connection piece

- ♦ Red
- ♦ Calibrated

10 Support bracket

- ♦ For throttle cable

11 Connecting pipe

**12 Coolant temperature sender -G62**

- ♦ Resistance values => Page 138
- ♦ Tighten to 25 Nm

13 Connector

- ♦ For coolant temperature sender -G62

14 Fastener

- ♦ For ignition cable guide

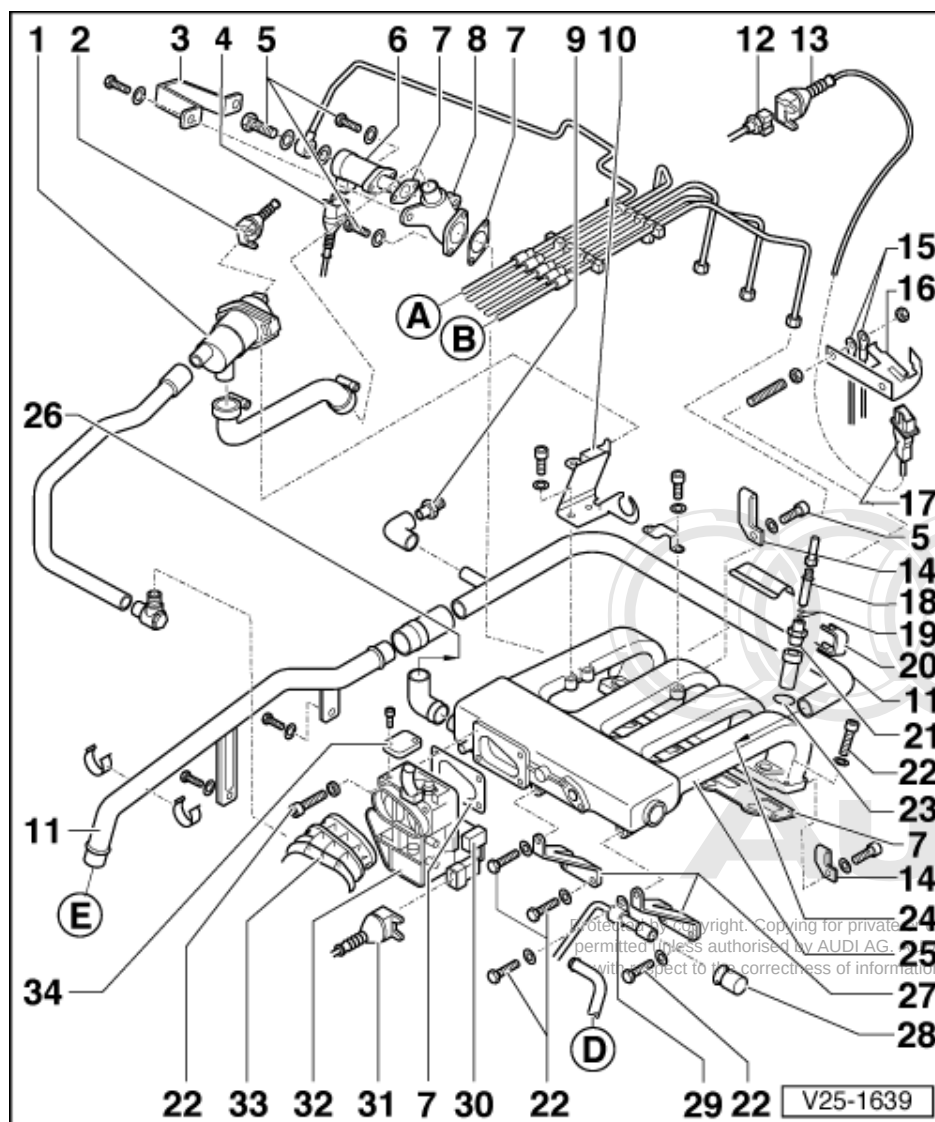
15 Earth connections

- ♦ For engine control unit

16 Holder for connectors

- ♦ For coolant temperature sender -G62
- ♦ For firing point sender -G4

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**17 Connector**

- ♦ For firing point sender -G4

18 Injector

- ♦ Checking => Page **91**

19 O-ring

- ♦ Replace

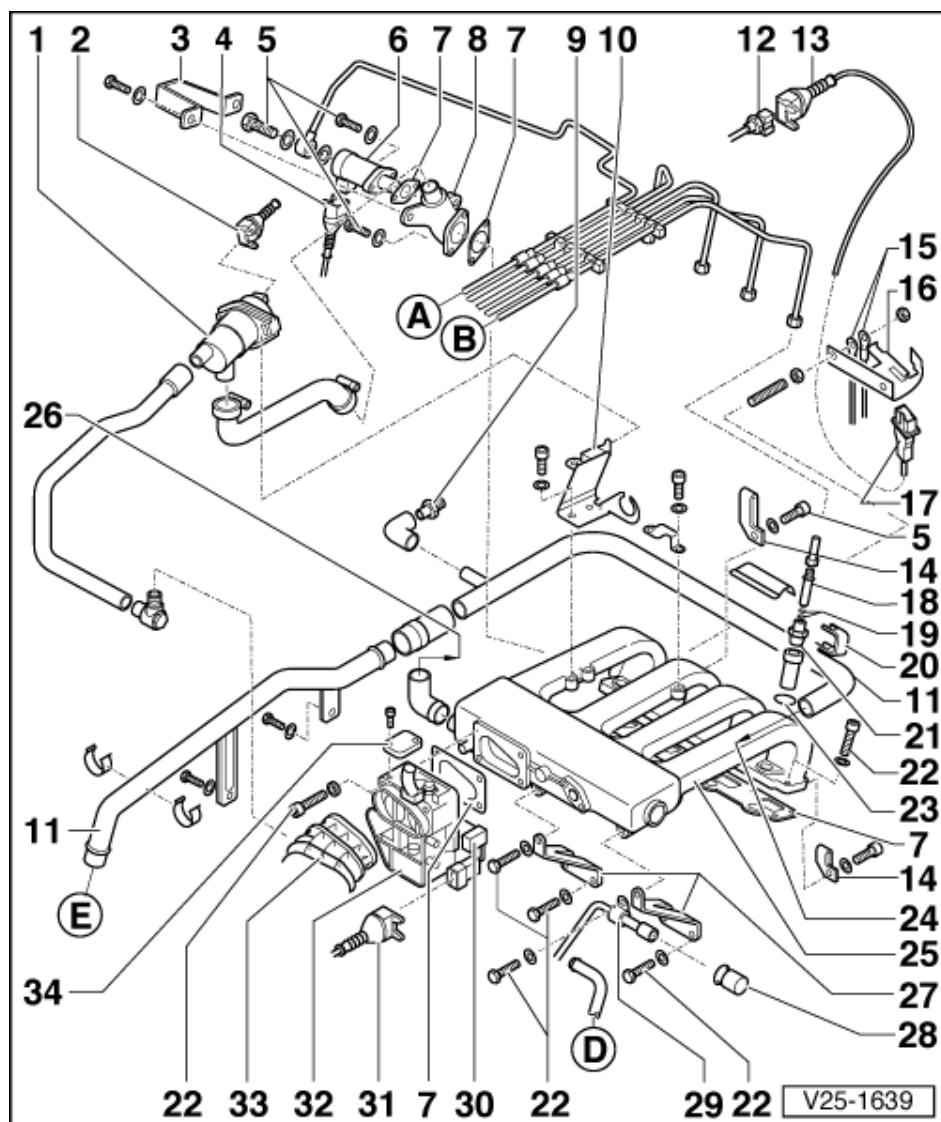
20 Clip

- ♦ For injector

21 Injector insert

- ♦ Use special tool 3135 for removal and installation
- ♦ Apply locking fluid "D 000 600 A2" to upper part on insertion and tighten to 20 Nm

22 20 Nm



23 O-ring

- ♦ Replace

24 To crankcase breather

25 Intake manifold

26 To brake servo

27 Support

- ♦ For intake manifold

28 Cap

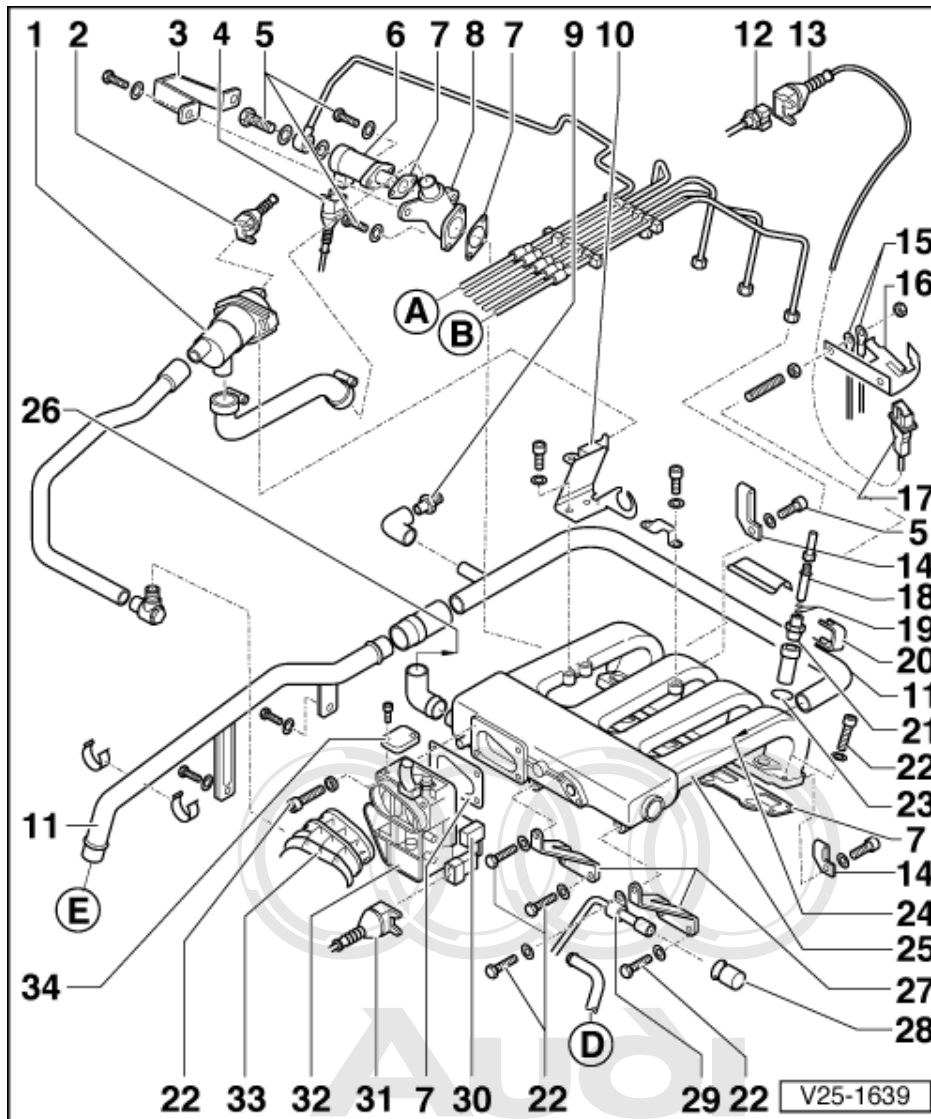
29 CO measurement pipe

30 Idling switch -F60

- ♦ Checking =>Page 54
- ♦ Adjusting => Page 55



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**31 Connector**

- ♦ For idling switch -F60 and full throttle switch -F81

32 Throttle valve assembly

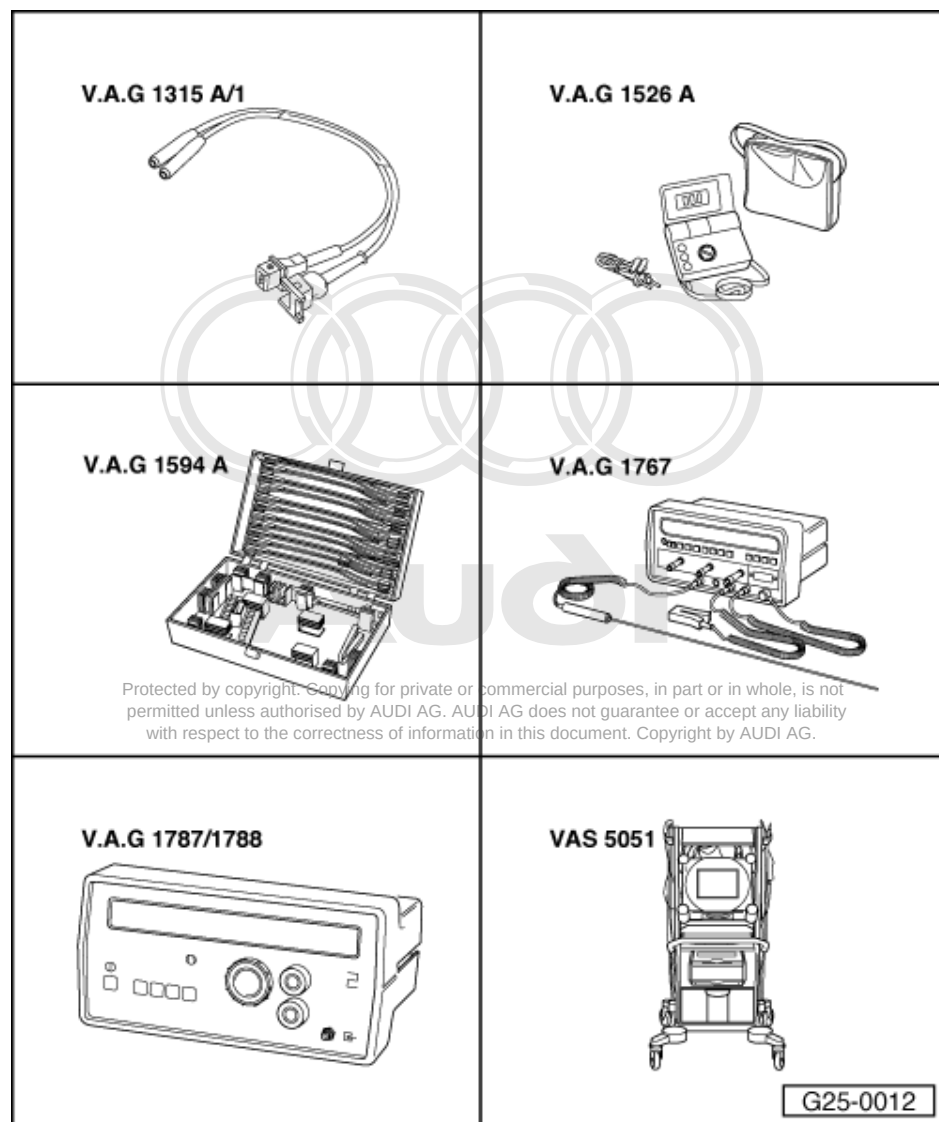
- ♦ With heat shield

33 Air intake elbow**34 Full throttle switch -F81**

- ♦ Checking =>Page 54
- ♦ Adjusting => Page 56



2.4 - Checking idling speed, CO content and ignition point



Special tools and workshop equipment required

- ♦ V.A.G 1315A/1
- ♦ V.A.G 1318/3
- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1767 or V.A.G 1367
with V.A.G 1367/8
- ♦ V.A.G 1788
- ♦ VAS 5051 with VAS 5051/1
and VAS 5051/2

or

- ♦ V.A.G 1551 with V.A.G 1551/1

Notes:

- ♦ Idling speed cannot be adjusted.
- ♦ Idling speed is checked during basic setting of engine.

Test requirements:

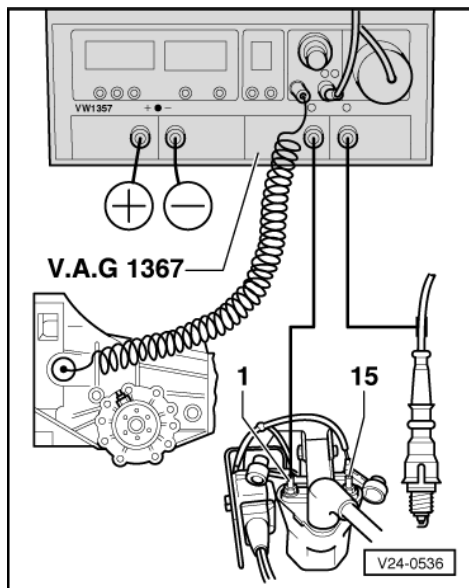
- No leaks in exhaust system
- Coolant temperature at least 85 °C
- Electr. loads switched off (radiator fan must not run during test)
- Air conditioner switched off
- Throttle cable correctly adjusted

=> Fuel Supply System - Petrol Engines; Repair Group 20; Servicing accelerator mechanism; Adjusting throttle cable
 Servicing accelerator mechanism Adjusting throttle cable

- No pressure gauge connected
- Lambda control OK
- If injector pipes have been unfastened or replaced: Rev up engine several times to 3000 rpm and leave it idling for at least 2 minutes

Connecting testers

- Connect vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 and select engine electronics control unit with "address word" 01 => Page 1 .
 Engine must be idling.
- Interrogate fault memory => Page 5 . There must not be any faults stored. If necessary, eliminate fault, erase fault memory, switch off and re-start engine, perform test drive and re-interrogate fault memory as a check.



- Connect up exhaust tester V.A.G 1788.

=> Operating instructions

- Insert measurement probe in exhaust tailpipe.
- -> With ignition switched off, connect up ignition tester V.A.G 1767 (or V.A.G 1367).

=> Operating instructions

Notes:

- ♦ Take particular care to ensure that TDC sender of ignition tester V.A.G 1367 is fully inserted in gearbox housing.
- ♦ Ignition point is displayed directly on V.A.G 1767 (or V.A.G 1367). There is no need to aim timing light at ignition point notches

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- ♦ Incorrect measurements may occur with ignition tester V.A.G 1767 if triggering probe is slightly open (e.g. excessive tension on helical cable).

System in basic setting 0

1 2 3 4 5 6 7 8
9 10

- > Start basic setting, display group 000=>Page 16 .
- Check display in zone 9.
- Specification: 5

If reading does not match specification:

- Check idling switch -F60 => Page 54 .

If reading matches specification:

- Read off ignition point on ignition tester V.A.G 1767 (or V.A.G 1367).
- Test specification: 4 ... 8° before TDC

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Note:

If ignition point displayed is outside tolerance, it must be adjusted prior to checking idling speed whilst system is still set to "Basic setting".

- Adjust ignition point by turning ignition distributor.
- Setting $6 \pm 1^\circ$ before TDC
- Read off idling speed on ignition tester V.A.G 1767 (or V.A.G 1367).
- Specification: 800 ... 1000 rpm 1)
- Read off CO content on exhaust tester.
- Specification: 0.2 ... 1.2 % by vol. 1)

1) Current values:

=> Exhaust emission test binder

If readings match specifications:

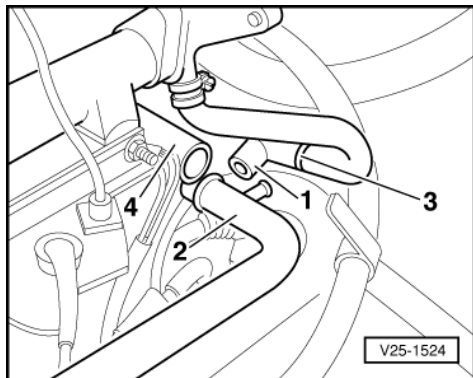
- Exit from basic setting function by pressing =>key.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

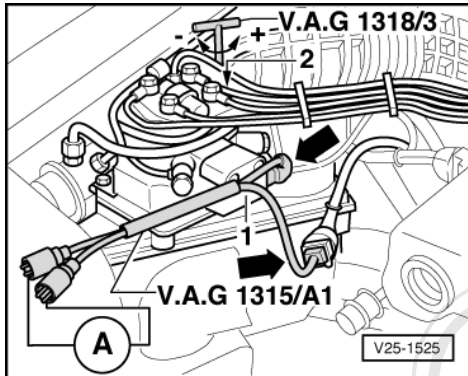
- Enter "06" for "End output" function and confirm with Q key.

If CO value is outside tolerance:



- Switch off ignition.
- > Pull breather hose -1- off crankcase breather pipe -2-.
- Connecting piece -3- with calibrated bore must remain in breather hose

- Pull crankcase breather pipe out of connecting hose -4- so that only fresh air can be drawn in.
- Unplug connector from differential pressure regulator.



- -> Set multimeter to 200 mA measuring range and connect it up with test lead V.A.G 1315 A/1 between differential pressure regulator and its connector.
- Switch on ignition.
 - Positive differential pressure regulator current must be displayed in the range 90... 110 mA

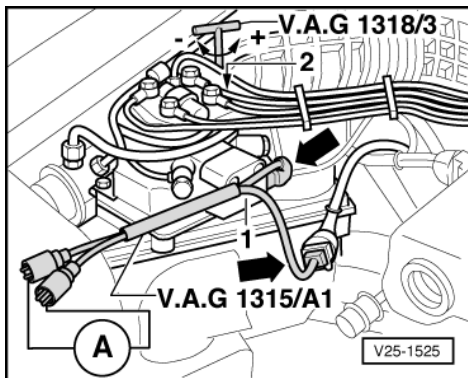
If negative control current is displayed:

- Interchange connections at V.A.G 1315 A/1.
- Start engine and let it idle.

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

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-> Start basic setting, display group 000=>Page 16.



- -> Set control current at adjusting screw -2-.
- Setting: 2.5 ± 2.5 mA (fluctuating)

Note:

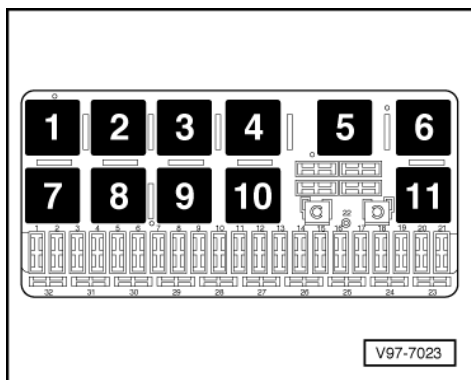
- ♦ If control current does not fluctuate, check Lambda probe -G39 and Lambda control => Page 104 .
- ♦ When adjusting control current, do not press down adjusting key and do not accelerate with adjusting key inserted.
- ♦ After each adjustment operation, remove adjusting key and accelerate briefly before reading off control current at idling speed.
- Exit from basic setting function by pressing =>key.
- Interrogate and erase fault memory => Page 5 .



Perform the following tests marked with a dot if idling speed is too high/too low and no faults have been stored in the fault memory:

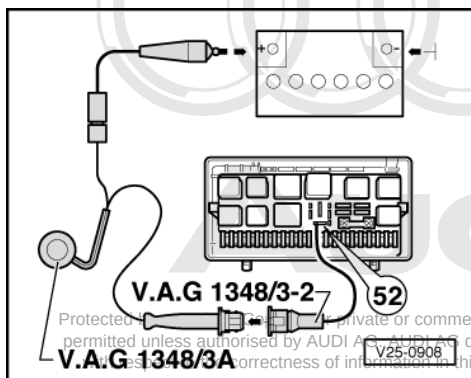
- Check idling-speed switch =>Page **53** .
- Check vacuum connections (unmetered air) => Page **118** .
- Check intake system for leaks (unmetered air) => Page **65** .
- Perform final control diagnosis => Page **13** .

2.5 - Connecting remote control V.A.G 1348/3A with adapter lead V.A.G 1348/3-2



Sequence of operations

- -> Pull off fuel-pump relay (on relay plate with fuse box in plenum chamber, position 10).



- -> Connect remote control V.A.G 1348/3A with adapter lead V.A.G 1348/3-2 to contact 52 of relay socket (position 10).
- Connect pick-off to vehicle battery (+).

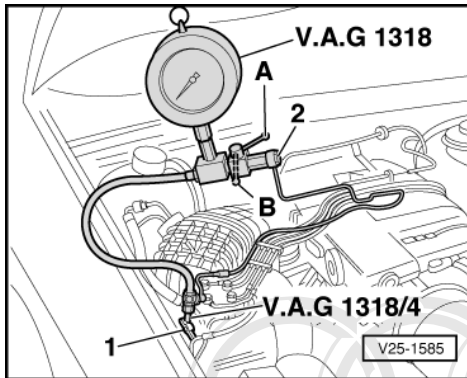
2.6 - Connecting pressure gauge V.A.G 1318 with test adapter 1318/4

Attention:

Fuel system is pressurised. Wrap cloth around joint before opening system. Then dissipate pressure by carefully unfastening joint.

Note:

Always use new sealing rings.



- -> Connect pressure gauge V.A.G 1318 with test adapter 1318/4 to measurement point -1- of fuel distributor.
- Unscrew pipe -2- at cold start valve and connect it to pressure gauge V.A.G 1318; pressure gauge lever in -open- position (lever in direction of flow).

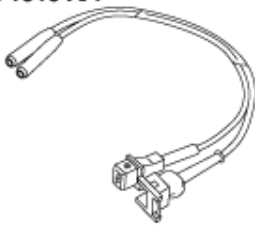
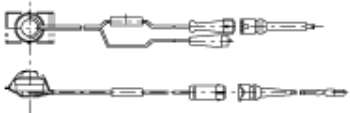
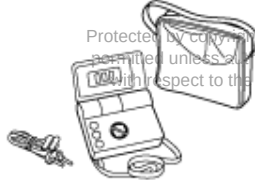
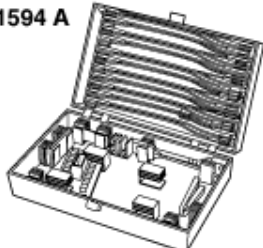
Position of cut-off valve:

- A - open
- B - closed

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2.7 - Checking system pressure, differential pressure and holding pressure

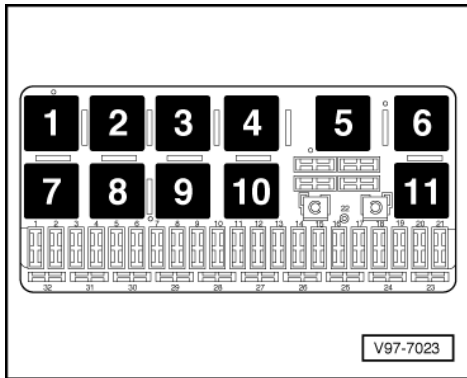
V.A.G 1315 A/1 	V.A.G 1318 
V.A.G 1348/3A 	V.A.G 1526 A 
V.A.G 1594 A 	G25-0013

Special tools and workshop equipment required

- ♦ V.A.G 1315 A/1
- ♦ V.A.G 1318
- ♦ V.A.G 1318/4
- ♦ V.A.G 1348/3A with V.A.G 1348/3-2
- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ Fuel-resistant beaker

Test requirements:

- Battery voltage at least 11 V



- -> Fuse S13 OK
- Fuel pump relay OK; checking => Page 38
- Fuel pump OK; checking

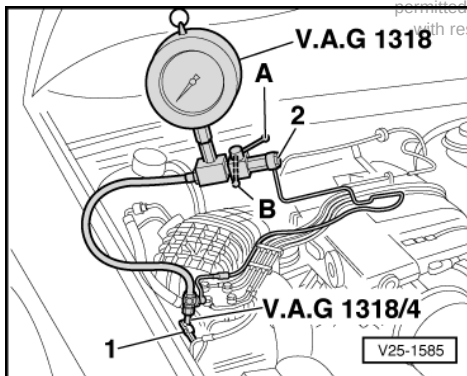
=> Fuel Supply System - Petrol Engines; Repair Group 20; Fuel Supply Fuel Supply

- Fuel filter OK
- Remote control V.A.G 1348/3A connected with adapter lead V.A.G 1348/3-2 => Page 84
- Pressure gauge V.A.G 1318 connected with test adapter 1318/4 => Page 84

Attention:

Checking system pressure and fuel pressure regulator

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- -> Open cut-off valve of pressure gauge V.A.G 1318 -position A-.
- Press switch on remote control.
 - Specification: 6.1 ... 6.6 bar

If reading does not match specification:

- Replace fuel pressure regulator.

If reading exceeds specification:

- Disconnect return hose from pressure regulator at return hose/pipe connection and hold over a suitable vessel.
- Repeat test.

If reading now matches specification:

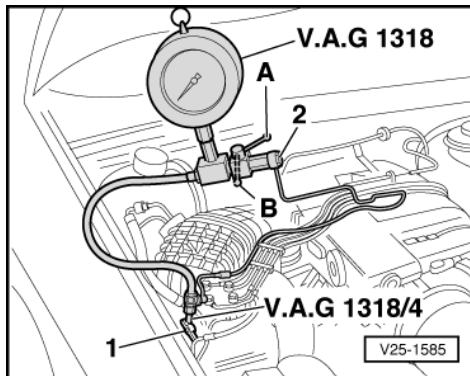
- Check return pipe for blockage.

If reading still exceeds specification:



- Replace fuel pressure regulator.

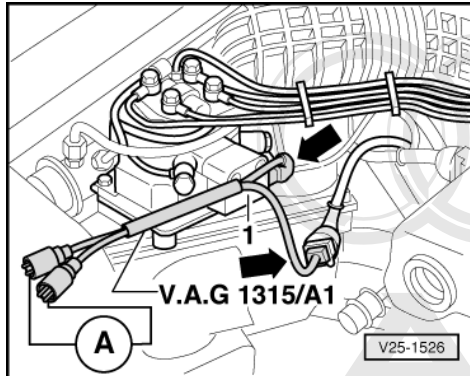
Checking differential pressure



- -> Close cut-off valve of pressure gauge V.A.G 1318 -position B-.
- Unplug connector from differential pressure regulator.
- Press switch on remote control.
 - Differential pressure specification:
0.3 ... 0.5 bar below system pressure

If reading exceeds or drops below specification:

- Unscrew thin pipe at fuel pressure regulator and hold it over a beaker.
- Seal off free connection at fuel pressure regulator.
- Press switch on remote control.
 - Overflow specification: 130 ... 150 cm³
- If necessary, replace differential pressure regulator.
- Re-connect thin pipe to fuel pressure regulator.



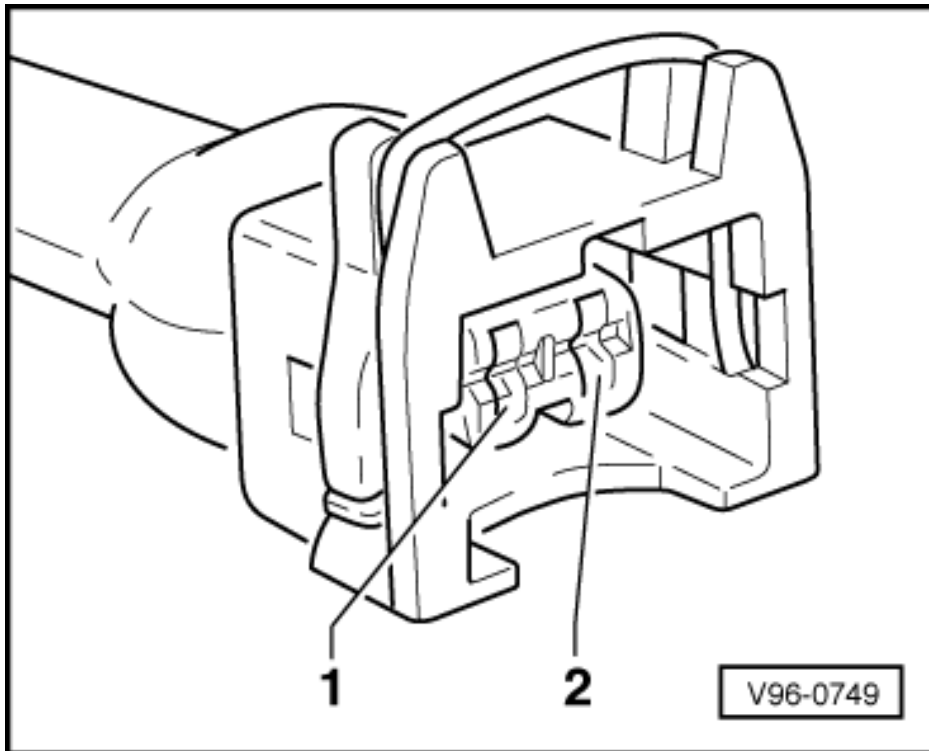
- -> Set multimeter to 200 mA measuring range and connect it up with test lead V.A.G 1315 A/1 between differential pressure regulator -1- and its connector -arrows-.
- Switch on ignition.
- Press switch on remote control.
 - Differential pressure specification:
1.3 ... 1.6 bar below system pressure
 - Differential pressure regulator current specification: 90 ... 110 mA

If reading exceeds or drops below differential pressure specification:

- Replace pressure regulator -N73.

If reading exceeds or drops below differential pressure and differential pressure regulator current specifications:

- With ignition switched off, use adapter V.A.G 1598/3 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 35 .



- -> Check for open circuit and short to earth/positive in the following wiring.

Connector Contact	Test box V.A.G 1598 A Socket
1	4
2	5

- If necessary, eliminate open circuit in wiring/short circuit.

=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

If no fault is found in wiring:

- Replace engine control unit => Page 36 .

Checking holding pressure

Note:

This test is only to be performed on vehicles with warm starting problems.

- Press switch on remote control for approx. 5 seconds.

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- Check holding pressure on pressure gauge
- After 10 minutes pressure must still be at least 3.3 bar
- After 20 minutes pressure must still be at least 3.2 bar

Possible faults if holding pressure drops below minimum values:

- ◆ Non-return valve in fuel pump defective

=> Fuel Supply System - Petrol Engines; Repair Group 20; Fuel Supply Fuel Supply

- ◆ Idle motion of sensor plate not OK; checking => Page 96 .
- ◆ Check injector and fuel pipe unions at fuel distributor for leaks



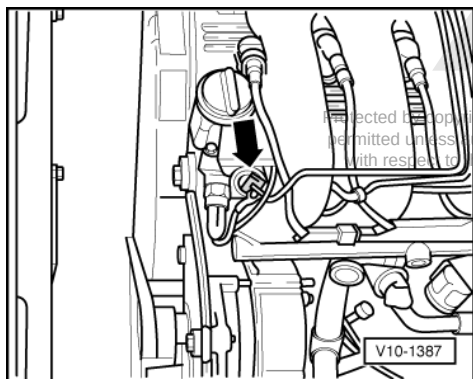
- ♦ Fuel pressure regulator defective

Note:

Drain fuel at measuring device before detaching pressure gauge.

2.8 - Removing and installing injectors

Removing



- -> Pull off fasteners -arrow- at injector/fuel pipe connection.
- Pull injectors with connected fuel pipes out of intake manifold.

Note:

Take care not to kink fuel pipes.

- Injector must be unscrewed from injector pipe for injector replacement.

Attention:

- Detach upper and lower O-ring at injector.

Installing

Install in reverse order, paying attention to the following:

Note:

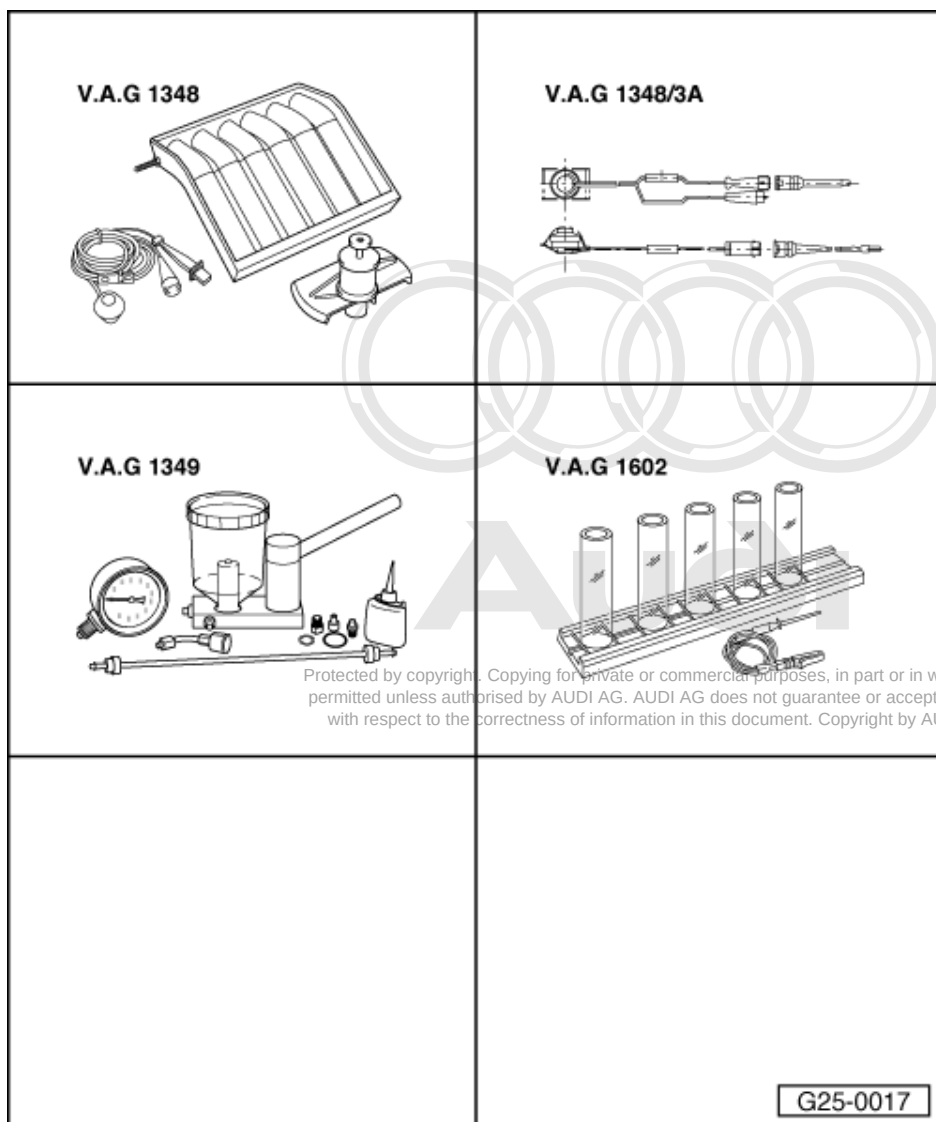
Replace O-rings.

- Moisten O-rings at injectors with a small quantity of fresh engine oil.

Tightening torque

Component	Nm
Injector pipe to injector	20

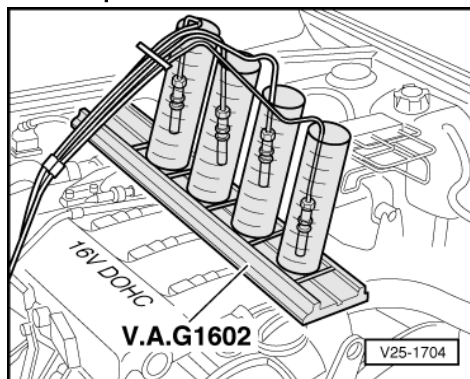
2.9 - Checking injectors



Special tools and workshop equipment required

- ◆ V.A.G 1348/1A from V.A.G 1348
- ◆ V.A.G 1348/3A with V.A.G 1348/3-2
- ◆ V.A.G 1349
- ◆ V.A.G 1602

Test sequence

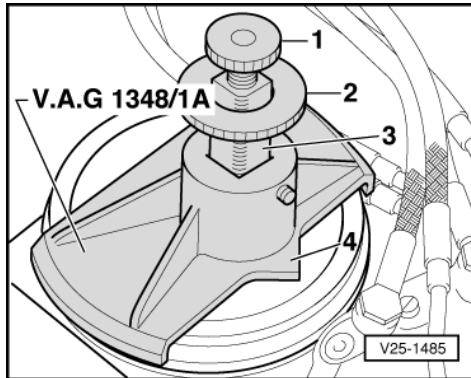




- Remove injectors => Page **90** .
- -> Insert injectors in openings in measuring device V.A.G 1602.

Note:

Make sure fuel pipes are not kinked; remove from retaining clips if necessary.

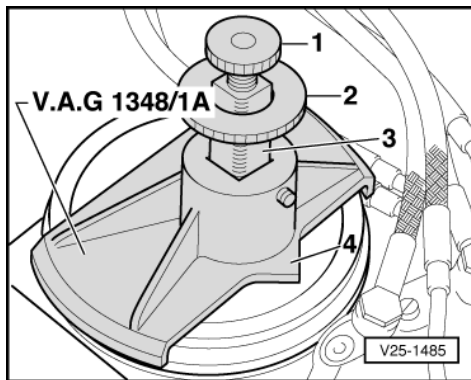


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- -> Screw adjusting screw -1- and knurled nut -2- at V.A.G 1348/1A into upper end position and pull slide -3- upwards.
- Position V.A.G 1348/1A on rim of air-flow meter such that tip -4- points in direction of fuel distributor.
- Push in slide -3- as far as it will go.
- Hold sensor plate manually in rest position.
- Screw in adjusting screw -1- until magnetic base makes contact with securing bolt of sensor plate.

Checking spray pattern and freedom from leaks

- Connect up remote control V.A.G 1348/3A with adapter lead V.A.G 1348/3-2 => Page **84** .

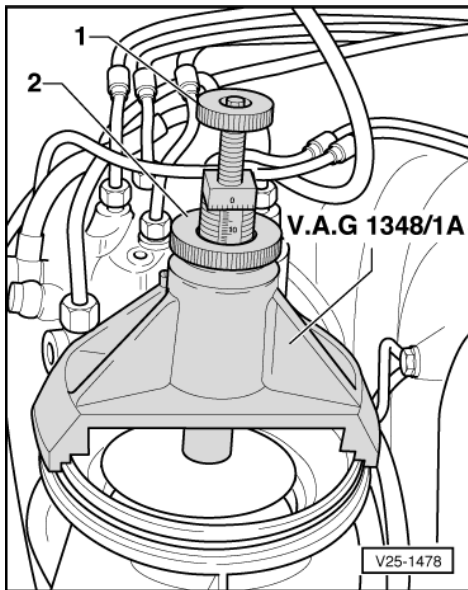


- -> Pull up slide -3- as far as it will go.
- Press switch on remote control.
 - Injectors must exhibit conical spray pattern
 - Spray pattern must be the same for all injectors

If spray pattern of one injector is different:

- Briefly lift sensor plate once and repeat test.
- Return sensor plate to rest position.
- Dry nozzles of injectors.
- Press switch on remote control for 2 minutes.
 - Injectors must not dribble within 2 minutes
- Drain V.A.G 1602.

Checking idle injection tolerance



- -> Screw down knurled nut -2- by 15 mm.
- Press switch on remote control until there are 20 ml of fuel in beaker.
- Compare fuel quantities of injectors.
 - Permissible difference: max. 2.0 ml for all injectors

Note:

Hold measuring device horizontal.

If difference is greater:

- Interchange injectors with highest and lowest injection quantity.
- Drain V.A.G 1602.
- Repeat test.

If difference in fuel quantity accompanies injector:

- ♦ Injector defective

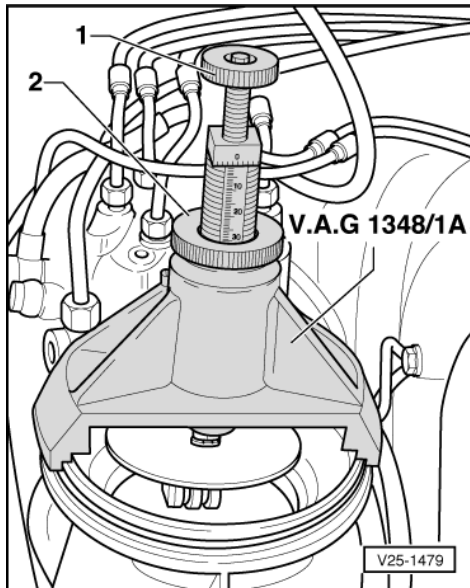
If difference in fuel quantity is still found at same cylinder:

- ♦ Pipe to injector constricted or fuel distributor defective

Checking full throttle injection tolerance

- Drain V.A.G 1602.

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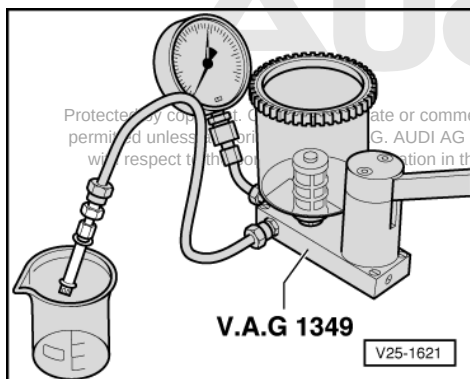
- -> Screw down knurled nut -2- by 30 mm.
- Press switch on remote control until there are 80 ml of fuel in beaker.
- Compare fuel quantities of injectors.
 - Permissible difference: max. 8.0 ml for all injectors

Note:

Hold measuring device horizontal.

Checking spray pressure

- Disconnect fuel pipe at injector to be checked.

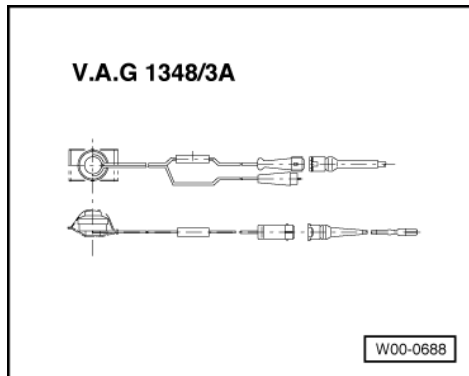


- -> Connect injector to V.A.G 1349.
- Bleed pipe to injector with union nut open by moving lever on V.A.G 1349 several times.
- Tighten union nut.
- Bleed injector by rapidly moving lever 10 ... 15 times on V.A.G 1349.
- Open cut-off valve.
- Check spray pressure by slowly moving lever.
 - Specification: 3.7 ... 4.8 bar

If reading does not match specification:

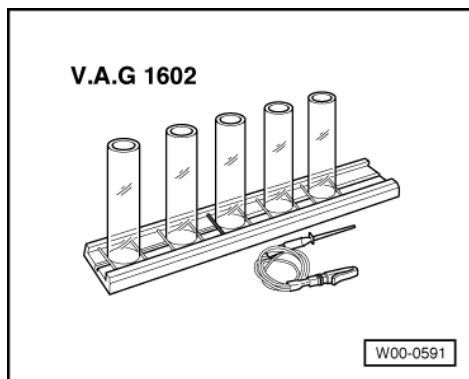
- Replace injector.

2.10 - Checking adjusting lever and control plunger



Special tools and workshop equipment required

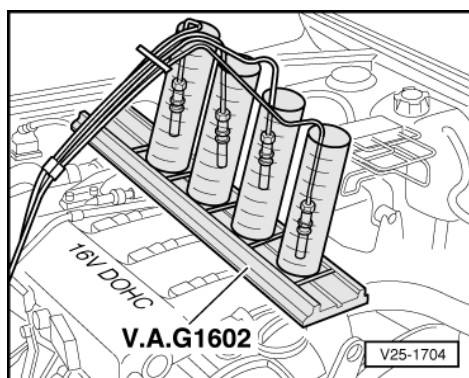
- ♦ V.A.G 1348/3A with V.A.G 1348/3-2



- ♦ V.A.G 1602

Test sequence

- Remove injectors => Page 90 .



- -> Insert injectors in openings in measuring device V.A.G 1602.

Note:

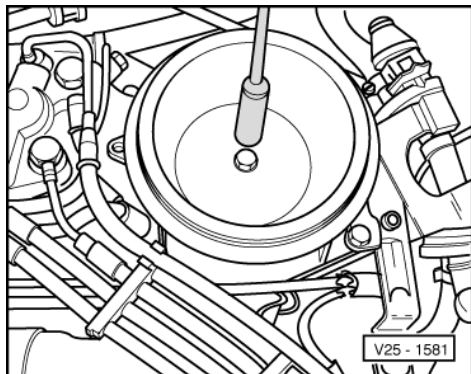
Make sure fuel pipes are not kinked; remove from retaining clips if necessary.

- Detach air intake elbow.



- Operate starter for approx. 10 seconds to build up control pressure.

or



- Press switch on remote control for approx. 10 seconds (connecting remote control V.A.G 1348/3A with adapter lead V.A.G 1348/3-2 => Page 84).
- -> Lift adjusting lever by way of sensor plate.
 - Lever resistance must be uniform over entire distance
 - No resistance must be felt on rapid downwards movement
- If necessary, replace air-flow meter.

If lever is difficult to move upwards but moves easily downwards, then control plunger is sticking:

- Replace fuel distributor.

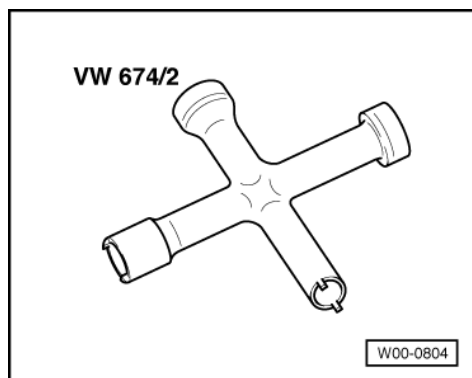
If lever is difficult to move in both directions:

- Replace air-flow meter.

2.11 - Checking and adjusting rest position and idle motion of sensor plate

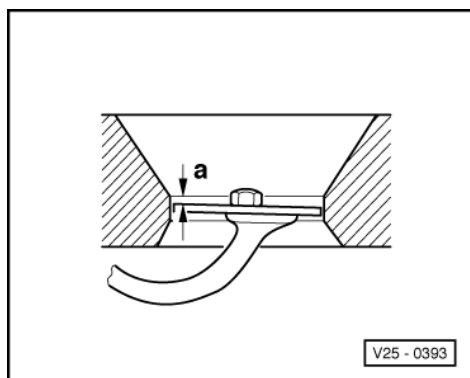
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Special tools and workshop equipment required



- ♦ Cross wrench VW 674/2

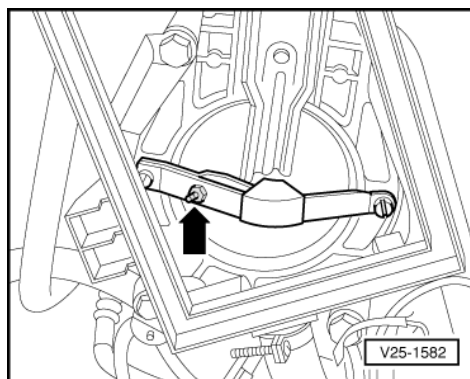
Checking rest position



- -> Top edge of sensor plate must be below tapered edge of venturi (dimension -a-)
- Dimension $a = 1.9 + 1.1 \text{ mm}$

Adjusting rest position

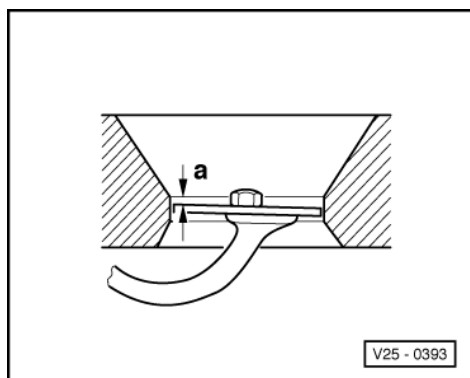
- Remove lower part of air cleaner housing and take out filter element.



- -> Adjust rest position of sensor plate at adjusting screw -arrow- such that ...

Note:

Take care not to bend leaf spring.



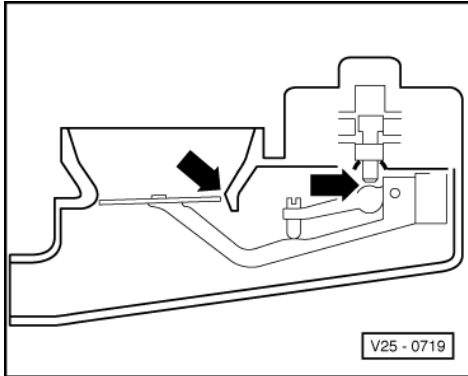
- -> ... top edge of sensor plate is below tapered edge of venturi (dimension -a-).
- Dimension $a = 1.9 + 1.1 \text{ mm}$



Checking idle motion of sensor plate

Test requirements:

- Rest position of sensor plate OK
- CO setting OK; checking => Page 80



-> Idle motion refers to the clearance between control plunger and adjusting lever -right arrow- measured on side of sensor plate facing fuel distributor -left arrow-.

- Operate starter for approx. 10 seconds to build up control pressure.
- or
- Press switch on remote control for approx. 10 seconds (connecting remote control V.A.G 1348/3A with adapter lead V.A.G 1348/3-2 => Page 84).
- Lift sensor plate slightly until resistance is felt.
 - Min. idle motion: 0.5 mm
 - Max. idle motion: As far as tapered edge of venturi = 3 mm

If idle motion is not OK:

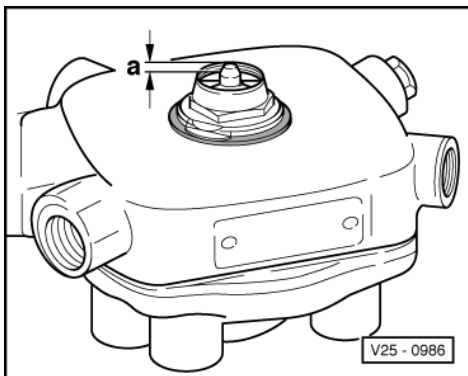
- Adjust idle motion at fuel distributor.

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Adjusting idle motion at fuel distributor

Requirement:

- CO setting OK; checking => Page 80



- -> Set idle motion of sensor plate using cross wrench VW 674/2 at stop bolt for control plunger.

Alteration to dimension -a-:

- Screw in = Greater idle motion
 - Screw out = Less idle motion
 - 1/4 turn = approx. 1.3 mm at sensor plate
- Check idling speed, CO content and ignition point => Page 80 .

2.12 - Basic setting of adjusting lever

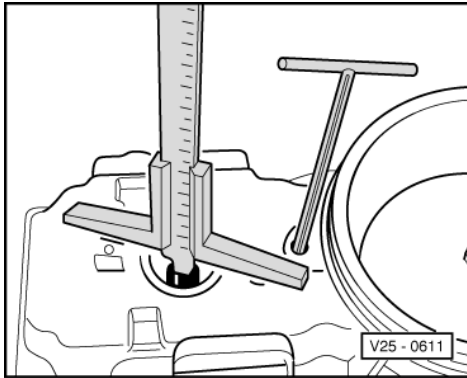
Note:

Basic setting of adjusting lever is only necessary if fuel distributor or air-flow meter is replaced.

Special tools and workshop equipment required

- ♦ V.A.G 1318/3
- ♦ Depth gauge

Sequence of operations



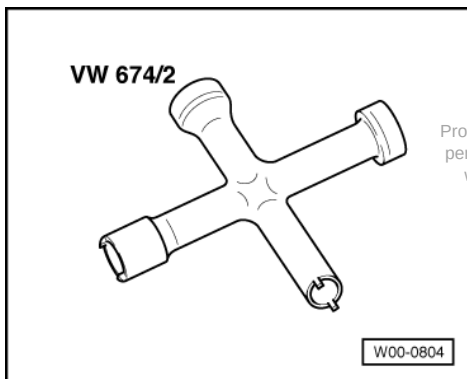
- -> Measure distance between resting surfaces for fuel distributor at air-flow meter and roller of adjusting lever.
 - Specification: 21.3 ± 0.1 mm
- If necessary, adjust distance at CO adjusting screw.

Note:

This setting is no longer valid after adjusting CO content (differential pressure regulator current) to specified value.

2.13 - Removing and installing control plunger

Special tools and workshop equipment required



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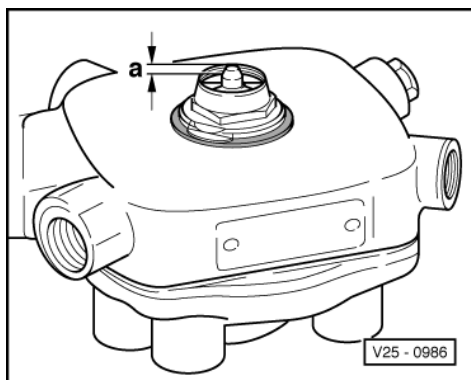
- ♦ Cross wrench VW 674/2

Sequence of operations

Note:

Stop bolt only has to be adjusted after replacing gasket for control plunger.

- Perform the following operations before turning stop bolt:
 - Use scriber to mark position of stop bolt.

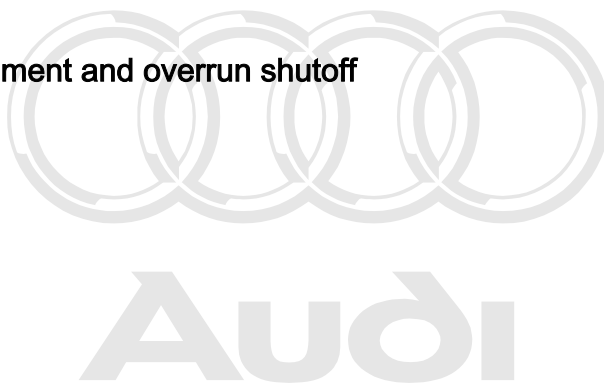
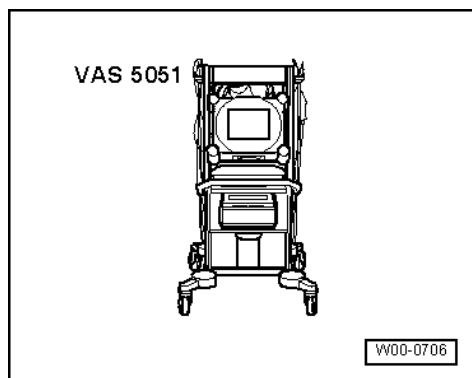


- -> Measure distance -a- between stop bolt and collar of hexagon nut and note down value.
Screw out stop bolt for control plunger using tool VW674/2.
Clean control plunger with petrol before inserting.
- Replace sealing ring for stop bolt.
 - Small $\varnothing$ of sealing ring faces control plunger
- Screw in stop bolt as far as value -a- noted down.
- Check rest position and idle motion of sensor plate => Page 96 .

Notes:

- ♦ Mechanical cleaning of control plunger is not permitted.
- ♦ If control plunger is severely scored or if freedom of movement cannot be achieved by applying clean naphtha, replace fuel distributor.

2.14 - Checking cold acceleration enrichment and overrun shutoff



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Special tools and workshop equipment required

- ♦ VAS 5051 with VAS 5051/1 and VAS 5051/2
- or

- ♦ V.A.G 1551 with V.A.G 1551/1

Checking cold acceleration enrichment

Test requirements:

- Engine cold
- Air conditioner switched off
- Idling-speed switch and full throttle switch OK; checking
=> Page 54

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

-> Read measured value block, Display group 000, engine idling
=>Page 19 .

Only continue with test if value in display zone 1 is at least 96 (corresponding to a coolant temperature of less than 60 °C).

- Check display in zone 9.
 - Specification: 5
- Abruptly open throttle valves as far as they will go and release accelerator mechanism again (burst of throttle).
 - Value must briefly increase to 70

If reading does not match specification:

- Check coolant temperature sender -G62=>Page 138 .

Checking overrun shutoff

Test requirements:

- Coolant temperature at least 60 °C
- Air conditioner switched off
- Idling-speed switch and full throttle switch OK; checking
=> Page 54

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

-> Read measured value block, Display group 000, engine idling
=>Page 19 .

Do not continue with test until value in display zone 1 is no greater than 95 (corresponding to a coolant temperature of greater than 60 °C).

- Check display in zone 9.
 - Specification: 5
- Increase engine speed to in excess of 3000 rpm and abruptly release accelerator mechanism.
 - Value must briefly increase to 133

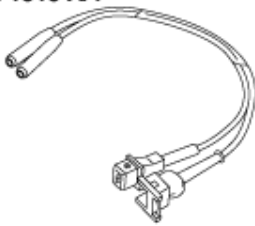
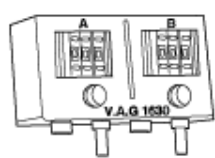
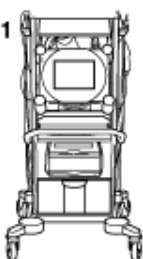
If reading does not match specification:

- Check coolant temperature sender -G62=>Page 138 .

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2.15 - Checking post-start and warm-up enrichment

V.A.G 1315 A/1 	V.A.G 1526 A 
V.A.G 1594 A 	V.A.G 1630 
VAS 5051 	G25-0015

Special tools and workshop equipment required

- ♦ V.A.G 1315A/1
- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1630
- ♦ VAS 5051 with VAS 5051/1 and VAS 5051/2

or

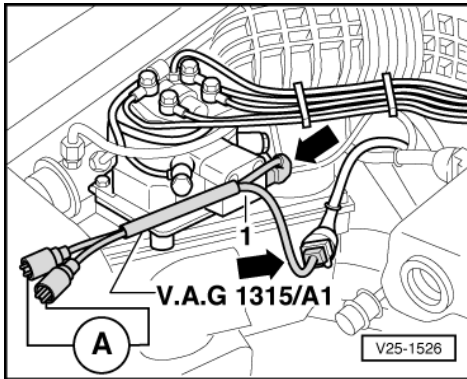
- ♦ V.A.G 1551 with V.A.G 1551/1

Test requirements:

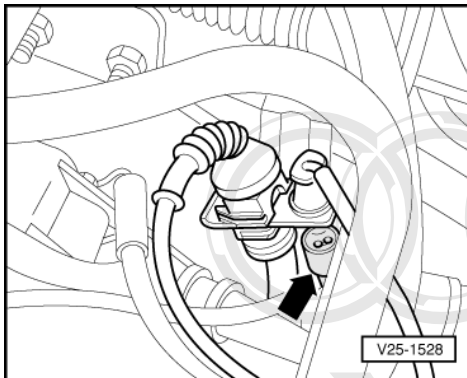
- No faults stored in fault memory
- Coolant temperature at least 80 °C

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Test sequence

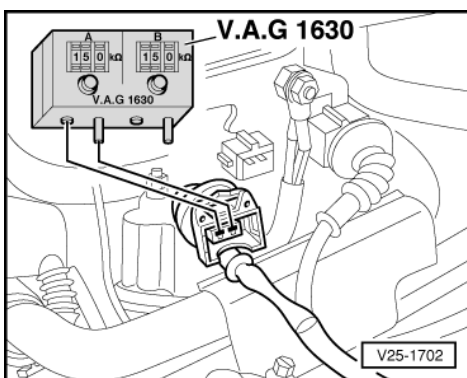


- Unplug connector from differential pressure regulator.
- -> Set multimeter to 200 mA measuring range and connect it up with test lead V.A.G 1315 A/1 between differential pressure regulator -1- and its connector -arrows-.
- Switch on ignition.
 - Positive differential pressure regulator current must be displayed in the range 90... 110 mA



If negative differential pressure regulator current is displayed:

- Interchange connections at V.A.G 1315 A/1.
- -> Unplug connector -arrow- for Lambda probe signal wire.
- Unplug connector at coolant temperature sender.



- -> Connect side A of digital potentiometer V.A.G 1630 to unplugged connector of coolant temperature sender.
- Set side A of V.A.G 1630 to 2.5 kΩ.
- Start engine and let it idle.
 - Specification for 6 ... 9 seconds: 12 ... 34 mA



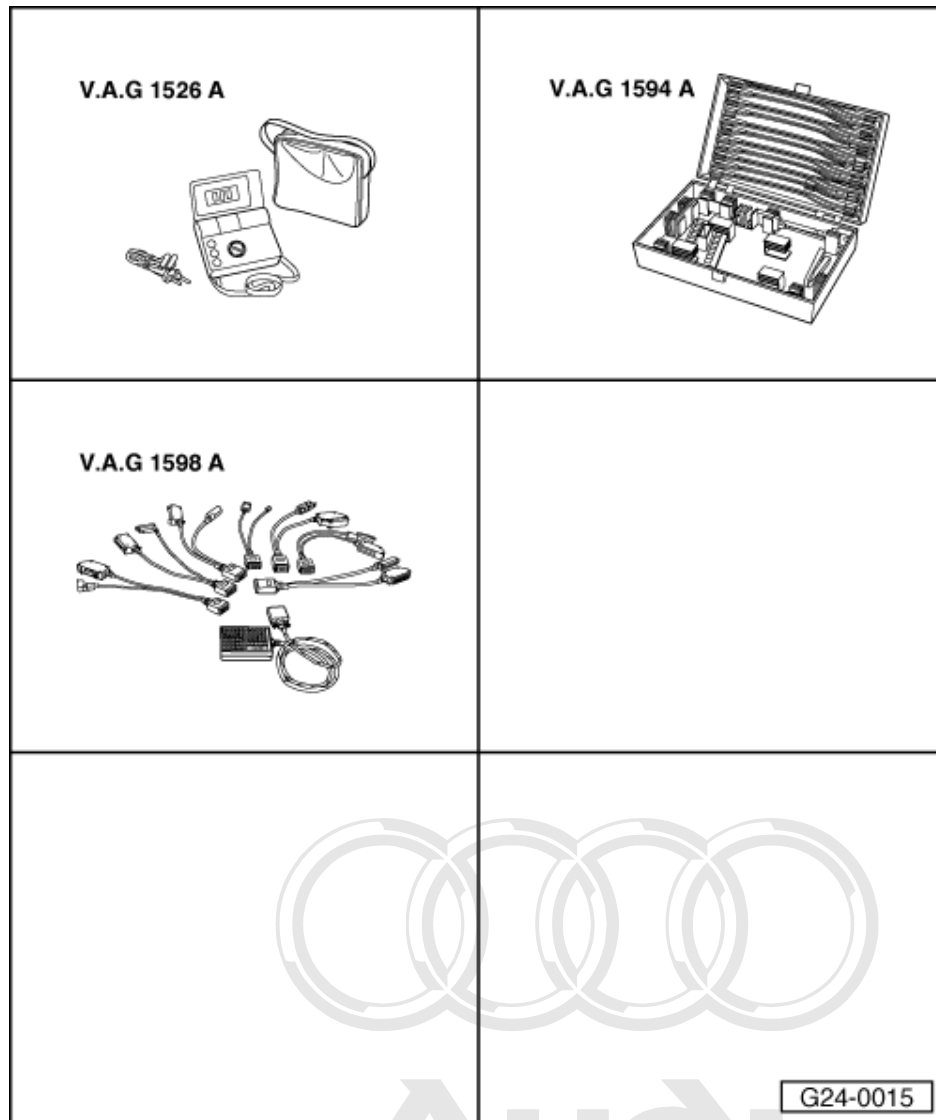
subsequently decreasing by 14 ... 18 mA

If reading does not match specification:

- Check differential pressure regulator => Page **62** .

3 - Checking Lambda control

3.1 - Checking Lambda control



3.2 - Checking Lambda probe -G39 and Lambda control

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Special tools and workshop equipment required

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

♦ V.A.G 1598/3

Test requirements:

- Coolant temperature at least 85 °C
- Idling speed OK
- Differential pressure regulator OK; checking => Page 62
- No leaks in exhaust system between catalytic converter and cylinder head
- Lambda-probe heater OK; checking => Page 106
- Coolant temperature sender -G62 OK; checking => Page 138

Test sequence

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

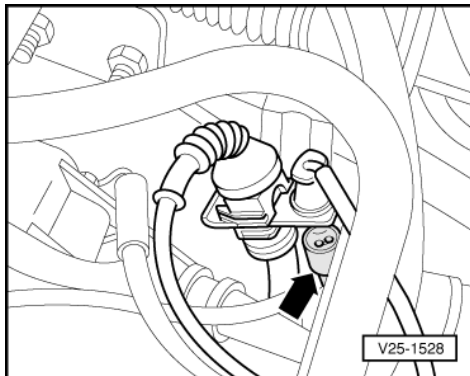
-> Read measured value block, Display group 000, engine idling
=>Page 19 .

Do not continue with test until value in display zone 1 is no greater than 56 (corresponding to a coolant temperature of greater than 85 °C).

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- Check display in zone 6.
- Specification: 0 ... 255 (fluctuating)

If value displayed does not fluctuate as described:



- -> Unplug connector -arrow- for Lambda probe signal wire.
- Connect up multimeter for resistance measurement between signal wire and engine earth.
- Specification: $\infty \Omega$

If reading does not match specification:

- Replace Lambda probe.

If reading matches specification:

- Connect up multimeter for voltage measurement between connector of signal wire to engine control unit and engine earth.
- Switch on ignition.
- Specification: 400 ... 700 mV

If reading does not match specification:

- With ignition switched off, use adapter V.A.G 1598/3 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 35 .
- Check for open circuit and short to earth/positive in the following wiring.



Connector Contact	Test box V.A.G 1598 A Socket
Signal wire	7

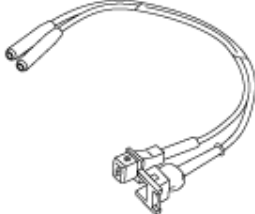
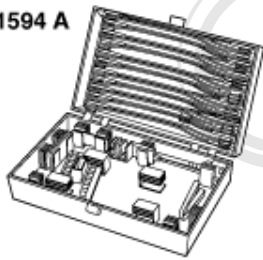
- If necessary, eliminate open circuit in wiring/short circuit.

=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

If wiring is OK:

- Replace engine control unit => Page **36** .

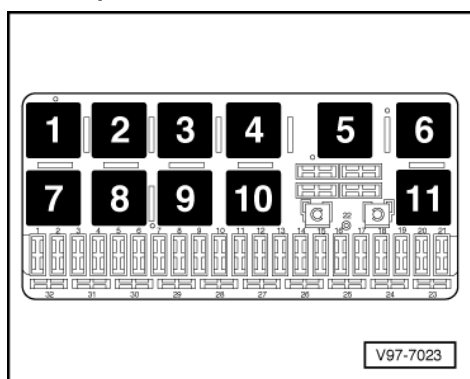
3.3 - Checking Lambda probe heater -Z19

V.A.G 1315 A/1 	V.A.G 1526 A 
V.A.G 1594 A 	
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Special tools and workshop equipment required

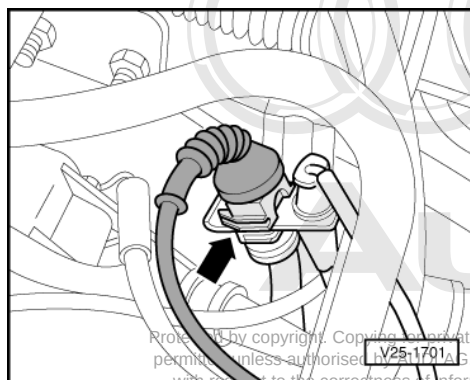
- ♦ V.A.G 1315 A/1
- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A

Test requirements:

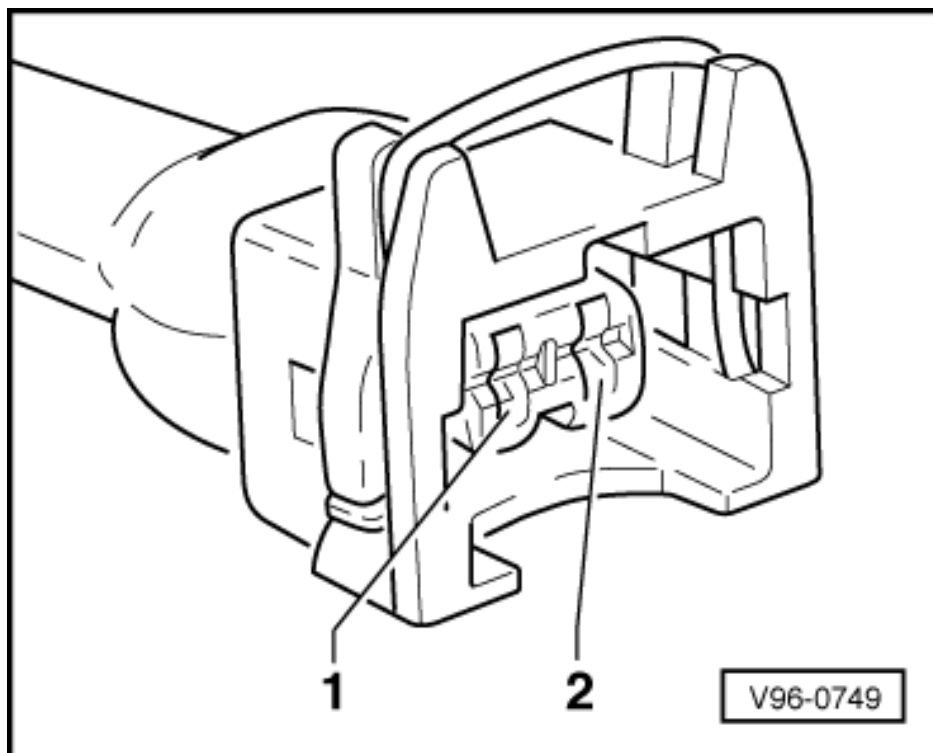


- -> Fuse S25 OK (in fuse box)
- Fuel pump relay OK; checking => Page 38
- Engine cold

Test sequence



- -> Unplug connector -arrow- for Lambda probe heating.





- -> Connect up multimeter for voltage measurement between contacts 1 and 2.
- Start engine and let it idle.
 - Specification: approx. battery voltage

If reading does not match specification:

- Eliminate open circuit in wiring.

=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

If reading matches specification:

- Connect auxiliary test lead V.A.G 1315 A/1 to 2-pin connector.
- Switch multimeter to 10 A measuring range (connect test lead to 10 A connection).
- Start engine and leave it idling.
 - Specification: 0.5 ... 3.0 A

Note:

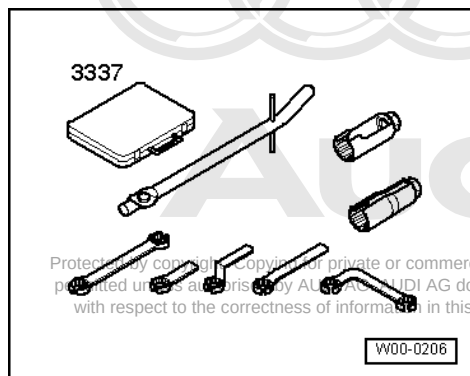
Current input decreases as Lambda probe becomes warmer.

If reading does not match specification:

- Replace Lambda probe.

3.4 - Removing and installing Lambda probe

Special tools and workshop equipment required



- ♦ Ring spanner set for Lambda probe 3337
- ♦ Hot bolt paste G 052 112 A3

Sequence of operations

- Unplug connectors for Lambda probe.
- Unfasten cable ties.
- Use special tool 3337 to screw out Lambda probe.

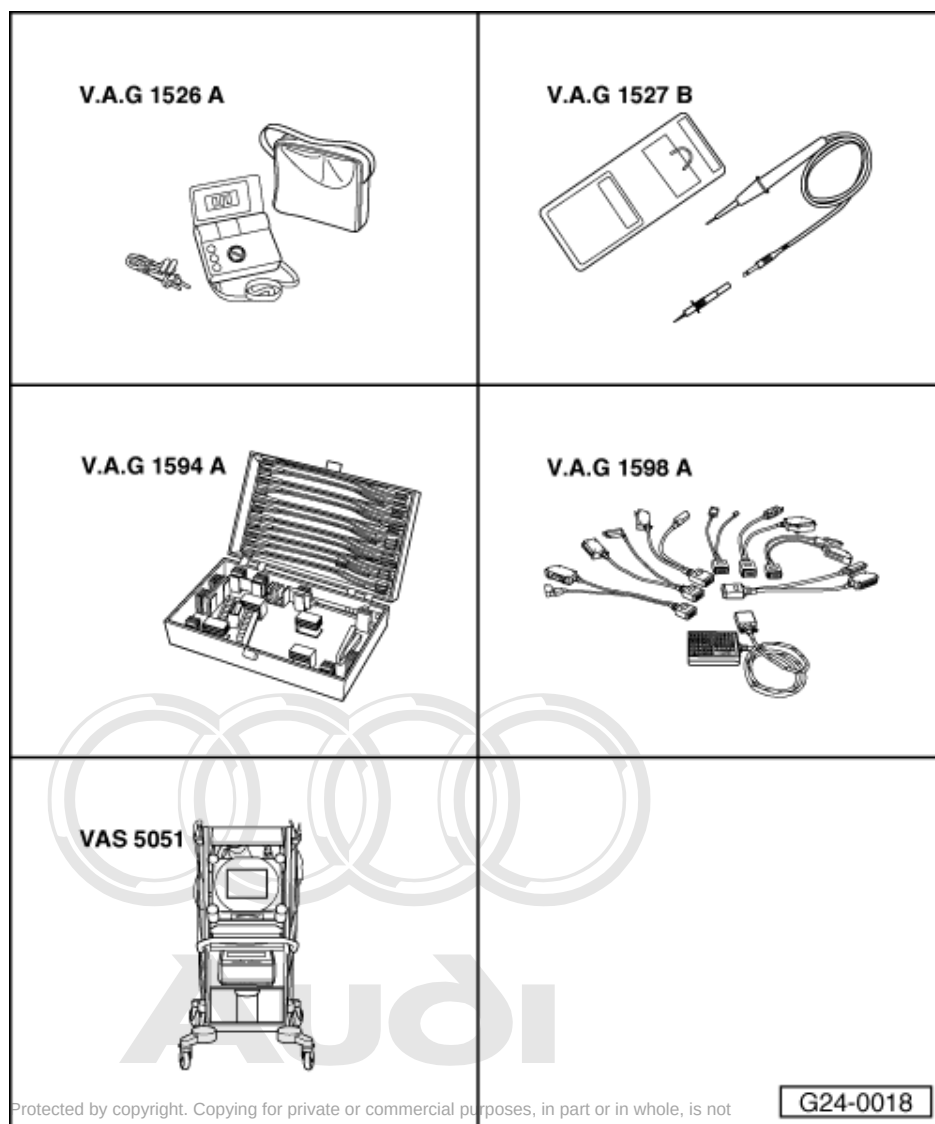
Pay attention to the following on installation:

Notes:

- ♦ The thread of the Lambda probe is coated with an assembly paste, which must not be allowed to ingress into the openings in the probe.
- ♦ Tightening torque 55 Nm

4 - Checking fuel tank breather system

4.1 - Checking fuel tank breather system



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4.2 - Checking activated charcoal filter solenoid valve -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 A
- ◆ V.A.G 1598/3
- ◆ VAS 5051 with VAS 5051/1 and VAS 5051/2

or

- ◆ V.A.G 1551 with V.A.G 1551/1



Fitting location => Exploded view of fitting locations - Page 30

Note:

The activated charcoal filter solenoid valve is also referred to in this context as fuel tank breather valve or ACF valve.

Leak test

Activated charcoal filter solenoid valve -N80 is closed when deenergised.

- Pull hoses off ACF valve; leave connector attached.
- Connect test hose to one connection of ACF valve.
- Start final control diagnosis =>Page 13 and actuate activated charcoal filter solenoid valve -N80.

-> Indicated on display:

Final control diagnosis
Activated charcoal filter solenoid valve
-N80

Valve must click...

...and must open and close (can be checked by blowing into test hose).

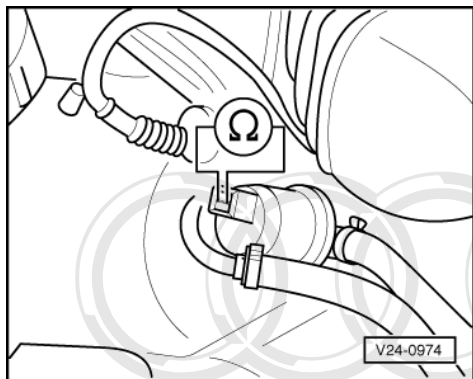
If valve does not open and close properly:

- Replace ACF valve.

If solenoid valve does not react during final control diagnosis:

- Check internal resistance of ACF valve.

Checking internal resistance



- Unplug connector at ACF valve.
- -> Connect multimeter to valve for resistance measurement.
- Specification: 20 ... 28 ω

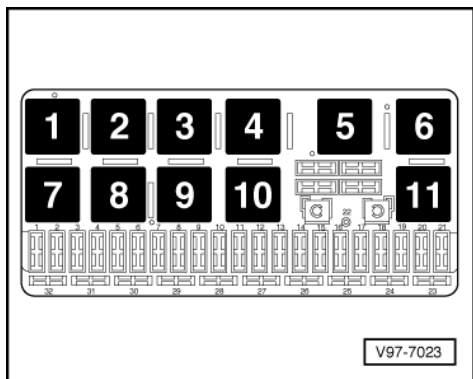
If reading does not match specification:

- Replace ACF valve.

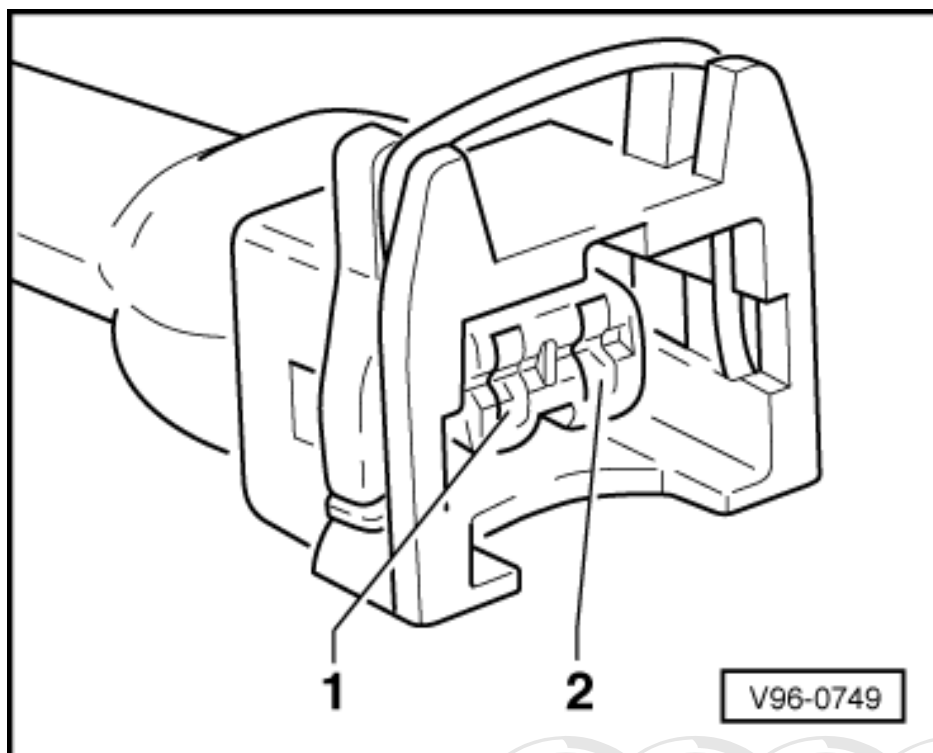
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Checking power supply AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Test requirement:



- -> Fuse S28 OK (in fuse box)
- Unplug connector at ACF valve.



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

Connector Contact	Measure to
1	Engine earth

- Switch on ignition.
- LED must light

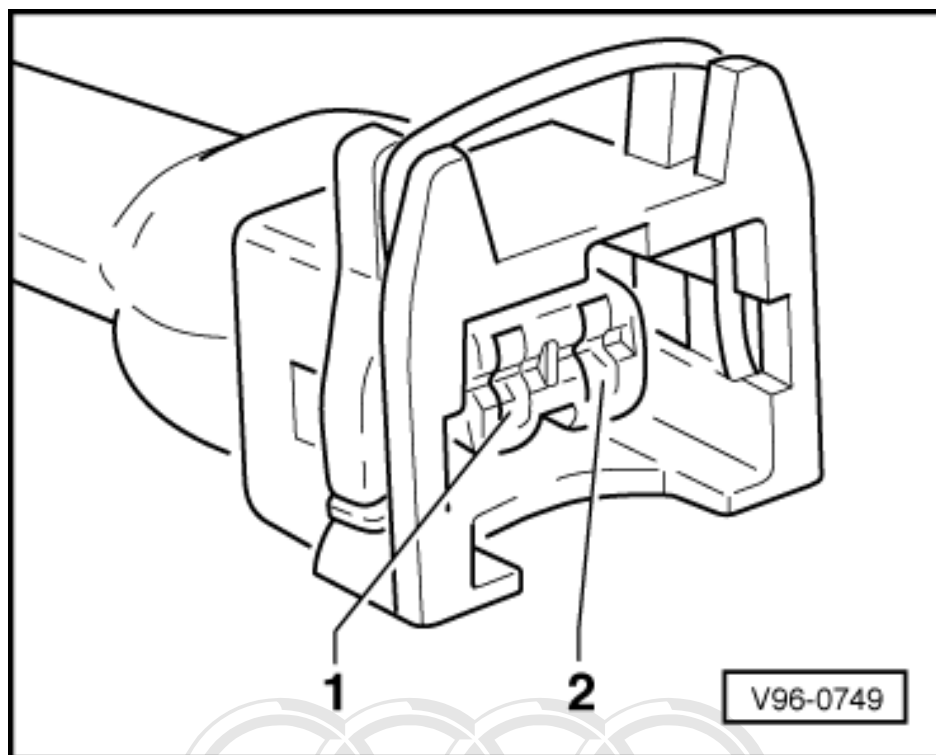
If LED does not light:

- Use current flow diagram to eliminate open circuit in wiring.

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Checking actuation



- Unplug connector at ACF valve.
- -> Connect up voltage tester V.A.G 1527 B between contacts 1 and 2.
- Start final control diagnosis and actuate ACF valve => Page 13 .
 - LED must flash

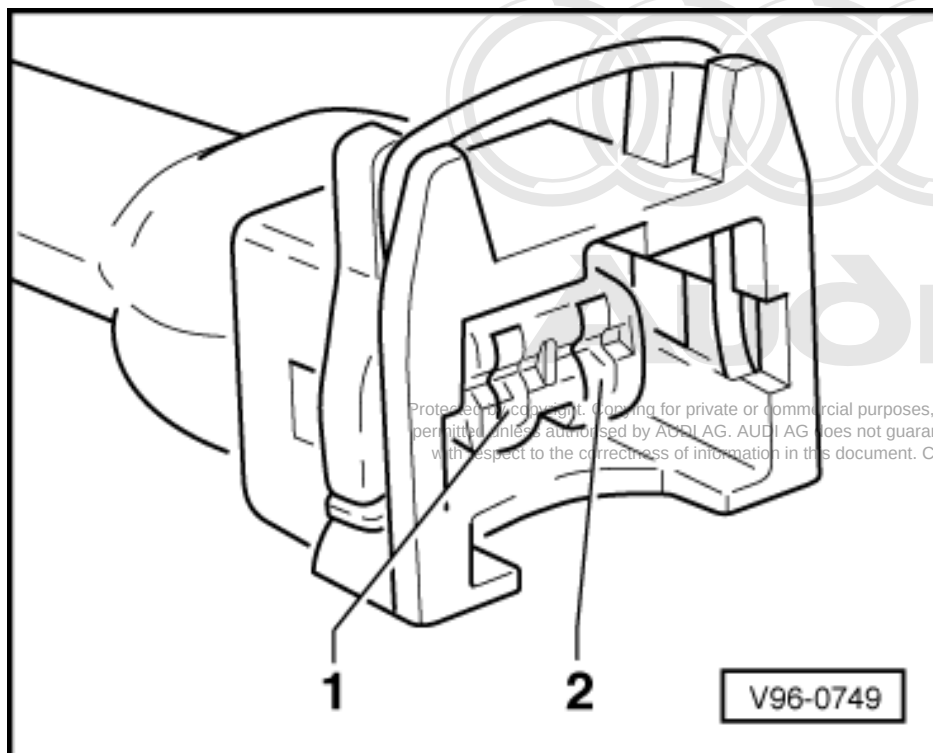
If LED flashes:

- Replace ACF valve.

If LED does not flash or if it is permanently lit:

- With ignition switched off, use adapter V.A.G 1598/3 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 35 .

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- -> Check for open circuit and short to earth/positive in the following wiring.

Connector Contact	Test box V.A.G 1598 A Socket
2	15

- If necessary, eliminate open circuit in wiring/short circuit.

=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

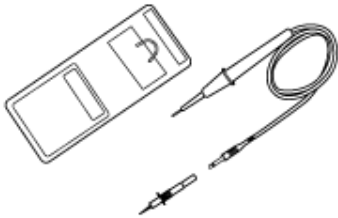
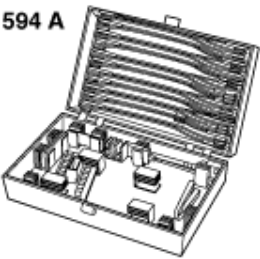
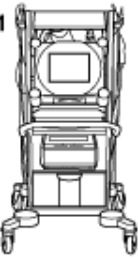
If wiring is OK and there is no actuation:

- Replace engine control unit => Page 36 .



5 - Checking additional signals

5.1 - Checking additional signals

V.A.G 1526 A 	V.A.G 1527 B 
V.A.G 1594 A 	V.A.G 1598 A 
VAS 5051 	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. G24-0018

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 A
- ♦ V.A.G 1598/3
- ♦ VAS 5051 with VAS 5051/1 and VAS 5051/2

or

- ♦ V.A.G 1551 with V.A.G 1551/1

5.2 - Checking air-conditioner compressor shutoff

Note:

On accelerating from a standstill/low vehicle speed, air-conditioner compressor is switched off for approx. 12 seconds by engine control unit. If accelerator pedal is released sooner, time decreases to min. 3 seconds.

Test requirements:

- No faults stored in fault memory
- Vehicle at ambient temperature (more than +15 °C)
- Air conditioner OK

Test sequence

- Start engine and let it idle.
 - Switch on air conditioner.

 - Give short burst of full throttle; engine does not have to reach maximum speed.
 - Air-conditioner compressor must come to a halt for several seconds (visual inspection)
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If air-conditioner compressor is not shut off:

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

- > Read measured value block, Display group 000, engine idling
=>Page 19 .

 - Check display in zone 9.
 - Specification: 5
 - Switch on air conditioner.
 - Value must increase to 13
 - Give short burst of full throttle; engine does not have to reach maximum speed.
 - Value must briefly decrease

If reading does not match specification:

- With ignition switched off, use adapter V.A.G 1598/3 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 35 .
- Check for open circuit and short to earth/positive in the following wiring.

Test box V.A.G 1598 A Socket	Magnetic coupling control unit -J153 Contact	Operating and dis- play unit for air conditioner/Clima- tronic -E87 Contact
33	=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder	

- If necessary, eliminate open circuit in wiring/short circuit.
- If there is no fault in the wiring, check operation of air conditioner.

=> Heating, Air Conditioner; Repair Group 87; Air Conditioner; Servicing components of manually controlled air conditioner
Air Conditioner Servicing components of manually controlled air conditioner



=> Heating, Air Conditioner; Repair Group 87; Air Conditioner; Servicing components for control and regulation of fully automatic air conditioner Air Conditioner Servicing components for control and regulation of fully automatic air conditioner

If both air conditioner and wiring OK:

- Replace engine control unit => Page **36** .

5.3 - Checking engine-speed signal

Notes:

- ♦ Rev counter in dash panel insert is actuated by engine control unit.
- ♦ Checking engine-speed signal

=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

5.4 - Checking consumption signal for on-board computer

Notes:

- ♦ Consumption signal is calculated by engine control unit from injection period and relayed to on-board computer.
- ♦ Checking consumption signal:

=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

5.5 - Checking vehicle-speed signal

Test requirement:

- Speedometer function and display OK

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Test sequence

- Raise vehicle (if at all possible using lifting platform) until front left wheel is free to turn.
- With ignition switched off, use adapter V.A.G 1598/3 to connect test box V.A.G 1598 A to engine control-unit connector and also to actual engine control unit => Page **35** .
- Connect up voltage tester V.A.G 1527 B as follows.

Test box V.A.G 1598 A Socket	Measure to
2	Battery positive

- Switch on ignition.
 - LED must light faintly
- Turn front left wheel.
 - LED must flash

If LED does not flash:

- Check for open circuit and short to earth/positive in the following wiring.

Test box V.A.G 1598 A Socket	Dash panel insert Contact
2	=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

If no fault is found in wiring:

- Pull adapter V.A.G 1598/3 off engine control unit.

If LED now flashes:

- Replace engine control unit => Page 36.

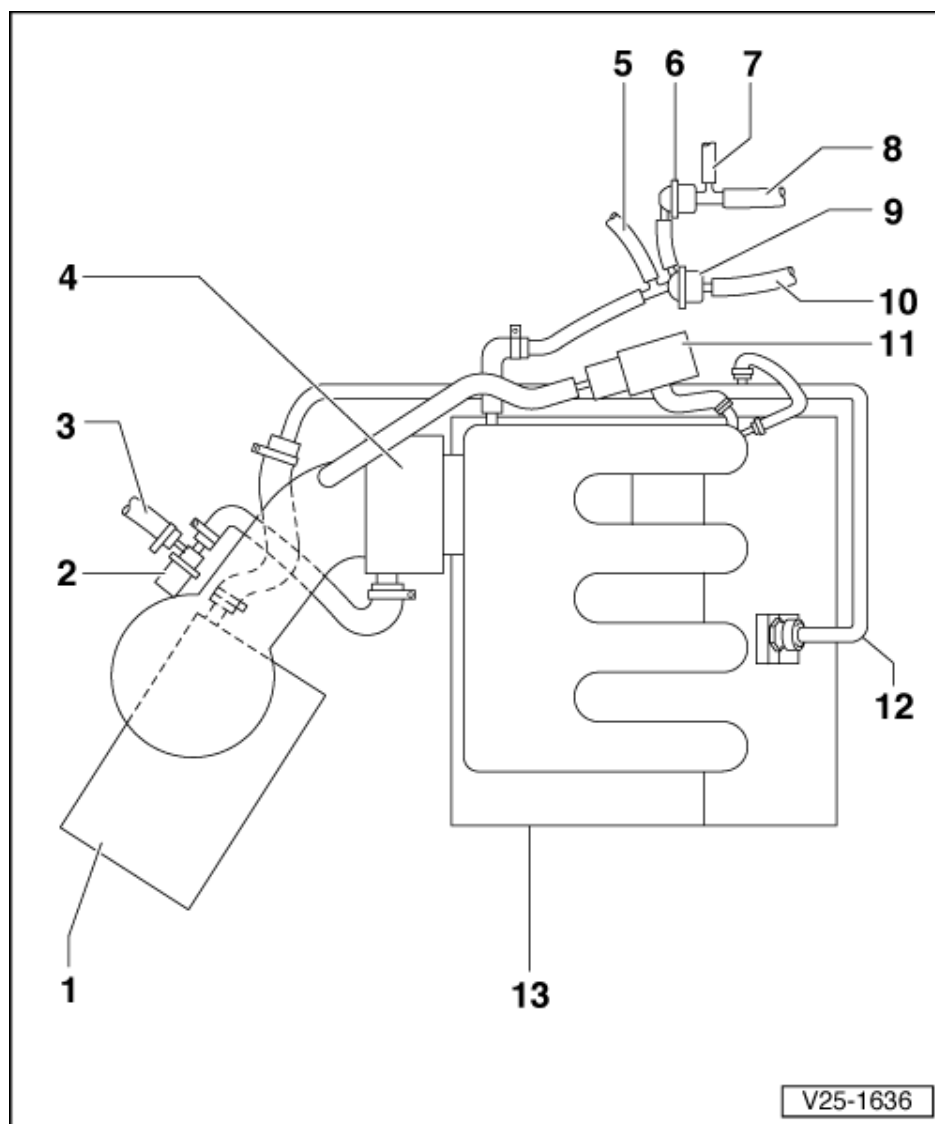
If LED still does not flash:

- Identify all components making use of vehicle-speed signal (e.g. radio, air conditioner), consecutively disconnect them from dash panel insert and repeat test until cause has been established.

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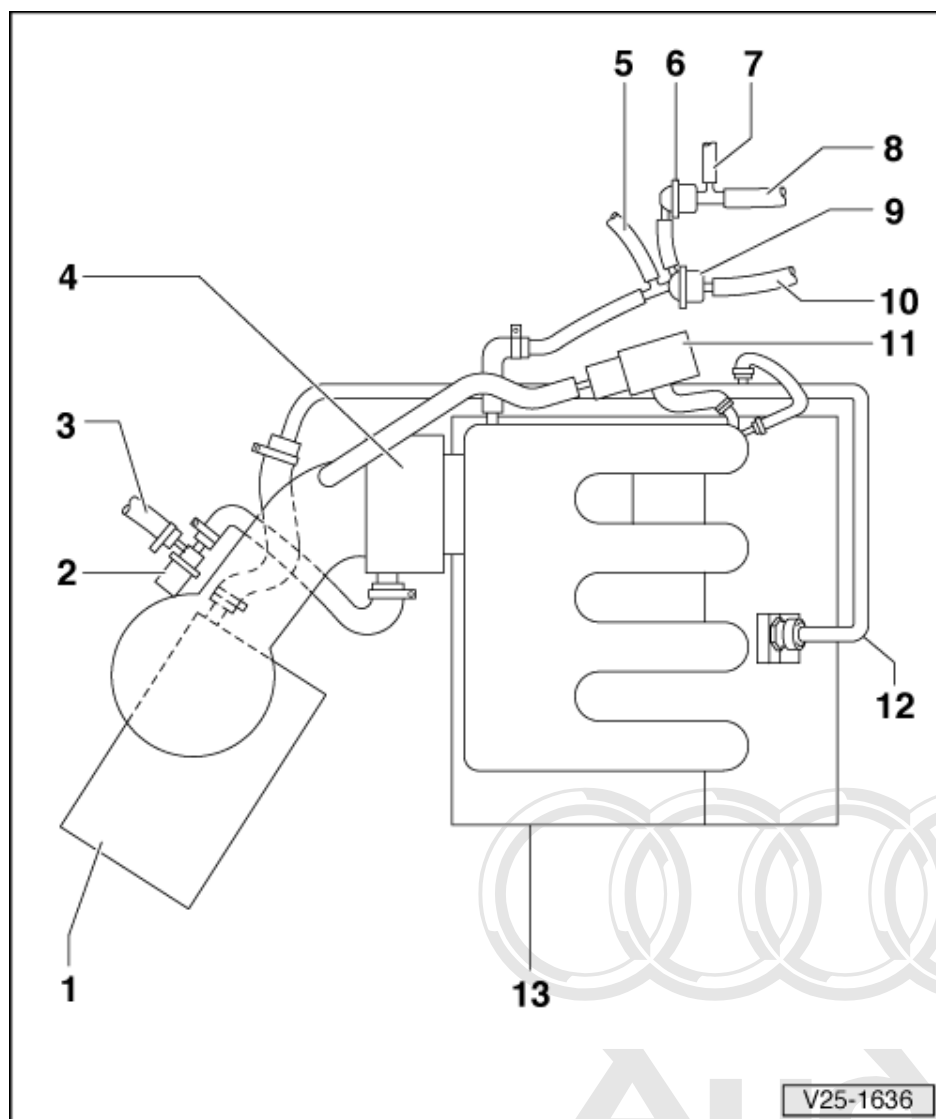
6 - Vacuum diagram

6.1 - Vacuum diagram





- 1 Air cleaner housing
- 2 Activated charcoal filter solenoid valve -N80
- 3 From activated charcoal filter
- 4 Throttle valve assembly
- 5 Vacuum connection
 - ♦ For differential lock on vehicles with four-wheel drive
 - ♦ Sealed with dummy plug on vehicles with front-wheel drive
- 6 Non-return valve
 - ♦ Vehicles with air conditioner only



- 7 To 2-way valve
 - ♦ For fresh/recirculated air flap
 - ♦ Vehicles with air conditioner only
- 8 To vacuum reservoir
 - ♦ Vehicles with air conditioner only
- 9 Non-return valve
- 10 To brake servo
- 11 Idling-speed stabilisation valve -N71
- 12 Crankcase breather
- 13 Cylinder block

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28 - Ignition system

1 - Checking ignition system

1.1 - Checking ignition system

1.2 - Safety precautions

Heed the following so as to avoid possible injury and/or the destruction of the injection and ignition system:

- ◆ Never touch/disconnect ignition cables with engine running or at cranking speed.
- ◆ Always switch off ignition before disconnecting and connecting ignition system wires (also applies to H.T. wires and measuring instrument leads).
- ◆ If engine is to be operated at cranking speed without it starting, e.g. for checking compression pressure, unplug connector from output stage at ignition coil and remove fuse 13. Interrogate fault memory on completion of work.
- ◆ Boost starting with rapid charger is only permitted for up to 1 minute at a maximum of 16.5 V.
- ◆ Always switch off ignition before washing engine.
- ◆ Always switch off ignition before disconnecting and connecting battery so as not to damage engine control unit.
- ◆ Vehicles with a definite or suspected fault in the ignition system are only to be towed after unplugging connector at output stage.
- ◆ Never connect capacitor to terminal 1 (10).
- ◆ 1 kW ignition distributor rotor (identification: R1) is never to be replaced with a different rotor (including radio interference suppression).
- ◆ For connection of measuring instruments (e.g. voltage tester V.A.G 1527 B, portable multimeter V.A.G 1526 A), always make use of adapter set V.A.G 1594 A.

1.3 - Adjustment data, spark plugs

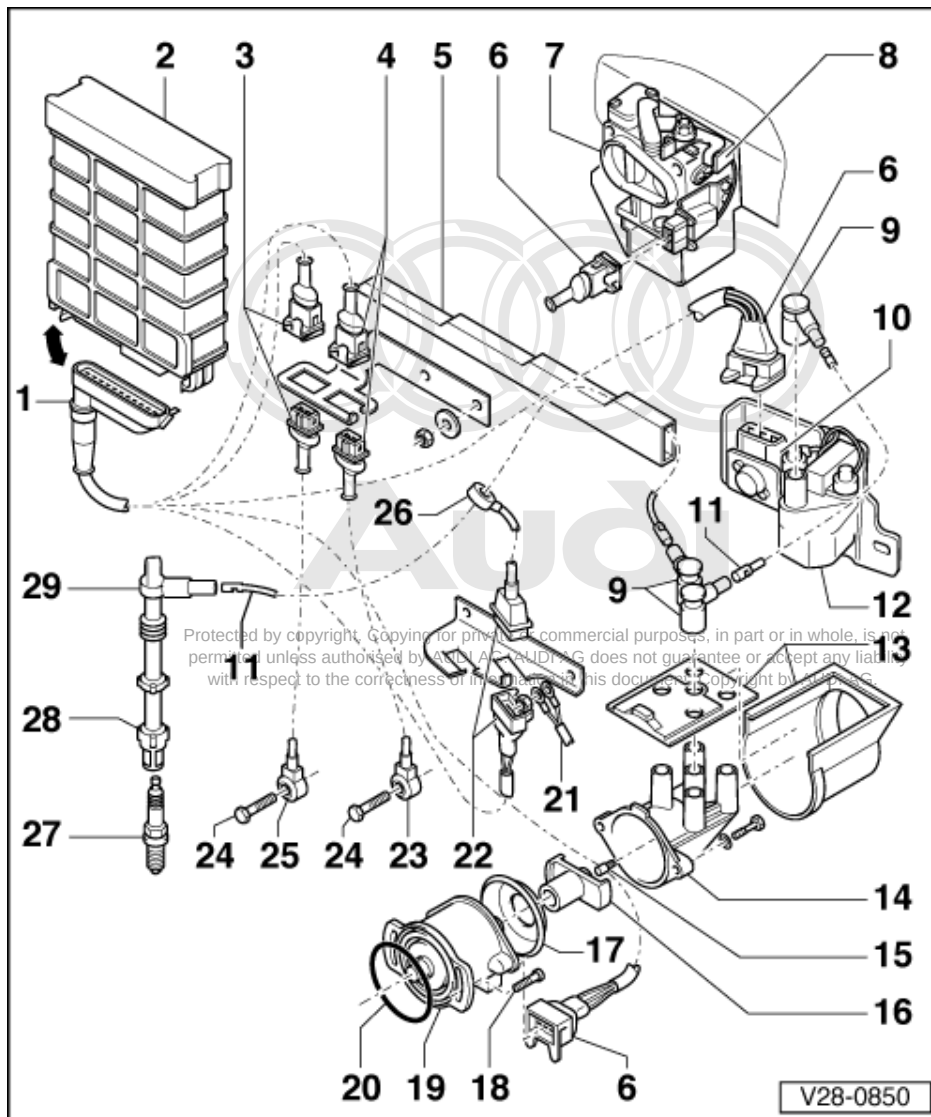
Engine codes			6A (2.0 l / 101 kW engine) ACE (2.0 l / 103 kW engine)
Engine control unit	Part no.		=>Parts List
Ignition point 1)	Test specification	° before TDC	4 ... 8
	Setting	° before TDC	6 ± 1
	Engine speed	rpm	800 ... 1000
Firing order			1-3-4-2
Spark plugs 2)	Tightening torque	Nm	30

1) Engine-oil temperature at least 80 ° C

2) Current values:

=> Exhaust emission test binder

1.4 - Servicing ignition system



1 Connector

- ◆ For KE Motronic control unit
- ◆ Wait 30 seconds after switching off ignition before unplugging or attaching connector

2 KE Motronic control unit -J204

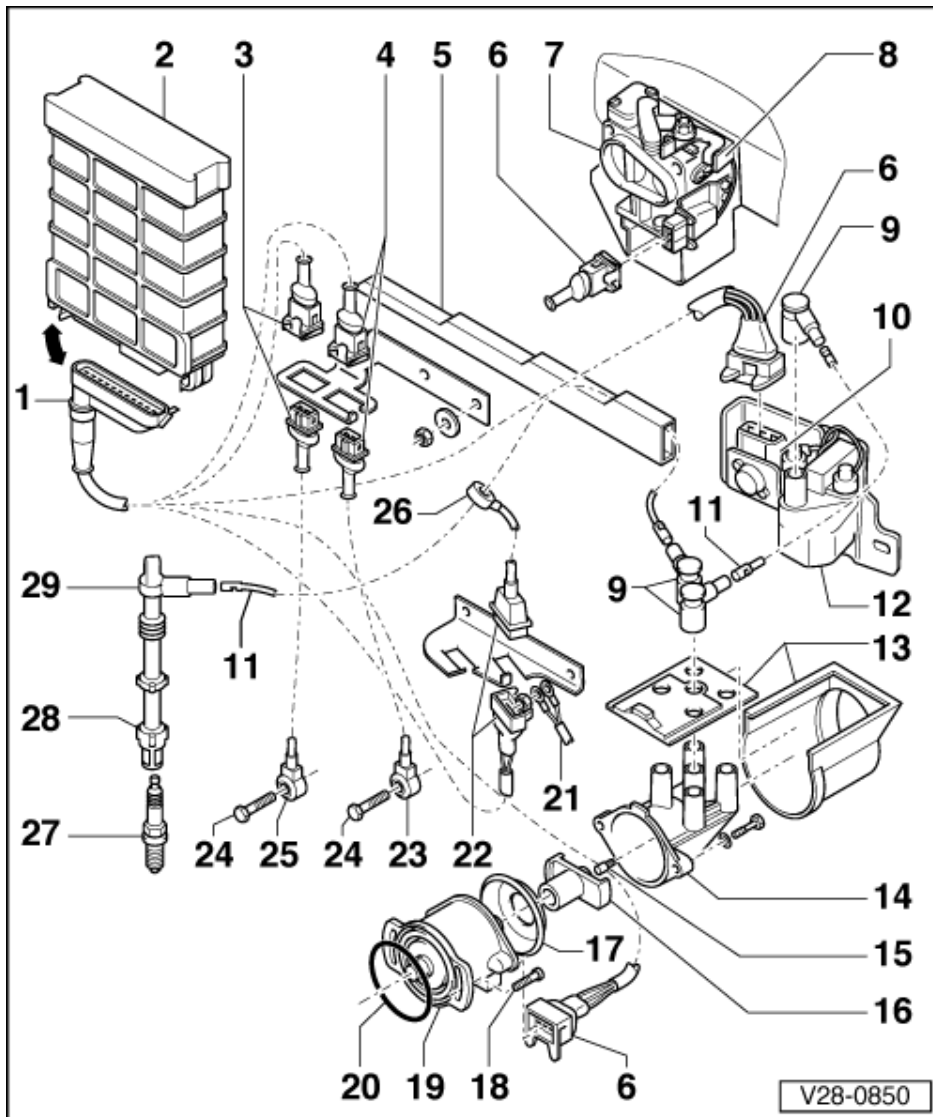
- ◆ Between bulkhead and air duct in passenger's footwell
- ◆ Removing and installing=>Page 36

3 Connector

- ◆ Green
- ◆ For knock sensor 1 -G61

4 Connector

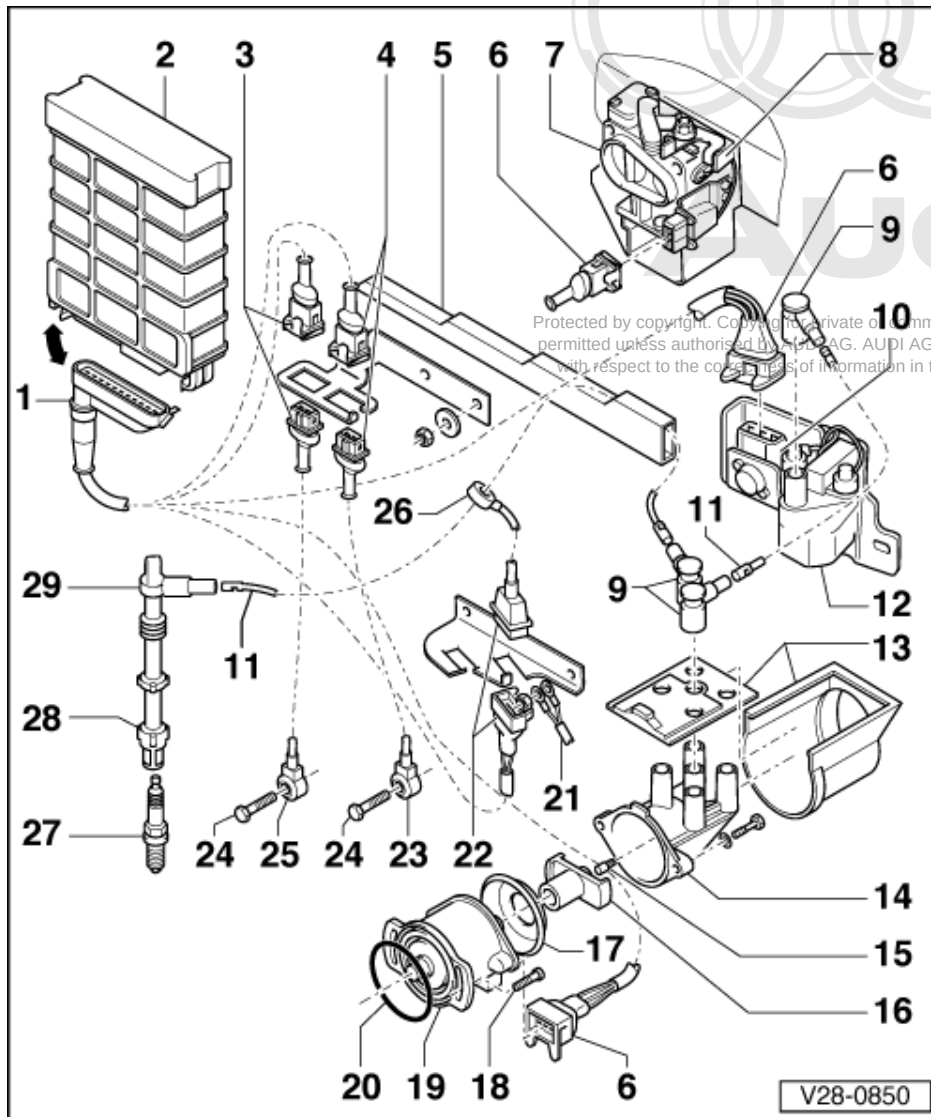
- ◆ Blue
- ◆ For knock sensor 2 -G66



- 5 Cable guide**
 - ◆ For ignition cables
 - ◆ Clipped to intake manifold
- 6 Connector**
- 7 Throttle valve assembly**
- 8 Idling switch -F60**
 - ◆ Checking =>Page **53**
- 9 Interference suppression connector**
 - ◆ 0.6...1.4 kw
- 10 Output stage for ignition transformer**
 - ◆ Checking => Page **132**
 - ◆ Cannot be replaced separately
- 11 Ignition cable**
 - ◆ Check for continuity



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**12 Ignition transformer -N152**

- ♦ Checking => Page 130

13 Screen

- ♦ For radio interference suppression

14 Distributor cap

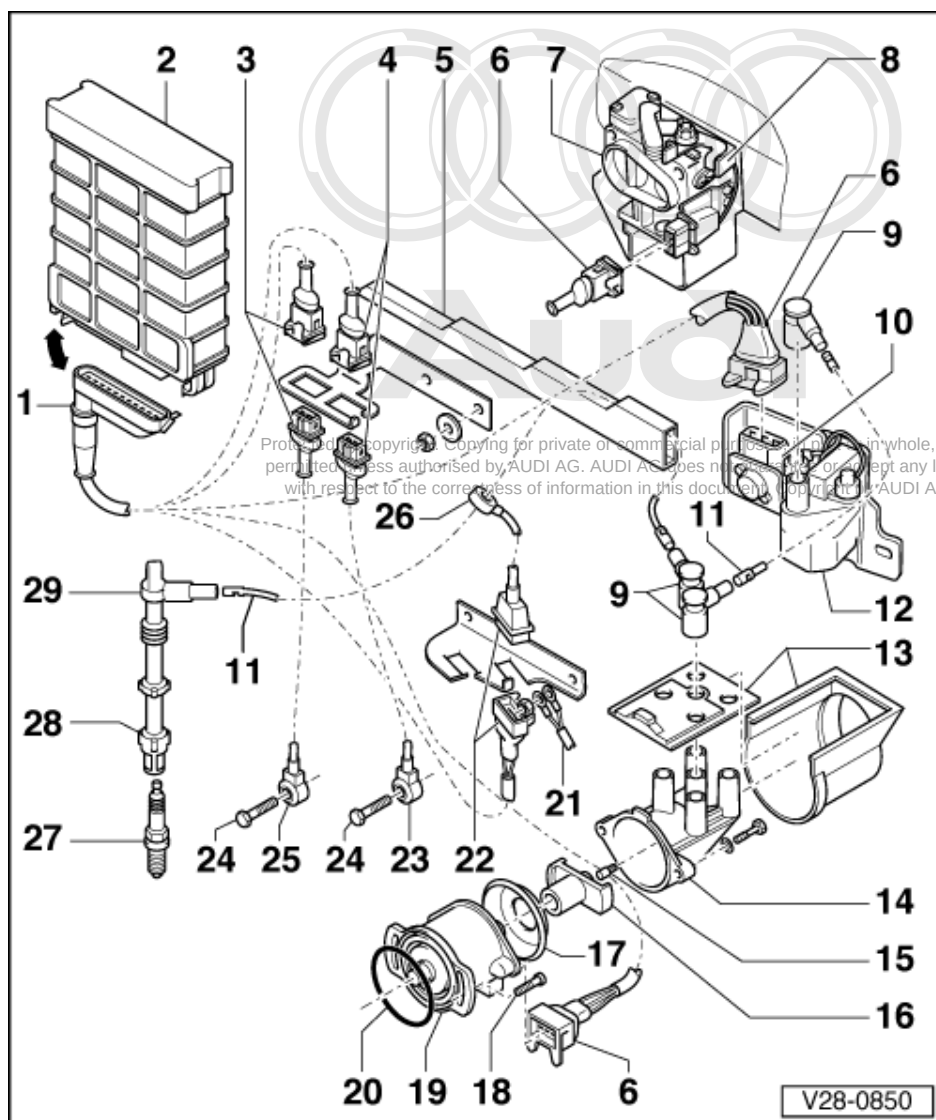
- ♦ Watch out for cracks and traces of leakage current
- ♦ Check contact wear
- ♦ Clean before fitting

15 Carbon brush with spring

- ♦ Check for wear, damage and freedom of movement

16 Ignition distributor rotor

- ♦ Identification: R1
- ♦ 0.6...1.4 kW
- ♦ Non-destructive removal not possible
- ♦ Replacing => Page 127



17 Dust cap

18 10 Nm

19 Ignition distributor

- ♦ Checking and adjusting ignition point => Page 128
- ♦ Checking Hall sender
=> Page 146
- ♦ Dismantling and assembling
=> Page 126

20 O-ring

- ♦ Replace if damaged

21 Earth connections

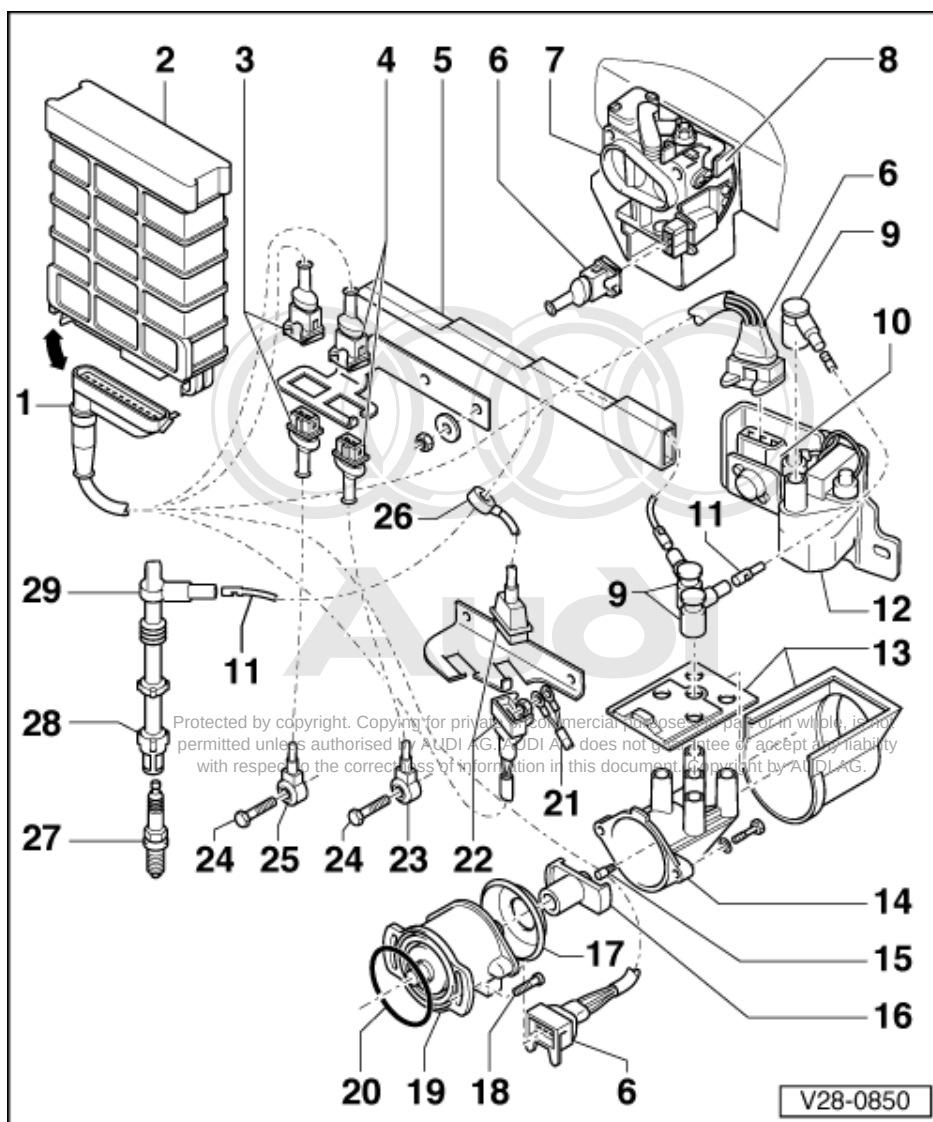
- ♦ For engine control unit

22 Connector

- ♦ For firing point sender -G4

23 Knock sensor 2 -G66

- ♦ At rear



24 20 Nm

- ♦ Tightening torque affects operation of knock sensor

25 Knock sensor 1 -G61

- ♦ At front

26 Firing point sender -G4

- ♦ On ignition cable, cylinder 4
- ♦ Installation position: Clamping lugs face ignition distributor

27 Spark plug, 30 Nm

- ♦ Type and spark gap

=> Exhaust emission test binder

- ♦ Use 3122 B for removal and installation

28 Spark plug connector

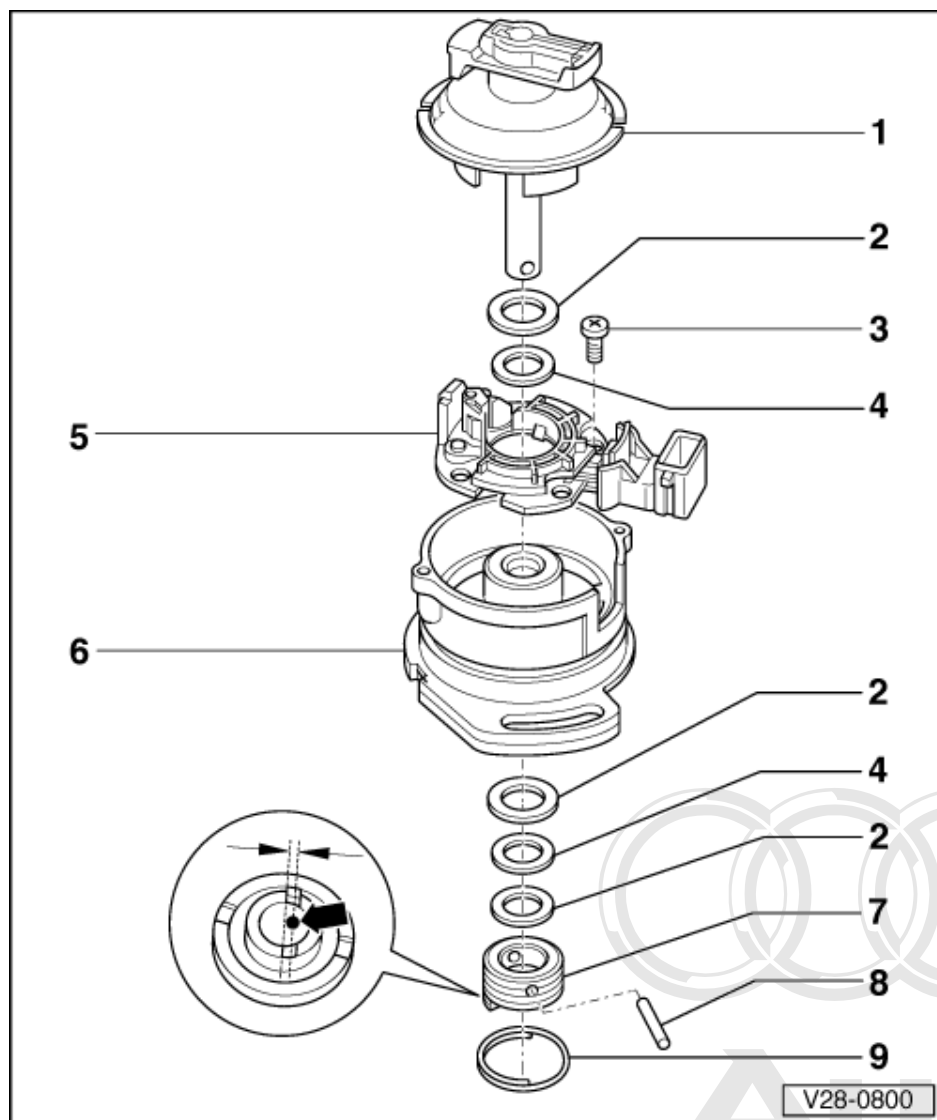
- ♦ 4...6 kW

29 Extractor ring

- ♦ For spark plug connector



1.5 - Dismantling and assembling ignition distributor



1 Ignition distributor shaft

- ♦ With rotor for Hall sender
- ♦ Pull out after removing spring pin - 8 -

2 Shim

3 Bolt

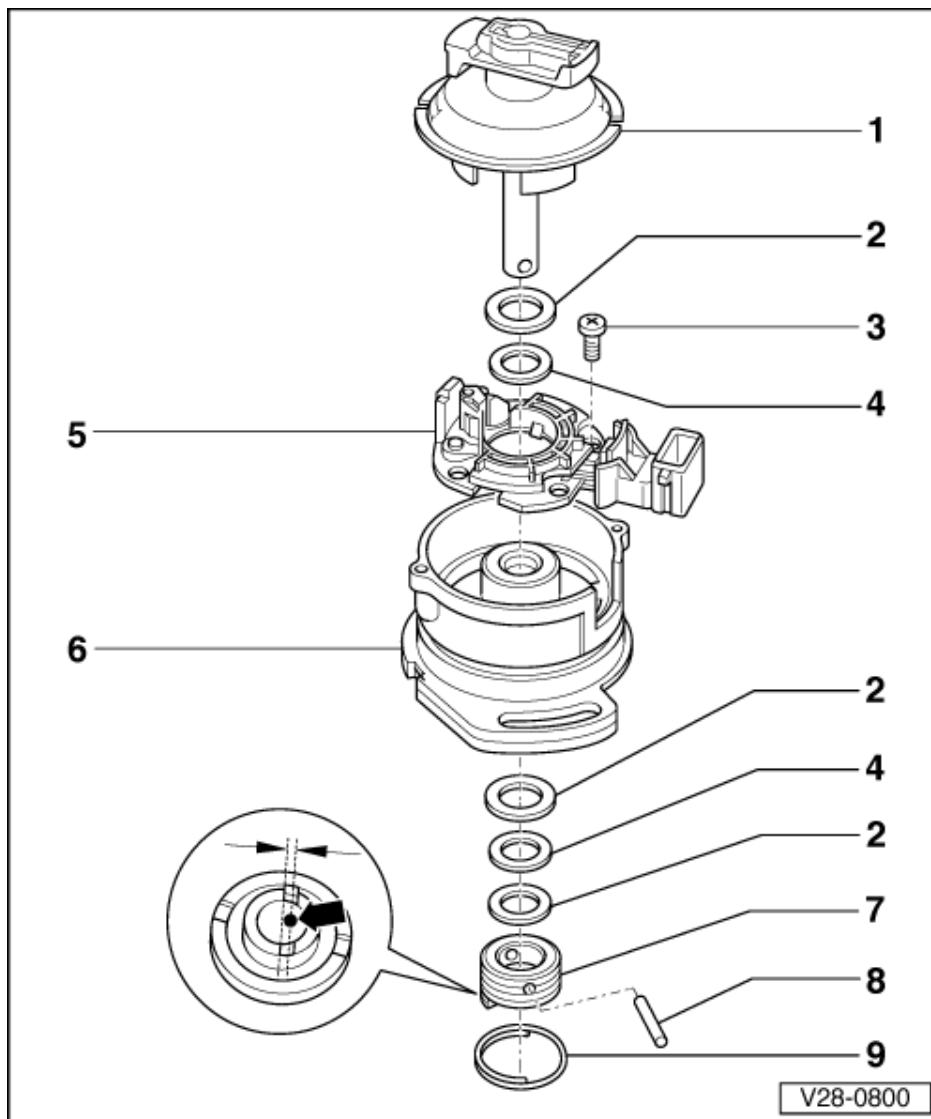
4 Plastic washer

5 Hall sender -G40

- ♦ Checking => Page 146

6 Ignition distributor housing

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7 Coupling

- ♦ Mark position of drive pin with respect to shaft - **1** - before removing -arrow-

8 Spring pin

9 Locking spring

1.6 - Replacing ignition distributor rotor

Rotor is bonded to distributor shaft. Removal involves destroying old distributor rotor.

Removing

- Use pliers for example to squash distributor rotor.

Attention:

Distributor rotor is not to be smashed, as such action could damage distributor shaft or its mount.

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- Carefully remove remnants from distributor shaft.

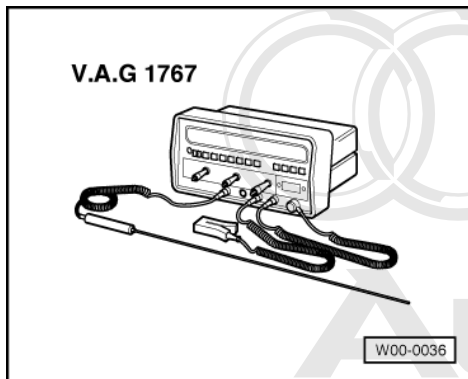


Installing

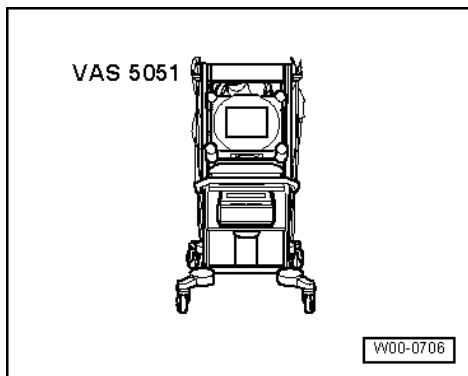
- Bond new distributor rotor to distributor shaft using locking fluid AMV 101 A1.

1.7 - Checking and adjusting ignition point

Special tools and workshop equipment required



- ♦ V.A.G 1767
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- or
- ♦ V.A.G 1367 with V.A.G 1367/8

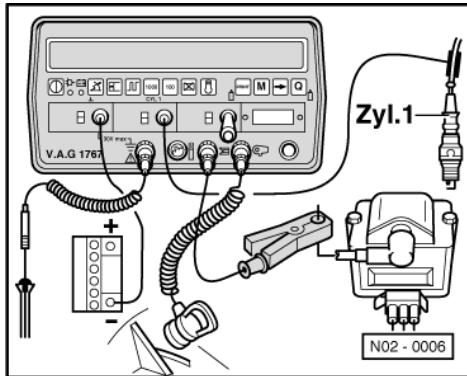


- ♦ VAS 5051 with VAS 5051/1 and VAS 5051/2
- or
- ♦ V.A.G 1551 with V.A.G 1551/1

Note:

Ignition point is only to be adjusted if a deviation is found when checking idling speed => Page 80.

Test sequence



- -> With ignition switched off, connect up ignition tester V.A.G 1767 (or V.A.G 1367).

=> Operating instructions

Notes:

- ◆ Take particular care to ensure that TDC sender of ignition tester V.A.G 1367 is fully inserted in gearbox housing.
- ◆ Ignition point is displayed directly on V.A.G 1767 (or V.A.G 1367). There is no need to aim timing light at ignition point notches.

- Interrogate and erase fault memory => Page 5 .

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

- > Start basic setting, display group 000=>Page 16 .

- Read off ignition point on ignition tester V.A.G 1767 (or V.A.G 1367).
- Test specification: 4 ... 8° before TDC

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Note:

If ignition point displayed is outside tolerance, it must be adjusted prior to checking idling speed whilst system is still set to "Basic setting 0".

- Adjust ignition point by turning ignition distributor.
 - Setting $6 \pm 1^\circ$ before TDC
- Leave engine idling.
- Press ➡key.
 - Ignition point may fluctuate in range 2 ... 10 ° before TDC

Note:

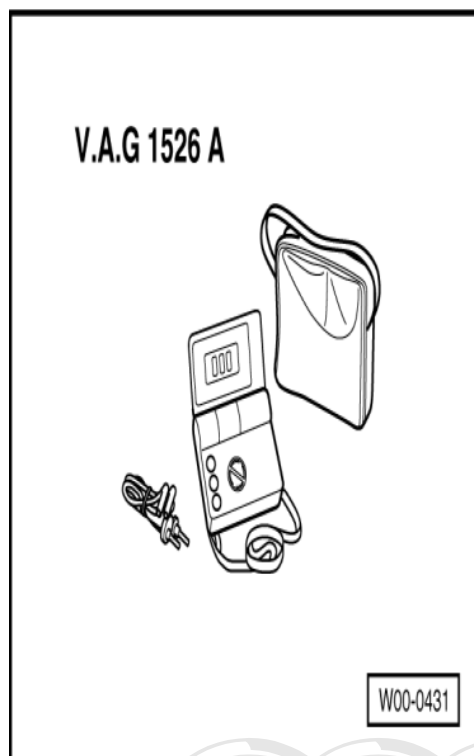
In the event of severe fluctuation in ignition point, check tightness of Hall sender.

- After adjusting ignition point, check idling speed => Page 80 .

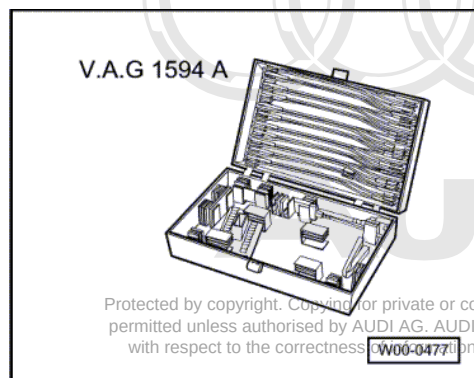


1.8 - Checking ignition transformer-N152

Special tools and workshop equipment required



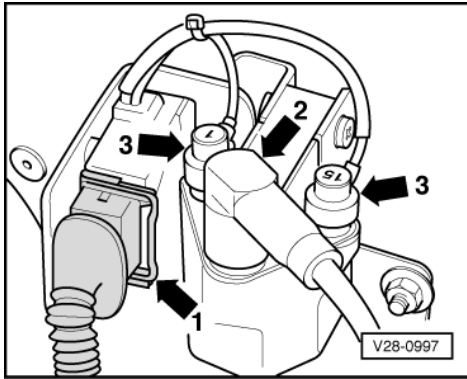
- ♦ V.A.G 1526 A



- ♦ V.A.G 1594 A

Notes:

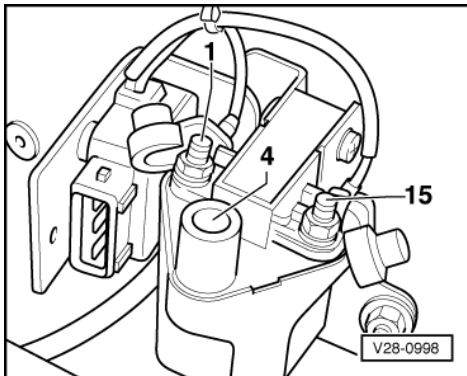
- ♦ Check for corrosion/damage in wiring between output stage and ignition transformer.



- ♦ Checking output stage for ignition transformer => Page 132 .

Test sequence

- -> Unplug connector -arrow 1- from output stage and main ignition cable -arrow 2- from ignition transformer.



- -> Check primary resistance with portable multimeter V.A.G 1526 A between terminals 1 and 15.
 - Specification: 0.5 ... 1.5 Ω
- Check secondary resistance with portable multimeter between terminals 4 and 15.
 - Specification: 5 ... 9 k Ω

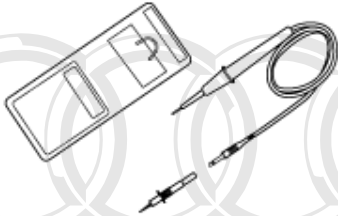
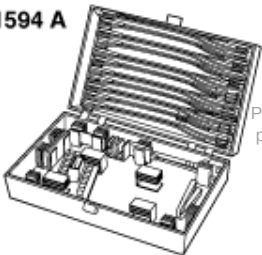
If a reading does not match specification:

- Replace output stage with ignition transformer.

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1.9 - Checking output stage for ignition transformer

V.A.G 1526 A 	V.A.G 1527 B 
V.A.G 1594 A 	V.A.G 1598 A 
	G24-0019

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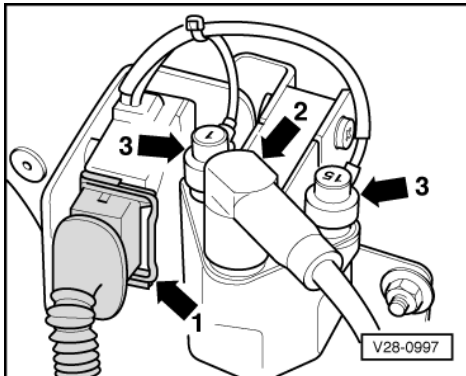
Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1527 B
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 A
- ♦ V.A.G 1598/3

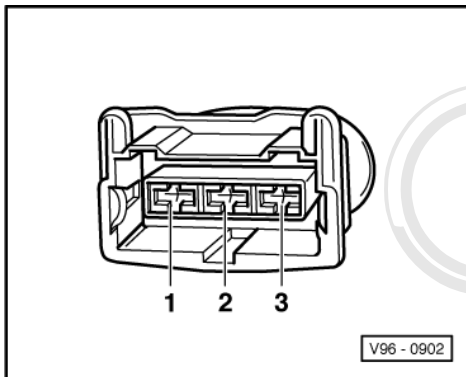
Test requirement:

- Ignition transformer OK; checking => Page 130

Checking power supply



- -> Unplug connector -arrow 1- from output stage.



- -> Connect up multimeter for voltage measurement between contacts 1 and 3.
- Switch on ignition.
 - Specification: approx. battery voltage

If reading does not match specification

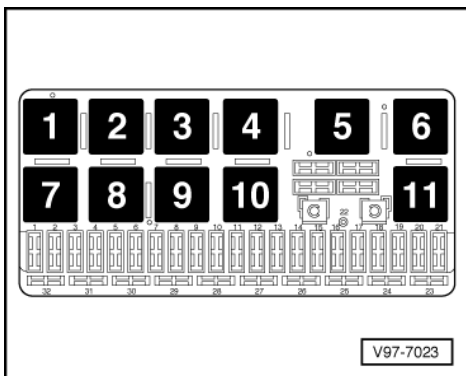
- Connect up multimeter for voltage measurement as follows.

Connector Contact	Measure to
1	Engine earth
3	Battery positive

- Switch on ignition.
 - Specification: approx. battery voltage in each case

If reading does not match specification:

- Use current flow diagram to eliminate open circuit in wiring.

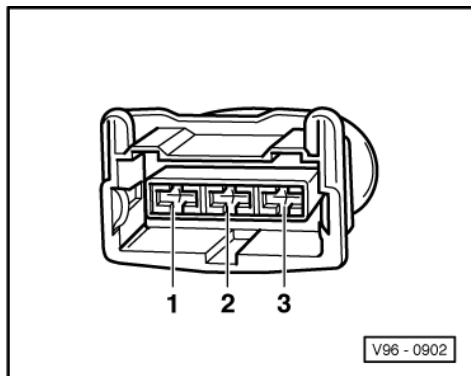




Checking actuation

Test requirement:

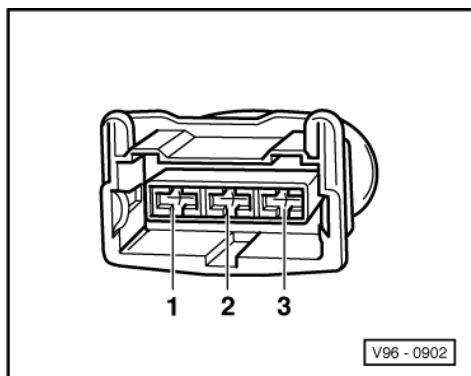
- Hall sender OK; checking => Page 146
- -> Pull out fuse S13.



- -> Connect up voltage tester V.A.G 1527 B between contacts 2 and 3.
- Operate starter.
 - LED must flash

If LED does not flash:

- With ignition switched off, use adapter V.A.G 1598/3 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 35 .



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- -> Check for open circuit and short to earth/positive in the following wiring.

Connector Contact	Test box V.A.G 1598 A Socket
2	11

- Additionally check wires for mutual short circuit.
- If necessary, eliminate open circuit in wiring/short circuit.

=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

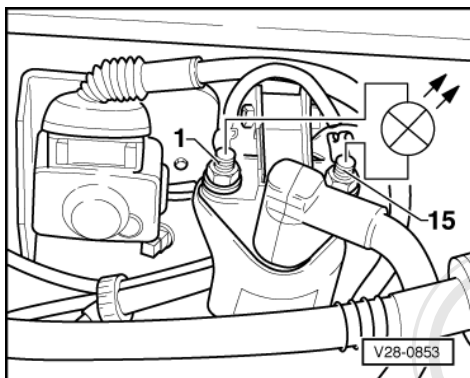
If wiring is OK:

- Replace engine control unit => Page 36 .

If power supply and actuation are OK:

- Switch off ignition.

- Re-attach connector and ignition cable at ignition transformer.



- -> Connect voltage tester V.A.G 1527 B with test leads and terminals to contacts 1 and 15 at ignition transformer.

Attention:

- Operate starter.
 - LEDs must flash

If LEDs do not flash:

- Replace output stage with ignition transformer.

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1.10 - Checking firing point sender -G4

V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598 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.
	G24-0015

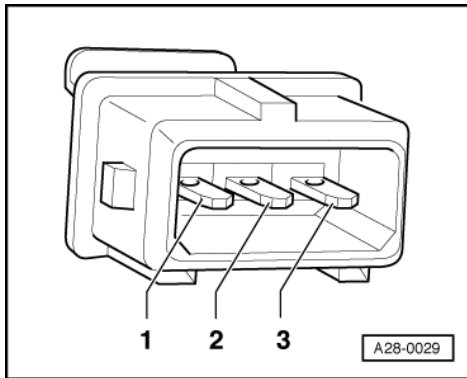
Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 A
- ♦ V.A.G 1598/3

Fitting location => Exploded view of fitting locations - Page **30**

Checking internal resistance

- Unplug black 3-pin connector at firing point sender.



- -> Connect up multimeter for resistance measurement between contacts 1 and 2 at sender.
- Specification: max. 2 ω

If reading does not match specification:

- Replace firing point sender.
- Connect up multimeter for resistance measurement between contacts 1 and 3 as well as 2 and 3 at sender.
- Specification: $\infty \omega$
 (No mutual connection between wires)

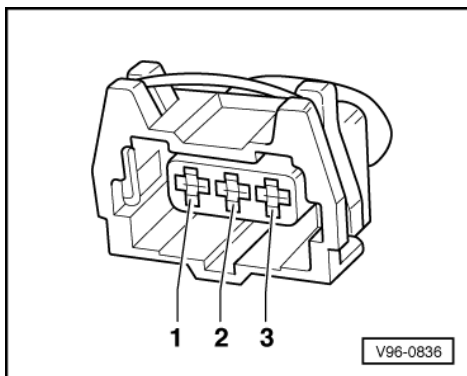
If readings do not match specifications:

- Replace firing point sender.

Checking wiring

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- With ignition switched off, use adapter V.A.G 1598/3 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 35 .



- -> Check for open circuit and short to earth/positive in the following wiring.

Connector Contact	Measure to
1	Test box V.A.G 1598 A
2	Socket 29
3 (screen)	Engine earth

- If necessary, eliminate open circuit in wiring/short circuit.

=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

If no fault is found:

- Replace engine control unit => Page 36 .



1.11 - Checking coolant temperature sender -G62

V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598 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.
	G24-0015

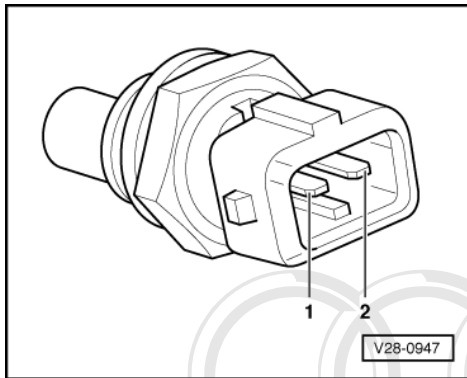
Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 A
- ♦ V.A.G 1598/3

Fitting location => Exploded view of fitting locations - Page 30

Note:

Checking operation => Reading measured value block, display group 000, Page 19.

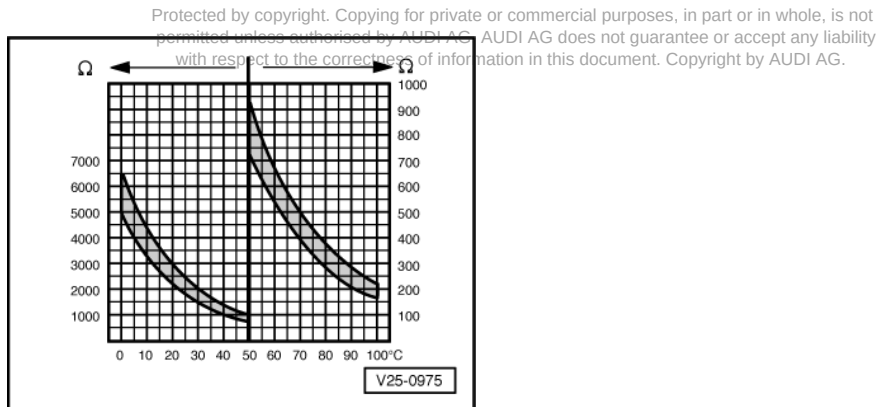


Checking internal resistance

- Unplug connector at coolant temperature sender.
- -> Connect up multimeter for resistance measurement between contacts 1 and 2 at sender.

Note:

Checking can also be performed at adapter on left of intake manifold.



-> Specifications:

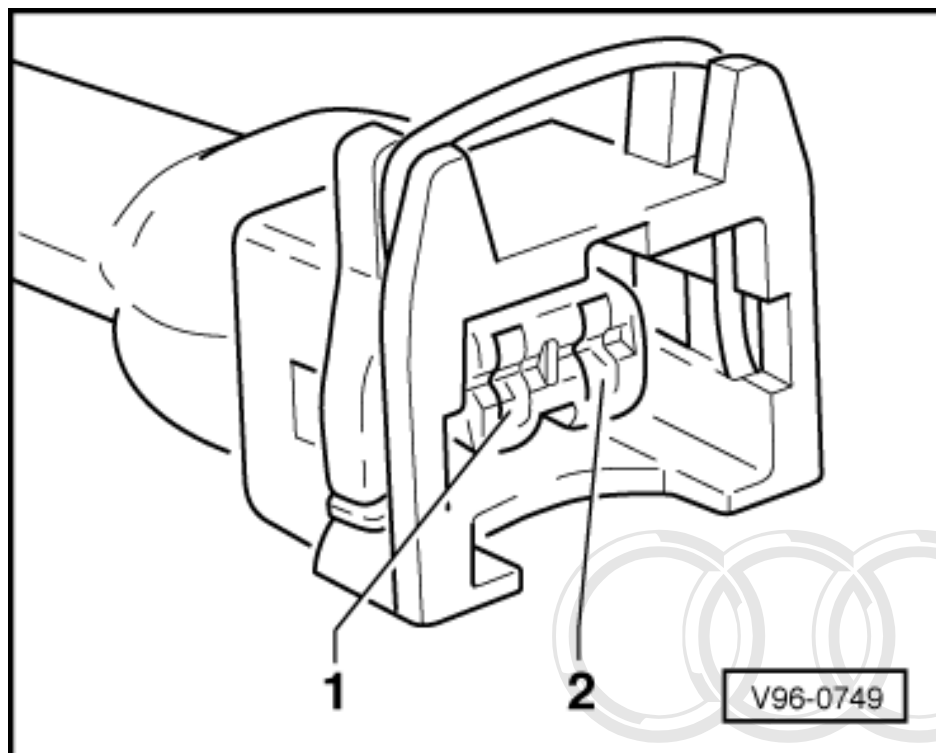
Coolant temperature	Resistance
approx. 20 °C	approx. 2.5 kW
approx. 80 °C	approx. 330 ω

If readings do not match specifications:

- Replace coolant temperature sender.

Checking wiring

- With ignition switched off, use adapter V.A.G 1598/3 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 35 .



- -> Check for open circuit and short to earth/positive in the following wiring.

Connector Contact	Measure to
1	Engine earth
2	Test box V.A.G 1598-A Socket 3

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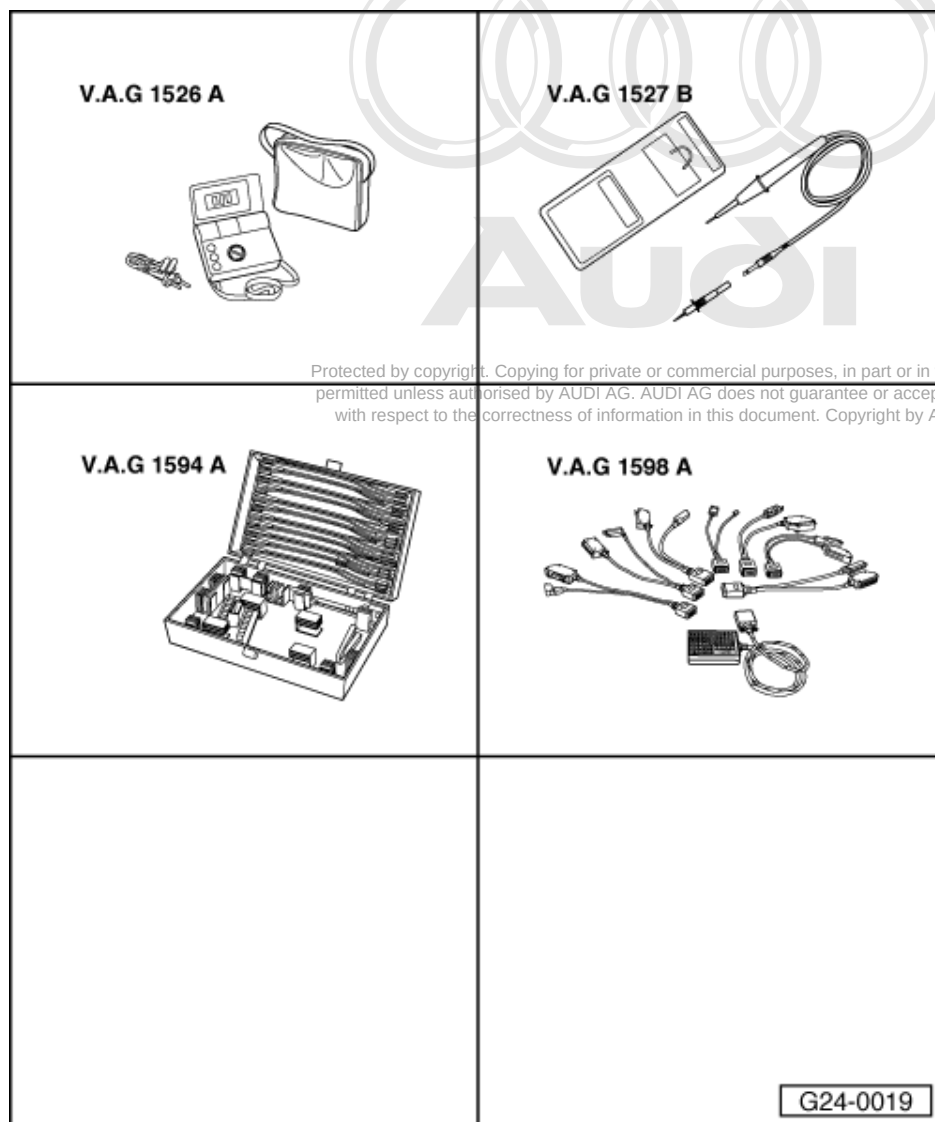
- If necessary, eliminate open circuit in wiring/short circuit.

=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

If no fault is found:

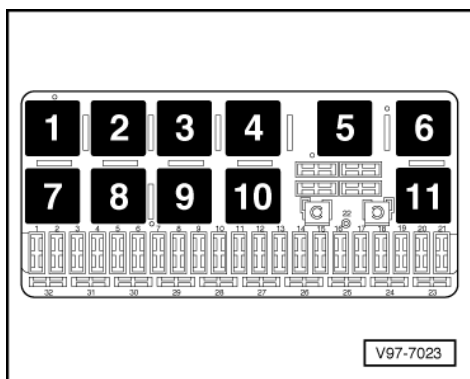
- Replace engine control unit => Page 36 .

1.12 - Checking control unit power supply



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 A
- ♦ V.A.G 1598/3

**Test requirements:**

- -> Fuse S27 OK (in fuse box)
- Battery voltage at least 11 V
- Alternator OK

Test sequence**Notes:**

- ♦ Engine control unit is supplied with positive voltage via contact 14 (terminal 15) and contact 19 (terminal 30).
- ♦ Earth supply for engine control unit is provided by way of contacts 18, 34 and 35.
- With ignition switched off, use adapter V.A.G 1598/3 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 35.

Checking power supply

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- Connect up multimeter for voltage measurement as follows.

Test box V.A.G 1598 A Socket	Measure to
19	Engine earth

- Specification: approx. battery voltage
- Connect up multimeter for voltage measurement as follows.

Test box V.A.G 1598 A Socket	Measure to
14	Engine earth

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

If a reading does not match specification:

- Check wiring.

=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

Checking earth supply

- Connect up multimeter for voltage measurement as follows.

Test box V.A.G 1598 A Socket	Measure to
18	Battery positive

Test box V.A.G 1598 A Socket	Measure to
34	Battery positive
35	Battery positive

- Specification: approx. battery voltage in each case

If a reading does not match specification:

- Check wiring.

=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

Checking earth supply between engine control unit, contact 35 and intake manifold

Note:

This test is only to be performed if interrogation of fault memory results in display of fault 00537 "Lambda control, control limit exceeded" or 00587 "Adjustment limit mixture regulation, adaption limit exceeded".

- With ignition switched off, use adapter V.A.G 1598/3 to connect test box V.A.G 1598 A to engine control-unit connector and also to actual engine control unit => Page 35 .
- Start engine and let it idle.

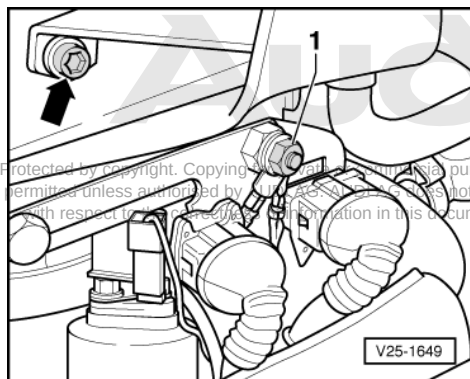
Note:

Take care not to interchange connections when implementing the following test. Multimeters with several voltage measuring ranges are to be set to 200 mV, so as not to destroy engine control unit.

- Connect up multimeter for voltage measurement as follows.

Test box V.A.G 1598 A Socket	Measure to
35	Engine earth at intake manifold

Note:



-> Connect second test lead directly to intake manifold -arrow-, not to earth attachment point -1-.

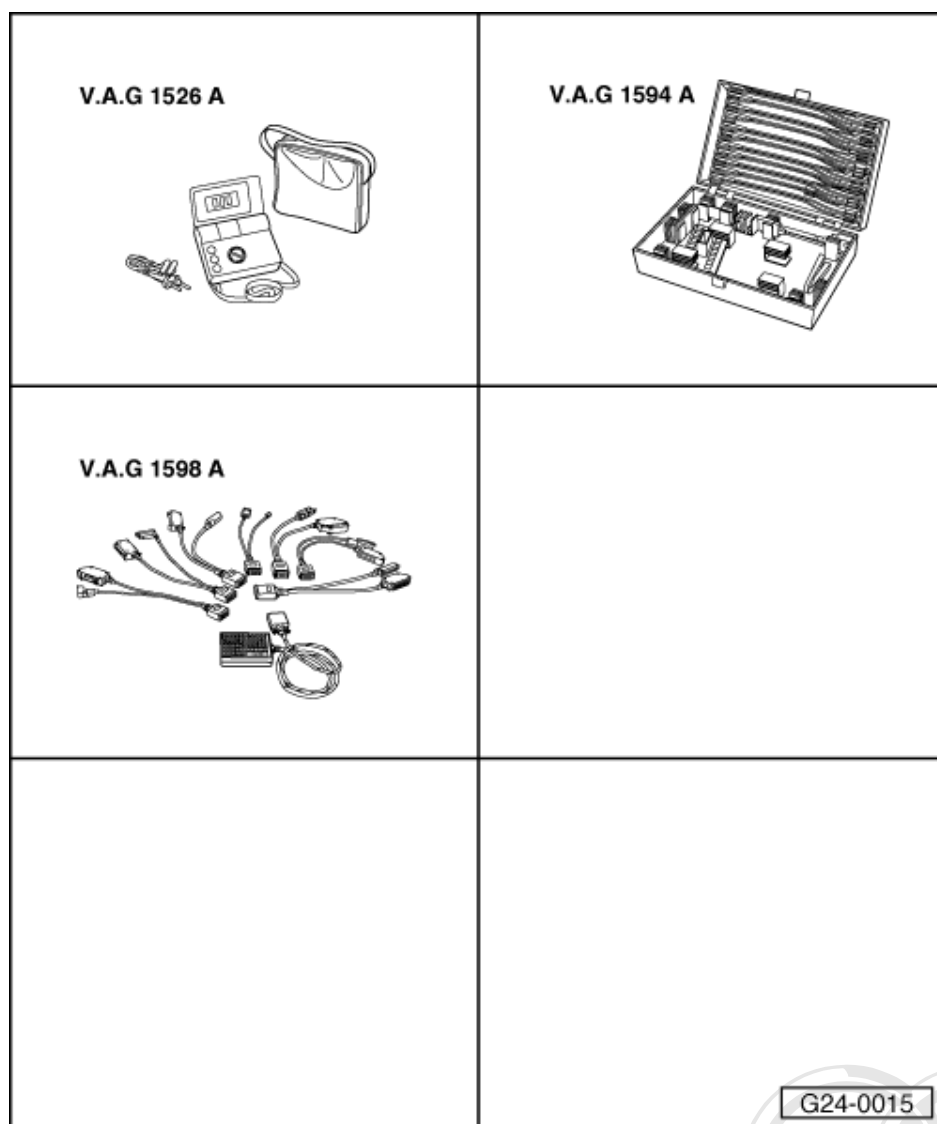
- Specification: max. 60 mV

If reading exceeds specification:

- Check earth attachment point -1- for corrosion and poor connection and if necessary clean/repair.



1.13 - Checking knock sensors



Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598 A
- ♦ V.A.G 1598/3

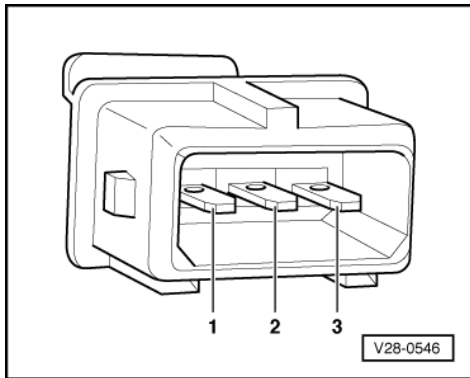
Fitting location => Exploded view of fitting locations - Page 30

Notes:

- ♦ The actual knock sensors cannot be checked electrically (interrogate fault memory => Page 5).
- ♦ Exact compliance with tightening torque of 20 Nm is essential to proper knock sensor operation.
- ♦ Check connectors for traces of corrosion.
- ♦ Exclusive use is to be made of gold-plated contacts when repairing contacts in knock sensor connector.

Checking knock sensor wiring

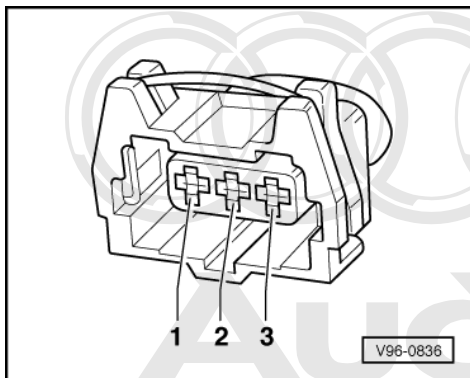
- Unplug connector of appropriate knock sensor in engine compartment.



- -> Connect up multimeter for resistance measurement between connector contacts.
 - Specification: $\infty \omega$
 - (No mutual connection between wires)
- Replace knock sensor if there is a connection between wires.

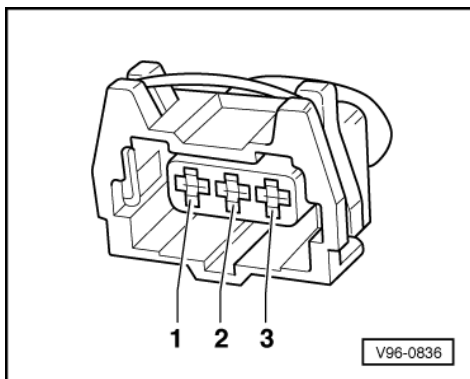
Checking wiring between knock sensors and engine control unit

- With ignition switched off, use adapter V.A.G 1598/3 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 35 .
- Check for open circuit and short to earth/positive in the following wiring.



- -> Knock sensor 1
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Connector Contact	Measure to
1 (signal)	Test box V.A.G 1598 A
2 (earth)	Socket 24
3 (screen)	Socket 8
	Engine earth



- -> Knock sensor 2

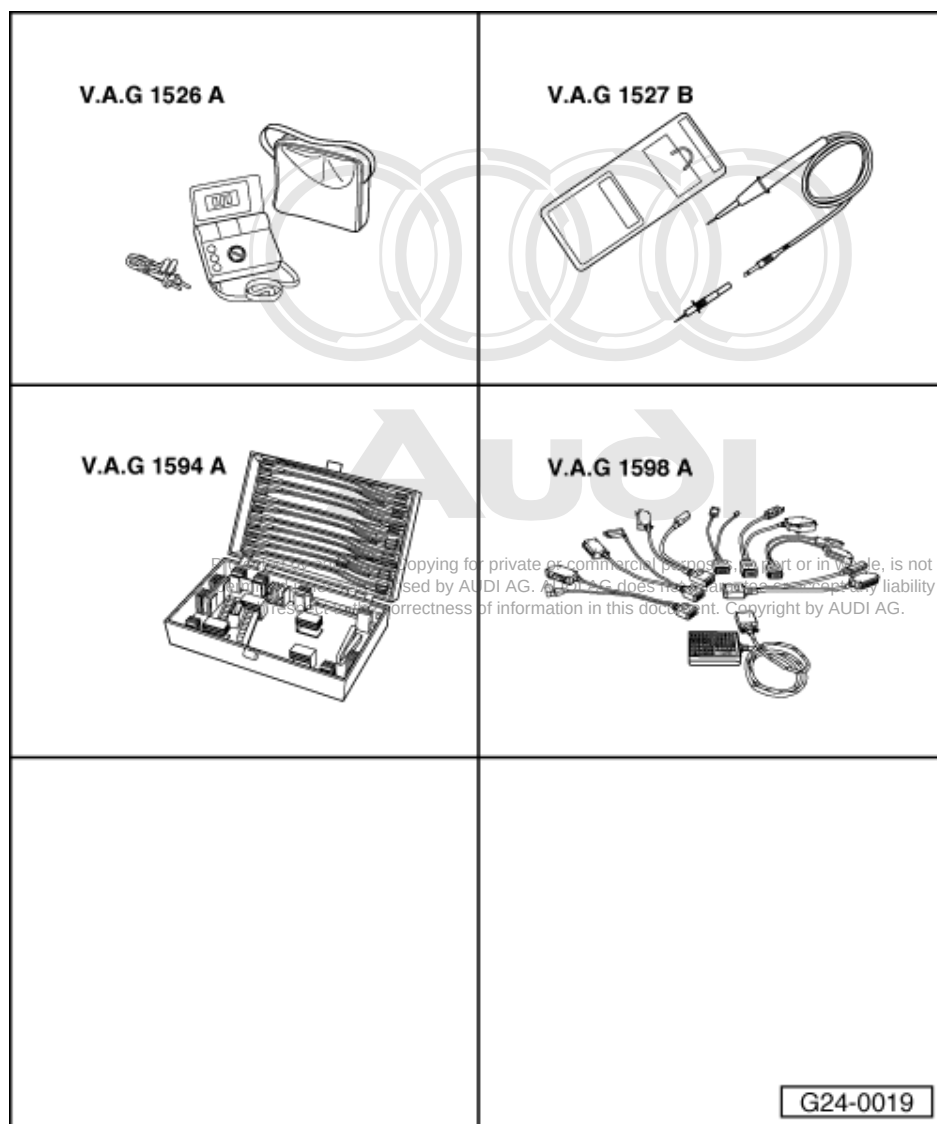


Connector Contact	Measure to
1 (signal)	Test box V.A.G 1598 A
2 (earth)	Socket 6
3 (screen)	Socket 8
	Engine earth

- If necessary, eliminate open circuit in wiring/short circuit.

=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

1.14 - Checking Hall sender -G40



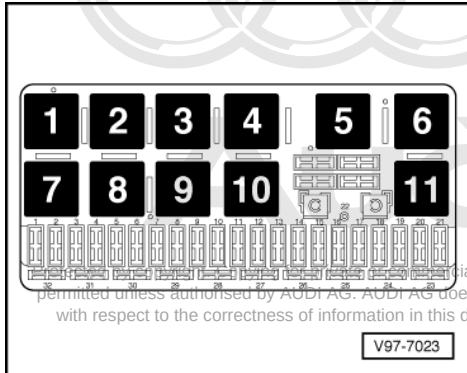
Special tools and workshop equipment required

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

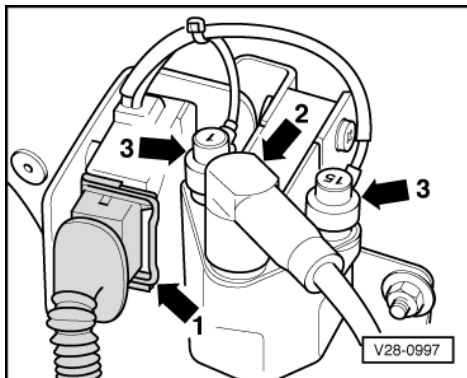
♦ V.A.G 1598/3

Fitting location => Exploded view of fitting locations - Page 30

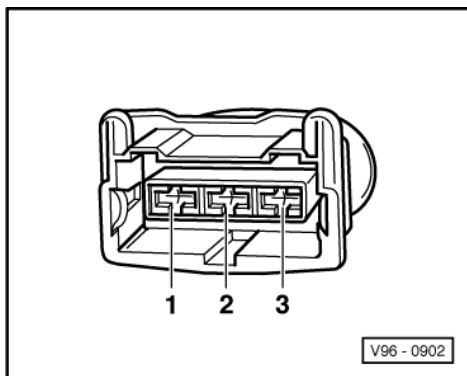
Test sequence



- -> Pull out fuse S13.



- -> Unplug connector -arrow 1- from output stage.



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

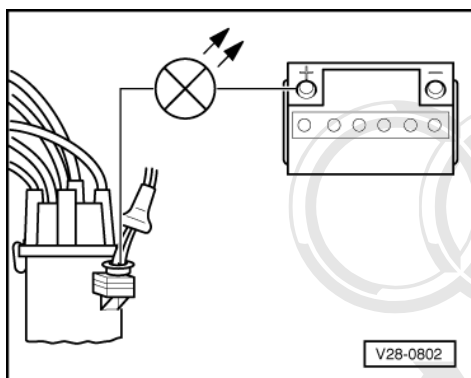
Connector Contact	Measure to
2 (signal)	Engine earth

- Briefly operate starter.
 - LED must flash

If LED does not flash:



- Push back rubber grommet of Hall sender connector but leave connector attached.



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

Connector Contact	Measure to
2 (signal)	Battery positive

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Note:

Pin assignment is marked on back of connector.

- Briefly operate starter.
 - LED must flash

Note:

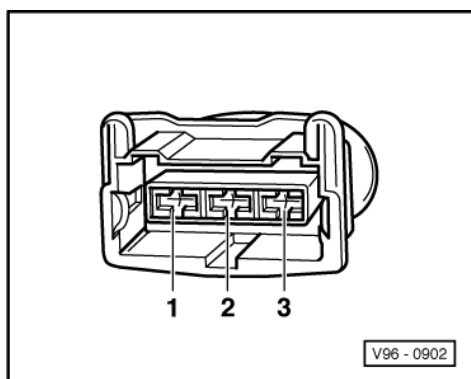
Voltage testers with a low current input do not go out completely between actuation of engine control unit, but rather continue to glow slightly and become distinctly brighter on actuation.

If LED does not flash:

- Check power supply for Hall sender => Page 149 .

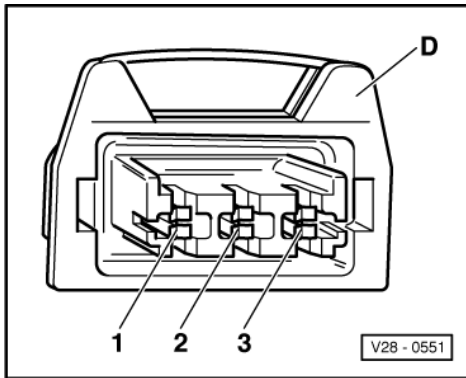
If LED now flashes:

- With ignition switched off, use adapter V.A.G 1598/3 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 35 .



- -> Check for open circuit and short to earth/positive in the following wiring.

Connector of output stage Contact	Test box V.A.G 1598 A Socket
2	11



- -> Check for open circuit and short to earth/positive in the following wiring.

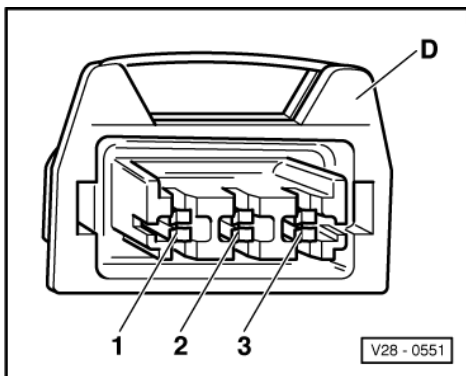
Connector of Hall sender Contact	Test box V.A.G 1598 A Socket
2	30

If no fault is found in wiring:

- Replace engine control unit => Page 36 .

Checking power supply

- Unplug connector of Hall sender at ignition distributor.



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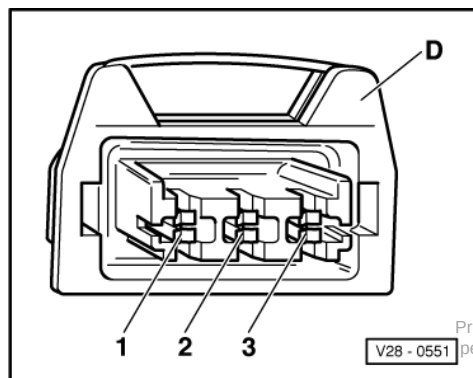
- -> Connect up multimeter for voltage measurement to contacts 3 (positive) and 1 (earth).
- Switch on ignition.
 - Specification: min. 9 V

If reading matches specification, but LED does not flash:

- Replace Hall sender.

If reading does not match specification:

- With ignition switched off, use adapter V.A.G 1598/3 to connect test box V.A.G 1598A to engine control-unit connector only (not to control unit) => Page 35 .



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- -> Check for open circuit and short to earth/positive or short circuit in the following wiring.

Connector Contact	Measure to
3 (positive)	Test box V.A.G 1598 A Socket 21
1 (earth)	Engine earth

- If necessary, eliminate open circuit in wiring/short circuit.

=> "Current Flow Diagrams, Electrical Fault-finding and Fitting Locations" binder

If no fault is found in wiring:

- Replace engine control unit => Page 36 .