

Audi 100 1991 ➤

Digifant injection and ignition system (4-cyl.)								
Engine ID	ABK	ADW						

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List of Workshop Manual Repair GroupsList of Workshop Manual Repair Groups Audi 100 1991 ➤

Digifant injection and ignition system (4-cyl.)

Repair Group

01 - Self-diagnosis

24 - Mixture preparation, Injection

28 - Ignition system



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

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01 - Self-diagnosis

1 - Self-diagnosis

1.1 - Self-diagnosis

1.2 - Technical self-diagnosis data

Equipment

- ♦ Fault memory: Non-volatile memory (a maximum of 4 different faults can be stored at the same time)¹⁾
- ♦ Rapid data transfer

1) Will be erased after 40th engine start if fault has not occurred again.

1.3 - Safety precautions

Observe the following if testers and measuring instruments have to be used during test drives:

Warning

- ♦ Always attach testers and measuring instruments to the back seat and have a second person operate them from there.
- ♦ Operation of test equipment from the front passenger seat could result in injuries to the person sitting there in the event of an accident (activation of passenger's airbag).

1.4 - Connecting fault reader V.A.G 1551 and selecting engine electronic control unit

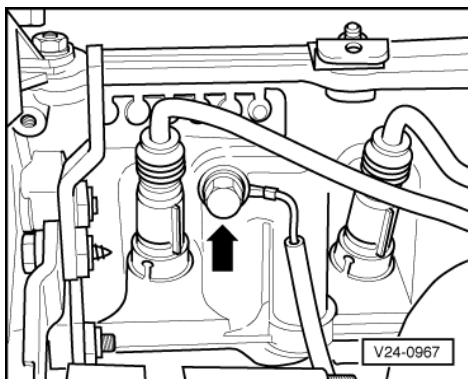
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Test requirements:

- Supply voltage of vehicle electrical system OK
- Engine fuses OK

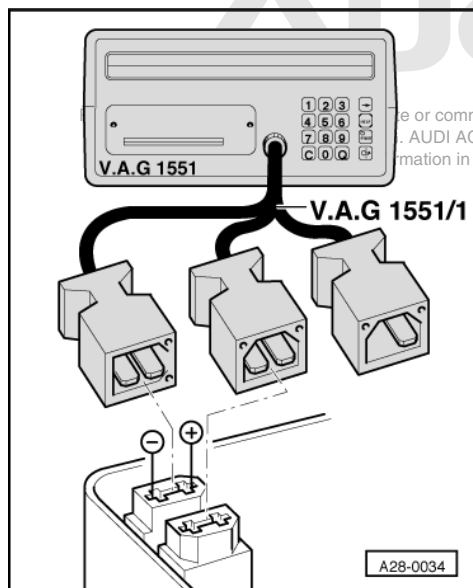
=> "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder

- Fuel pump relay -J17 and current supply relay -J176 OK. Testing => page 116 .
- earth connections checked.





- Test following earth connections for corrosion and poor connection before interrogating fault memory, final control diagnosis, engine basic settings, test of wiring and also before replacing components:
- ♦ -> Earth attachment point at left of cylinder head -arrow-.
- ♦ Battery earth strap and earth strap between engine and side member.
- Repair any damaged earth connections.



- Take off the cover of the auxiliary relay carrier 1 in the left of the plenum chamber.
- -> Connect fault reader V.A.G 1551 or vehicle system tester V.A.G 1552 to diagnostic connectors on relay panel as follows using wire V.A.G1551/1:
- With the ignition switched off, connect black connector to black diagnostic connection.

-> Indicated on display:

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

1) appears alternately

Note:

If the display remains blank, test voltage supply to black diagnostic connector => page 29.

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

Depending on the which function is required => "Available functions" table, page 3 :

- Switch the ignition on.

or

- Start the engine.
- Switch on the fault reader printer with the print key. The indicator lamp in the key must light up.
- Enter "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. interrogation of fault memory via rapid data transfer for all vehicle systems with a self-diagnosis capability.

- Enter "01" for address word "Engine electronics" and confirm entry with Q key.

-> The display on the fault reader V.A.G 1551 will show the control unit identification code (example).

039906024A	Digifant	1.75
1566		
Code 00002	WSC 12345	

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Note:

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

Control unit identification (example)

- 39.906.024 A	Part no.; assignment => Parts catalogue
- Digifant 1.75	Digifant fuel injection and ignition system.
- 1566	Data status (software status) of control unit
- Coding 00002	Control unit code
- WSC 12345	Workshop Code of V.A.G 1551 with which encoding was last performed

Note:

If no data link can be established with the control unit =>page 30.

- Press the =>key.

-> Indicated on display (function selection):

Rapid data transfer	HELP
Select function XX	

Note:

After entering the function "01"for "Interrogating control unit version" and confirming with the Q key, you may display the control unit identification again.

Available functions

Fault reader V.A.G 1551 fault reader or vehicle system tester V.A.G 1552		Ignition on, engine stopped	Engine idling	Vehicle running	page
Address words					
01	Engine electronics	yes	yes	yes	1
00	Automatic test routine	yes	yes	yes	3
Functions					
01	Interrogating control unit version	yes	yes	yes	1
02	Interrogating fault memory	yes	yes	yes	4
03	Final control diagnosis	yes	no	no	13
04	Basic setting	no	yes	no	15



05	Erase fault memory	yes	yes	yes	4
06	End of output	yes	yes	yes	4
07	Coding control unit	yes1.	no	no	16
08	Reading measured value block	yes	yes	yes	17

1) As of control unit no. 39.906.024 A

2 - Interrogating and erasing fault memory

2.1 - Interrogating and erasing fault memory

- Connect fault reader V.A.G 1551 (V.A.G 1552) and select the engine electronics control unit using "Address word" 01. The engine must be running at idle speed
(Connect fault reader and select engine electronics control unit => page 1.)

Note:

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

-> Indicated on display:

Rapid data transfer HELP
Select function XX

- Enter "02" for the function "Interrogate fault memory" and confirm entry with Q key.

-> Indicated on display:

No fault detected!

- Press the ⇒key.

Note:

If problems have been reported but no faults are detected by the self-diagnosis:

- Carry out final control diagnosis => page 17.

or

-> Indicated on display:

X faults detected!

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

Note:

If the printer is switched off, press the ⇒ key to display the next fault.

- After display and print out of the last fault the faults must be erased according to fault table => from page 5.
- Press the ⇒key.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

- Enter "05" for the function "Erase fault memory" and confirm entry with Q key.

Note:

-> Indicated on display:

Warning
Fault memory not interrogated

Sequence has not been correctly followed.

- Interrogate the fault memory:

The fault memory will also not be erased if :

- ♦ The ignition has been switched off after interrogating the fault memory.
- ♦ A static fault has not been rectified.

-> Indicated on display:

Rapid data transfer
Fault memory is erased

- Press the ➡key.
- Interrogate fault memory again after carrying out the repairs.

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Note:

This erases faults that have been stored whilst the fault was being rectified, for example, faults that have arisen as a result of connectors being detached.

- Take the vehicle for a test drive. Conditions:
 - Duration at least 5 minutes (fault recognition of the lambda control is time-dependent)
 - Coolant temperature at least 80 °C
 - Engine speed greater than 3000 rpm
 - Accelerator fully depressed for a short time
- Enter "00" for address word "Automatic test sequence" and confirm entry with Q key.

Note:

If, when rectifying faults on vehicles with automatic gearbox, the connector is pulled off the engine control unit, the fault memory of the gearbox control unit must also be interrogated and erased. This is because the "Engine/gearbox electrical connection: Open circuit" fault will have been stored in the gearbox control unit.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

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

-> Indicated on display:

Rapid data transfer HELP
Enter address word xx

- Switch off ignition and detach diagnostic connector.

2.2 - Fault table

Notes:

- ♦ The table below lists all the possible faults that can be detected by diesel direct injection system control unit -J169, and which may appear on fault reader V.A.G 1551 or vehicle system tester V.A.G 1552 when the fault memory is interrogated. The fault table lists the faults in order according to fault code.
- ♦ Before renewing components shown as being faulty, check the wiring and connectors to these components and the earth connections using the current flow diagram. This is particularly relevant for faults recorded as "occurring sporadically" (SP).



- ♦ If the engine is switched off after the test drive and before interrogating the fault memory, all existing faults will be displayed as sporadic faults. If a fault occurs only occasionally or if the fault memory is not erased after the repair has been carried out, the fault will also appear on the display as a "sporadic fault". "/SP" appears on the right of the V.A.G 1551 display.

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00513 Engine speed sensor -G28 No signal	- Voltage or earth supply for Hall sender -G40 faulty - Open circuit or short circuit to earth or to positive in signal wire between -G40 and engine control unit - Hall sender -G40 faulty - Faulty signal input in engine control unit (control unit defective)	- Engine cuts out or does not start (fuel pump and injectors are switched off)	- Test Hall sender -G40 => Page 106 - Replace engine control unit =>Page 48 .

Notes on fault code 00513:

- ♦ The engine control unit receives the speed information from the Hall sender in the distributor
- ♦ In place of the engine speed sender -G28 the Hall sender -G40 is monitored.
- ♦ Ignore fault code if ignition on and engine off.
Pay attention to fault code if ignition on after unsuccessful attempt at starting (engine does not start)

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00518 Throttle valve potentiometer - G69 Open/short circuit to earth1)	Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorized 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. - Power supply to -G69 defective - Open circuit or short to earth in signal wire between -G69 and engine control unit - -G69 defective - Faulty signal input in engine control unit (control unit defective) Continued ▼	- Loss of power - Driving faults	- Test throttle valve potentiometer -G69 => Page 86 - Replace engine control unit =>Page 48 .

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

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00518 Throttle valve potentiometer -G69 Short to positive 1)	(Fault 00518 continued) - Earth supply to -G69 defective - Short to positive in signal wire between -G69 and engine control unit - -G69 defective	- Loss of power - Driving faults	- Test throttle valve potentiometer -G69 => Page 86

	- Faulty signal input in engine control unit (control unit defective)		- Replace engine control unit =>Page 48 .
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1) One of these displays will appear in addition to the name of the component.

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00522 Coolant temperature sender -G62 Implausible signal 1)	- Loose contact or corrosion due to moisture in connector plug	- Cold start problems at very low temperatures	- Test coolant temperature sender -G62 => Page 112
Open/short circuit to positive 1)	- Earth supply to -G62 defective	- Driving faults in warming-up phase	- rectify open circuit or short circuit.
	- Open circuit or short to positive in wiring between -G62 and engine control unit		
	- -G62 defective		
	- Faulty signal input in engine control unit (control unit defective)		- Replace engine control unit =>Page 48

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

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00523 Intake air temperature sender -G42 Short to earth 1)	- Short circuit to earth	- Reduced power	- Test intake air temperature sensor -G42 => Page 111
Open/short circuit to positive 1)	- Open circuit or short to positive in wiring between -G42 and engine control unit		- Rectify open circuit or short circuit.
	- -G42 defective		
	- Faulty signal input in engine control unit (control unit defective)		- Replace engine control unit =>Page 48 .

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

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00524 Knock sensor 1 -G61 No signal	- Knock sensor 1 -G61 loose or corrosion caused by moisture in connector	- High fuel consumption - Loss of power - Abrupt loss of power (similar to misfiring)	- Test knock sensor 1 -G61 => Page 117
	- Open circuit or short to positive in wiring between -G61 and engine control unit		- Rectify open circuit or short circuit.
	- Short circuit between -G61 and earth or to screening		
	- -G61 defective		



	- Faulty signal input in engine control unit (control unit defective)		- Replace engine control unit =>Page 48 .
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V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00525 Lambda probe -G39 No signal1)	- Open circuit or short circuit between -G61 and engine control unit - Lambda probe heater -Z19 not operating - Heating resistor in -G39 defective - Thermofuse (brown) defective Continued ▼	- Exhaust not OK - Idling speed control switches to open loop control	- Rectify open circuit or short circuit. - Read measured value block, display group 001, read display zone 3, Read display constant between 0.40 V and 0.50 V => from Page 17 - Test lambda probe heater -Z19 => Page 76 - Test lambda probe heater -Z19 => Page 78

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

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00525 Lambda probe -G39 No signal1)	(Fault 00525 continued) - Wiring of lambda probe heater - Short to earth or short to screening in lambda probe signal line - -G39 defective	- Exhaust not OK - Idling speed control switches to open loop control	- Rectify open circuit or short circuit. - Read measured value block, display group 001, read display zone 3, Read display constant between 0.40 V and 0.50 V => from Page 17 - Test lambda probe heater -Z19 => Page 78 - Test Lambda probe -G39 and Lambda control => Page 76
Short to positive 1)	- Short circuit of lambda probe signal to positive		

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

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00532 Supply voltage Signal too great 1)	- Supply voltage greater than 16 V - Excess voltage from assisted start - Alternator defective	- Damage to the engine control unit	- Test voltage - Read measured value blockDisplay Group 002, display zone 3=> Page 24
Signal too small 1)	- Current supply relay for control unit defective	- Voltage less than 6 V - Engine will not run	- Test power supply to engine control unit => Page 114 .

	- Poor earth connection to engine control unit - Battery discharged - Current drain with ignition off	- Read measured value blockDisplay Group 002, display zone 3=> Page 24 - Test battery charge level
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1) One of these displays will appear in addition to the name of the component.

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00533 Idling speed regulation Lower stop value1)	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 the information in this document. Copyright by Audi AG - Idling speed stabilisation valve -N71 jamming when open - -N71 or wire faulty - Unmetered air downstream of air flow meter -G19 - Basic throttle valve setting - 2nd stage of throttle valve unit sticking - Throttle valve potentiometer -G69 does not move into "zero position"	- Idling speed too high - Irregular idling (surging) - Poor throttle response - Engine jerks	- Test idling stabilisation valve -N71 => Page 69 - Vacuum connections => Page 84 - Adjust throttle valve => Page 89 - Perform visual inspection - Test throttle valve potentiometer -G69 => Page 86
	Continued ▼		

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

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00533 Idling speed regulation Lower stop value1)	(Fault 00533 continued) - Air flow meter -G19 supplies incorrect load signal - Activated charcoal filter solenoid valve1 -N80 leaking - Ignition point too soon	- Idling speed too high - Irregular idling (surging) - Poor throttle response - Engine jerks	- Test air flow meter-G19 => Page 72 - Test activated charcoal filter solenoid valve 1 -N80 for leaks => Page 80 - Test ignition timing and set, if necessary => Page 105
	Continued ▼		

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

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00533 Idling speed regulation Upper stop value1)	(Fault 00533 continued) - Idling speed stabilisation valve -N71 jamming when closed - Idling stabilisation valve -N71 or wire connection defective	- Idling speed too low - Irregular idling (surging) - Poor throttle response - Engine jerks	- Test idling stabilisation valve -N71 => Page 69



	- Corrosion caused by moisture in connector of idling speed stabilisation valve -N71		- Perform visual inspection
	- Air flow meter -G19 supplies incorrect load signal		- Test are flow meter -G19 => Page 72
	- Ignition point too late		- Test ignition timing and set, if necessary => Page 105

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

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00535 First knock regulation Upper stop value	- Poor quality fuel (less than RON 91)	- Slight power loss - Max. speed too low	- Refuel with fuel of at least 95 RON
	- Knock sensor 1 -G61 loose		- Tighten knock sensor to 20 Nm
	- Open circuit in screening of knock sensor 1 -G61		- Test knock sensor 1 -G61 => Page 117
	- Abnormal engine noises (ancillaries loose) caused by mechanical damage, e.g. slackened bolted connections, fractured securing bolts or split/fractured brackets of components on engine Continued ▼		- Rectify mechanical damage

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00535 First knock regulation Upper stop value	(Fault 00535 continued)	- Slight power loss - Max. speed too low	- Replace engine control unit =>Page 48 .
	- Knock control in engine control unit faulty (engine control unit faulty)		- Test ignition timing and set, if necessary => Page 105
	- Ignition point too soon		- Test compression pressure => 4-cyl. -Fuel injection engine (2-valve), Mechanical Components; Repair Group 15; Cylinder head Valve Gear; Test compression pressure 59

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00537 Lambda control Upper stop value1)	- Fuel tank empty, at least 10 l	- CO upstream of catalytic converter less than 0.3 % vol.	- Refuel the vehicle
	- Fuel system pressure too low		- Test fuel system pressure => Page 53
	- Unmetered air downstream of air flow meter -G19		- Vacuum connections => Page 84

	- Leaks in the exhaust system up to the catalytic converter		- Rectify leak
	- Wiring to the lambda probe -G39 has a short to earth		- Test Lambda probe -G39 and Lambda control => Page 76
	- Injector does not open		- Test injectors => Page 59
	Continued ▼		

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

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00537 Lambda control Lower stop value1)	(Fault 00537 continued)	- CO upstream of catalytic converter greater than 1,2 % vol. - Soot deposits on spark plugs - Fuel consumption too high - Black smoke	- Perform visual inspection
	- Failure of spark plugs		- Test fuel system pressure => Page 53
	- Fuel pressure too high		- Test cold start valve -N17 => Page 69
	- Cold start valve -N17 leaking		- Test activated charcoal filter solenoid valve 1 -N80 for leaks => Page 80
	- Activated charcoal filter solenoid valve 1 -N80 leaking, constantly open		- Test injectors => Page 59
	- Injector not closing		

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

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00545 Engine/gearbox electrical connection No signal	- Open circuit or short circuit to positive or earth	- Cold starting problems	- Rectify open circuit in wiring or short circuit => Page 96
	- Automatic gearbox control unit -J217 defective		

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00552 Air flow meter potentiometer-G19 Open/short circuit to earth 1) Short to positive 1)	- Air flow meter -G19 defective	- Reduced power - Jolting - Poor acceleration	- Test air flow meter-G19 => Page 72



No fault type recognised1) Implausible signal 1)	- Open circuit or short to positive or earth in signal wire between air flow meter -G19 and engine control unit		- Rectify open circuit or short circuit.
---	---	--	--

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

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00625 Road speed signal No signal	- Speedometer sender/road speed sender -G22/-G68 defective - Speedometer -G21 defective - Open circuit or short in wiring between dash panel insert and engine control unit - Faulty signal input in engine control unit (control unit defective)	- Load change jolt	- Test speed signal => Page 94 - Replace engine control unit =>Page 48 .

Note on Fault code 00625:

Start by checking whether speedometer reading is OK. If reading is not OK, fault display can be ignored.

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
00703 Idling recognition DK.-poti/LL-switch Implausible signal	- Open circuit in wiring or short circuit to positive or earth to idling switch -F60 - Earth wire idling switch - F60 has open circuit or short circuit to positive - -F60 idling switch defective - Faulty signal input in engine control unit (control unit defective)	- Fast idling with cold start - Engine cuts out when clutch released in overrun	- Test idling switch -F60 => Page 90 - Replace engine control unit =>Page 48

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
01087 Basic setting not performed	- Basic setting not carried out after changing control unit - Setting conditions in function 04 "Basic setting, display group 001, display block 4" are not met (e.g. throttle valve potentiometer - -G69 defective		- Carry out basic setting => Display group 001, Display block 4 from Page 15 - Determine cause and rectify (e.g. replace throttle valve potentiometer -G69, then adapt engine control unit to throttle valve potentiometer => Page 89)

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
17978			

Engine control unit blocked	- Fault in immobiliser system	- Engine does not start (cuts out after one second)	- Interrogate fault memory of immobiliser => Electrical System; Repair Group 01; Immobiliser Self-diagnosis; Interrogating fault memory Immobiliser Self-diagnosis; Interrogating fault memory
	- Adaptation of immobiliser control unit -J362 to engine control unit not carried out		- Carry out adaptation of immobiliser control unit -J362 to engine control unit => Electrical system; Repair group 01; Self-diagnosis; Adaptation procedure after renewing engine control unit Self-diagnosis; Adaptation procedure after renewing engine control unit
	- Open circuit between immobiliser control unit -J362 and engine control unit		- Determine faults with test box V.A.G 1598/18 according to current flow diagram and rectify

V.A.G 1551 print-out	Possible causes of fault	Possible effects	Fault remedy
65535 Control unit faulty	- Earth connection to engine control unit at contacts 1 and 42	- Engine will not start	- Test earth connection according to current flow diagram
	- Internal fault in control unit	- Engine running problems - Engine cuts out	- Replace engine control unit => Page 48
	- Signal communication problems between fault reader and engine control unit	- No	- Erase fault memory and continue to observe vehicle

3 - Final control diagnosis

3.1 - Final control diagnosis

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

Actuation sequence
1 Fuel pump relay -J17
2 Idling stabilisation valve - N71
3 Solenoid valve 1 for activated charcoal filter -N80

Notes:

- ♦ It is only possible to carry out a complete final control diagnosis once each time after switching one.
- ♦ To repeat final control diagnosis, it is necessary to switch off the ignition for 30 seconds and to unplug the "white" diagnosis connector for about 5 seconds.



- ♦ After initiating final control diagnosis, it is not possible to start the engine as the injectors and the ignition transformer are not operating. To start the engine it is necessary to switch the ignition on and off again.
- Connect fault reader V.A.G 1551 (V.A.G 1552) and select the engine electronics control unit using "Address word" 01. Engine must not be running.
(Connect fault reader and select engine electronics control unit => Page 1.)

-> Indicated on display:

Rapid data transfer HELP
Select function XX

- Press keys 0 and 3 for the function "Final control diagnosis" and confirm entry with Q key.

-> Indicated on display:

Final control diagnosis
Fuel pump relay -J17

The relay must be energised and the fuel pump must run. Flow noise at fuel pressure regulator is clearly audible.

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If the relay does not respond:

- Test actuation of the fuel pump relay -J17 => Page 58 .
- Press the ➡key.

-> Indicated on display:

Final control diagnosis
Idling stabilisation valve -N71

The idling stabilisation valve must hum and vibrate.

Note:

The humming of the valve is difficult to hear and is therefore best checked by touching the valve.

If the valve does not hum and vibrate:

- Test idling stabilisation valve -N71 => Page 69 .
- Press the ➡key.

-> Indicated on display:

Final control diagnosis
Solenoid valve 1 for activated charcoal
filter -N80

The injector valve should click.

If the injector does not click:

- Test actuation of solenoid valve 1 for activated charcoal filter -N80 => Page 80 .
- Press the ➡key.

-> Indicated on display (function selection):

Rapid data transfer HELP
Select function XX

4 - Basic setting

4.1 - Basic setting

In the basic setting the engine control unit carries out the following functions:

- ♦ The learned values for idling speed control and lambda control are relearned (idling speed and CO value are set automatically).
- ♦ Engine control unit and throttle valve potentiometer are adapted to each other.

Basic setting is only carried out if the setting conditions in display group 001,display block 4 are met => from Page **15** .

Test requirements:

- Coolant temperature at least 85 oC.
 - Electrical consumers switched off (radiator fan must not run during the test)
 - Air conditioner switched off.
 - Selector lever in position P or N
 - Engine speed less than 1300 rpm
 - Accelerator pedal not depressed.
- Connect fault reader V.A.G 1551 (or V.A.G 1552) and interrogate fault memory => Page **4** . After interrogating the fault memory, run the engine at idling speed.

-> Indicated on display:

Rapid data transfer **HELP**
 Select function XX

- Switch on the fault reader printer with the Print key. The indicator lamp in the key must light up.
- Enter "04" to select "Start basic setting" and confirm with Q key.

-> Indicated on display:

Basic setting **Q**
 Enter display group number XXX

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

-> The readout in display group number 001 appears in 4 display blocks; explanation => Page **15** .

Default setting 1
 1 2 3 4

Note:

If the printer is switched on, the current readout in the display can be printed out on the record slip by pressing the print key.

- If the specifications are achieved in all the display blocks, press the =>key and end the output => Page **4** .

Display group 001

System in basic setting 1			=>	Indicated on display
820 rpm	95 oC	0.75 V	00000000	
			Setting conditions, meaning => Page 16	
			Lambda probe voltage (varies) ▪ 0.10 ... 1.10 V OK ▪ If outside tolerance=> Display Group 001, Page 22	



Coolant temperature
▪ 85 ... 115 oC ok
▪ less than 85 oC => warm up engine
Engine speed
▪ 770 ... 870 rpm OK
▪ If outside tolerance=> Display Group 001, Page 22

Notes on display zone 4:

- ♦ If the setting conditions are not met, the engine control unit is moved into the setting mode. Idling speed and CO content are set automatically in this case.
- ♦ The setting conditions are met if "00000000" appears in display block 4. If a "1" is displayed only at one place in the 8-digit readout, this indicates that a setting condition is not met, and the engine control unit does not move into the setting mode.

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Meaning of the 8 digit setting condition

1	1	1	1	1	1	1	1	
								Coolant temperature less than 80 oC
								Engine speed not within valid range
								Throttle valve open
								Lambda control switched off
								Idling speed switch not closed
								Air conditioner compressor not switched off (switched off automatically in "Basic setting")
								Ignition angle retardation during gearshift active (automatic gearbox)
								No meaning

5 - Coding control unit

5.1 - Coding control unit

From control unit no. 39.906.024 A

Note:

-> If the control unit identification displays a code that does not correspond to the vehicle, it is then necessary to code the control unit.

039906024A	Digifant	1.75
1566	□	
Code 00001	WSC 12345	

- Connect fault reader V.A.G 1551 (V.A.G 1552) and select the engine electronics control unit using "Address word" 01. The ignition must be switched on.
(Connect fault reader and select engine electronics control unit => Page 1.)

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

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

-> Indicated on display:

Coding control unit
Enter code number XXXXX (0-00127)

- Enter the correct coding for the vehicle and confirm entry with Q key.

Coding	Model
00001	Audi 80
00002	Audi 100 / A6

Note:

The Digifant control unit is supplied as a replacement part with the coding for the Audi 100 / A6 (with idling speed switch -F60).

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

039906024A Digifant 1.75
1566 ☐
Code 00002 WSC 6744

- Press the ➡key.

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-> Indicated on display:

Rapid data transfer HELP
Select function XX

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

-> Indicated on display:

Rapid data transfer HELP
Enter address word XX

- Switch off ignition and detach diagnostic connector.

Note:

The next time the ignition is switched on the newly entered code will be activated.

6 - Reading measured value block

6.1 - Reading measured value block

Test requirements:

- Electrical consumers switched off (radiator fan must not run during the test)
- Air conditioner switched off.
- Connect fault reader V.A.G 1551 (or V.A.G 1552) and interrogate fault memory => Page 4 . After interrogating the fault memory, run the engine at idling speed.

Notes:

- ♦ If displayed values are to be read out while moving, a second operator is required.
- ♦ Observe safety precautions => Page 1

-> Indicated on display:

Rapid data transfer HELP
Select function XX



- Switch on the fault reader printer with the print key. The indicator lamp in the key must light up.
- Enter "08" to select the function "Reading measured value block" and confirm entry with Q key.

-> Indicated on display:

```
Reading measured value block    Q
Enter display group number XXX
```

- Enter the display group number => List of display group numbers available for selection, Page 18.
- Confirm input with the Q key.

-> Display for display group 000:

```
Read measurement block 0
1 2 3 4 5 6 7
8 9 10
```

-> Display for display group 001 (example):

```
Reading measured value block    1
1 2 3 4
```

Notes:

- ♦ If the printer is switched on, the current display can be printed out on the record slip.
- ♦ Before selecting another display group, press the key C.
- If the specifications are achieved in all the display blocks, press the ➔key and end the output => Page 4.
- If the specifications are not achieved in display group 000 => test table, Page 20.
- If the specifications are not achieved in display groups 001 ... 006 => relevant test tables.

List of Display Group numbers for selection

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Display group no.	Indicated on display	Designation
000	Read measured value block 0 1 2 3 4 5 6 7 8 9 10	1 = Intake air temperature 2 = Engine control unit power supply 3 = Coolant temperature 4 = Engine load 5 = Lambda probe voltage 6 = Time counter active/not active 7 = Probe status counter; ignore 8 = Throttle valve potentiometer voltage 9 = Injection period 10 = Engine speed

Notes:

- ♦ Display block 6 shows how long the lambda control is switched off for a certain time in certain operating states (e.g. fuel shut-off on overrun). This shutoff is indicated by a time counter. If the time counter is not equal to "0", the lambda control is switched off for a certain time.
- ♦ Display block 7 shows how often the lambda probe supplies a signal which cannot be analysed, or no signal. The readout is incremented (increased) with each ignition.

Display group no.	Indicated on display	Designation
001	Read measured value block 1 1 2 3 4	1 = Engine speed 2 = Coolant temperature 3 = Lambda probe voltage 4 = Setting conditions

Display group no.	Indicated on display	Designation
002	Read measured value block 2 1 2 3 4	1 = Engine speed 2 = Injection period 3 = Engine control unit power supply 4 = Intake air temperature
003	Read measured value block 3 1 2 3 4	1 = Engine speed 2 = Engine load 3 = Throttle valve angle 4 = Internal specified duty cycle of idling stabilisation valve

Display group no.	Indicated on display	Designation
004	Read measured value block 4 1 2 3 4	1 = Engine speed 2 = Engine load 3 = Speed signal 4 = Engine load operating state
005	Read measured value block 5 1 2 3 4	1 = Engine speed 2 = Signal ratio of activated charcoal filter solenoid valve 3 = Consumption signal 4 = Cold start valve
006 1)	Read measured value block 6 1 2 3 4	1 = Lambda control readout 1 2 = Lambda control readout 2 3 = Learned value of idling speed control 4 = Learned value of throttle valve zero position

1) Display group 006 is only displayed in the case of control unit with Part No. 039 906 024 D.

Display group 000

Reading measured value block										⇒	• indicated on display	Specification	Corresponds to
1	2	3	4	5	6	7	8	9	10				
											Engine speed	211 ... 186	770 ... 870 rpm
											Injection time (figure computed internally by control unit)	3 ... 7	1.5 ... 3.5 ms
											Throttle valve potentiometer voltage	10 ... 130	0.2 ... 2.6 V
											Probe status counter; ignore	0 ... 5	-
											Lambda control time counter; ignore	0	-
											Lambda probe voltage (varies)	230 ... 80	0.1 ... 1.1 V
											Engine load	35 ... 65	14 ... 25 %
											Coolant temperature	0 ... 8	+ 85 ... 115 °C
											Engine control unit power supply	115 ... 150	10.8 ... 14 V
											Intake air temperature	15 ... 70	+ 65 ... 12 °C

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Test table, Display group 000

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1	Deviation from tolerance range	- Intake air temperature sender - G42 defective - Wiring fault between intake air temperature sender -G42 and engine control unit.	- Interrogate fault memory =>Page 111
2	Deviation from tolerance range	- Alternator defective - Battery discharged (current drain) - Poor earth connection to engine control unit - Current supply relay for control unit defective	- Test power supply => Page 114
3	Deviation from tolerance range	- Coolant temperature sender -G62 defective - Wiring fault between coolant temperature sender -G62 and engine control unit.	- Interrogate fault memory =>Page 112

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
4	Deviation from tolerance range	- Poor idling (not running on all cylinders)	- Test spark plugs => Page 59
		- Air flow meter -G19 defective	- Interrogate fault memory =>Page 72
		- Idling stabilisation valve -N71 defective - Wiring fault between idling speed stabilisation valve -N71 and engine control unit	- Test idling stabilisation valve -N71 => Page 69 .
		- Intake system drawing in unmetred air	- Test air intake system for leaks => Vacuum connections, Page 84
		- Loads switched on, e.g. air conditioner is on; steering wheel is at end stop; selector lever of automatic gearbox not set to position "P" or "N"	- Switch off all electrical loads Centre steering wheel Move selector lever to "P" or "N"

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
5	Deviation from tolerance range	- Injector defective - Defective spark plug	- Test injection valves => Page 99
(cont.) ▼		- Air intake system drawing in large quantities - Unmetered air	- Test air intake system for leaks => Vacuum connections, Page 84
		- Coolant temperature sender -G62 defective	- Interrogate fault memory =>Page 112
		- Activated charcoal filter system solenoid 1 -N80 defective	- Perform final control diagnosis =>Page 13
		- Lambda probe -G39 dirty	- Interrogate fault memory =>Page 78
		- Lambda probe heater -Z19 defective	- Test lambda probe heater -Z19 => Page 78

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
5	Deviation from tolerance range	- Fuel system pressure too low or too high	- Test fuel pressure regulator and holding pressure => Page 53
	Constantly at readout between 3 and 4	- Short to positive through: - - Lambda probe -G39 - - Lambda probe wiring - - Engine control unit	- Test lambda probe -G39 => Page 78
	Constantly at readout between 164 and 168	- Open circuit through: - - Lambda probe -G39 - - Lambda probe wiring - - Engine control unit	
	Constantly at readout greater than 230	- Short to earth through: - - Lambda probe -G39 - - Lambda probe wiring - - Engine control unit	

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
6	...	Ignore	
7	Deviation from tolerance range or readout at constant 127	- Fault in fault memory	- Interrogate fault memory =>Page 4
		- Lambda probe heater -Z19 defective	- Test lambda probe heater -Z19 => Page 78
		- Defect in wire between throttle valve potentiometer -J169 and engine control unit -G39	- Test lambda probe -G39 => Page 78
8	Deviation from tolerance range	- -G69 throttle valve potentiometer defective - Defect in wire between throttle valve potentiometer -G69 and engine control unit	- Interrogate fault memory =>Page 86

Note on display zone 7:

If the readout 127 appears in the display, the lambda control has switched to the open-loop control mode

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
9	...	Ignore	
10	Deviation from tolerance range	- Air intake system drawing in large quantities of unmetered air	- Test air intake system for leaks => Vacuum connections, Page 4
		- Engine control unit not coded ¹⁾	- Code engine control unit =>Page 16
		- Idling stabilisation valve -N71 is sticking or stiff	- Perform final control diagnosis =>Page 69 .
		- Idling switch -F60 defective or incorrectly set	- Test and adjust idling speed switch -F60 => Page 90
		- -G69 throttle valve potentiometer defective	- Test throttle valve potentiometer - G69 => Page 86 or display group 003, Display zone 3

1) As of control unit no. 39.906.024 A



Display group 001

Reading measured value block 1			⇒	Indicated on display
820 rpm	95 oC	0.75 V	XXXXXXXX	
Setting conditions => Page 16				
Lambda probe voltage (varies)				
▪ 0.1 ... 1.1 V				
Coolant temperature				
Engine speed (idling speed)				
▪ 770 ... 870 rpm OK				

Test table, Display group 001

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1 (cont.) ▼	Greater than 870 rpm	- Idling switch -F60 defective or incorrectly set	- Test and adjust idling speed switch -F60 => Page 90 or 4th position in display block 4
		- Throttle valve potentiometer -G69 - Defective	- Test throttle valve potentiometer -G69 => Page 86 or display group 003, Display zone 3
		- Idling stabilisation valve -N71 is sticking or stiff	- Perform final control diagnosis =>Page 69 .
		- Air intake system drawing in large quantities - Unmetered air	- Test air intake system for leaks => Vacuum connections, Page 84
		- Unmetered air at 2nd stage of throttle valve	- Perform basic setting of throttle valve=> Page 89
		- Incorrect throttle cable setting	- Adjust throttle cable => 4-cyl. Injection engine (2-valve), Mechanical components, Repair Group 20, Removing and installing parts of fuel system, adjusting throttle cable.

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1	Less than 770 rpm	- Idling switch -F60 defective or incorrectly set	- Test and adjust idling speed switch -F60 => Page 90 or 4th position in display block 4
		- Idling stabilisation valve -N71 is sticking or stiff	- Perform final control diagnosis =>Page 69 .
		- Loads switched on, e.g. air conditioner is on; steering wheel is at end stop; selector lever of automatic gearbox not set to position "P" or "N"	- Switch off all electrical loads Centre steering wheel Move selector lever to "P" or "N"

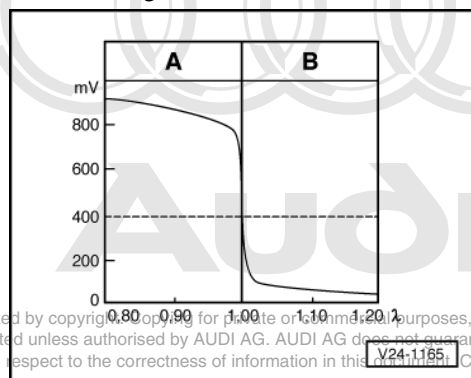
Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
2	Greater than 115 oC or less than 85 oC 1)	- Coolant temperature sender -G62 defective - Wiring fault between coolant temperature sender -G62 and engine control unit -J169	- Interrogate fault memory =>Page 112
3 (cont.) ▼	Deviation from tolerance range	- Injector defective - Defective spark plug	- Test injection valves => Page 99

1) Vehicle at operating temperature.

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
3	Deviation from tolerance range	- Air intake system drawing in large quantities of unmetered air	- Test air intake system for leaks => Vacuum connections, Page 84
		- Coolant temperature sender -G62 defective	- Interrogate fault memory =>Page 112
		- Activated charcoal filter system solenoid 1 -N80 defective	- Perform final control diagnosis =>Page 80
		- Lambda probe -G39 dirty	- Interrogate fault memory =>Page 78
		- Lambda probe heater -Z19 defective	- Test lambda probe heater -Z19 => Page 78
		- Fuel system pressure too low or too high	- Test fuel pressure regulator and holding pressure => Page 53
(cont.) ▼	constant readout of 1.60 V	- Short to positive through: - - Lambda probe -G39 - - Lambda probe wiring - - Engine control unit	- Test lambda probe -G39 => Page 78

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
3	Constant readout between 0.40 and 0.50 V	- Open circuit through: - Lambda probe -G39 - Wiring for lambda probe - Engine control unit	- Test lambda probe -G39 => Page 78
	Constant readout of 0,00 V	- Short to earth through: - Lambda probe -G39 - Wiring for lambda probe - Engine control unit	
4	00010000	- Idling speed switch not closed (the positions shown with "0" are only of importance for the basic setting)	- Test and adjust idling speed switch -F60 => Page 90

Note on display zone 3:
Probe voltage U in mV



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Air ratio

- A - -> Lambda-probe voltage (mV) high, rich mixture (fuel excess or air deficiency), high CO value
 B - Lambda probe voltage (mV) low, lean mixture (fuel deficiency or air excess), low CO value

Display group 002

Reading measured value block 2				⇒	◀ Indicated on display
820 rpm	2.0 ms	11.0 V		40 °C	
					Intake air temperature
					▪ no specification, as dependent on ambient temperature
					Engine control unit power supply
					▪ 10.8 ... 14.0 V OK
					Injection time (figure computed internally by control unit at idling speed)
					▪ 1.5 ... 3.5 ms OK
Engine speed => Display group 001, display zone 1					

Test table, Display group 002

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1	... rpm	Engine speed => Display group 001, display zone 1	
2	... ms	Injection time (figure computed internally by control unit at idling speed)	
3	Less than 10.8 V or Greater than 14.0 V	- Alternator defective - Battery discharged (current drain)	- Test voltage
		- Poor earth connection to engine control unit - Current supply relay for control unit defective	- Test power supply => Page 114
4	Varies from ambient temperature	- Intake air temperature sender - G42 defective - Wiring fault between intake air temperature sender -G42 and engine control unit.	- Interrogate fault memory =>Page 111

Display group 003

Reading measured value block 3				⇒	◀ Indicated on display
820 rpm	20 %	1.5 <0	18 %		
				Internal specified duty cycle of idling stabilisation valve (idling)	
				▪ 0 ... 35 % OK	
				Throttle valve angle:	
				▪ Idling: 0.0 ... 2.0 <0OK	
				▪ Full throttle: Greater than 75 <0OK	
				Engine load (idling speed)	
				▪ 14 ... 25 % OK	
Engine speed => Display group 001, display zone 1					

Test table, Display group 003

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1	... rpm	Engine speed => Display group 001, display zone 1	
2	Deviation from tolerance range	- Poor idling (not running on all cylinders)	- Test spark plugs => Page 59
		- Air flow meter -G19 defective	- Interrogate fault memory =>Page 72
		- Idling stabilisation valve -N71 defective - Wiring fault between idling speed stabilisation valve -N71 and engine control unit	- Test idling stabilisation valve -N71 => Page 69 .
		- Intake system drawing in unmettered air	- Inspect intake system for leaks => vacuum connections, Page 84
		- Loads switched on, e.g. air conditioner is on; steering wheel is at end stop; selector lever of automatic gearbox not set to position "P" or "N"	- Switch off all electrical loads Centre steering wheel Move selector lever to "P" or "N"

Note on display zone 2:

The engine load is calculated on the basis of the intake manifold pressure from the airflow meter signal.

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
3	Idling greater than 2 <0	- -G69 throttle valve potentiometer defective	- Interrogate fault memory =>Page 86
		- Incorrect throttle cable setting	- Adjust throttle cable => 4-cyl. Injection engine (2-valve), Mechanical components, Repair Group 20, Removing and installing parts of fuel system, adjusting throttle cable.
		- Throttle valve sticking	- Eliminate cause
	At full throttle less than 75 <0	- -G69 throttle valve potentiometer defective	- Interrogate fault memory =>Page 86
		- Incorrect throttle cable setting	- Adjust throttle cable => 4-cyl. Injection engine (2-valve), Mechanical components, Repair Group 20, Removing and installing parts of fuel system, adjusting throttle cable.

Note on display zone 3:

For checking at full throttle, switch engine off and ignition on.

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
4	Deviation from tolerance range	- Idling stabilisation valve -N71 is sticking or stiff	- Perform final control diagnosis =>Page 69 .



Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
		- Air intake system drawing in large quantities of unmetered air	- Inspect intake system for leaks => vacuum connections, Page 84

Note on display zone 4:

What is displayed is the value computed internally by the control unit for the specified on/off ratio to achieve the specified current (0% = fully closed / 100% = fully open)

Display group 004

Reading measured value block 4				⇒	Indicated on display
820 rpm	20 %	0	XXXXXXXX		
				Engine load operating state => Page 26	
				Speed signal	
				▪ Stationary 255	
				▪ Driving 0	
				Engine load => Display group 003, display zone 2	
				Engine speed => Display group 001, display zone 1	

Test table, Display group 004

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1	... rpm	Engine speed => Display group 001, display zone 1	
2	.. %	Engine load => Display group 003, display zone 2	
3	No change in readout when car accelerated from stationary start	- Fault in wiring between dash panel insert and engine control unit	- Testing wiring => "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder
		- Open circuit or short circuit between speedometer sender/road speed sender -G22/-G68 and engine control unit	- Testing wiring => "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder
		- Speedometer sender/road speed sender -G22/-G68	- Test speedometer sender/road speed sender -G22/-G68 => Page 94

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If there is no change in the readout in display zone 3 at the transition from stationary to driving, first of all check whether the speedometer indication is OK.

Significance of the 8-digit "Engine load operating state"

X	X	X	X	X	X	X	X	
								No meaning
								No meaning
								No meaning

			No meaning
			Full throttle (00010000)
			Part throttle (00100000)
			Idling (01000000)
			Fuel shut-off on overrun (10000000)

Note:

The engine load operating states may also be added, e.g. idling and fuel shut-off on overrun: 11000000.

Display group 005

Reading measured value block 5		=>	Indicated on display
820 rpm	60 %	...	closed
		Cold start valve	
		On-board computer consumption signal	
		Duty cycle (actuation) of activated charcoal filter solenoid 1 -N80	
		▪ 0 % = ACF valve fully closed	
		▪ 100 % = ACF valve fully open	
Engine speed => Display group 001, display zone 1			

Notes on display zone 2:

- ◆ The activated charcoal filter solenoid -N80 is closed at idling speed so long as the lambda control is not active.
- ◆ It is possible to assess the influence of the AFC by comparing the readout at idling speed (ACF valve fully closed = 0 %) and when engine speed is increased (ACF valve fully open = 100 %).

Notes on display zone 3:

- ◆ The consumption signal is calculated from the injection time and is used by the on-board computer for displaying the fuel consumption.
- ◆ By comparing the readout at idling speed, it is possible to check the consumption signal when engine speed is increased and at fuel shut-off as follows:
Run engine at idling speed: Specification "1".
Briefly increase engine speed by blipping the throttle: The readout should increase, should drop to "0" and rise again to "1". If the readout does not react as described, replace the engine control unit => Page 48.

Display group 006

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Reading measured value block 6	0	-	40 60
		Learned value of throttle valve zero position	
		▪ 10 ... -104 OK	
		Learned value of idling speed control	
		▪ 0 ... -100 OK	
		Lambda control readout 2	
		Lambda control readout 1	
		▪ 0 = richer mixture	
		▪ 255 = leaner mixture	



Test table, Display group 006

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1	...	Lambda controls => Notes	
2	...	Lambda controls => Notes	

Notes on display zones 1 and 2:

- ♦ The lambda control is split up into display zones 1 and 2. It is necessary to consider display zones 1 and 2 together when assessing the lambda control: mean value ($\lambda = 1$) is 0 ... 0
When the engine is cold a constant 0 - 0 is displayed until the lambda control is activated. If for a warm engine a constant 0 ... 0 is displayed, this indicates a fault in the mixture composition, in other words the lambda control is switched off and is set to open-loop control => interrogate fault memory, Page 4.
- ♦ It is possible to determine from display zone 1 whether the control unit is producing a richer or a leaner mixture.
If the readout is "0" the control unit is producing a richer mixture; if the readout is "255", the control unit is producing a leaner mixture.
- ♦ It is possible to determine from display zone 2 the extent to which the control unit is producing a richer or a leaner mixture.
If the readouts are tending in the direction 0 ... 1 / 0 ... 2 / 0 ... 3 (0 ... 50 at idling speed), the control unit is producing a richer mixture.
Upper stop value is 0 ... 224. If the stop value is reached or exceeded, the fault "00537/Lambda control/upper stop value" is stored in the fault memory.
High readouts indicate leaks in the intake or exhaust system, too low a fuel pressure (fuel pressure regulator faulty) or a faulty injector (injector does not open).
If the readouts are tending in the direction 255... 255 / 255 ... 254 / 255 ... 253 (255 ... 200 at idling speed), the control unit is producing a leaner mixture.
Lower stop value is 255 ... 0. If the stop value is reached the fault "00537/Lambda control/lower stop value" is stored in the fault memory.
Lower readouts indicate an excessively filled activated charcoal filter system, too high a fuel pressure (return flow fault) or a faulty injector (injector does not close).

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
3	Higher than 100	- Loads switched on, e.g. air conditioner is on; steering wheel is at end stop; selector lever of automatic gearbox not set to position "P" or "N"	- Switch off all electrical loads Centre steering wheel Move selector lever to "P" or "N"
4	Lower than 10 or higher than 104	- Fault in fault memory - -G69 throttle valve potentiometer defective	- Interrogate fault memory =>Page 4 - Test throttle valve potentiometer - G69 => Page 89

Note on display zone 3:

The readouts at idling speed (all electrical components off/steering wheel in centre position/selector lever in position "P" or "N") range from 10 to 100. If the readouts are not within the tolerance window, this indicates a fault in the idling speed stabilisation system or the toothed belt has jumped 1 tooth.

Note on display zone 4:

This value is learned in function 04 "Basic setting" provided the setting conditions are met (=> display group 01/display zone 4) and stored in the permanent memory.

Upper stop value is 104. If the stop value is exceeded, the setting conditions are not met when function 04 "Basic setting" is initiated under display group 01/display zone 04 and, consequently, fault "01087/Basic setting not performed" is stored in the fault memory

Lower stop value is 10. If the value drops below the lower stop value, fault "00518/Throttle valve potentiometer -G69" is stored in the fault memory.

7 - Testing wiring for diagnostic connector

7.1 - Testing wiring for diagnostic connector

Warning

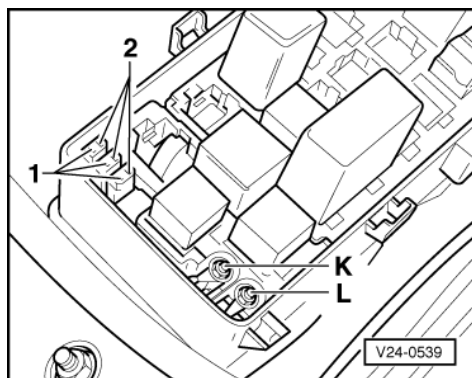
Switch off ignition before checking wiring.

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Special tools, testers and auxiliary equipment required

- ◆ Hand-held multimeter V.A.G 1526 or V.A.G 1526 A
- ◆ Adapter wire set V.A.G 1594 A
- ◆ Test box V.A.G 1598/18

7.2 - Testing power supply for "black" diagnostic connector



-> Location of diagnostic connector: In relay panel with fuse holder in plenum chamber

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

Contact assignment for black diagnostic connector:

- 1 - Earth
- 2 - Terminal 30

- Set hand-held multimeter V.A.G 1526 to voltage measuring range (20 V direct current) and connect it as follows:

Black diagnostic connector contact	Measure to
1	Battery positive
2	Car body earth point

- Specification: approx. battery voltage

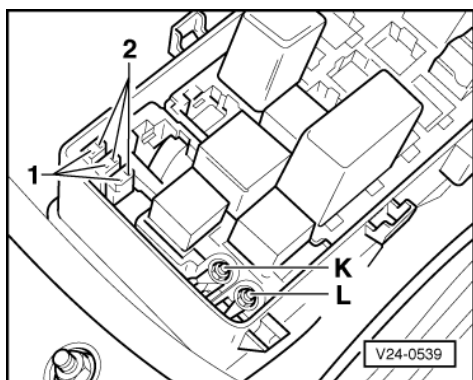
If the specified values are not obtained:

- Rectify any open/short circuit as necessary.



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

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



-> Fitting location of the diagnostic connectors and of the K and L junctions: In relay panel with fuse holder in plenum chamber

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

Contact assignment for "white" diagnostic connector:

- 1 - L-wire
- 2 - K-wire

Vehicles without immobiliser (control unit No. 039 306 024 A)

The wiring connection between the "white" diagnostic connector and the Digifant control unit -J169 runs through the junction K in the relay plate with fuse holder:

White diagnostic connector contact	Junction	Digifant control unit - J169 contact
1	L	-
2	K	43

Note:

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

-> Indicated on display:

Rapid data transfer HELP
No reply from control unit

or

Rapid data transfer
Communication problem

or

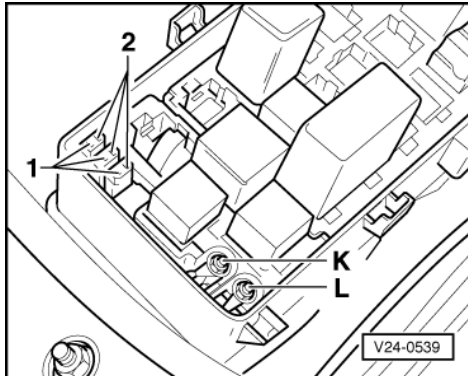
Rapid data transfer HELP
K-wire not switching to earth

or

Rapid data transfer HELP
K-wire not switching to positive

- Switch off ignition.

Note:



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

- One by one, disconnect from junctions K and L all other wires for vehicle systems with diagnostic capability.
- Determine the K wire for the Digifant control unit -J169 and connect to junction K.

Notes:

- ◆ If wires of different colours are connected to junction K, determine the wire colour:

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

- ◆ If wires with the same wire colours are connected to junction K, determine the wire by using test box V.A.G 1598/18 (resistance measurement).
- Start the engine, allow to run at idling speed and enter address word 01 for "Engine electronics" again => Page 1.

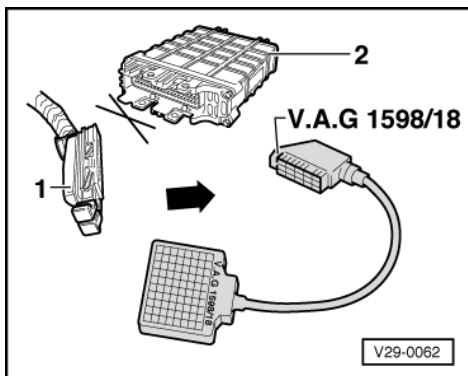
-> If the control unit identification of the Digifant control unit appears in the display of fault reader V.A.G 1551:

039906024A	Digifant	1.75
1566	☐	
Code 00002	WSC 12345	

The fault is located in another system with self-diagnosis capability.

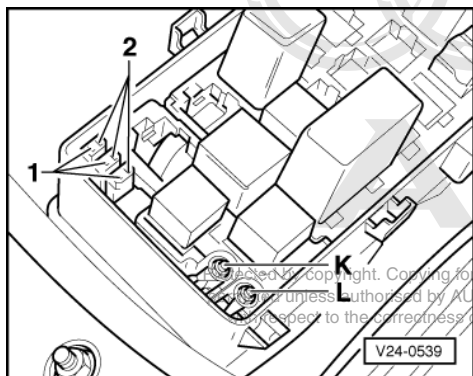
- Determine the other systems with self-diagnosis capability, connect to junction K and test one after the other.

If the control unit identification is again not displayed:





- Remove the engine control unit and lock it in the service position => Page **48**.
- With the ignition switched off, connect test box V.A.G 1598/18 to connector -1- (the control unit -2- remains disconnected).



- -> Test the wire connections between test box V.A.G 1598/18, socket 43, junction K and white diagnostic connector, socket 2 for open circuit and short circuit to earth and positive.
- Rectify any open/short circuit as necessary.

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

- If no short circuit or open circuit is found, fit a new engine control unit

Vehicles without immobiliser (control unit No. 039 306 024 D)

The wiring connection between the "white" diagnostic connector and the Digifant control unit -J169 runs through the wiring junction K in the relay plate with fuse holder and the immobiliser control unit -J362:

White diagnostic connector Contact	Junction	Immobiliser control unit -J362		Digifant control unit -J169 Contact
		IN	OUT	
1	L	-	-	-
2	K	10	9	43

Note:

This following check has to be made if one of the following readouts appears in the display of the connected fault reader V.A.G 1551.

-> Indicated on display:

Rapid data transfer **HELP**
No reply from control unit

or

Rapid data transfer
Communication problem

or

Rapid data transfer **HELP**
K-wire not switching to earth

or

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

- Press the ➔key.

-> Indicated on display:

Rapid data transfer HELP
Enter address word XX

- Press keys 2 and 5 for address word "Immobiliser" and confirm entry by pressing Q.

-> If immobiliser control unit identification is displayed on connected fault reader V.A.G 1551:

8D0953234 IMMO AUZ9Z0R4010830 D66
Code 00000 WSC 12345

- Continue with check A => Page 33.

If immobiliser control unit identification is not displayed:

- Continue with check B => Page 33.

Test A

- Test the immobiliser control unit and the wiring connection as follows:
- Switch off ignition.
- Pull connector off immobiliser control unit -J362.

=> Repair electrical system; Repair Group 96; servicing immobiliser, Removing and installing immobiliser control unit servicing immobiliser, Removing and installing immobiliser control unit

- Use wire 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:

- Renew immobiliser control unit.

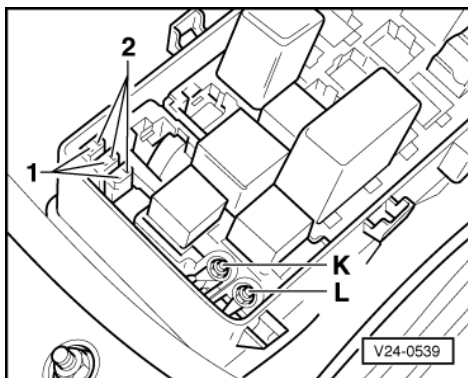
If engine control unit identification is not displayed:

- Use current flow diagram to test wiring between immobiliser control unit -J362 and Digifant control unit - J169 for open circuit or short to earth/positive.

Test B

- Switch off ignition.

Note:



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

- One by one, disconnect from junctions K and L all other wires for vehicle systems with diagnostic capability.
- Determine the K wire for the immobiliser control unit -J362 and Digifant control unit -J169 and connect to junction K.

Notes:

- ♦ If wires of different colours are connected to junction K, determine the wire colour:

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

- ♦ If wires with the same wire colours are connected to junction K, determine the wire by using test box V.A.G 1598/18 (resistance measurement).

- Switch on ignition and once again enter address word 25 for "immobiliser".

-> If immobiliser control unit identification is displayed on connected fault reader V.A.G 1551:

4A0953234	IMMO	AUZ9Z0R4010830	D66
Code	00000	WSC	00000

The fault is located in another system with self-diagnosis capability.

- Determine the other systems with self-diagnosis capability, connect to junction K and test.

If immobiliser control unit identification is not displayed:

- Pull connector off immobiliser control unit -J362.

=> Repair electrical system; Repair Group 96; servicing immobiliser, Removing and installing immobiliser control unit servicing immobiliser, Removing and installing immobiliser control unit

- Using the current flow diagram test the wire connection between contact 10 of the plug connection of the immobiliser control and junction K for open circuit or short circuit to earth or positive.
- Rectify any open/short circuit as necessary.

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

- Replace immobiliser control unit if neither an open circuit nor a short circuit is found.



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24 - Mixture preparation, Injection

1 - Servicing Digifant fuel injection system

1.1 - Servicing Digifant fuel injection system

1.2 - Safety precautions

Warning

Fuel system is pressurised. Before loosening hose connections or opening the test connection, place a cloth around the connection. Then release pressure by carefully pulling off the hose or cap.

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

- ◆ Do not touch or disconnect ignition wiring when the engine is running or at starter speed.
- ◆ Always switch off the ignition before connecting or disconnecting injection or ignition system wiring or tester wires.
- ◆ If the engine is to be turned at starter speed, without starting, e.g. when checking compressions, pull plug off Hall sender (distributor).
- ◆ Always switch off the ignition before washing the engine.
- ◆ Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.

Observe the following if test equipment has to be used during test drives:

Warning

- ◆ **Always attach test equipment to the back seat and have a second person operate them from there.**
- ◆ **Operation of test equipment from the front passenger seat could result in injuries to the person sitting there in the event of an accident (activation of passenger's airbag).**

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1.3 - Rules for cleanliness

Pay careful attention to the following "6 rules" for cleanliness when carrying out work on the fuel supply/fuel injection system:

- ◆ Thoroughly clean all connections and the surrounding areas before disconnecting.
- ◆ Place removed parts on a clean surface and cover. Use lint-free cloths!
- ◆ Carefully cover or seal open components if repairs cannot be carried out immediately.
- ◆ Only install clean components:
Only remove replacement parts from packaging immediately prior to installation.
Do not use parts that have been stored loose (e.g. in tool boxes etc.).
- ◆ When the system is open:
Do not work with compressed air if this can be avoided.
Do not move vehicle unless absolutely necessary.
- ◆ Separated electrical connections:
Protect from dirt and moisture.
Make sure connections are dry when attaching.



1.4 - Technical data

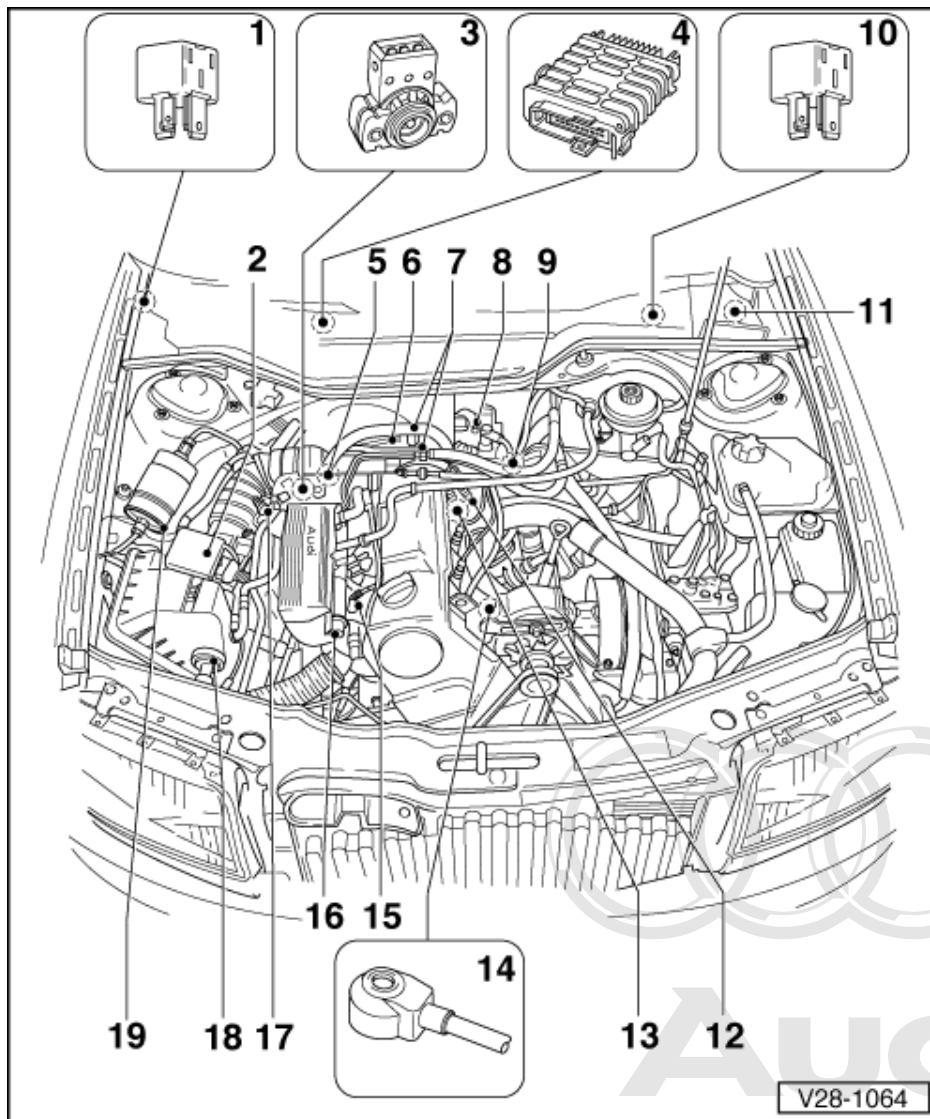
Engine code letters		ABK (2.0 l / 85 kW-Motor) ABK (1.8 l / 79 kW-Motor) ¹⁾
Digifant control unit	Part no.	=>Parts list
	Engine speed limiter	1 rpm 6400 ... 6500
Idling speed adjustment	Idling speed	1 rpm 770 ... 870 1)
	CO content at test pipe	% vol. 0.6 ± 0.4
	Workshop at altitude above 300 m	% vol. 0.2 for each 100 m increase in altitude
Fuel pressure regulator	Fuel pressure at idling	
	Vacuum hose	fitted on approx. 2.5 bars
		detached approx. 3.0 bars
	Holding pressure	after 10 min at least 2.0 bar
Injectors	Spray pattern	Same for all injectors
	Resistance in Ω	
	Manufacturer	Bosch 15 ... 17
		Siemens 13.5 ... 15.5

1) China, CIS

2) Current values:

=> "Exhaust emission test" binder

1.5 - Fitting locations overview



1 Current supply relay -J176

- ◆ Digifant control unit
- ◆ On auxiliary relay carrier III in passenger footwell, contact position 1

2 Air flow meter -G19

- ◆ With intake air temperature sender -G42

3 Throttle valve potentiometer -G69

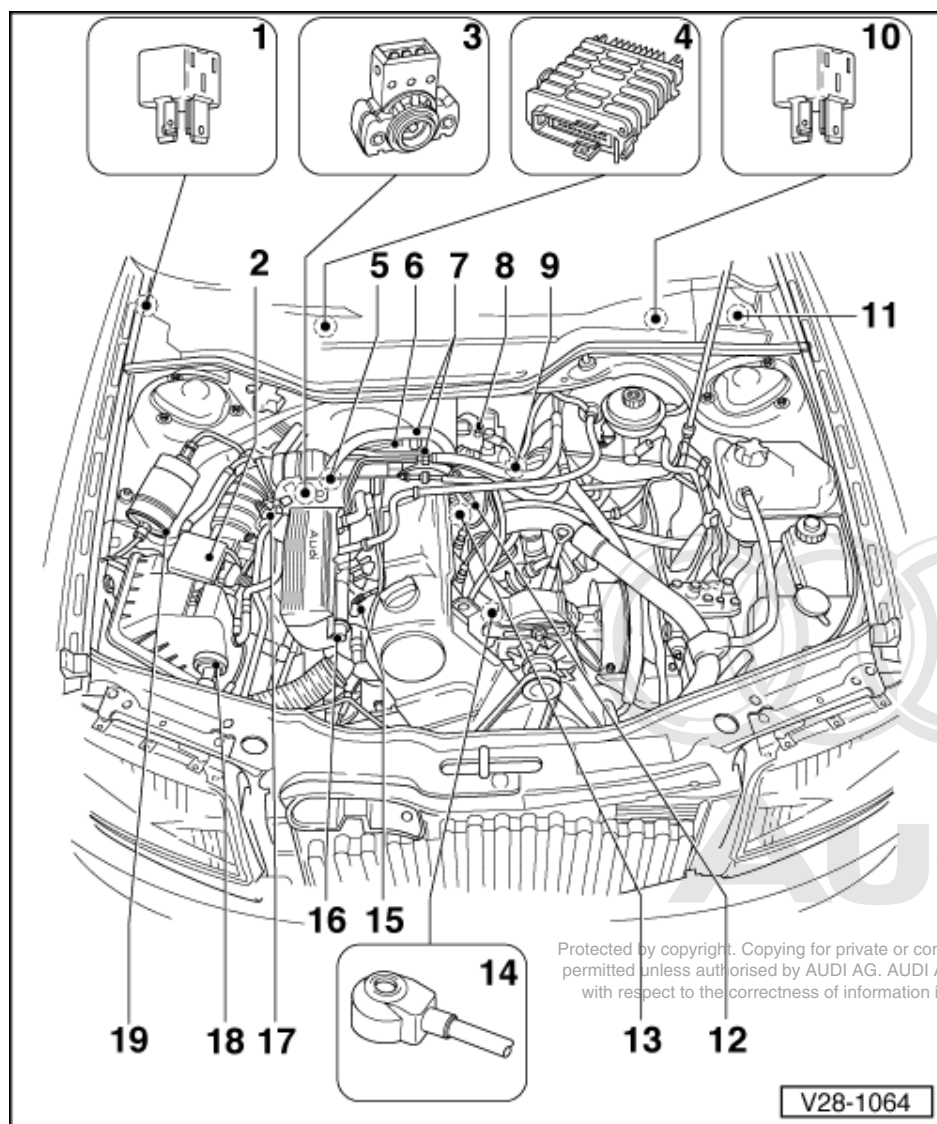
4 Digifant control unit -J169

- ◆ in electrical box in passenger footwell
- ◆ Removing and installing
=> Page 48

5 F60 idling switch.

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V28-1064


6 Connector

- ♦ For knock sensor 1 -G61

7 Connector

- ♦ For lambda probe -G39 and lambda probe heating -Z19

8 Ignition coil with power output stage -N70
9 Distributor -O

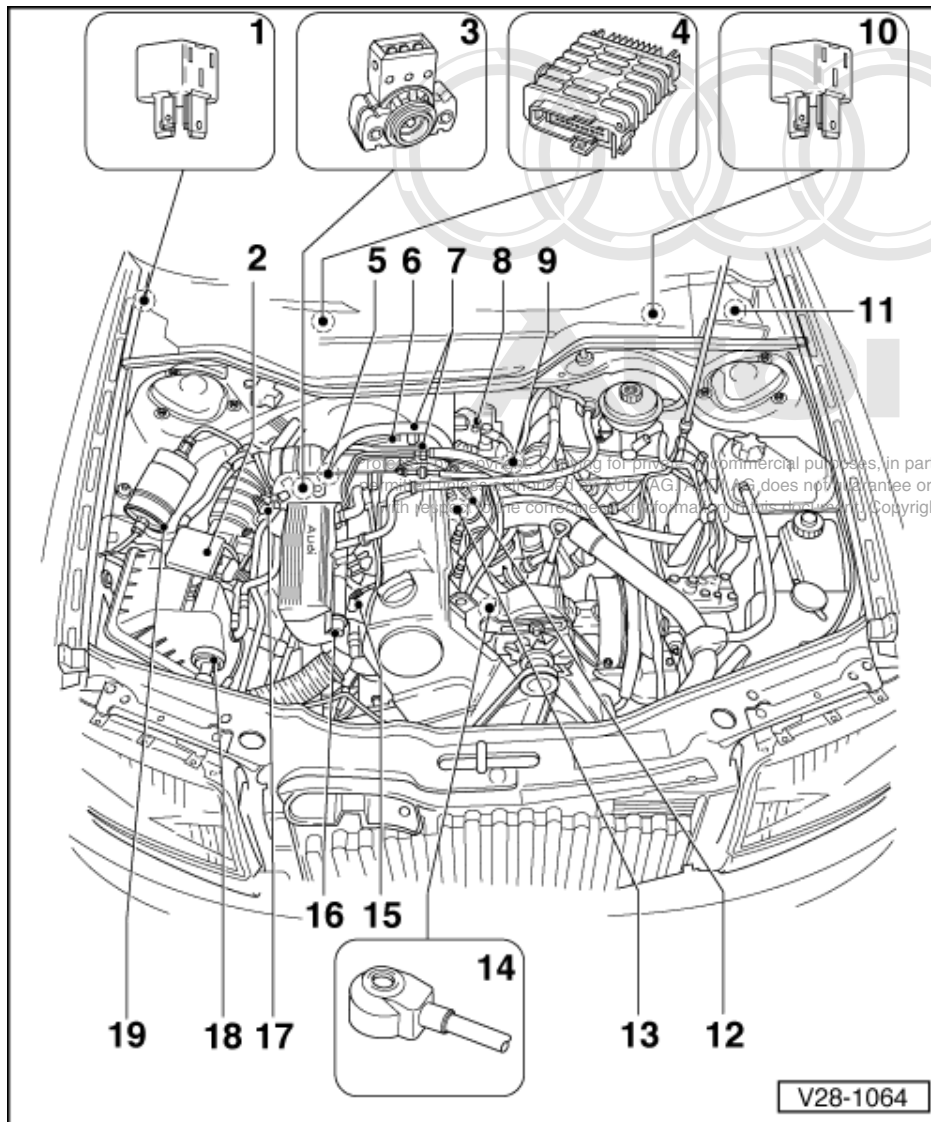
- ♦ With Hall sender -G40

10 Fuel pump relay -J17

- ♦ On central electrics below dash panel on left, contact point 6
- ♦ Testing => Page 54

11 Diagnosis socket
12 Coolant temperature sender -G62

- ♦ 2-pin
- ♦ Resistance values
=> Page 112



13 Coolant temperature gauge sender -G62

- ♦ 3-pin
- ♦ With overheating warning lamp switch -F14

14 Knock sensor 1 -G61

15 Injector -N30 ... -N33

- ♦ With noise insulation

16 Fuel pressure regulator

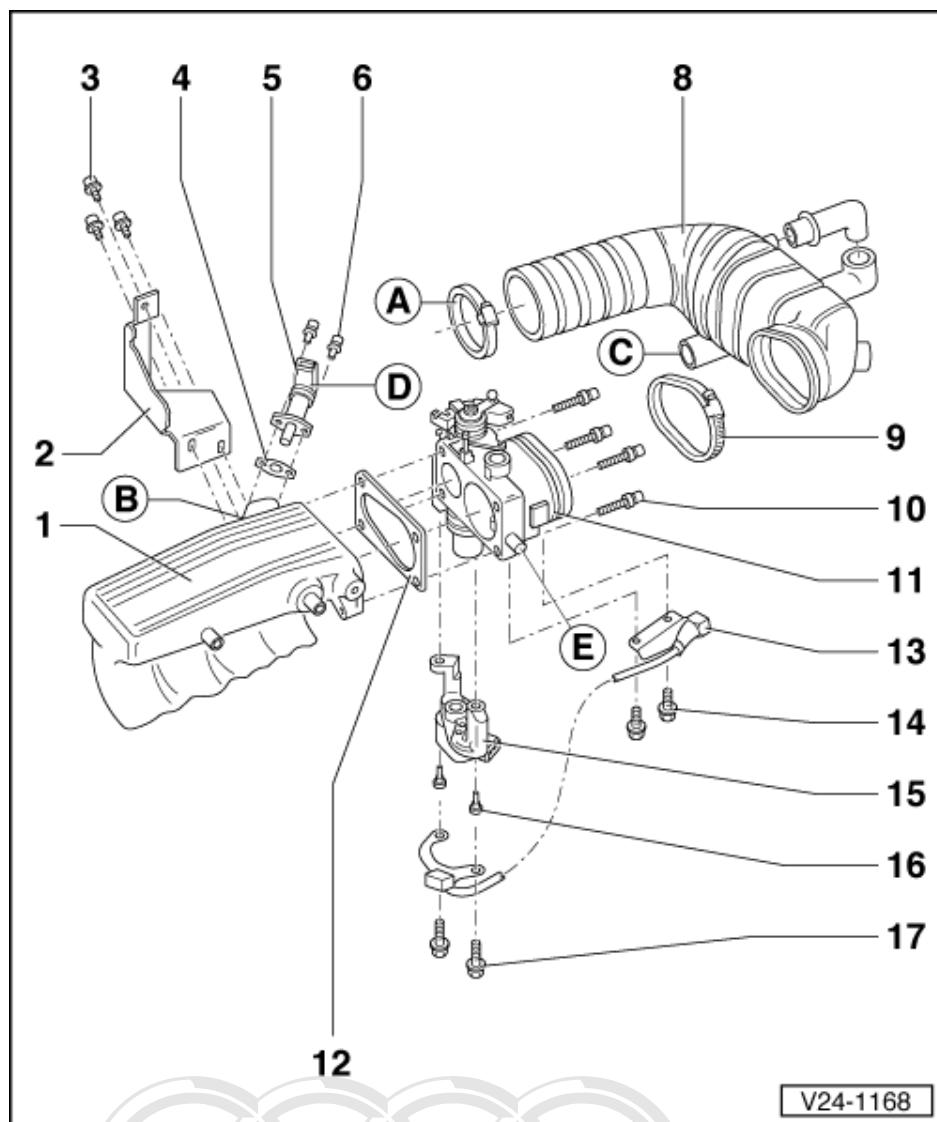
17 Cold start valve -N17

18 Idling stabilisation valve -N71

19 Solenoid valve 1 for activated charcoal filter -N80

- ♦ Testing => Page 13

1.6 - Removing and installing injection system components



A - => Page 43

B - => Page 43

C - => Page 43

D - =>Page 45

E - =>Page 45

1 Intake manifold

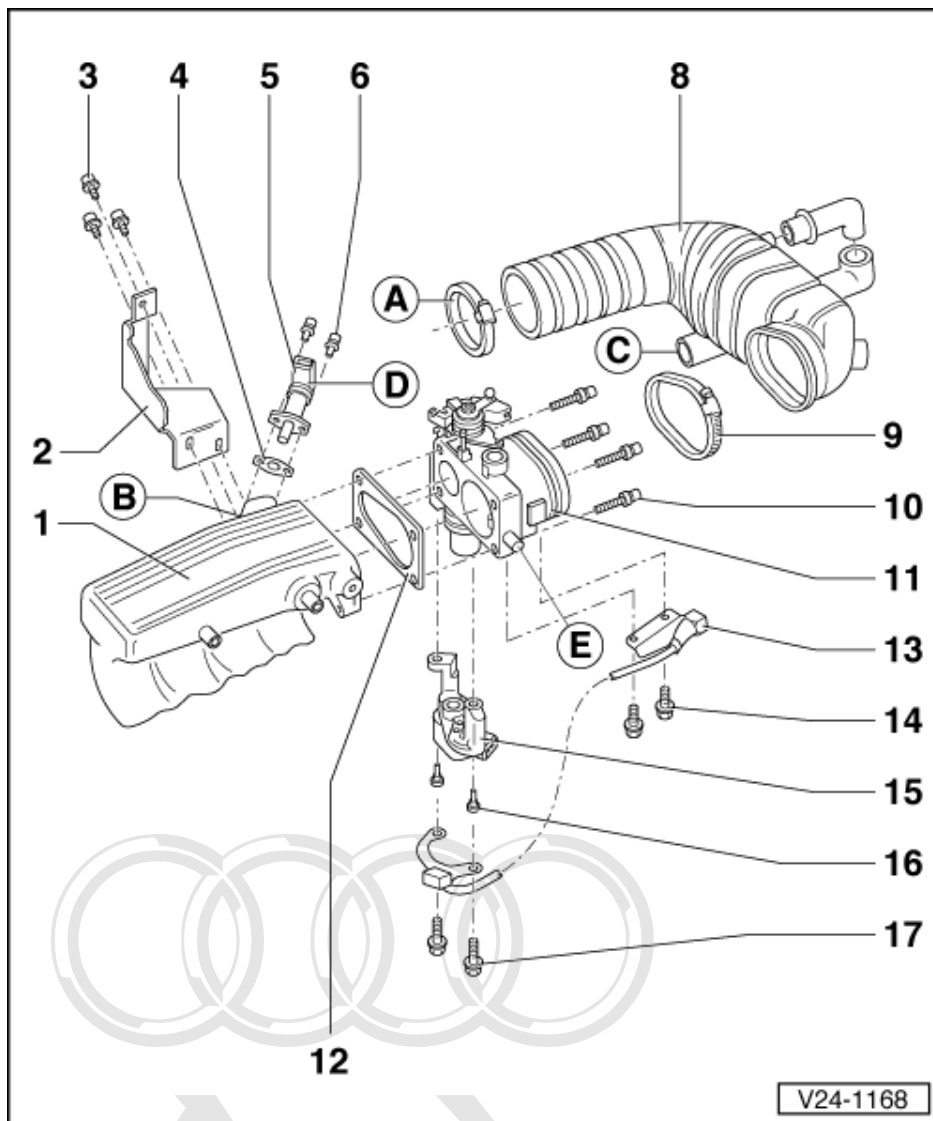
2 Heat shield

3 10 Nm

4 Gasket

♦ Replace

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5 Cold start valve -N17

- ♦ Testing => Page **65**

6 10 Nm

7 Screw-type clip

8 Intake hose

9 Screw-type clip

10 25 Nm

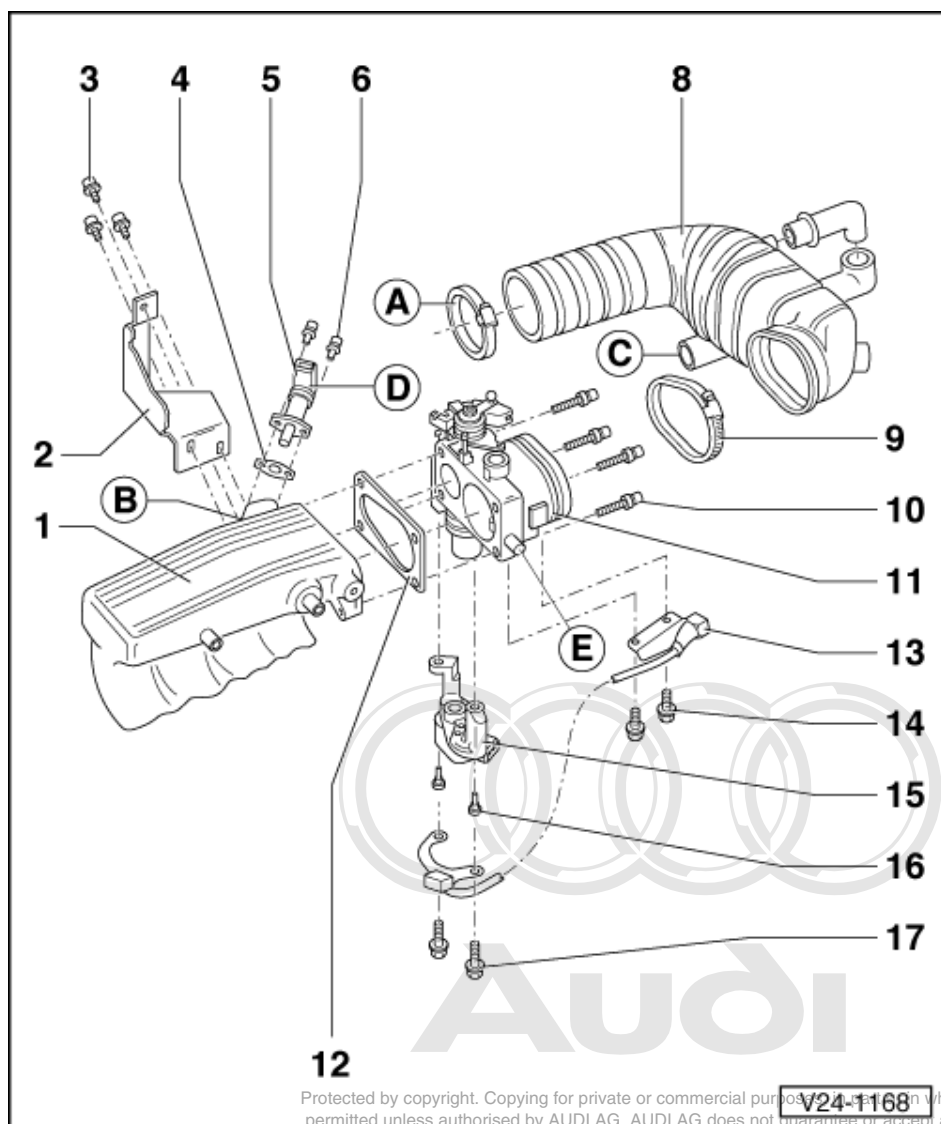
11 Throttle valve unit

12 Gasket

- ♦ Replace

13 -F60 idling switch.

- ♦ Testing => Page **90**



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14 10 Nm

15 Throttle valve potentiometer -G69

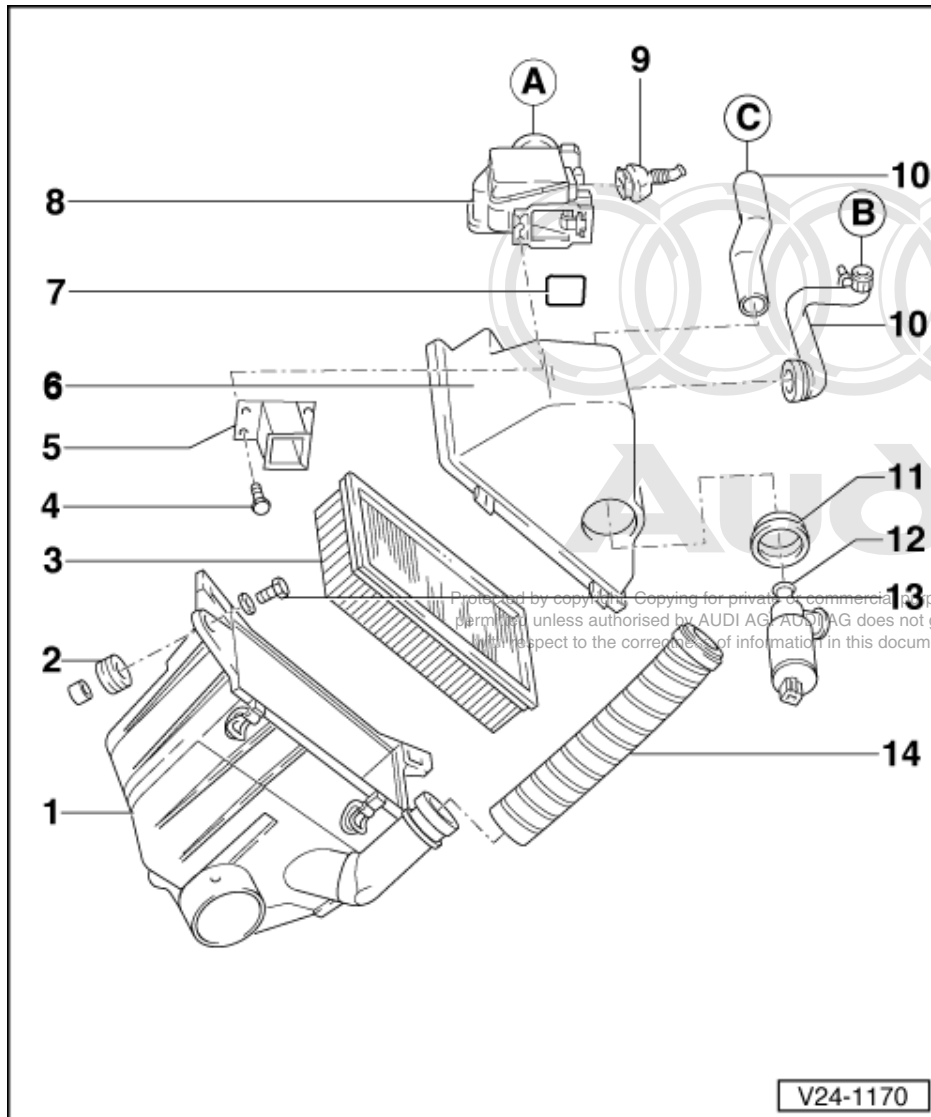
- ◆ With bracket
- ◆ Testing => Page 86
- ◆ After renewing:

Adapt Digifant control unit and throttle valve potentiometer to each other => Page 89

16 10 Nm

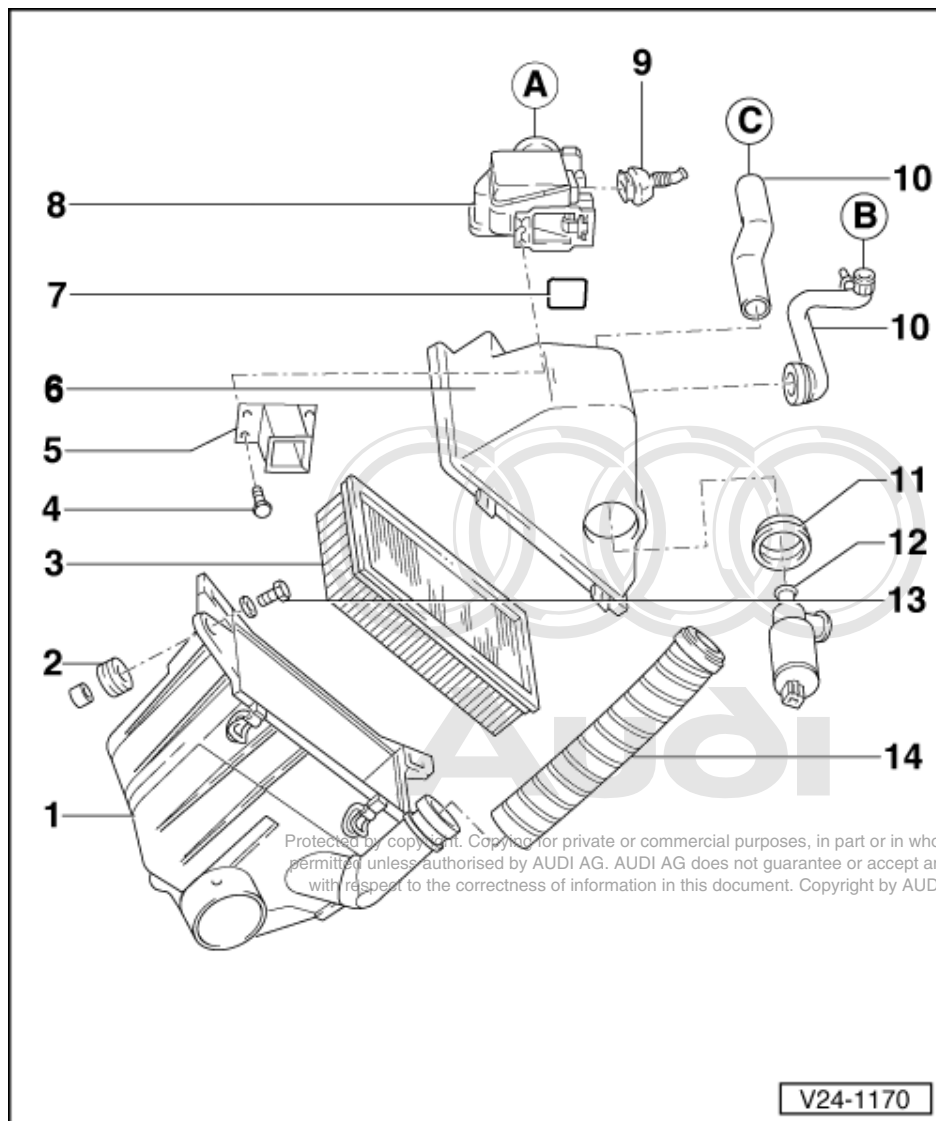
17 10 Nm

1.7 - Dismantling and assembling air cleaner



- A - => Page 40
 B - => Page 40
 C - => Page 40

- 1 Bottom part of air cleaner
- 2 Rubber washer
 - ♦ With bush
- 3 Filter element
- 4 10 Nm
- 5 Air duct
- 6 Top part of air cleaner
- 7 Rubber seal


8 Air flow meter -G19

- ♦ With intake air temperature sender -G42

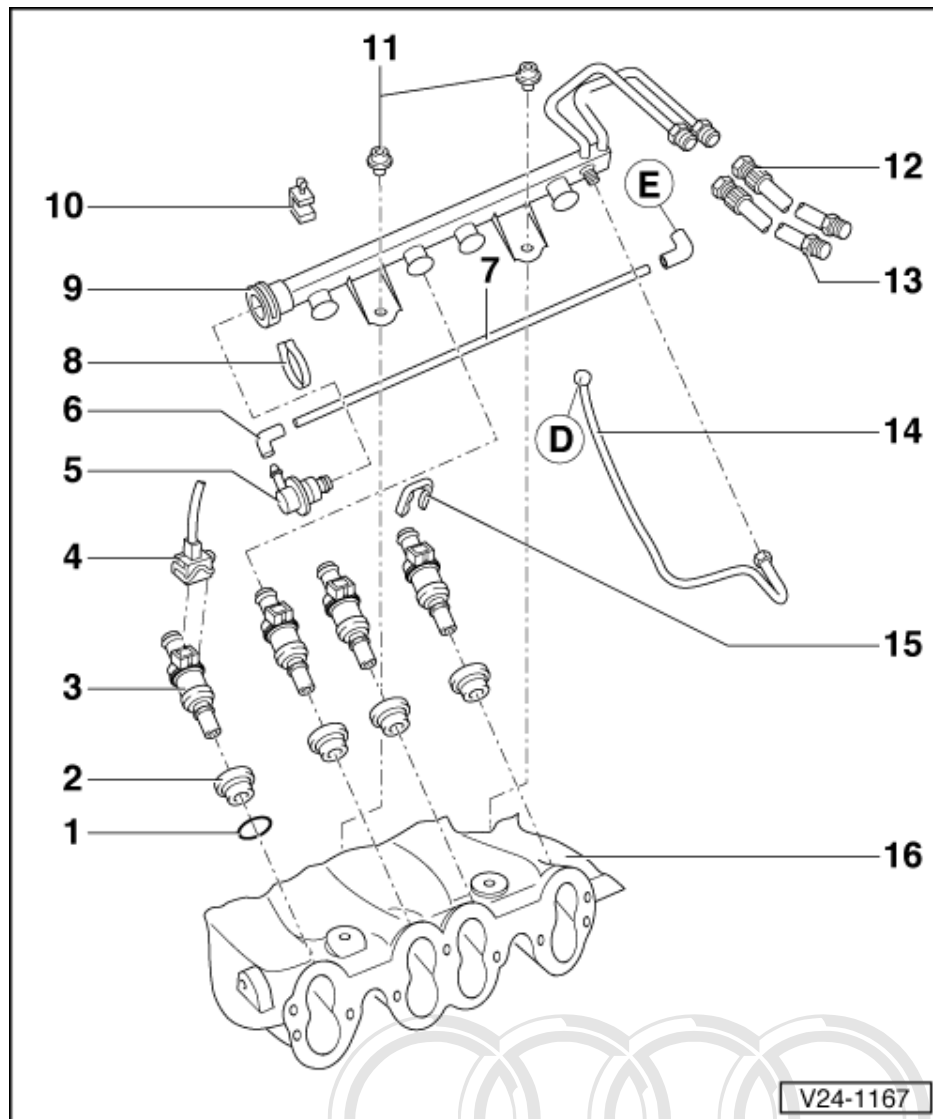
9 Connector
10 Hose
11 Rubber seal
12 Idling stabilisation valve -N71

- ♦ Testing => Page **69**

13 20 Nm
14 Hose

- ♦ To exhaust manifold

1.8 - Dismantling and assembling fuel manifold with injectors



D - =>Page 40

E - =>Page 40

1 O-ring

- ♦ Replace if damaged

2 Nozzle insert

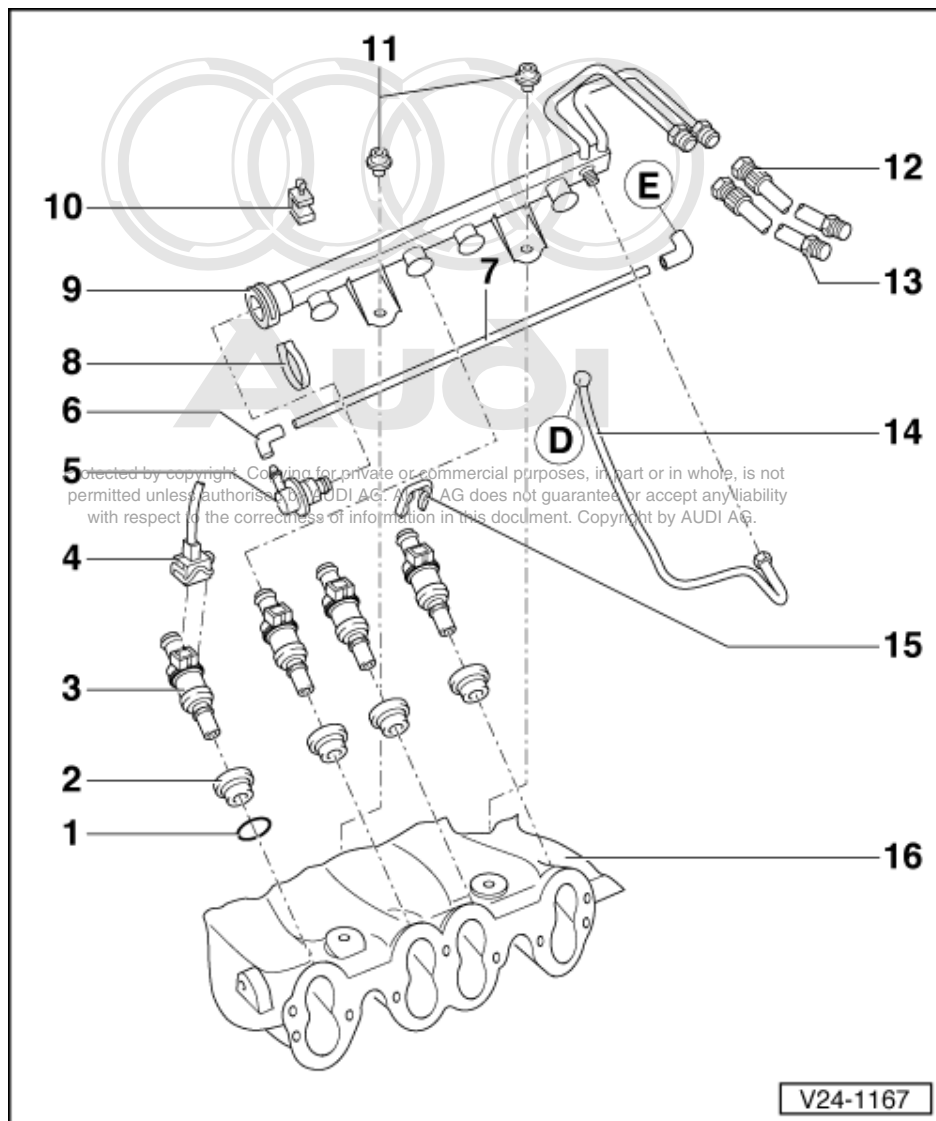
3 Injector -N30 ... -N33

- ♦ Testing => Page 59
- ♦ Removing and installing
=> Page 63

4 Connector

- ♦ Switch off ignition before pulling off or attaching connector

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5 Fuel pressure regulator

- ♦ Testing system pressure, fuel pressure regulator and holding pressure => Page 53

6 Angled connector
7 Vacuum line
8 Clamp
9 Fuel manifold

- ♦ Removing and installing => injectors, Page 63

10 Bracket

- ♦ For vacuum hose

11 10 Nm

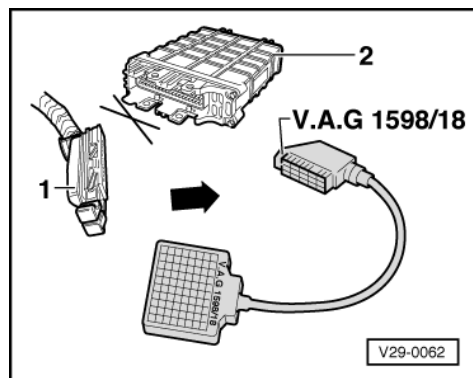


- ♦ The contact numbers of the plugs and the socket numbers in the test box are identical.

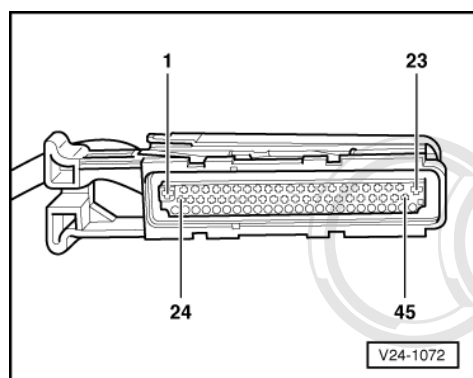
Warning

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

- Switch off ignition.



- Remove engine control unit => Page 48 .
- -> With the ignition switched off, connect test box V.A.G 1598/18 to connector -1- (the control unit -2- remains disconnected).



Notes:

- ♦ -> Contact assignment on connector for Digifant control unit -J169
- ♦ The contact assignment is identical to the socket assignment on test box V.A.G 1598/18.

- Carry out test as described in the appropriate repair procedures.

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1.10 - Renewing engine electronics control unit

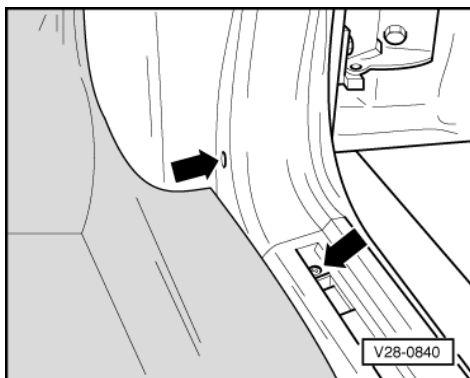
Special tools, testers and auxiliary equipment required

- ♦ Fault reader V.A.G 1551 with wire V.A.G 1551/1

Removing

- Connect fault reader V.A.G 1551 and select engine electronics control unit => Page 1 .
- Always start by displaying and printing out the control unit identification => Page 3 .

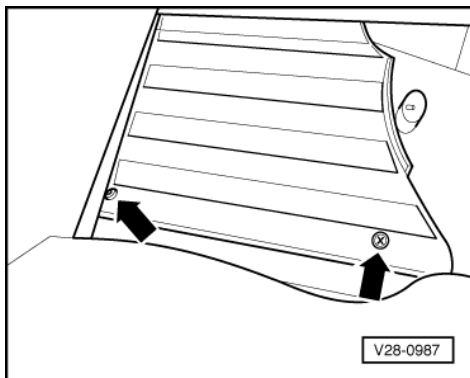
- Switch off ignition.



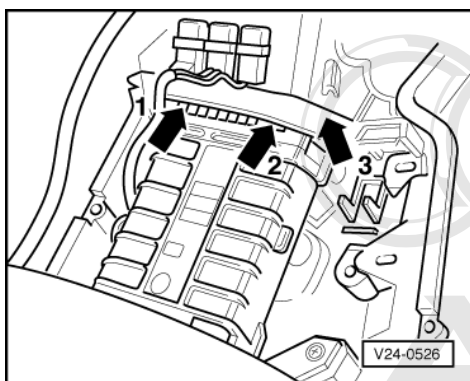
- -> Remove trim panel at the bottom of the right A pillar and the right entrance plate in the area of the front door

=> General Body Repairs; Repair Group 70; Trim Panel; Removing and installing trim panels of A pillar and inner entrance plate Trim Panel Removing and installing trim panels of A pillar and inner entrance plate

- Turn back carpeting in the front right footwell (cut open left pre-punched seam with a knife, if necessary).

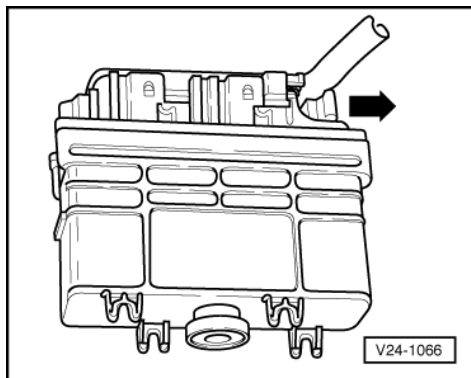


- -> Remove the screws for the cover of the electronics box -arrows-.
- Carefully detach the top and bottom cover part



- -> Pull out the cross strut -3- with the attached parts.

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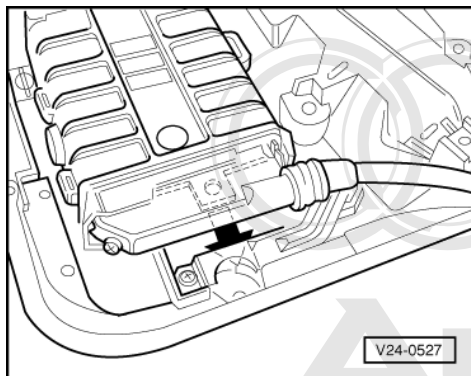
- Unscrew the engine control unit from the electronics box in the right footwell -arrows-.
- Take out engine control unit.
- -> Disengage retainer clip and unplug control unit connector in the direction of the arrow.

Note:

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

Installing

Install in reverse order, paying attention to the following:

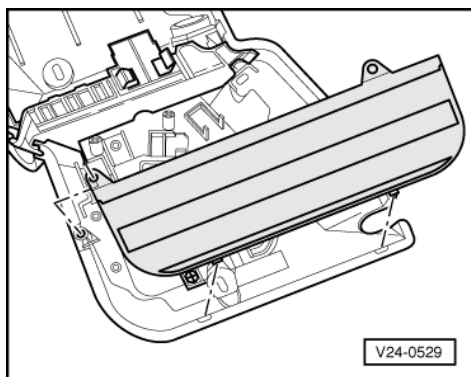


Note:

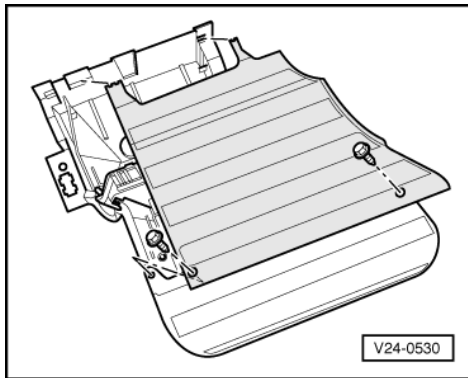
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Always make sure that the ignition is switched off before unplugging or fitting the connector for the engine control unit.

- -> Push the lug of the control unit into the fixture of the electronics box.



- -> Guide the bottom cover part into both openings of the electronics box in the right footwell.



- -> Attach the top cover part into both openings of the electronics box in the right footwell.
- Code the control unit, if necessary => Page 16 .
- Make basic settings => Page 15 .

Vehicles with immobiliser:

- Adapt engine electronics control unit to the immobiliser control unit:

=> Electrical system; Repair group 01; Self-diagnosis; Adaptation procedure after renewing engine control unit
Self-diagnosis Adaptation procedure after renewing engine control unit

1.11 - Testing idling speed

Notes:

- ◆ The idling speed cannot be adjusted.
- ◆ The idling speed is tested during the basic setting of the engine.
- ◆ In the basic setting, the Digifant control unit is matched to the throttle valve potentiometer at idling speed. The ignition timing control is switched off.

Test requirements:

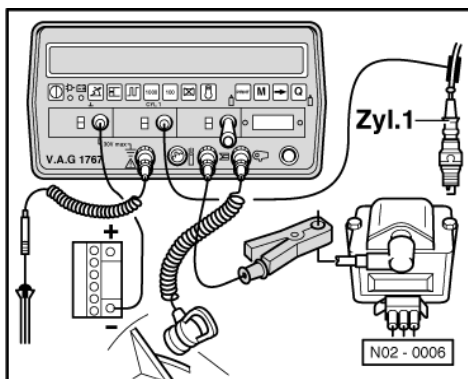
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- Engine oil temperature at least 80 °C
- Electrical consumers switched off (radiator fan must not run during the test)
- Air conditioner switched off.
- No leaks in exhaust system
- Vehicles with automatic gearbox: Throttle cable setting OK

=> 4-cyl. Injection engine (2-valve), Mechanical Components; Repair Group 20; Removing and installing parts of fuel system, adjusting throttle cable. Removing and installing parts of fuel system, adjusting throttle cable.

Special tools, testers and auxiliary equipment required

- ◆ Fault reader V.A.G 1551 (or vehicle system tester V.A.G 1552) with wire V.A.G 1551/1
- ◆ Ignition tester V.A.G 1767 or V.A.G 1367 with HT pick-up clamp V.A.G 1367/8





- -> Connect ignition tester V.A.G1767 (or V.A.G 1367) with ignition switched off:

=> Operating instructions

Notes:

- ♦ Ensure that the TDC sender is inserted fully into the gearbox housing
- ♦ The ignition timing is indicated directly on V.A.G 1767 (or V.A.G 1367). It is not necessary to use a strobe light aimed at the timing notches.
- Connect fault reader V.A.G 1551 and select engine electronics control unit => Page 1 .
- Interrogate fault memory =>Page 4 .
- If necessary, rectify any faults and erase the fault memory. Switch off the engine, then start up again. Take vehicle for a test drive and interrogate the fault memory again to make sure it is clear.
- Leave engine idling.

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

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

-> Indicated on display:

Basic setting	Q
Enter display group number XXX	

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

-> Indicated on display:

Default setting 1
1 2 3 4

- Maintain the engine at 2000 ... 2500 rpm and at the same time read off the ignition timing on the ignition tester V.A.G 1767 (or V.A.G 1367)
- Test value 4 ... 8°: Before TDC.

Note:

If the ignition timing displayed is not within the tolerance range, you first of all have to set the ignition timing before testing idling speed so long as the system is still in "Basic setting 1".

- Set the ignition timing point by turning the distributor at an engine speed of 2000 ... 2500 rpm.
- Setting $6 \pm 1^\circ$
- Continue running the engine at idling speed for at least 1 minute.
- To quit the basic setting, press the ➡key. The electric fan of the radiator must not be running at this moment.
- Read off the idling speed on the ignition tester V.A.G 1767 (or V.A.G 1367).
- Specification: 770 ... 870 rpm 1).

1) Current values:

=> "Exhaust emission test" binder

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

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

If the specification is not obtained:

- Interrogate fault memory again =>Page 4 .

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

- Test for leaks (unmetered air) in intake air system => Page 84 .
- Test idling stabilisation valve => Page 69

1.12 - Testing system pressure, fuel pressure regulator and holding pressure

Note:

The fuel pressure regulator regulates the fuel pressure according to the intake manifold pressure at the throttle valve unit.

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Special tools, testers and auxiliary equipment required

- ◆ Pressure tester V.A.G 1318
- ◆ Adapter 1318/7
- ◆ Adapter V.A.G 1318/13

Test requirements:

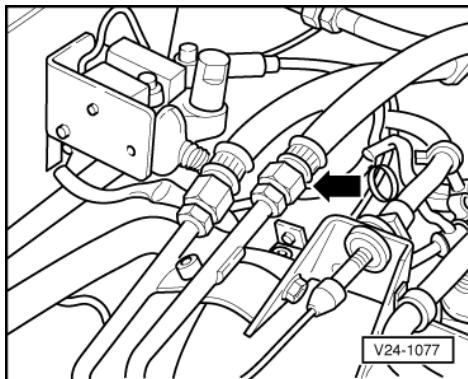
- Fuel pump relay OK; checking =>Page 54 .
- Fuel pump OK; checking:

=> 4-cyl. Injection engine (2-valve), Mechanical components; Repair Group 20; Removing and installing parts of fuel supply system, Testing fuel pump Removing and installing parts of fuel supply system, Testing fuel pump

- Battery voltage at least 11 V

Warning

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



- -> Slacken the bolted connection -arrow- of the fuel supply pipe.
- Connect pressure measuring device V.A.G 1318 to the fuel supply pipe using adapters V.A.G 1318/7 and V.A.G 1318/13.

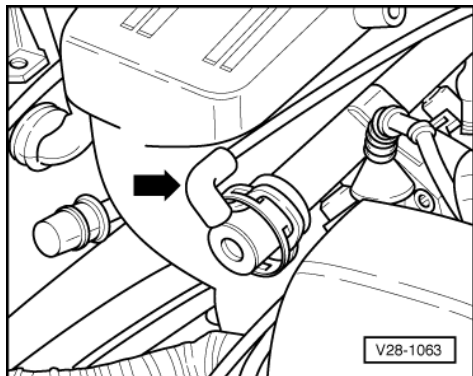
Note:

The shut-off cock of the pressure measuring device should be open (lever facing in the direction of flow).

- Start engine and run at idling speed.
- Measure the fuel pressure.
 - Specification: approx. 2,5 bars

Note:

If no fuel pressure is built up, check that the fuel feed and fuel return-flow lines have not been interchanged.



- -> Pull vacuum hose off fuel pressure regulator.
- The fuel pressure should rise to approx. 3.0 bar.
- Switch off ignition.
- Test for leaks and holding pressure by watching pressure drop on gauge.
- After 10 minutes the remaining pressure should be at least 2 bar.

If the holding pressure drops below 2 bars:

- Start engine and run at idling speed.
- After the pressure has built-up switch off ignition and at the same time clamp-off the return pipe on fuel manifold.
- Watch pressure drop on gauge.

If the pressure does not drop:

- Replace fuel pressure regulator

If the pressure drops again:

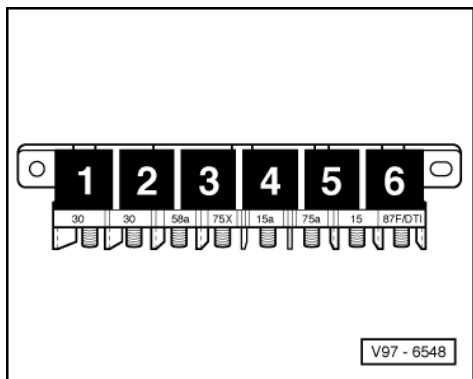
- Test pipe connections, O rings on fuel manifold and injectors for leaks.
- Test the cold start valve => Page 65
- Test pressure gauge for leaks
- Test fuel pump non-return valve.

=> 4-cyl. Injection engine (2-valve), Mechanical components; Repair Group 20; Removing and installing parts of fuel supply system, Testing fuel pump Removing and installing parts of fuel supply system, Testing fuel pump

Note:

Before removing the pressure gauge, release fuel pressure at the gauge.

1.13 - Testing fuel pump relay -J17 and actuation



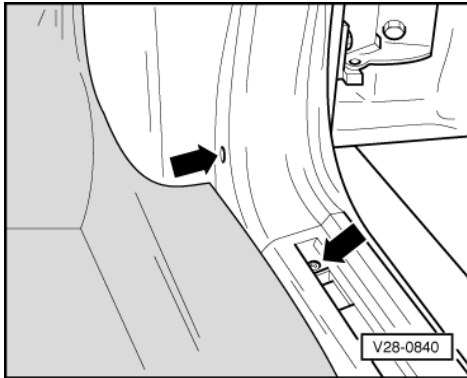
Note:

-> -> Fitting location of fuel pump relay: On central electrics below dash panel on left, contact point 6

Special tools, testers and auxiliary equipment required

- ◆ Voltage tester V.A.G 1527 B
- ◆ Adapter wire set V.A.G 1594 A

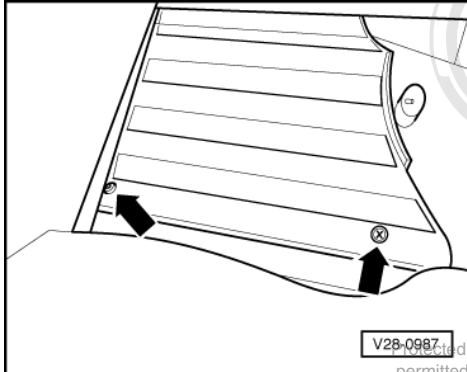
Testing operation of fuel pump relay



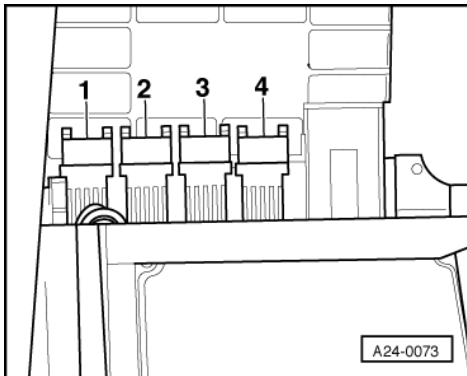
- -> Remove trim panel at the bottom of the right A pillar and the right entrance plate in the area of the front door

=> General Body Repairs; Repair Group 70; Trim Panel; Removing and installing trim panels of A pillar and inner entrance plate Trim Panel Removing and installing trim panels of A pillar and inner entrance plate

- Turn back carpeting in the front right footwell (cut open left pre-punched seam with a knife, if necessary).

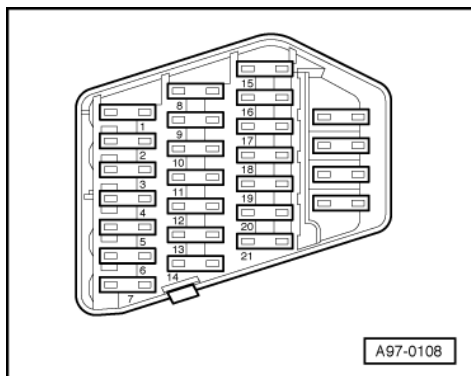


- -> Remove the screws for the cover of the electronics box -arrows-
- Carefully detach the top and bottom cover part





- -> Pull out the fuses in the black holder -1- and in the brown holder -2-.
- Take off the cover of the left fuse holder.

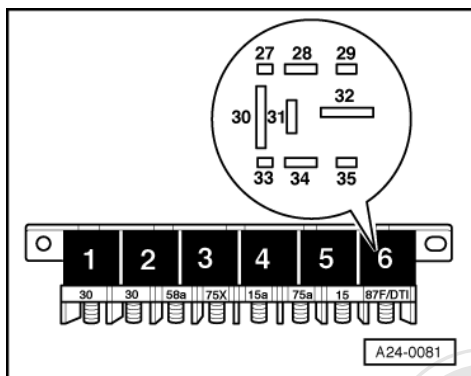


- -> Take out fuse 17 and connect voltage tester V.A.G 1527 B between earth and the rear contact for fuse 17 using auxiliary wires from V.A.G 1594.
- Operate starter briefly.
 - The fuel pump relay should be heard and felt to operate; the LED should come on.

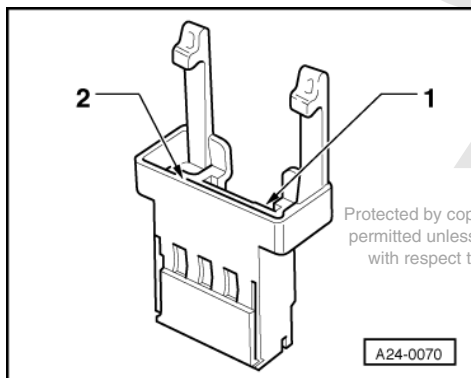
If the relay does not operate:

- Test actuation => Page 58

If the relay operates, but the LED does not come on:



- -> Referring to the current flow diagram remove the fuel pump relay and test the connection from fuse 17 to contact 30 in contact position 6 for open circuit.
- Replace the relay plate, if necessary.
- If no open circuit can be found, continue the test.
- Re-insert the fuel pump relay and fuse 17.



- -> Connect voltage tester V.A.G 1527 B with auxiliary wire from V.A.G 1594 A between earth and contact -1- for fuse S73 in the brown holder.
- Operate starter briefly.

- The fuel pump relay should be heard and felt to operate; the LED should come on.

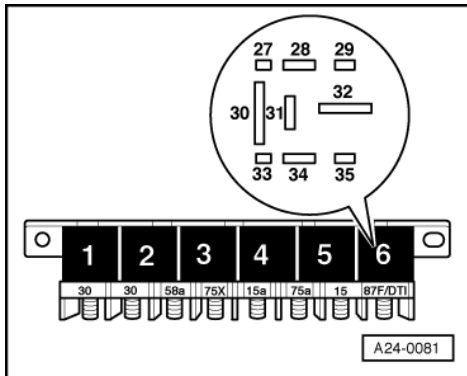
If the relay does not operate:

- Test actuation => Page 58

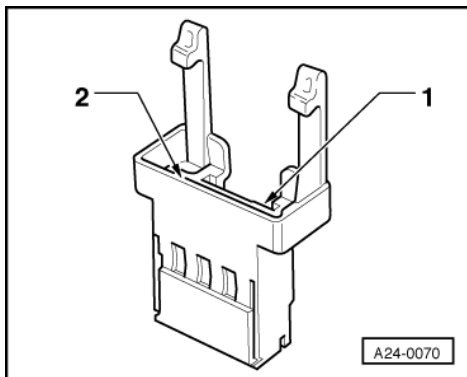
If the relay operates, but the LED does not come on:

- Repeat the test at contact -2- for fuse S73 in the brown holder.

If LED still does not light:



- Disconnect fuel pump relay.
- -> Referring to the current flow diagram test the wiring connection between fuel pump relay base contact 31 and fuse S73 in the brown holder for open circuit
- If no open circuit can be found, continue the test.
- Re-insert the fuel pump relay and fuse 17 in the brown holder.



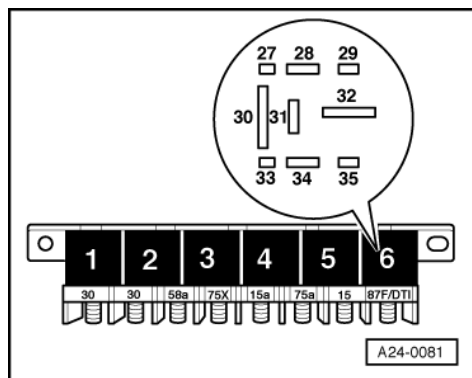
- -> Connect voltage tester V.A.G 1527 B with auxiliary wire from V.A.G 1594 A between earth and contact -1- for fuse S72 in the black holder.
- Operate starter briefly.
 - The fuel pump relay should be heard and felt to operate; the LED should come on.

If the relay does not operate:

- Test actuation => Page 58

If the relay operates, but the LED does not come on:

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- Repeat the test at contact -2- for fuse S72 in the black holder.

If LED still does not light:

- Disconnect fuel pump relay.
- -> Referring to the current flow diagram test the wiring connection between fuel pump relay base contact 30 and fuse S72 in the black holder for open circuit
- Rectify open circuit, if necessary
- If the wiring connection is OK, replace the fuel pump relay.
- Re-insert the fuel pump relay and fuse S72 in the black holder.

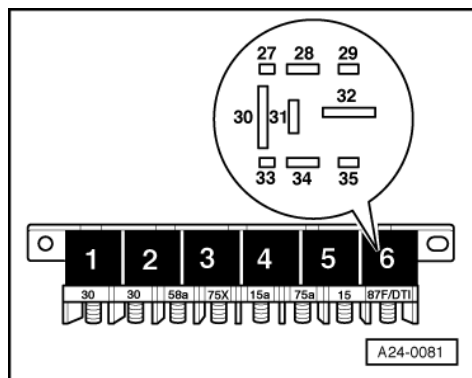
Testing the power supply and actuation of the fuel pump relay

- Take off the cover of the auxiliary relay carrier 1 in the left of the plenum chamber.
- Disconnect fuel pump relay.

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Testing power supply

- Switch the ignition on.



- -> Set hand held multimeter V.A.G 1526 to voltage measuring range (20 V direct current) and connect it as follows:

Contacts	Specification
28 + 34	approx. battery voltage
32 + 34	approx. battery voltage

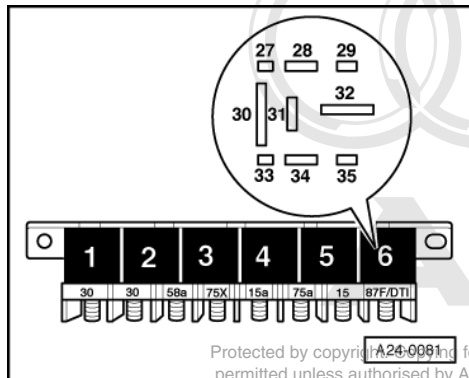
- Switch off ignition.

If the specified values are not obtained:

- Test the wiring.

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

Testing actuation



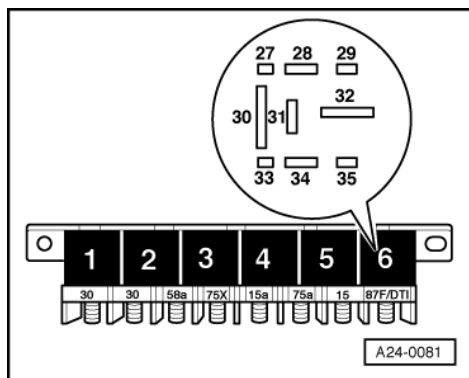
- -> Connect voltage tester V.A.G 1527 B as follows:

Fuel pump relay base	
Contact	Contact
28	29

- Switch the ignition on.
 - The LED should come on for about 1 second
- Operate starter.
 - The LED should come on and remain on during the starting operation.

If the LED does not come on:

- With the ignition switched off, connect test box V.A.G 1598/18 to connector for engine control unit => Page 47.



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

Fuel pump relay base Contact	Test box V.A.G 1598/18 Socket
29	31

- Rectify any open/short circuit as necessary.
- If the actuation and wiring connection is OK, replace the fuel pump relay.

1.14 - Testing injectors

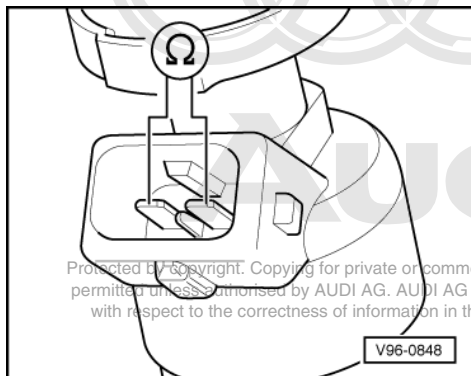
Special tools, testers and auxiliary equipment required

- ◆ Hand-held multimeter V.A.G 1526 or V.A.G 1526 A
- ◆ Voltage tester V.A.G 1527 B

- ♦ Adapter set V.A.G 1594 A
- ♦ Test box V.A.G 1598/18

Testing internal resistance

- Unplug connector on injector to be checked.



- -> Set hand held multimeter V.A.G 1526 to resistance measuring range and connect to injector contacts using the auxiliary leads from V.A.G 1594 A.
- Specification
 - Bosch injector: 15 ... 17 ω
 - Siemens injector: 13.5 ... 15.5 ω

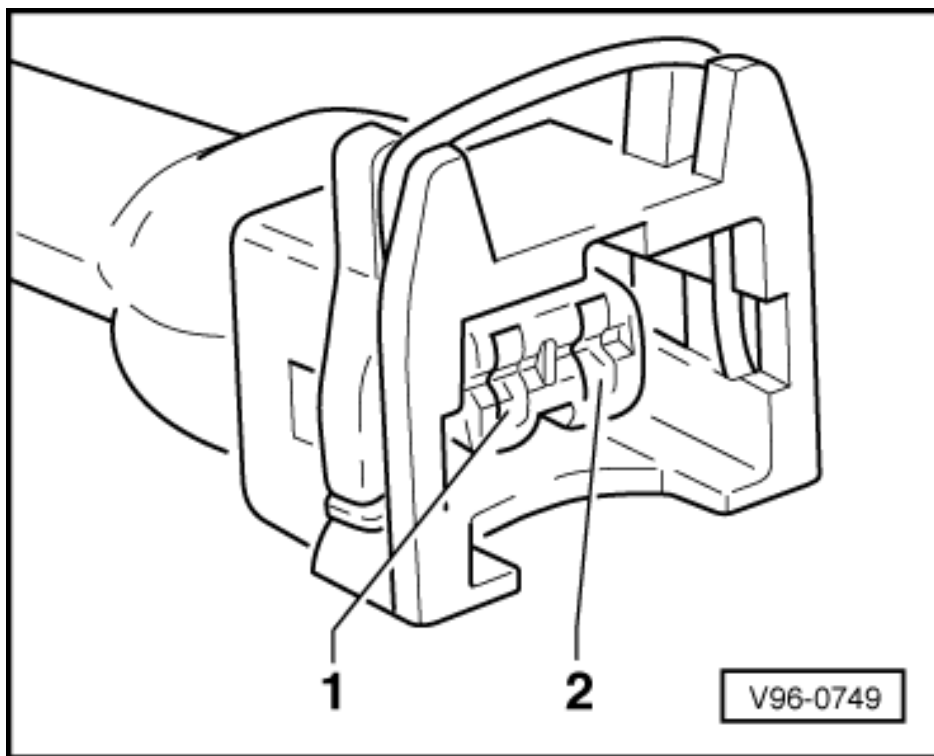
If the specification is not obtained:

- Replace the injector => Page **63** .

Testing power supply

Test requirements:

- Fuse S72 in black holder in electronics box in passenger footwell OK
- Fuel pump relay OK, checking =>Page **54** .
- Pull connector off cold start valve.
- Unplug connector on injector to be checked.



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

Injector connector Contact	Measure to
1	Engine earth

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

If the LED does not light up:

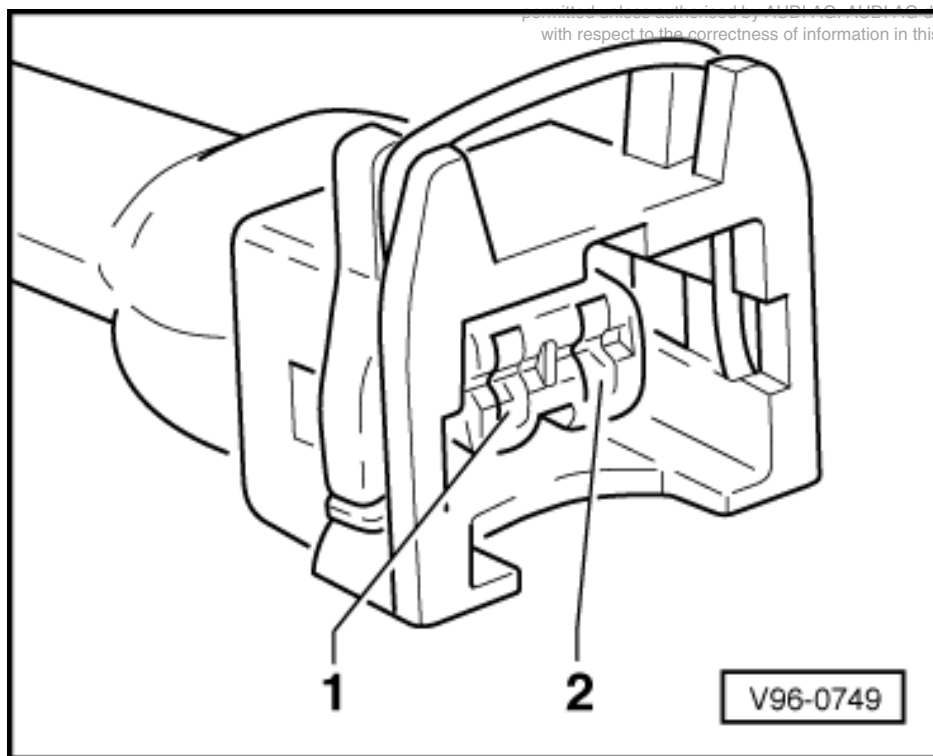
- Referring to the current flow diagram test the wiring connection between contact 1 and fuse S72 in the black holder in the electronics box in passenger footwell for open circuit .
- Rectify open circuit, if necessary

Testing actuation

Test requirements:

- Hall sender -G40 OK; testing => Page 106 .
- Unplug connector on injector to be checked.

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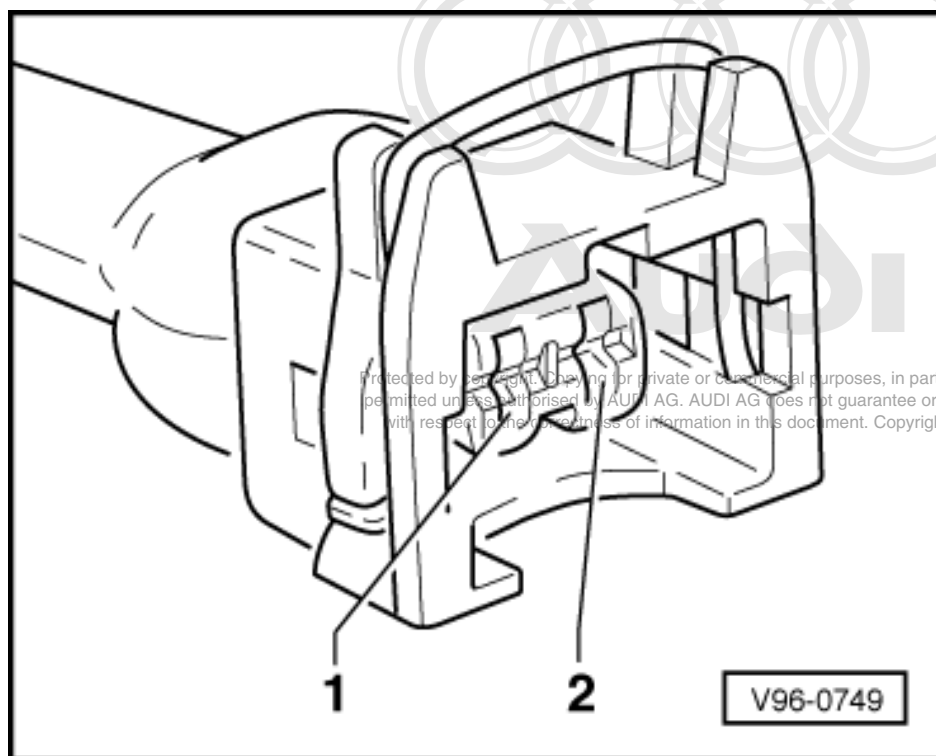
- -> Connect voltage tester V.A.G 1527 B as follows with auxiliary leads from V.A.G 1594 A:

Injector connector contact	Measure to
2	Battery positive

- Operate the starter briefly (the engine may start).
 - The LED should flash.

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

- With the ignition switched off, connect test box V.A.G 1598/18 to connector for engine control unit => Page 47 .



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

Injector connector Contact	Test box V.A.G 1598/18 Socket
2	2

- Rectify any open/short circuit as necessary.

If the wiring connection is OK although the LED does not flash or comes on and remains on:

- Test the voltage supply of the Digifant-control unit => Page 114 .

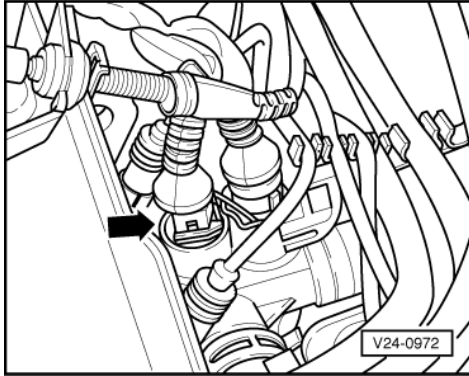
Testing spray pattern and for leaks

Special tools, testers and auxiliary equipment required

- ♦ Measuring unit for fuel quantity injected V.A.G 1602

Test requirements:

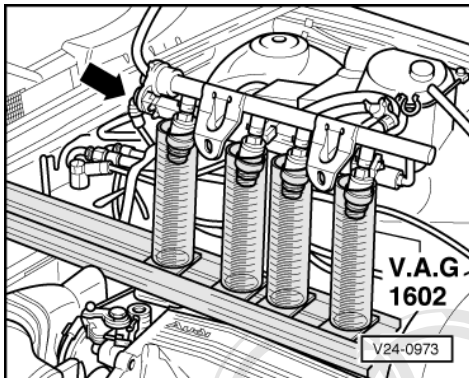
- Connector at cold start valve unplugged.
- Remove the fuel manifold together with injectors => Removing and installing injectors, Page 63 .



- -> Pull plug off coolant temperature sender -G62 -arrow-
- Connect the fuel supply and return pipes to fuel manifold.
- Detach the cold start valve with the fuel line connected from the intake manifold.

Note:

Do not remove the retaining clip (Part no. 035 906 037) at the connection of injector/ fuel manifold until after installation in the intake manifold.



- -> Plug in connectors at the line guide and the connectors at the injectors.
- Insert injectors into the openings in the measuring appliance V.A.G 1602.
- Operate starter.
 - The injectors should eject fuel with even pulsations
- Unplug connectors from all injectors.
- Switch on the ignition for about 5 seconds and inspect the injectors for leaks.
 - Not more than 2 drops/minute should flow out at each injector

Notes:

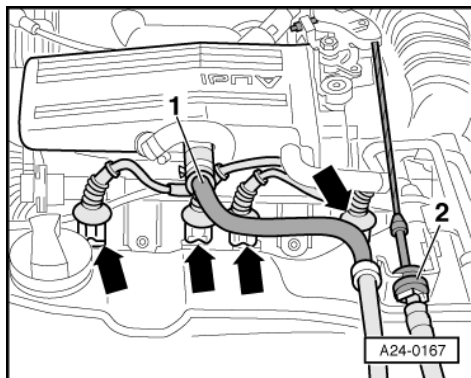
- ◆ When installing the injectors, ensure that the O-rings are not damaged
- ◆ Replace O-rings that are damaged.

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1.15 - Removing and installing injectors

Removing

- Remove intake hose between air flow meter and throttle valve housing.

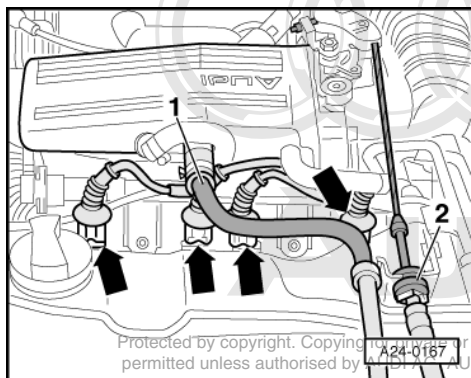


- -> Detach the throttle cable at the support bracket -2- (do not remove securing clip). Move throttle cable clear to the side.
- Detach the vacuum pipe -1- to the brake servo unit.
- Detach the heat shield for the throttle valve potentiometer at the side of the throttle valve body.
- Detach the throttle valve body at the intake manifold and place in to the rear.

Warning

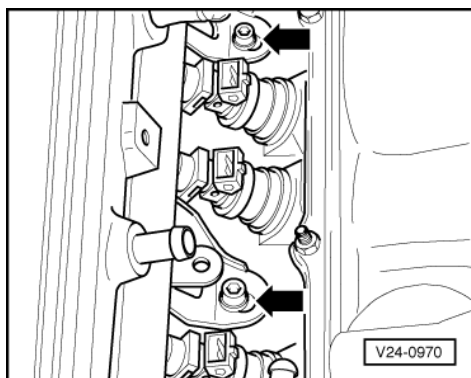
Fuel system is pressurised. Before opening the system place a cloth around the connection. Then release pressure by carefully loosening the connection.

- Detach the fuel line for the cold start valve at the fuel manifold.



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- Detach the fuel supply and fuel return pipes at the fuel manifold.
- -> Disconnect connectors -1- at the injectors.
- Push on the retaining clips with Part No. 035 906 037 at the connection of the injectors/fuel manifold

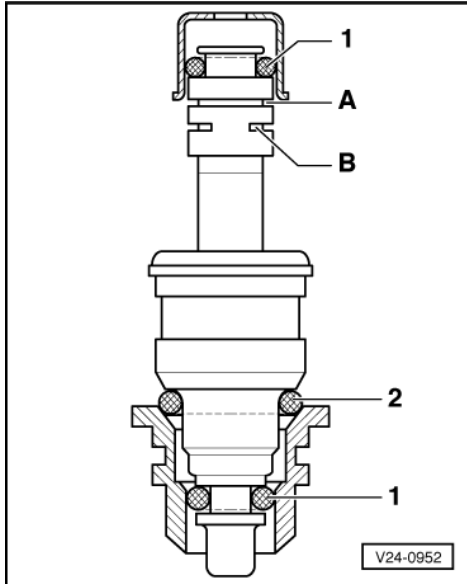


- -> Unscrew fuel manifold from intake manifold -arrows-.
- Pull the fuel manifold together with the injectors out of the intake manifold.
- Pull off the retaining clips again at the connection of the injectors/fuel manifold and pull the injectors out of the fuel manifold.

Installing

Note:

Replace O-rings as well as nozzle inserts (in intake manifold) of the injectors which are damaged.



- -> Moisten the small O-rings -1- at the injectors lightly with clean engine oil.
- Push the injectors the correct way round into the fuel manifold as far as the first notch -A- and secure the injectors with the retaining clips (Part No. 035 906 037).

Note:

If you push the injectors into the fuel rail as far as the second notch -B- and secure with the retaining clips, injection noises will be transmitted.

- Insert the fuel manifold with the secured injectors at the intake manifold and press it in fully at the large O-ring -2-.
- Insert the securing bolts, press the fuel rail slightly toward the intake manifold and tighten the bolts to the final torque.
- Remove the retaining clips at the connection of injectors/fuel manifold.

Note:

Attach the fuel lines at the fuel manifold so that they are not touching the cylinder head cover.

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

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Tightening torques

Component	Nm
Throttle valve body to intake manifold	25
Fuel feed and fuel return-flow line to fuel manifold	25

1.16 - Testing cold start valve -N17

Special tools, testers and auxiliary equipment required

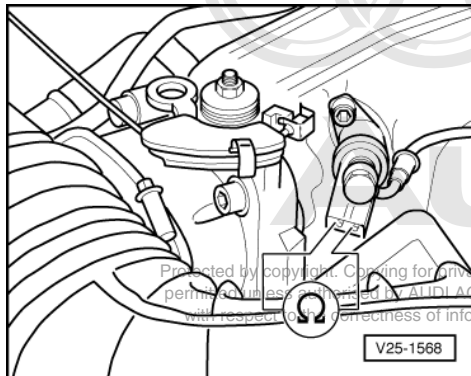
- ◆ Hand-held multimeter V.A.G 1526 or V.A.G 1526 A
- ◆ Voltage tester V.A.G 1527 B

- ♦ Test box V.A.G 1598/18

Testing internal resistance**Note:**

The cold start valve injects only at coolant temperatures below 15 °C.

- Pull connector off cold start valve.



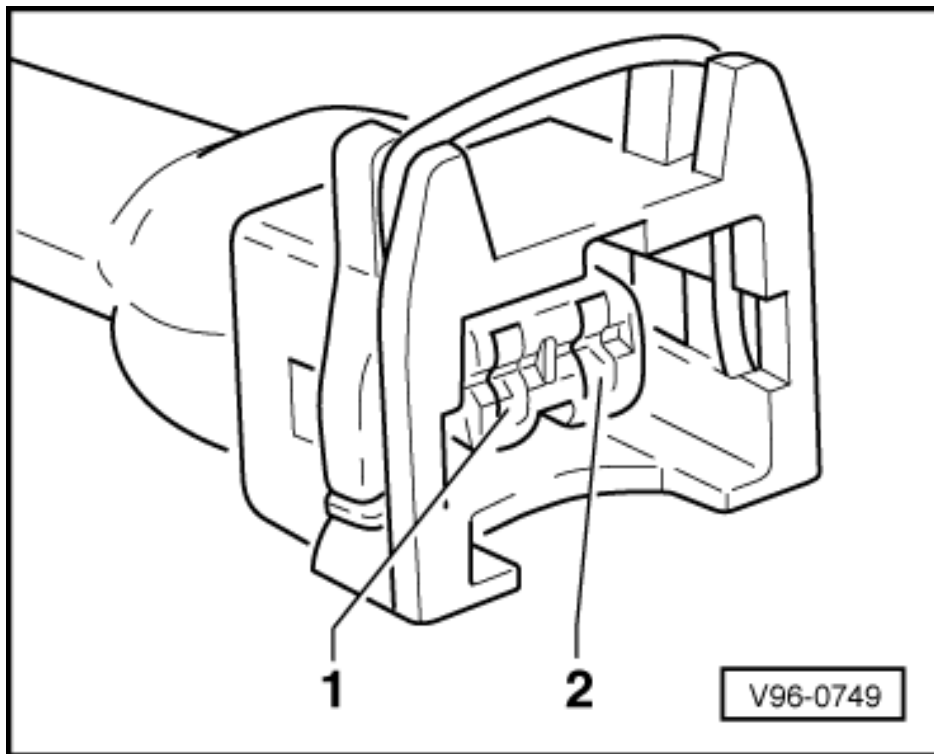
- -> Set hand held multimeter V.A.G 1526 to resistance measuring range and connect to valve contacts using test leads from V.A.G 1594 A.
- Specification: 8 ... 15 Ω

If the specification is not obtained:

- Replace the cold start valve

Testing voltage supply and actuation**Test requirements:**

- Fuse S75 in red holder in electronics box in passenger footwell OK
- Start signal present; testing => Page 97 .
- Unplug connectors from all injectors.
- Pull connector off cold start valve.



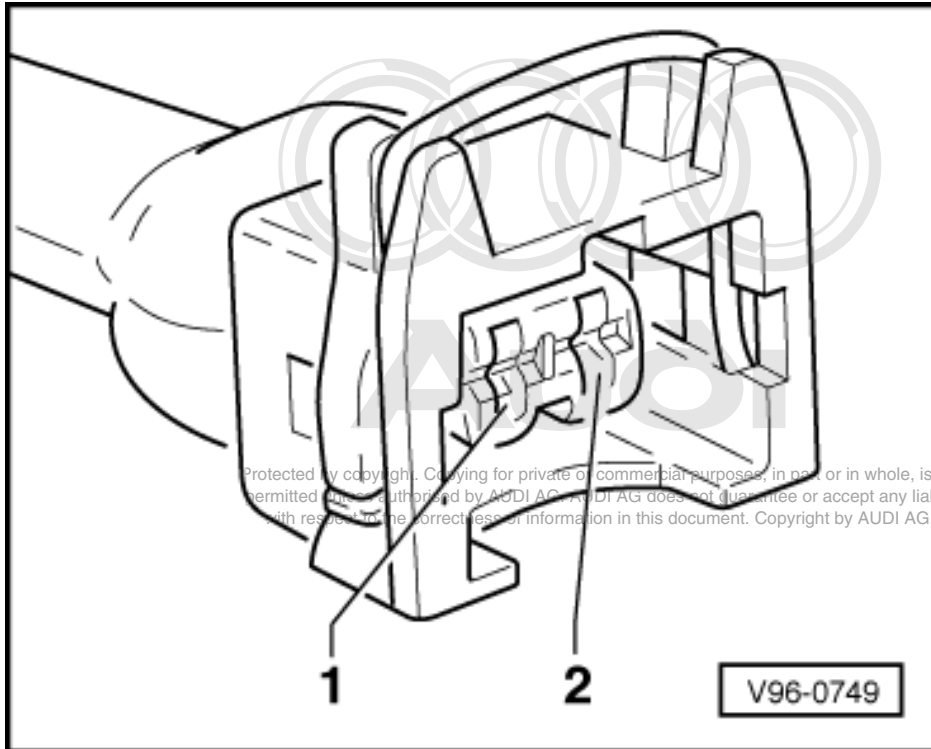
- -> Connect voltage tester V.A.G 1527 B as follows with auxiliary leads from V.A.G 1594 A:

-N17 connector Contact	Measure to
1	Engine earth

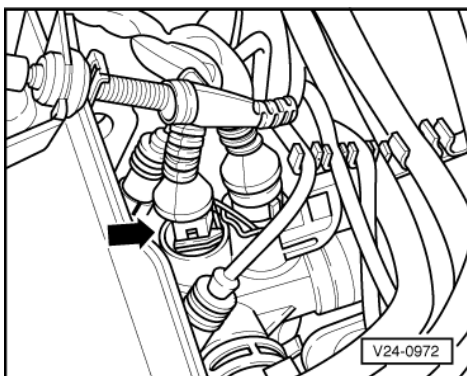
- Switch the ignition on.
 - The LED should light up.

If the LED does not light up:

- Eliminate open circuit in wiring according to current flow diagram



- -> Connect voltage tester V.A.G 1527 B between contacts 1 and 2 of the connector of the cold start valve using auxiliary wires from V.A.G 1594 A.

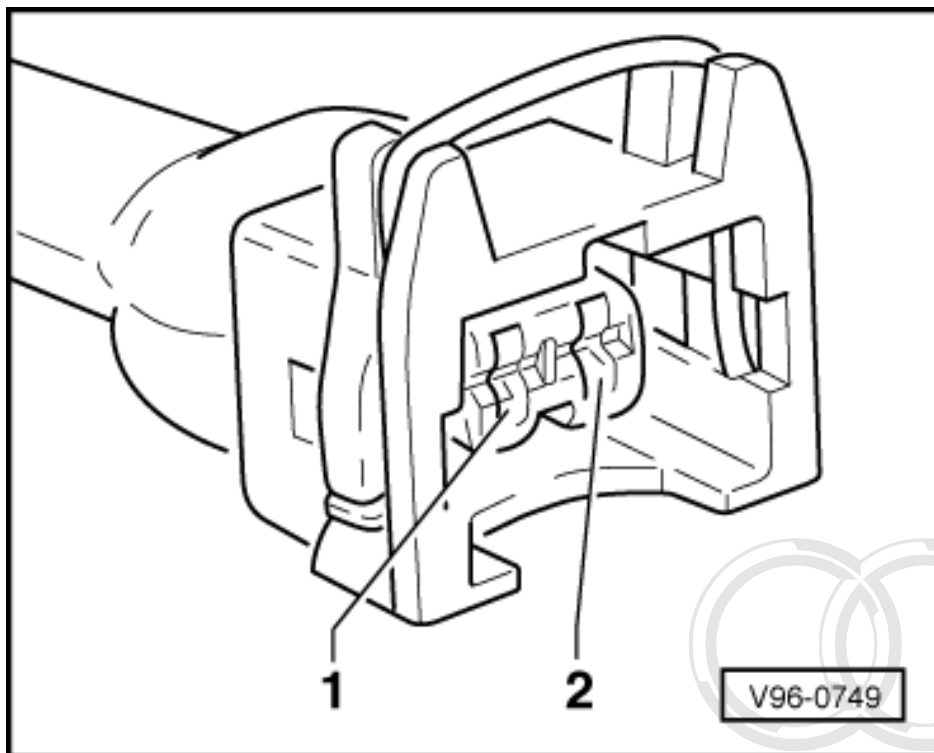


- -> Pull connector off coolant temperature sender -G62 -arrow-
- Operate starter.
 - The LED should come on for 1 ... 4 seconds

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



- With the ignition switched off, connect test box V.A.G 1598/18 to connector for engine control unit => Page 47 .



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

-N17 connector Contact	Test box V.A.G 1598/18 socket
2	6

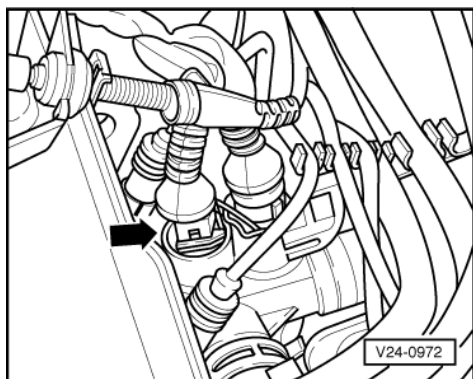
- If the wiring is OK, but the valve is not actuated, renew the Digifant control unit => Page 48 .

Notes:

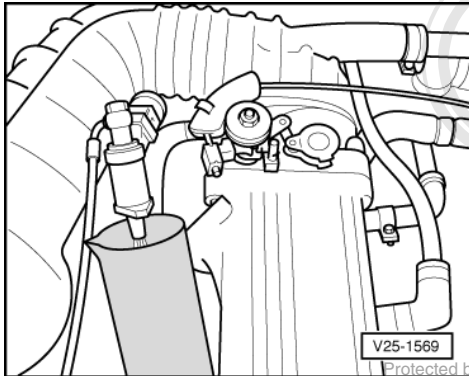
- ♦ After replacing the Digifant control unit , it is necessary to adapt the control unit and throttle valve potentiometer to each other=> Page 89 .
- ♦ After replacing the Digifant control unit on vehicles fitted with an automatic gearbox, it is necessary to adapt the automatic gearbox control unit and the throttle valve potentiometer to each other => Page 89 .

Testing spray pattern, injection time and absence of leaks of cold start valve

- Unplug connectors from all injectors.



- -> Pull plug off coolant temperature sender -G62 -arrow-.



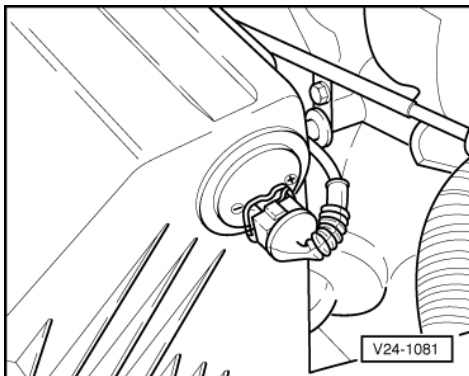
- -> Detach the cold start valve with the fuel line connected from the intake manifold.
- Detach fuel supply line from fuel manifold.
- Turn the cold start valve with the fuel supply pipe and hold the cold start valve in a measuring glass.
- Connect the fuel supply pipe to the fuel manifold again.
- Operate starter.
 - The cold start valve should eject a pulsating spray on a uniform cone for 1 ... 4 seconds
- Dry off the cold start valve at the nozzle.
 - No drip should drop from the cold start valve within 1 minute. The cold start valve must also not be moist on the outside.

1.17 - Testing idling stabilisation valve -N71

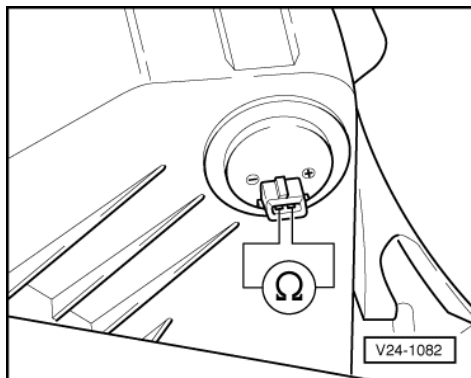
Special tools, testers and auxiliary equipment required

- ◆ Hand-held multimeter V.A.G 1526 or V.A.G 1526 A
- ◆ Voltage tester V.A.G 1527 B
- ◆ Fault reader V.A.G 1551 (or vehicle system tester V.A.G 1552) with wire V.A.G 1551/1
- ◆ Adapter set V.A.G 1594 A
- ◆ Test box V.A.G 1598/18

Testing internal resistance



- Switch off ignition.
- -> Pull connector -arrow- off idling stabilisation valve.



- -> Set hand held multimeter V.A.G 1526 to resistance measuring range and connect to valve contacts using test leads from V.A.G 1594 A.
- Specification: 2 ... 10 ω

Note:

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

If the specification is not obtained:

- Renew idling stabilisation valve.

Mechanical checking

- Remove idling stabilisation valve
- Inspect the piston slide for signs of rubbing (visual inspection).

Note:

Never use a screwdriver or similar tool to move the piston slide when checking for freedom of movement.

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

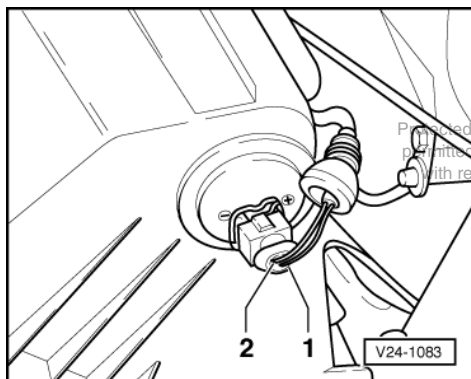
If scoring is found which impairs freedom of movement or if piston slide does not move freely (sticking, sluggish or not full range of travel):

- Renew idling stabilisation valve.

If idling stabilisation valve does not react in final control diagnosis:

- Test the voltage supply or the actuation.

Testing power supply

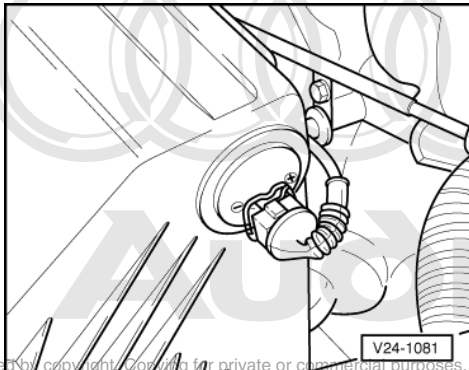


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- Push back protective cap at connector
- ➔ Set hand-held multimeter V.A.G 1526 to voltage measuring range (20 V direct current) and connect to contact 1 and to engine earth using test leads from V.A.G 1594 A.
- Switch the ignition on.
 - Specification: approx. battery voltage

If the specification is not obtained:

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



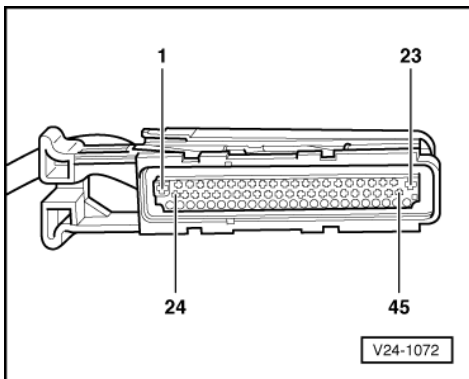
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Testing actuation of the idling speed stabilisation valve

- ➔ Pull connector -arrow- off idling stabilisation valve.
- Connect voltage tester V.A.G 1527 B between contact 1 (positive) and 2 (signal) of the connector.
- Connect fault reader V.A.G 1551 and select engine electronics control unit => Page 1.
- Start final control diagnosis and actuate the idling speed stabilisation -N71 an => Page 13.
- The LED should flash.

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

- With the ignition switched off, connect test box V.A.G 1598/18 to connector for engine control unit => Page 47.



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

Connector for -N71 Contact	Test box V.A.G 1598/18 Socket
2	30

- Rectify any open/short circuit as necessary.



- If actuation and wiring are OK, but idling stabilisation valve does not react, valve is seized up. Renew idling stabilisation valve.

1.18 - Testing acceleration/full throttle enrichment and overrun cut-off

Note:

The fuel shut-off is tested with the following procedure. If this test is OK, the acceleration and full throttle enrichment are also operating properly.

Special tools, testers and auxiliary equipment required

- ♦ Fault reader V.A.G 1551 (or vehicle system tester V.A.G 1552) with wire V.A.G 1551/1
- Connect fault reader V.A.G 1551 (V.A.G 1552) and select the engine electronics control unit using "Address word" 01. The engine must be running at idle speed
(Connect fault reader and select engine electronics control unit => Page 1.)

Read measured value block 2			
1	2	3	4

- > Read measured value block, display group 002 => Page 24 .
- Do not continue with the test until the coolant temperature has reached 80 °C and then run the engine at idling speed for a further 2 minutes.
- Test display in display zone 2.
 - Specification: 1.5 - 3.5 ms
- Increase engine speed (=> display zone 1) by revving up to at least 3000 rpm and then release accelerator.
- Read off the injection time in display zone 2
 - Specification:
The injection time should rise, drop off to 0.0 ms and rise again to the reading previously obtained.

If the reading does not rise and also does not drop to 0.0 ms:

- Adapt the Digifant control unit and throttle valve potentiometer to each other => Page 89 .
- Adapt automatic gearbox control unit -J217 and throttle valve potentiometer to each other => Page 89
- Test throttle valve potentiometer => Page 86

1.19 - Testing air flow meter -G19

Note:

If the air flow meter is recognised as faulty, no acceleration enrichment is performed.

Special tools, testers and auxiliary equipment required

- ♦ Hand-held multimeter V.A.G 1526 or V.A.G 1526 A
- ♦ Fault reader V.A.G 1551 (or vehicle system tester V.A.G 1552) with wire V.A.G 1551/1
- ♦ Adapter set V.A.G 1594 A
- ♦ Test box V.A.G 1598/18
- Connect fault reader V.A.G 1551 (V.A.G 1552) and select the engine electronics control unit using "Address word" 01. The engine must be running at idle speed
(Connect fault reader and select engine electronics control unit => Page 1.)

Read measurement block 3			
1	2	3	4

-> Read measured value block, display group 003 => Page 24 .

- Do not continue with the test until the coolant temperature has reached 80 °C
- Test display in display zone 2.
 - Specification: 14 ... 25 %
- Press the ➔key.

-> Indicated on display:

Rapid data transfer HELP
 Select function XX

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

If specification not attained or exceeded:

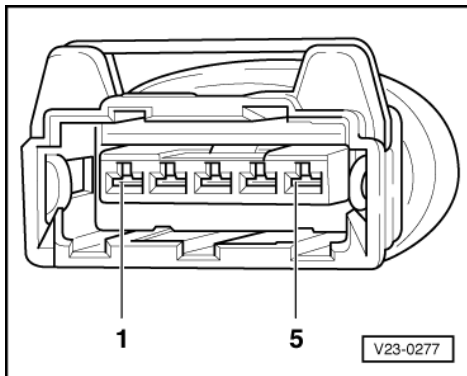
- Test idling stabilisation valve => Page 69 .
- Test intake air system for leaks.
- If no fault is found, continue with the following test.

Notes:

- ◆ The air flow meter contains a pre-amplifier for the output signal. For this reason it is not possible to test the resistance path by simply measuring the resistance.
- ◆ Contact 5 in the connector at the air flow meter is not assigned.

Testing wiring

- With the ignition switched off, connect test box V.A.G 1598/18 to connector for engine control unit => Page 47 .



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

Connector of -G19 Contact	Test box V.A.G 1598/18 Socket
2	14
3	16
4	35

- Rectify any open/short circuit as necessary.
- If there are no faults in the wiring, test the power supply.

Testing power supply

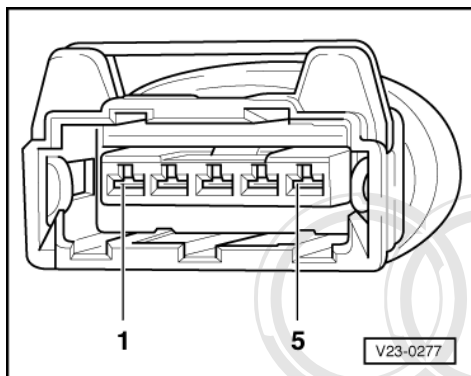
Test requirements:

- Wiring OK

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- Engine control unit attached
- Pull off connector at the air flow meter.



- -> Set hand held multimeter V.A.G 1526 to voltage measuring range (20 V direct current) and connect it to contacts 3 and 4 of the connector of the air flow meter using test leads from V.A.G 1594 A.
- Switch the ignition on.
 - Specification: approx. 5 V.

If the specification is not obtained:

- Replace Digifant control unit => Page 48.
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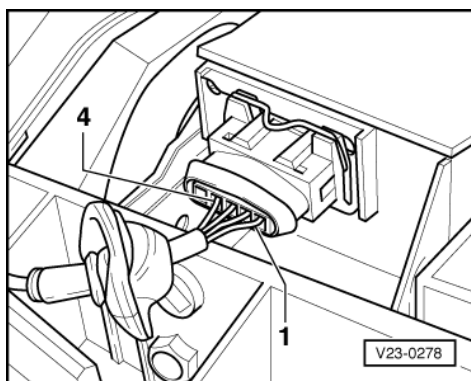
Notes:

- ♦ After replacing the Digifant control unit, it is necessary to adapt the control unit and throttle valve potentiometer to each other => Page 89.
- ♦ After replacing the Digifant control unit on vehicles fitted with an automatic gearbox, it is necessary to adapt the automatic gearbox control unit and the throttle valve potentiometer to each other => Page 89.

Testing signal voltage

Test requirements:

- Wiring OK
- Air flow meter connected
- Push back rubber grommet at connector of air mass meter



- -> Set hand held multimeter V.A.G 1526 to voltage measuring range (20 V direct current) and connect it to contacts 2 and 4 of the connector of the air flow meter using test leads from V.A.G 1594 A.
- Start engine and run at idling speed.
 - Specification: 0.5 ... 1.5 V
- Increase engine speed and observe change in voltage.
 - Specification:

With increasing engine speed, and thus increasing air throughput, signal voltage increases proportionally up to approx. 4,5 V at maximums revs.

If voltage does not change, or if voltage dips with increasing engine speed:

- Renew air mass meter.

2 - Testing Lambda control

2.1 - Testing Lambda control

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Notes:

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

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

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

During the transition from "rich" to "lean" and vice versa ($\lambda = 1.0$), there is a voltage jump from 0.7 ... 1.1 V to 0.0 ... +0.3 V or vice versa.

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

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

- ◆ Slots or holes in probe head are blocked.
- ◆ Lambda probe has been subjected to excessive thermal stress.
- ◆ Contact resistance in signal wiring.
- ◆ Lambda probe too cold; lambda probe heating not working.
- ◆ Lambda control switched off (control unit has registered a fault in the injection system => interrogate fault memory and read measured value block, display group 006).
- ◆ Lambda probe damaged by contact spray or similar product (the contact spray is drawn into the Lambda probe via the fine cavities in the electrical wiring as a result of temperature fluctuations and capillary effects).
- ◆ Lambda probe damaged by silicone vapours (the engine draws in traces of any silicone based sealants that may have been used. The silicone does not burn and damages the lambda probe).

2.2 - Engine running problems after cold start

Test requirements:

- No faults relating to lambda control function recorded in fault memory. If faults are recorded, rectify them and erase the fault memory.

The time it takes for the lambda control to cut in (lambda probe temperature must be approx. 300 °C) is mainly determined by the following factors.

- ◆ Ambient temperature (summer/winter)
- ◆ Operating conditions after starting
- ◆ Functioning of lambda probe heating

If faults occur after a cold start, check whether the problem arises before or after the lambda control cuts in.



Special tools, testers and auxiliary equipment required

- ♦ Fault reader V.A.G 1551 (or vehicle system tester V.A.G 1552) with wire V.A.G 1551/1

Testing vehicle under cold start conditions:

- Connect fault reader V.A.G 1551 (V.A.G 1552) and select the engine electronics control unit using "Address word" 01. The engine must be running at idle speed
(Connect fault reader and select engine electronics control unit => Page 1.)

Read measurement block 3
1 2 3 4

-> Read measured value block, display group 003 => Page 24 .

Display zone 3 will show the signal voltage for lambda probe 1.

Engine cold or lambda control not running: 0.45 ... 0.50 V.

- Take the vehicle for a test drive.

Warning

Secure fault reader to the rear seat and operate from this location. Always observe the relevant safety precautions when doing this.

=> Page 35

- Observe the readout in display zone 3.

-> -> When the control action cuts in, the voltage signal in display zone 3 must fluctuate between the ranges 0.0 ... +0.3 and +0.7 ... +1.1 V.

Read measurement block 3
1 2 3 4

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Voltages of more than +0.7 V indicate a rich fuel mixture (low oxygen level in exhaust gas).

Voltages of less than +0.3 V indicate a lean fuel mixture (high oxygen level in exhaust gas).

- If the engine performance is poor before the lambda control cuts in, the lambda control is not the cause of the problem.
- If the engine running problems only occur after the lambda control has cut in, test the operation of the lambda control
=> Page 76

2.3 - Testing Lambda probe -G39 and Lambda control

Note:

A fault relating to the function of the lambda control system can only be checked after a test drive of at least 5 minutes duration (time-related fault detection).

Special tools, testers and auxiliary equipment required

- ♦ Hand-held multimeter V.A.G 1526 or V.A.G 1526 A
- ♦ Fault reader V.A.G 1551 (or vehicle system tester V.A.G 1552) with wire V.A.G 1551/1
- ♦ Adapter set V.A.G 1594 A
- ♦ Test box V.A.G 1598/18

Test requirements:

- No leak in exhaust system between catalytic converter and cylinder head.
- Lambda probe heater OK; testing => Page 78 .
- Connect fault reader V.A.G 1551 (V.A.G 1552) and select the engine electronics control unit using "Address word" 01. The engine must be running at idle speed
(Connect fault reader and select engine electronics control unit => Page 1 .)

Read measurement block 1
1 2 3 4

- > Read measured value block, display group 001 => Page 22 .
- Do not proceed with the test until the following conditions are met:
 - Readout in display zone 2 greater than 80 °C
 - Readout in display zone 4.
 - 5. position = 0 (lambda control)
 - 8. position = 0 (coolant temperature)
- Read off the figure in display zone 3
 - Specification: varies between 0.1 and 1.1 V
- If the lambda probe voltage fluctuates very slowly, test the lambda probe heating => Page 78 .
- If the display shows a constant lambda probe voltage reading of 0.45 - 0.50 V, this means there is an open circuit in the signal wiring, check the wiring => Page 77 .
- Press the =>key.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

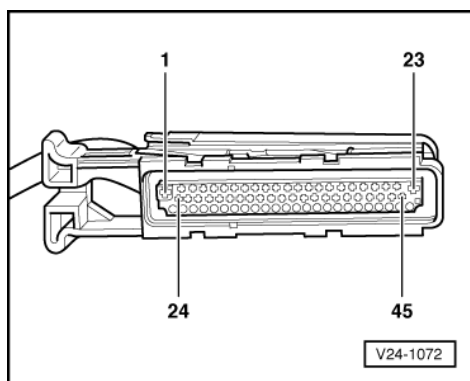
- Enter "06" for "End output" function and confirm entry with Q key.

If the specification is not obtained:

- Test lambda probe => Page 78

Testing wiring

- Set hand-held multimeter V.A.G 1526 to voltage measuring range (2 V direct current) and connect it to the connector on the engine control unit and engine earth using test leads from V.A.G 1594 A.
- Switch the ignition on.
 - Specification: 450 ± 50 mV.



If the specification is not obtained:

- With the ignition switched off, connect test box V.A.G 1598/18 to connector for engine control unit => Page 47 .
- -> Test the wiring connection of the lambda probe -G39 to socket 17 of test box V.A.G 1598/18 for an open circuit.
- Rectify open circuit, if necessary



Testing Lambda probe

- Switch off ignition.
- Separate the plug connection for the signal wire of the lambda probe => -Pos. **38**.
- Set hand held multimeter V.A.G 1526 to the resistance measuring range and connect it to the lambda probe and engine earth using the auxiliary leads from V.A.G 1594 A.
 - Specified value: $\infty\Omega$

If the specification is not obtained:

- Fit a new Lambda probe.

2.4 - Testing Lambda probe heater -Z19

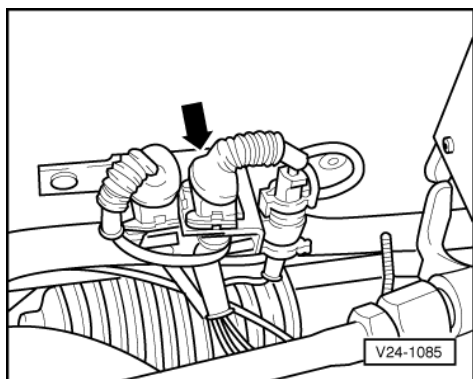
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Special tools, testers and auxiliary equipment required

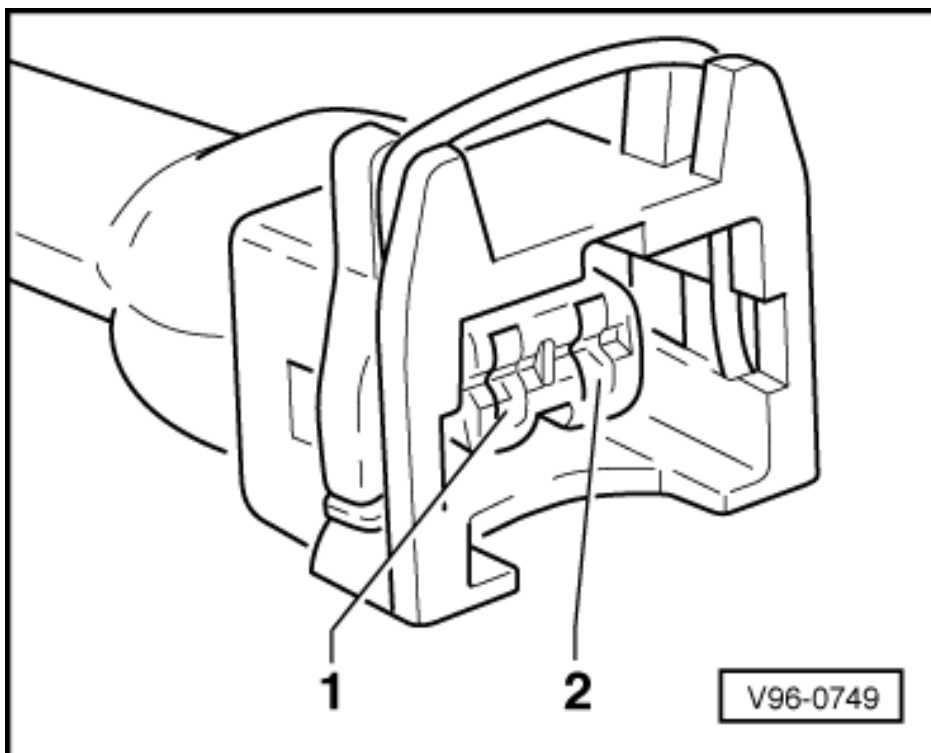
- ♦ Test lead V.A.G 1315A/1
- ♦ Hand-held multimeter V.A.G 1526 or V.A.G 1526 A
- ♦ Adapter set V.A.G 1594 A

Test requirements:

- Fuse No. 25 OK
- Fuel pump relay OK.
- Engine cold



- -> Unplug the lambda probe connector.

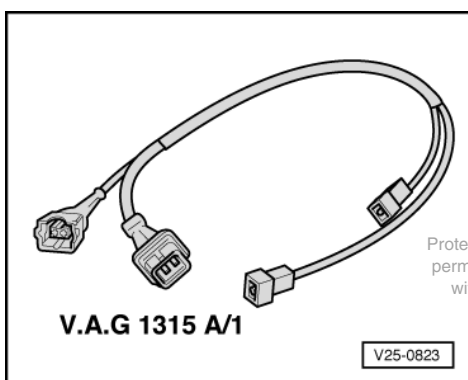


- -> Set hand held multimeter V.A.G 1526 to voltage measuring range (20 V direct current) and connect it to contacts 1 and 2 of the connector of the engine control unit using test leads from V.A.G 1594 A.
- Start engine and run at idling speed.
 - Specification: approx. battery voltage

If the specification is not obtained:

- rectify open circuit.

If the specification is obtained:



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- -> Connect the test wire V.A.G 1315 A/1 between the connector for the lambda probe heater
- Set hand held multimeter V.A.G 1526 to the 10 A measuring range and connect it to the terminals of the test wire V.A.G 1315 A/1 using the auxiliary leads from V.A.G 1594 A.
- Start engine and run at idling speed.
 - Specification: 0.5 ... 3.0 A (the current decreases as the lambda probe heats up)

If the specification is not obtained:

- Test lambda probe => Page 78

3 - Testing fuel tank breather

3.1 - Testing fuel tank breather

3.2 - Testing activated charcoal filter solenoid valve 1 -N80

Notes:

- ♦ Solenoid valve 1 for the activated charcoal filter is closed under the following conditions:
At idling speed and so long as the lambda control is not active
- ♦ Fitting location => Pos. **39**.

Special tools, testers and auxiliary equipment required

- ♦ Hand-held multimeter V.A.G 1526 or V.A.G 1526 A
- ♦ Voltage tester V.A.G 1527 B
- ♦ Fault reader V.A.G 1551 (or vehicle system tester V.A.G 1552) with wire V.A.G 1551/1
- ♦ Adapter set V.A.G 1594 A
- ♦ Test box V.A.G 1598/18

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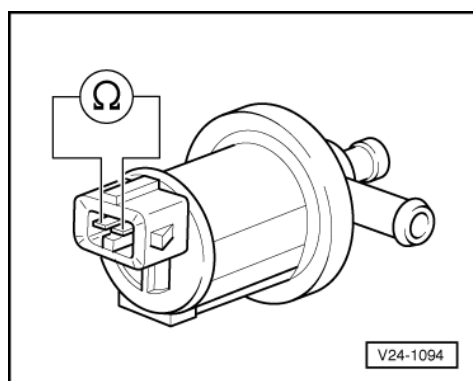
Testing for leaks

ACF solenoid valve -N80 remains closed when de-energised.

- Disconnect hoses from ACF valve but leave the electrical connector plugged in.
- Start final control diagnosis and actuate ACF valve => Page **13**.
- While final control diagnosis is running, blow into solenoid valve to check whether it opens properly. If necessary, fit a new solenoid valve.

Testing internal resistance

- Unplug connector on ACF valve.



- Set hand-held multimeter V.A.G 1526 to resistance measuring range and connect to contacts of the ACF valve using test leads from V.A.G 1594 A.
 - Specification: 20 ... 28 ω

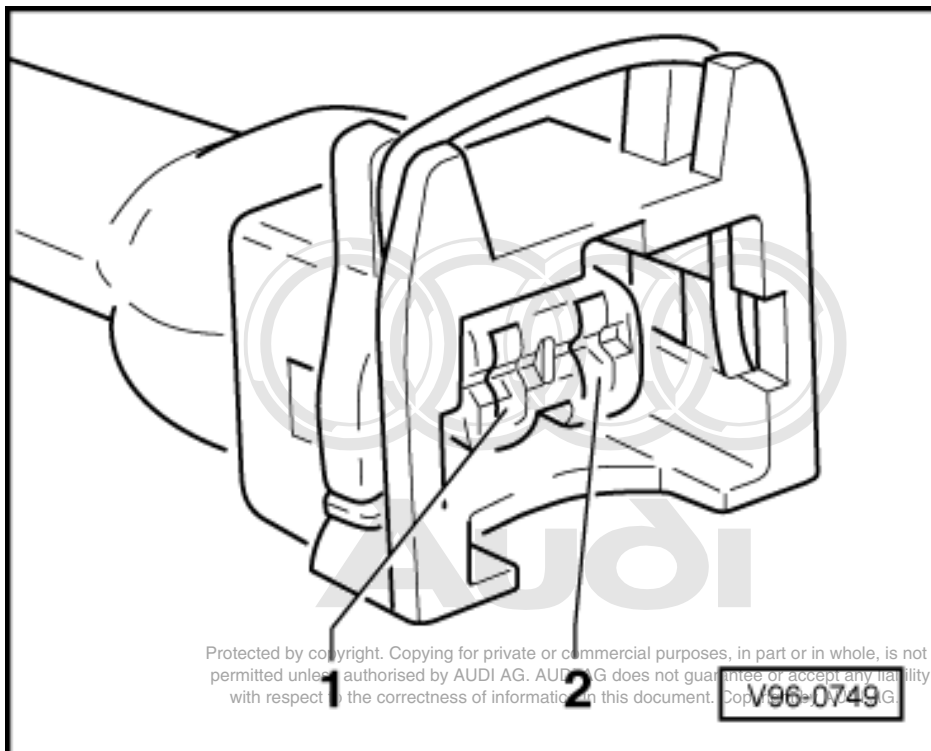
If the specification is not obtained:

- Fit a new ACF valve.

Testing power supply

Test requirements:

- Fuse S75 in red holder in electronics box in passenger footwell OK
- Unplug connector on ACF valve.



- -> Connect voltage tester V.A.G 1527 B to contact 1 (positive) of the connector of the AFC valve and to engine earth using auxiliary wires from V.A.G 1594 A.
- Switch the ignition on.
 - The LED should light up.

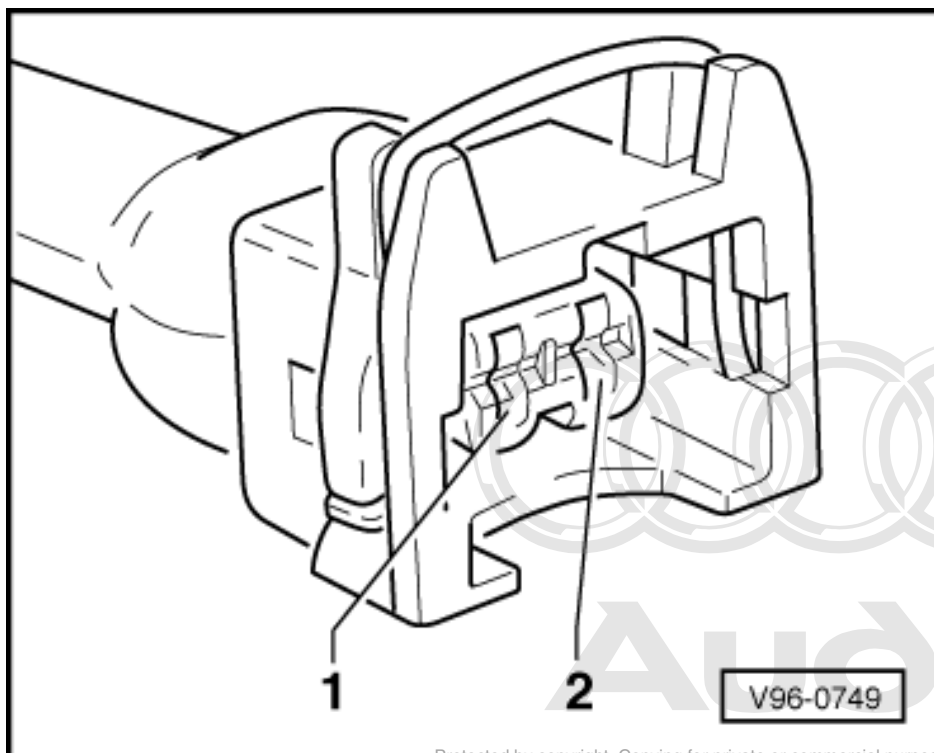
If the LED does not light up:

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

Testing actuation

Test requirements:

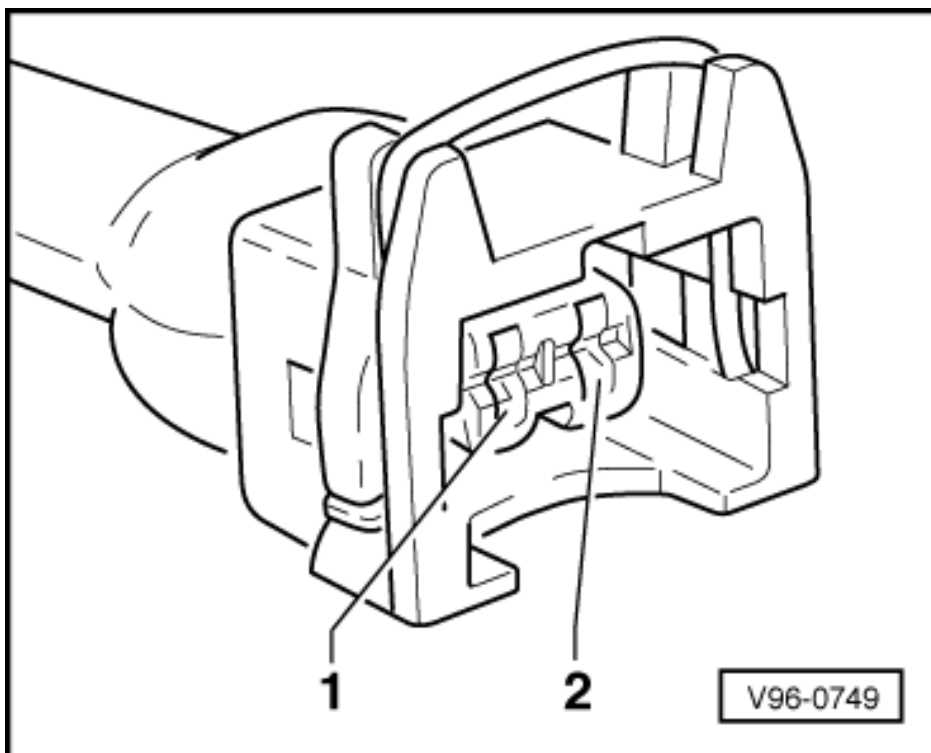
- Fuse S75 in red holder in electronics box in passenger footwell OK
- Unplug connector on ACF valve.



- -> Connect voltage tester V.A.G 1527 B to the contacts of the connector of the AFC valve using auxiliary wires from V.A.G 1594 A.
- Connect fault reader V.A.G 1551 and select engine electronics control unit => Page 1 .
- Start final control diagnosis and actuate ACF valve => Page 13 .
- The LED should flash.

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

- With the ignition switched off, connect test box V.A.G 1598/18 to connector for engine control unit => Page 47 .



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

Connector of -N80 Contact	Test box V.A.G 1598/18 Socket
2	33

- Rectify any open/short circuit as necessary.
- If the wiring is OK, fit a new Digifant control unit => Page 48 .

Notes:

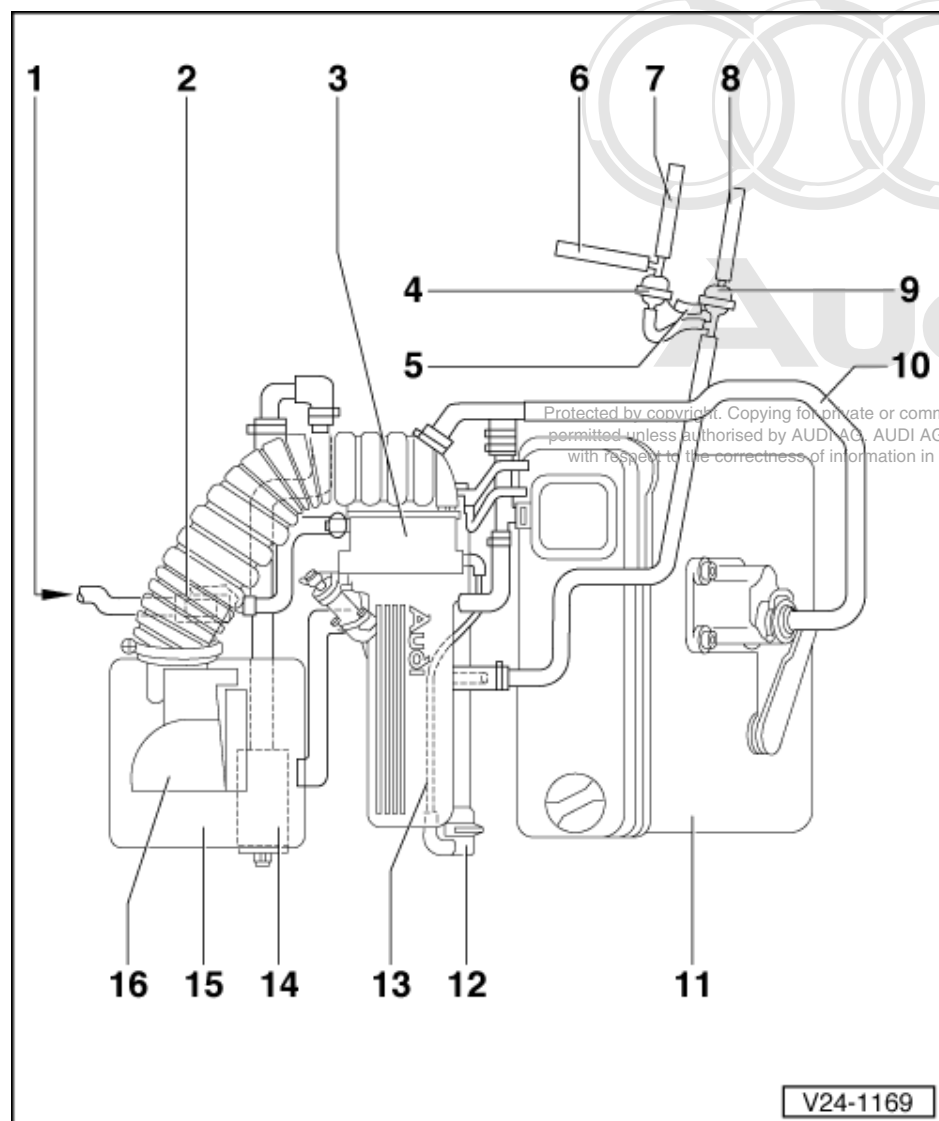
- ♦ After replacing the Digifant control unit , it is necessary to adapt the control unit and throttle valve potentiometer to each other=> Page 89 .
- ♦ After replacing the Digifant control unit on vehicles fitted with an automatic gearbox, it is necessary to adapt the automatic gearbox control unit and the throttle valve potentiometer to each other => Page 89 .



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4 - Connection diagram for vacuum hoses

4.1 - Connection diagram for vacuum hoses



1 From activated charcoal filter

- ♦ Servicing activated charcoal filter system

=> 4-cyl. Injection engine (2 valve), Mechanical components; Repair Group 20; Servicing fuel tank breather system with activated charcoal filter system. Servicing fuel tank breather system with activated charcoal filter system.

2 Solenoid valve 1 for activated charcoal filter -N80

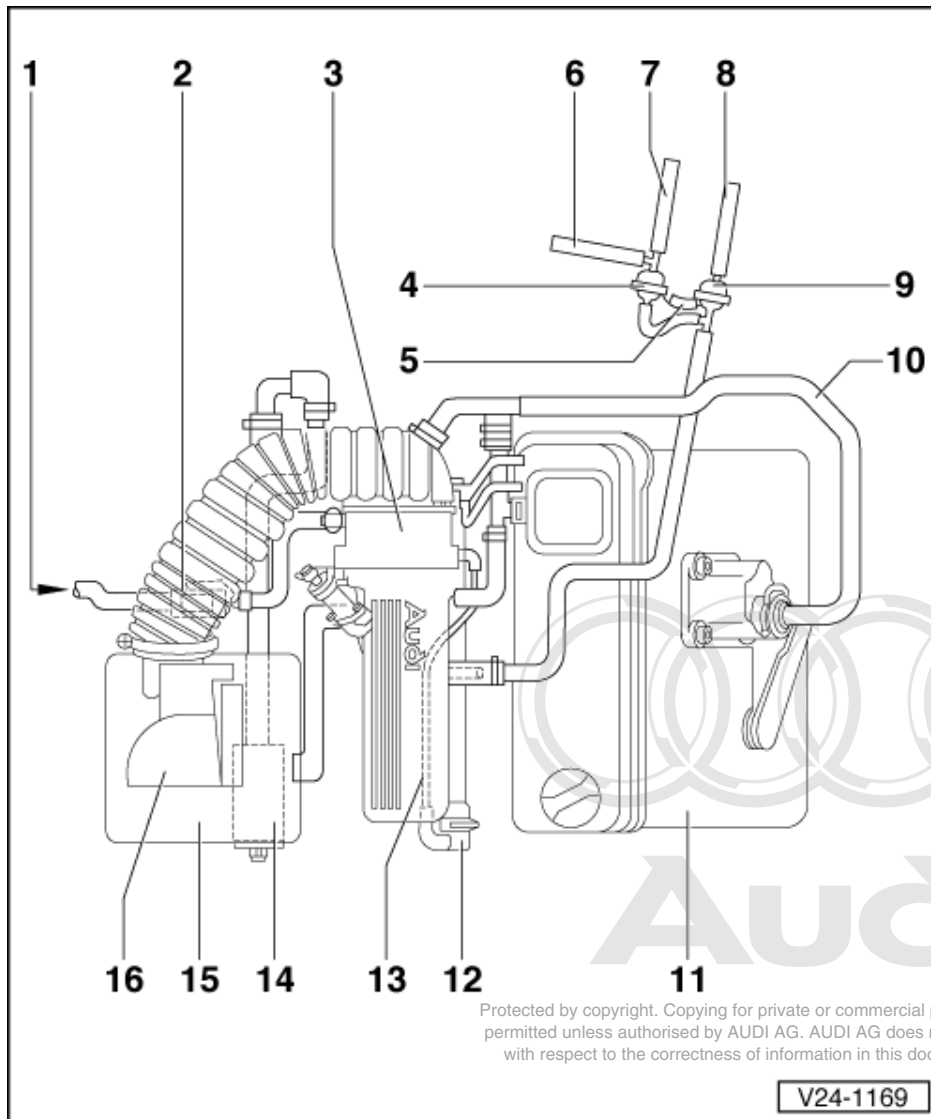
3 Throttle valve connection

4 Non return valve

- ♦ For air conditioner

5 Connection for differential lock

- ♦ Only on 4WD models
- ♦ Dummy plus for vehicles with front-wheel drive



- 6 To two-way valve
 - ♦ for fresh air/recirculated air flap
- 7 To vacuum reservoir
 - ♦ For air conditioner
- 8 To brake servo
- 9 Non return valve
- 10 Crankcase breather
- 11 Cylinder block
- 12 Fuel pressure regulator
- 13 Vacuum line
- 14 Idling stabilisation valve -N71
- 15 Air cleaner
- 16 Air flow meter -G19



5 - Testing throttle valve potentiometer -G69

5.1 - Testing throttle valve potentiometer -G69

The throttle valve potentiometer for vehicles with manual gearbox has a 3-way connector The Digifant control unit is supplied with the following information

Throttle valve closed

- Fuel shut off on overrun
- Idling speed stabilisation
- Ignition timing at idling speed (DIS-function)

Throttle valve fully open.

- Fuel quantity injected for full throttle enrichment

The throttle valve potentiometer for vehicles with automatic gearbox has a 4-way connector. Testing the throttle valve potentiometer

=> Automatic gearbox 097; Repair Group 01; Electrical testing of the automatic gearbox 097 Electrical testing of the automatic gearbox 097

=> Automatic gearbox 01N; Repair Group 01; Gearbox: Electrical Test Gearbox: Electrical Test

Special tools, testers and auxiliary equipment required

- ♦ Hand-held multimeter V.A.G 1526 or V.A.G 1526 A
- ♦ Fault reader V.A.G 1551 (or vehicle system tester V.A.G 1552) with wire V.A.G 1551/1
- ♦ Adapter set V.A.G 1594 A
- ♦ Test box V.A.G 1598/18

- Connect fault reader V.A.G 1551 (V.A.G 1552) and select the engine electronics control unit using "Address word" 01. Engine must not be running.
(Connect fault reader and select engine electronics control unit => Page 1 .)

Read measurement block 3
1 2 3 4

- > Read measured value block, display group 003 => Page 24 .
- Read off the throttle valve angle in display zone 3
 - Specification accelerator not depressed 0.0 ... 2.0 <o
 - Specification accelerator fully depressed Greater than 75.0 <o

Note:

When the throttle valve opens easily, the readout in display zone 3 should rise evenly and without interruption.

- Press the =>key.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

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

If the specified values are not obtained:

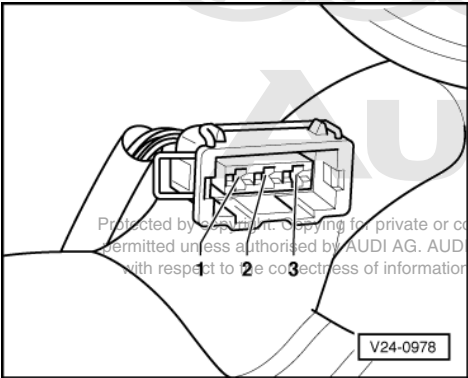
- Continue the test according to the table:

Display value	Possible causes of fault	Continue with
---------------	--------------------------	---------------

Display value	Possible causes of fault	Continue with
Remains at 0,0 <owhen throttle valve fully open and at full throttle	Open circuit or short circuit to earth caused by: Throttle valve potentiometer, wiring, Digifant control unit	Test A => Page 87
idling greater than 75.0 <o	Short to positive through: Throttle valve potentiometer, wiring, Digifant control unit	Test B => Page 88

Test A

- Pull connector off throttle valve potentiometer.



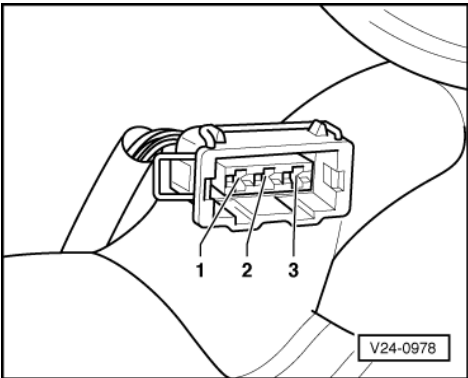
- -> Use the auxiliary wires from V.A.G 1594 A. to bridge contacts 2 and 1 in the connector of the throttle valve potentiometer.

If the readout rises to more than 75.0 <o:

- Switch off ignition.
- Renew throttle valve potentiometer.
- Interrogate fault memory and erase it => Page 4 .

If the readout remains at 0.0 <o:

- With the ignition switched off, connect test box V.A.G 1598/18 to connector for engine control unit => Page 47 .



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

Connector of -G69 Contact	Test box V.A.G 1598/18 Socket
---------------------------	-------------------------------

1	41 (positive)
2	40 (signal)
3	35 (earth)

- Rectify any open/short circuit as necessary.
- If the wiring is OK, fit a new Digifant control unit => Page 48 .
- Interrogate fault memory and erase it => Page 4 .

Notes:

- ♦ After replacing the Digifant control unit , it is necessary to adapt the control unit and throttle valve potentiometer to each other => Page 89 .
- ♦ After replacing the Digifant control unit on vehicles fitted with an automatic gearbox, it is necessary to adapt the automatic gearbox control unit and the throttle valve potentiometer to each other => Page 89 .

Test B

- Pull connector off throttle valve potentiometer.

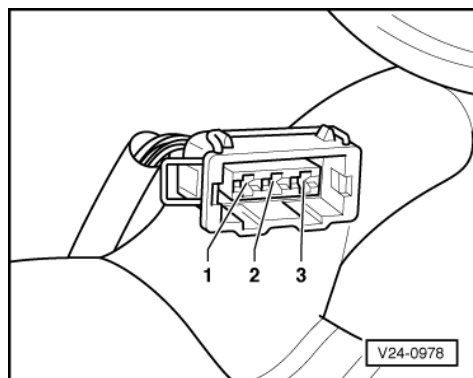
If the readout drops to 0.0 <o:

- Switch off ignition.
- Renew throttle valve potentiometer.
- Interrogate fault memory and erase it => Page 4 .

If the readout remains at more than 75.0 <o:

- With the ignition switched off, connect test box V.A.G 1598/18 to connector for engine control unit => Page 47 .

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

Connector of -G69 Contact	Test box V.A.G 1598/18 Socket
1	41 (positive)
2	40 (signal)
3	35 (earth)

- Rectify any open/short circuit as necessary.
- If the wiring is OK, fit a new Digifant control unit => Page 48 .
- Interrogate fault memory and erase it => Page 4 .

Notes:

- ♦ After replacing the Digifant control unit , it is necessary to adapt the control unit and throttle valve potentiometer to each other => Page 89 .

- ◆ After replacing the Digifant control unit on vehicles fitted with an automatic gearbox, it is necessary to adapt the automatic gearbox control unit and the throttle valve potentiometer to each other => Page 89 .

5.2 - Adapting the Digifant control unit -J169 and throttle valve potentiometer -G69 to each other

Note:

The Digifant control unit and the throttle valve potentiometer have to be adapted to each other after carrying out the following work:

- ◆ After replacing the Digifant control unit
- ◆ Removing and installing or replacing the throttle valve potentiometer
- Plug in connector to throttle valve potentiometer.
- Make basic settings => Page 15 .
- On vehicles fitted with an automatic gearbox, it is necessary also to adapt the automatic gearbox control unit and the throttle valve potentiometer to each other => Page 89 .

5.3 - Adapting automatic gearbox control unit and throttle valve potentiometer -G69 to each other

Note:

The automatic gearbox control unit and the throttle valve potentiometer have to be adapted to each other after carrying out the following work:

- ◆ After replacing the automatic gearbox control unit
- ◆ Removing and installing or replacing the throttle valve potentiometer
- Plug in connector to throttle valve potentiometer.
- Start the basic setting.

=> Automatic gearbox 097; Repair Group 01; Self-diagnosis of the automatic gearbox 097; initiating basic setting Self-diagnosis of the automatic gearbox 097 initiating basic setting

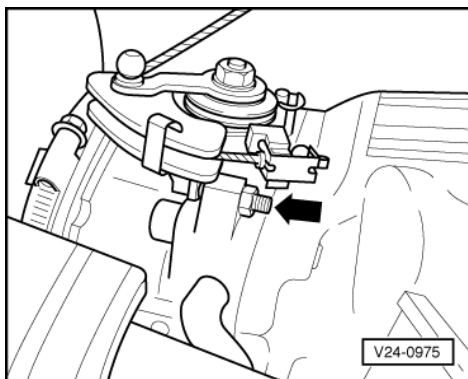
=> Automatic gearbox 01N; Repair group 01; Performing self-diagnosis; Initiating basic settings Performing self-diagnosis Initiating basic settings

5.4 - Basic throttle valve setting

Note:

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The limiting screw position is set at the factory and must not be altered. Should the screw have been turned inadvertently, carry out the setting procedure described below and once again mark the screw with locking varnish





- -> Screw out the limiting screw -arrow- sufficiently until a gap exists between the limiting screw and the stop
- Now screw in the limiting screw sufficiently until it touches the stop

Note:

Place a thin sheet of paper between the limiting screw and the stop in order to determine accurately the actual contact point of the limiting screw and the stop. Continually turn the sheet of paper and at the same time turn the limiting screw in order to determine the exact contact point.

- Screw in the limiting screw a further 1/2 turn from the contact point that you have determined.
- Mark the screw with locking varnish.
- Test idling speed => Page **51** .

5.5 - Testing idling switch -F60

Special tools, testers and auxiliary equipment required

- ♦ Hand-held multimeter V.A.G 1526 or V.A.G 1526 A
- ♦ Fault reader V.A.G 1551 (or vehicle system tester V.A.G 1552) with wire V.A.G 1551/3
- ♦ Adapter set V.A.G 1594 A
- ♦ Test box V.A.G 1598/22
- ♦ Feeler gauge

Test requirements:

- Basic setting of throttle valve OK => page **89**
- Connect fault reader V.A.G 1551 (V.A.G 1552) and select the engine electronics control unit using "Address word" 01. Engine must not be running.
(Connect fault reader and select engine electronics control unit => Page **1** .)

Read measurement block 1
1 2 3 4

-> Read measured value block, display group 001 => Page **22** .

- Test display in display zone 4.
- Specification:
4. Position = 0 (idling switch closed)

Note:

For the test described the readouts 1 ... 3 and 5 ... 8 of the 8 digit readout are of no significance and can therefore be ignored for the test described.

- Open throttle valve slightly.
(0.15 ... 0.5 mm).
- Specification:
4th Position = 1 (idling switch open)

If the specified values are attained:

- Press the =>key.

-> Indicated on display:

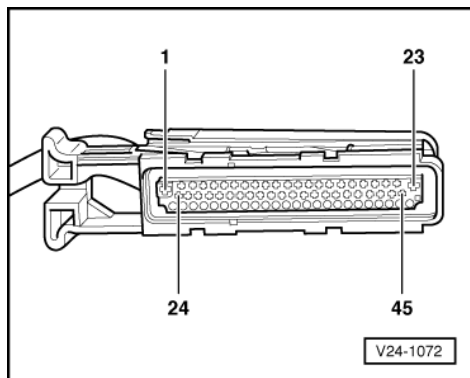
Rapid data transfer	HELP
Select function XX	

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

If the specified values are not obtained:

- With the ignition switched off, connect test box V.A.G 1598/18 to connector for engine control unit => Page 47.



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

-F60 connector Contact	Test box V.A.G 1598/18 socket
1	18
2	35

- Rectify any open/short circuit as necessary.
- If the wiring is OK, check the setting of the idling speed switch

Adjusting idling switch

- Remove the throttle valve unit.
- Set hand held multimeter V.A.G 1526 to resistance measuring range and connect to the contacts of the idling speed switch using test leads from V.A.G 1594 A.
 - Specification: 0 ω
- Insert an 0.15 ... 0.5 mm feeler gauge between the throttle valve stop and the adjuster screw.
 - Specification: $\infty \omega$

If the specified values are not obtained:

- Loosen the bolts of the idling speed switch and alter the position of the switch in the slots.
- Insert an 0.3 mm feeler gauge between the throttle valve stop and the adjuster screw
 - Specified value: $\infty \omega$
- Remove the feeler gauge.
 - Specification: 0 ω

If the specified values are attained:

- Tighten the bolts of the idling speed switch and secure with locking varnish.

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If the specified values are not obtained:

- Replace the idling speed switch.

6 - Testing auxiliary signals

6.1 - Testing auxiliary signals

6.2 - Testing engine speed increase for air conditioner

Note:

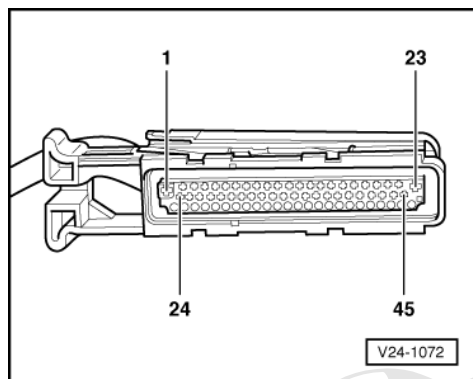
The Digifant control unit opens the idling speed stabilisation valve slightly more if voltage is supplied to pin 39 of the Digifant control unit by the air conditioner. This is the case if:

- ♦ the AC button is pressed on a manual air conditioner;
- ♦ a higher cooling capacity or higher heating capacity is requested from a fully automatically controlled air conditioner system.

Special tools, testers and auxiliary equipment required

- ♦ Hand-held multimeter V.A.G 1526 or V.A.G 1526 A
- ♦ Adapter set V.A.G 1594 A
- ♦ Test box V.A.G 1598/18

- With the ignition switched off, connect test box V.A.G 1598/18 to connector for engine control unit => Page 47 .



- -> Set hand-held multimeter V.A.G 1526 to voltage measuring range (20 V direct current) and connect to engine earth and contact 39 and 42 on connector using test leads from V.A.G 1594 A.
- Switch the ignition on.
- Switch off air conditioner.
 - Specification: Less than 1.5 V
- Switch on air conditioner system:
 - Manually controlled air conditioner: Press the "AC" button.
 - Fully automatically controlled air conditioner Press the "AUTO" button, set the temperature to "LO" and blower speed to "HI".
 - Specification: Greater than 8 V

If the specified values are not obtained:

- Test the wiring connection between contact 39 of the connector of the Digifant control unit and the air conditioner switch -E30 (manual air conditioner) or the operating and display unit -E87 (fully automatic air conditioner) for open circuit and short circuit according to the current flow diagram.
- If the wiring connection is OK, test the air conditioner system:

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

=> Heating, Air conditioner; Repair Group 87; Air conditioner; Components and control of the fully automatic air conditioner
Air conditioner Components and control of the fully automatic air conditioner

6.3 - Testing the air conditioner compressor shutoff

Note:

The compressor cut-off for the air conditioner is carried out in two directions ("in" and "out"):

- ◆ In: Voltage is supplied to pin 13 just before the air conditioner compressor is switched on. The Digifant control unit opens the idling speed stabilisation valve slightly more in order to compensate for the additional load as result of the faster idling speed.
- ◆ Out: When accelerating from a stationary start or from a low speed, the AC compressor is switched off for up to 12 seconds by the Digifant control unit.
In addition, the compressor is switched off when starting and if faults exist in the idling speed stabilisation.

Special tools, testers and auxiliary equipment required

- ◆ Hand-held multimeter V.A.G 1526 or V.A.G 1526 A
- ◆ Adapter set V.A.G 1594 A
- ◆ Test box V.A.G 1598/18

Test requirements:

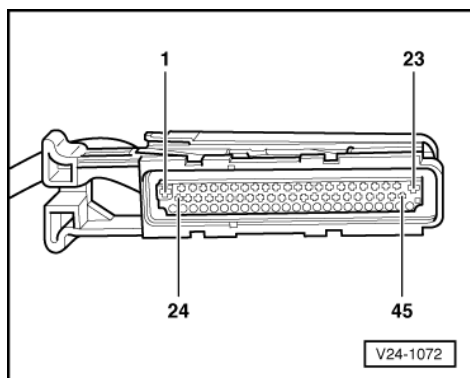
- Air conditioner system OK
 - No faults stored in fault memory
 - Vehicle at ambient temperature (warmer than + 15 °C)
-
- Start engine and run at idling speed.
 - Switch on the air conditioner (the AC compressor should run):
 - Manually controlled air conditioner Press the "AC" button.
 - Fully automatically controlled air conditioner Press the "AUTO" button, set the temperature to "LO" and blower speed to "HI".
 - Briefly operate full throttle, the engine must not reach its maximum revs.
 - Test visually to determine whether the AC compressor stops for a few seconds.

If the AC compressor is not switched off:

- Switch off the ignition and carry out the following test:

Vehicle with manually controlled air conditioner:

- With the ignition switched off, connect test box V.A.G 1598/18 to connector for engine control unit => Page 47 .





- -> Set hand-held multimeter V.A.G 1526 to voltage measuring range (20 V direct current) and connect to engine earth and contact 13 and 42 on connector using test leads from V.A.G 1594 A.
- Switch the ignition on.
- Switch on the air conditioner by pressing the "AC" button.
 - Specification: greater than 8 V (after about 10 seconds)

If the specified values are not obtained:

- Test the wiring connection between contact 13 of the connector of the Digifant control unit and the magnetic clutch control unit -J153 for open circuit or short circuit according to the current flow diagram.
- If the wiring connection is OK test the signal for the magnetic clutch control unit:

=> Heating, Air Conditioner; Repair Group 01; Performing self-diagnosis - Manually controlled air conditioner; Performing final control diagnosis Performing self-diagnosis - Manually controlled air conditioner Performing final control diagnosis

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Vehicles with fully automatically controlled air conditioner:

- Perform final control diagnosis:

=> Heating, Air Conditioner; Repair Group 01; Performing self-diagnosis - Fully automatically controlled air conditioner; Performing final control diagnosis Performing self-diagnosis - Fully automatically controlled air conditioner Performing final control diagnosis

6.4 - Testing engine speed signal

Notes:

- ♦ The rev. counter in the dash panel insert is actuated by the Digifant control unit.
- ♦ Testing engine speed signal:

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

6.5 - Testing fuel consumption signal

Notes:

- ♦ The on-board computer in the dash panel insert is actuated by the Digifant control unit.
- ♦ The fuel consumption signal is calculated directly from the fuel injection time and the ventilation rate of the tank breather system.
- ♦ The fuel consumption signal is used by the on-board computer in the dash panel insert for displaying the fuel consumption.
- ♦ Testing fuel consumption signal => Read measured value block, display group 005, display zone 3, Page 27.
- ♦ Testing wiring connection:

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

6.6 - Testing vehicle speed signal

Special tools, testers and auxiliary equipment required

- ♦ Hand-held multimeter V.A.G 1526 or V.A.G 1526 A
- ♦ Fault reader V.A.G 1551 (or vehicle system tester V.A.G 1552) with wire V.A.G 1551/1
- ♦ Adapter set V.A.G 1594 A

- ♦ Test box V.A.G 1598/18

Test requirements:

- Speedometer OK, checking:

=> Electrical system; Repair group 90; Testing dash panel insert components; Testing road speed signal sender
Testing dash panel insert components Testing road speed signal sender

- Connect fault reader V.A.G 1551 and select engine electronics control unit => Page 1 .

Read measurement block 4			
1	2	3	4

- > Read measured value block, display group 004 => Page 26 .

Notes:

- ♦ A second operator is required to note readings with the vehicle moving.
- ♦ Observe safety precautions => Page 35

- Take the vehicle for a test drive.

Note:

What is displayed in display zone 3 is not the road speed but a road speed signal.

- Test the readout in display zone 3 when starting off.
 - Specification when stationary: 255
 - Specification when driving: 0
- Press the =>key.

-> Indicated on display:

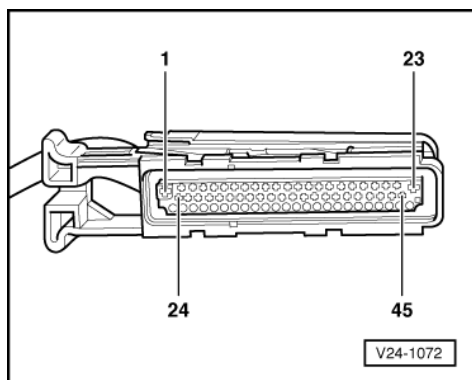
Rapid data transfer	HELP
Select function XX	

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

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If the readout does not change at the transition from stationary to driving:

- With the ignition switched off, connect test box V.A.G 1598/18 to connector for engine control unit => Page 47 .



- Test the wiring connection between contact 11 of the connector of the Digifant control unit and the dash panel insert for open circuit or short circuit according to the current flow diagram.
- Rectify any open/short circuit as necessary. "Testing road speed signal"
- If the wiring connection is OK continue fault finding with the fault finding programme "Testing road speed signal".

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



- If you have not found any fault so far on the basis of the fault finding programme "Testing road speed signal", replace the Digifant control unit => Page **48**.

Notes:

- ♦ After replacing the Digifant control unit, it is necessary to adapt the control unit and throttle valve potentiometer to each other => Page **89**.
- ♦ After replacing the Digifant control unit on vehicles fitted with an automatic gearbox, it is necessary to adapt the automatic gearbox control unit and the throttle valve potentiometer to each other => Page **89**.

6.7 - Testing wiring connection to automatic gearbox control unit

Signal wire for gearshift

Notes:

- ♦ Carry out the following test only if fault 00545 appears in the display of V.A.G 1551.
- ♦ This signal causes the ignition timing to be briefly retarded during gearshifts to ensure a smoother gear change.

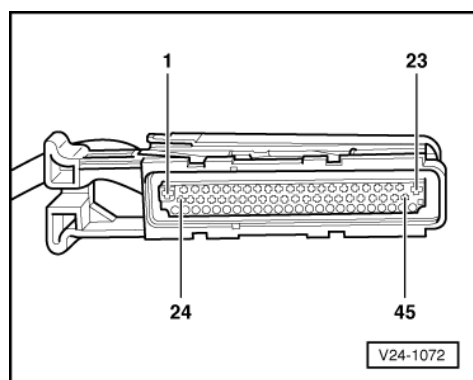
Special tools, testers and auxiliary equipment required

- ♦ Hand-held multimeter V.A.G 1526 or V.A.G 1526 A
- ♦ Adapter set V.A.G 1594 A
- ♦ Test box V.A.G 1598/18

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Test requirements:

- Battery voltage OK.
- With the ignition switched off, connect test box V.A.G 1598/18 to connector for engine control unit => Page **47**.



- -> Connect voltage tester V.A.G 1527 B to sockets 15 and 42 on test box V.A.G 1598/18 using test leads from V.A.G 1594 A.
- Switch the ignition on.
 - The LED should light up.

If the LED does not light up:

- Test the wiring connection between contact 15 of the connector of the Digifant control unit and the automatic gearbox control unit for open circuit or short circuit.
- If the wiring connection is OK test the automatic gearbox control unit:

=> Automatic gearbox 097; Repair Group 01; Self-diagnosis of the automatic gearbox 097 Self-diagnosis of the automatic gearbox 097

=> Automatic gearbox 01N, Self-diagnosis; Repair group 01; Performing self-diagnosis Performing self-diagnosis

If the LED lights up:

- Replace the Digifant control unit => Page 48 .

Notes:

- ◆ After replacing the Digifant control unit , it is necessary to adapt the control unit and throttle valve potentiometer to each other => Page 89 .
- ◆ After replacing the Digifant control unit on vehicles fitted with an automatic gearbox, it is necessary to adapt the automatic gearbox control unit and the throttle valve potentiometer to each other => Page 89 .

6.8 - Testing start signal

Terminal 50 signal

Notes:

- ◆ During starting, a terminal 50 signal is supplied to pin 32 of the Digifant control unit.
- ◆ Once the engine has started, the earth connection is made via the starter winding to pin 32 on models with manual gearbox. On models with automatic gearbox, pin 32 is open after starting.

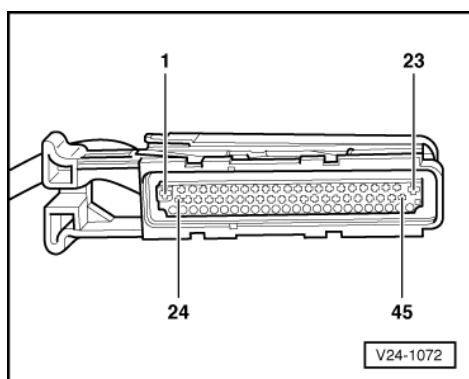
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Special tools, testers and auxiliary equipment required

- ◆ Hand-held multimeter V.A.G 1526 or V.A.G 1526 A
- ◆ Adapter set V.A.G 1594 A
- ◆ Test box V.A.G 1598/18

Test requirements:

- Battery voltage OK.
- With the ignition switched off, connect test box V.A.G 1598/18 to connector for engine control unit => Page 47 .



- -> Set hand-held multimeter V.A.G 1526 to voltage measuring range (20 V direct current) and connect to engine earth and contact 32 and 42 on connector using test leads from V.A.G 1594 A.
- Operate starter.
 - Specification: approx. battery voltage



Audi 100 1991 ➤

Audi Digifant injection and ignition system (4-cyl.) - Edition 04.1998

- If the specification is not achieved, test the wiring connection according to the current flow diagram.



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28 - Ignition system

1 - Testing ignition system

1.1 - Testing ignition system

1.2 - Safety precautions

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

- ◆ Do not touch or disconnect ignition wiring when the engine is running or at starter speed.
- ◆ Always switch off the ignition before connecting or disconnecting ignition system wiring. This also applies to HT cables and measuring instrument leads.
- ◆ If the engine is to be turned at starter speed, without starting, e.g. when checking compressions, unplug the connector from the power output stage at the ignition coil and remove fuse 17. After completing the work, interrogate the fault memory.
- ◆ Always switch off the ignition before washing the engine.
- ◆ Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.
- ◆ For assisted starts with a rapid charging unit the maximum permissible voltage is 16.5 V and the maximum charging time is 1 minute.
- ◆ Vehicles that have an actual or suspected fault in the ignition system, must not be towed unless the connector at the power output stage is unplugged.
- ◆ Do not connect a capacitor to terminal 1 (-).
- ◆ Do not replace the distributor rotor 1 kw (Identification: R1) with a different type even for radio interference suppression.
- ◆ When connecting test equipment (e.g. voltage tester V.A.G 1527 B, hand-held multimeter V.A.G 1526 etc.), always use adapter set V.A.G 1594 A.

1.3 - Test data, spark plugs

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Engine code letters			ABK (2.0 l / 85 kW-Motor) ABK (1.8 l / 79 kW-Motor) ¹⁾
Digifant control unit	Part no.		=>Parts list
Ignition timing 2)	Test value	o before TDC	4 ... 8
	Setting	o before TDC	6 ± 1
	Engine speed	rpm	2000 ... 2500
Firing order			1-3-4-2
Spark plugs 3)	Tightening torque	Nm	30

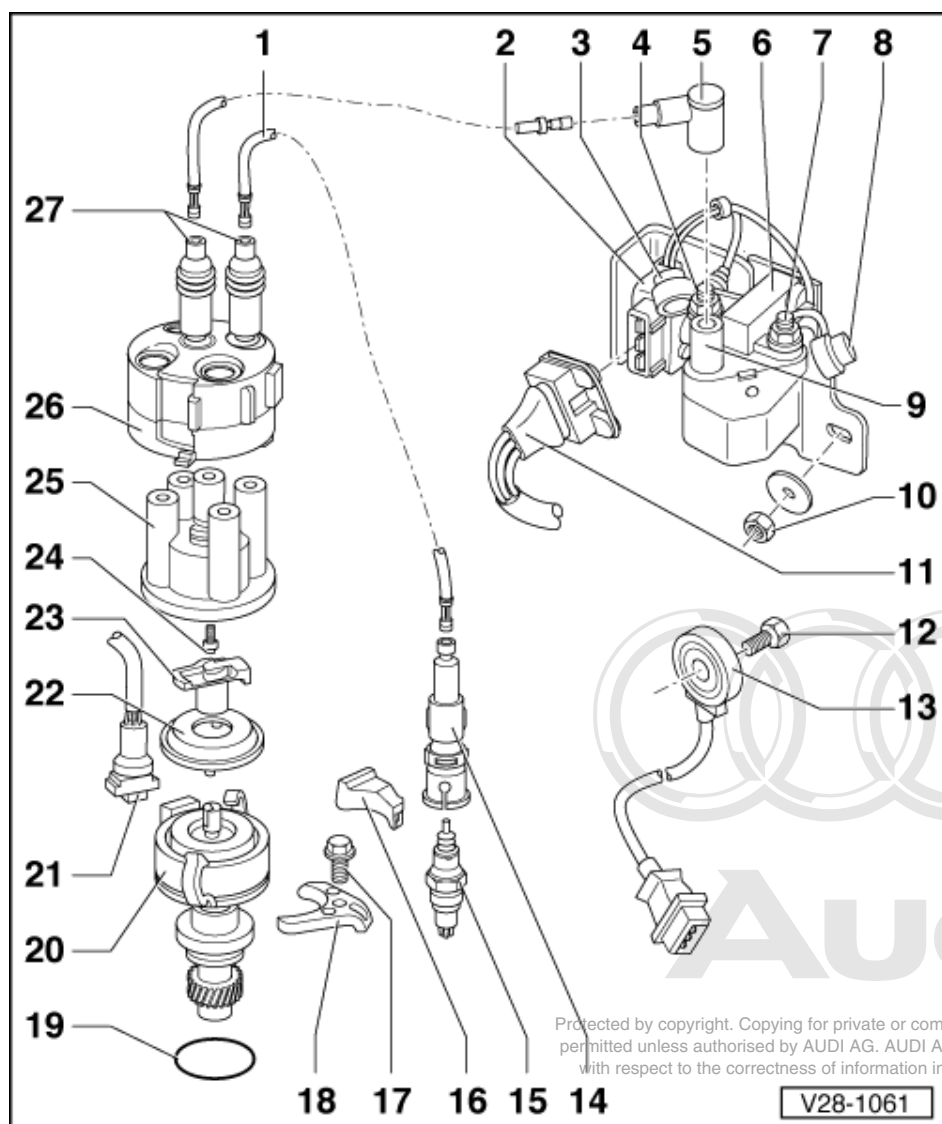
1) China, CIS

2) Engine oil temperature min. 80 °C

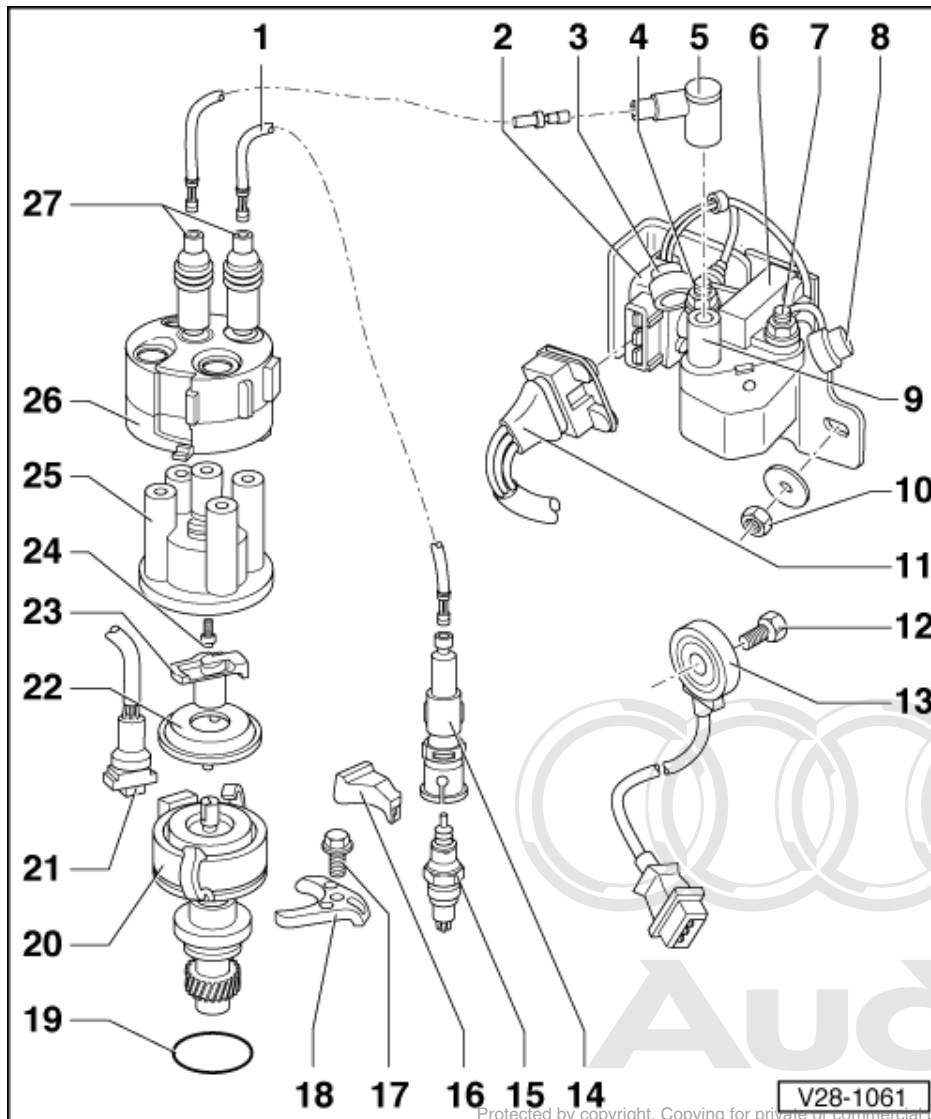
3) Current values:

=> "Exhaust emission test" binder

1.4 - Servicing ignition system



- 1 Ignition cable
 - ♦ Test for continuity
- 2 Ignition coil with power output stage 1 -N70
 - ♦ Testing => Page 109
- 3 End cap
- 4 Terminal 1 (-)
- 5 Suppressor
 - ♦ 0.6 ... 1.4 kw
- 6 Ignition coil
 - ♦ Testing => Page 108
- 7 Terminal 15 (+)
- 8 End cap



9 Terminal 4

10 10 Nm

11 Connector

- ♦ Press wire lock to unplug

12 20 Nm

- ♦ Tightening torque affects function of knock sensor

13 Knock sensor 1 -G61

14 Spark plug connectors

- ♦ 4 ... 6 kW

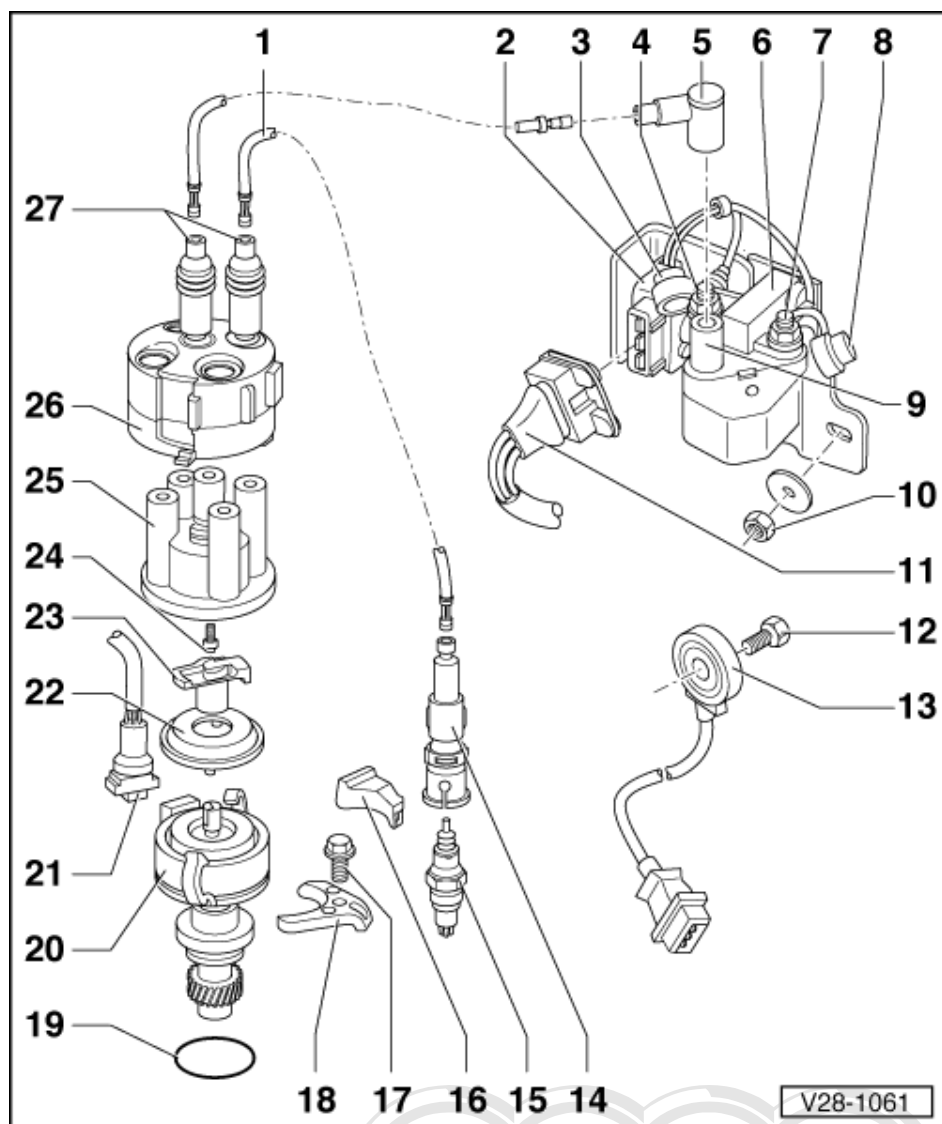
15 Spark plug - 30 Nm

- ♦ Type and electrode gap

=> "Exhaust emission test" binder

16 Locking cap

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17 25 Nm

18 Clip

19 O-ring

- ♦ Replace if damaged

20 Distributor

- ♦ Installing => Page 104
- ♦ Testing and setting ignition => Page 105
- ♦ Testing Hall sender
=> Page 106

21 Connector

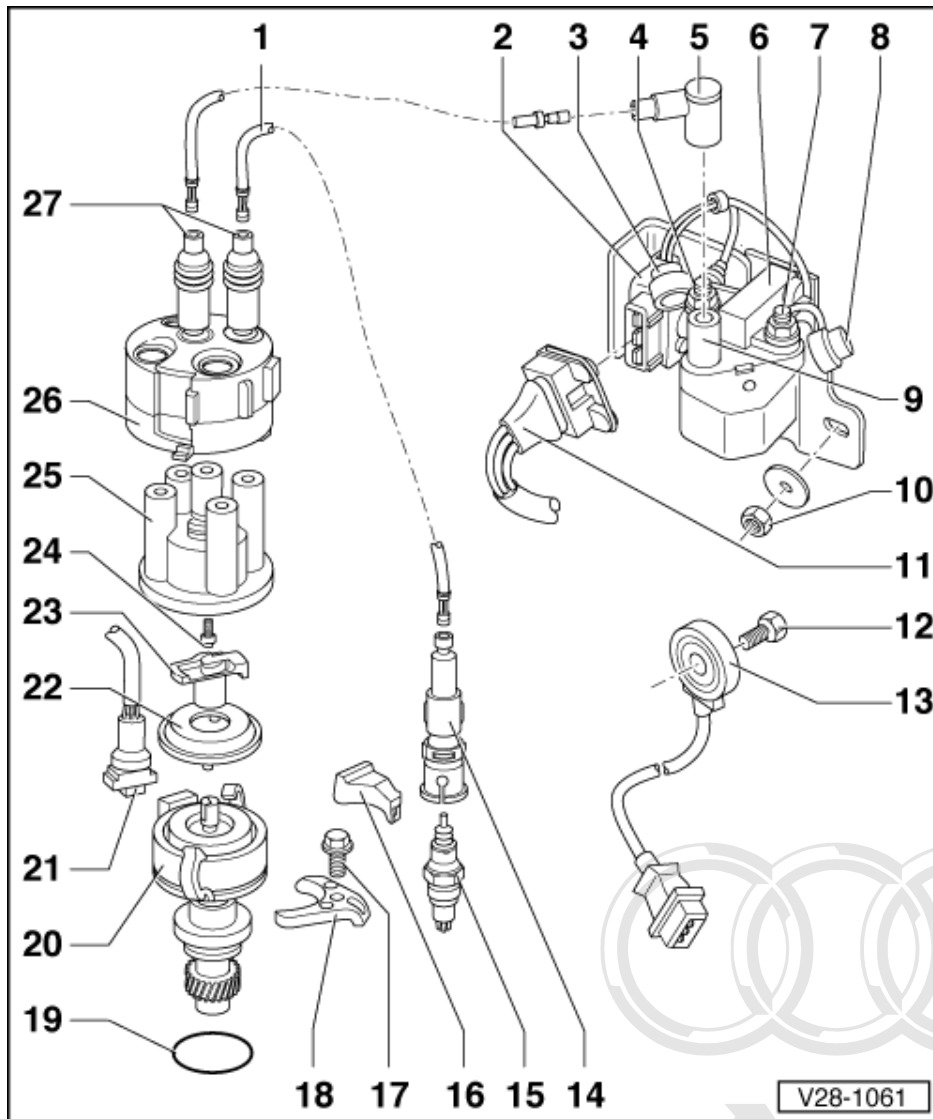
- ♦ Press wire lock to unplug

22 Dust cap

23 Rotor arm

- ♦ 0.6 ... 1.4 kW

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24 Carbon brush with spring

- ♦ Inspect for wear, damage and ease of movement

25 Distributor cap

- ♦ Test for cracks and signs of tracking
- ♦ Test contact wear
- ♦ Clean before fitting

26 Screening

- ♦ For radio interference suppression

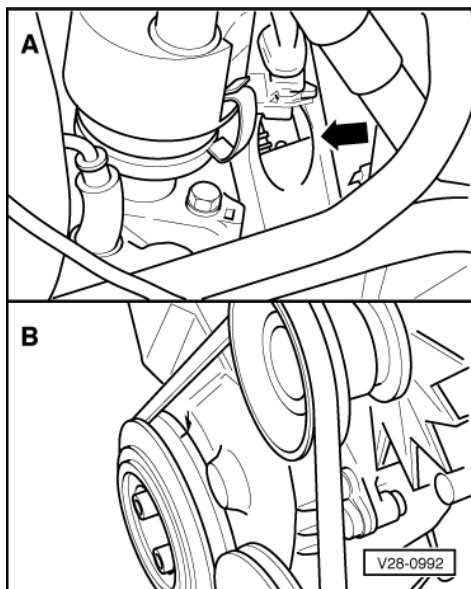
27 Suppressor

- ♦ 0.6 ... 1.4 kw

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1.5 - Installing distributor

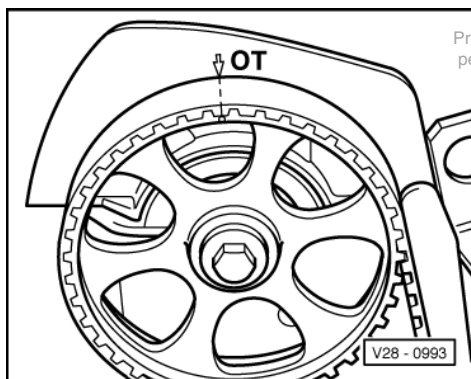


Engine in vehicle

- -> Set flywheel or drive plate to TDC No. 1 cylinder.

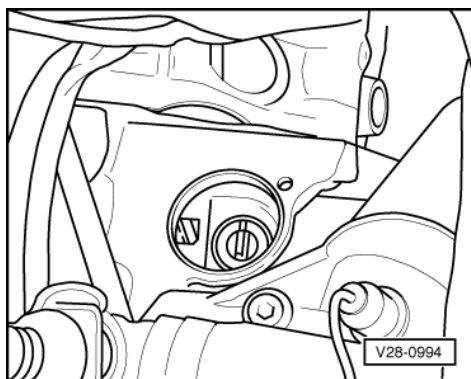
Engine removed:

- The marking on the vibration damper (belt pulley) should be aligned with the arrow on the toothed belt guard.

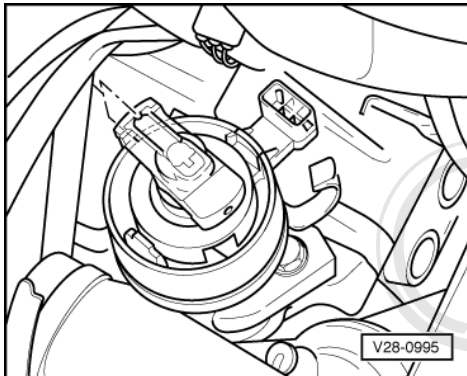


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- -> Mark on camshaft sprocket must align with arrow on the top toothed belt guard.



- -> Position mounting studs of oil pump shaft parallel to crankshaft.



- -> Insert distributor so that the rotor arm points to No. 1 cylinder mark on the distributor body.
- Insert the distributor rotor
- Before fitting, clean distributor cap and check for cracks and signs of tracking, renew if necessary.
- Testing and setting ignition => Page 105

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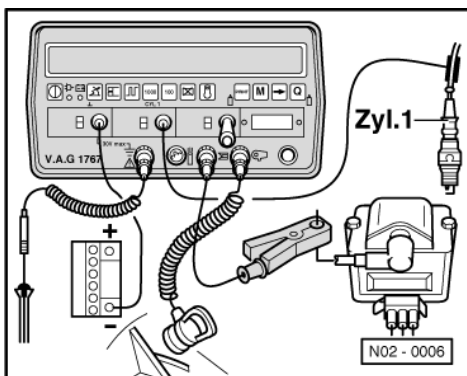
1.6 - Testing and adjusting ignition timing

Note:

Only set ignition timing if the timing point differs when testing idling speed => Page 51.

Special tools, testers and auxiliary equipment required

- ◆ Fault reader V.A.G 1551 (or vehicle system tester V.A.G 1552) with wire V.A.G 1551/1
- ◆ Ignition tester V.A.G 1767 or V.A.G 1367 with HT pick-up clamp V.A.G 1367/8



- -> Connect ignition tester V.A.G 1767 (or V.A.G 1367) with ignition switched off:

=> Operating instructions

Notes:

- ◆ Ensure that the TDC sender is inserted fully into the gearbox housing
- ◆ The ignition timing is indicated directly on V.A.G 1767 (or V.A.G 1367). It is not necessary to use a strobe light aimed at the timing notches.
- Connect fault reader V.A.G 1551, enter address word 01 for "Engine electronics", confirm the entry and move forward in the programme => Page 1.
- Interrogate fault memory and erase it => Page 4.
- Leave engine idling.

-> Indicated on display:



Rapid data transfer HELP
Select function XX

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

-> Indicated on display:

Default	setting	0				
1	2	3	4	5	6	7
8	9	10				

- Maintain the engine at 2000 ... 2500 rpm and at the same time read off the ignition timing on the ignition tester V.A.G 1767 (or V.A.G 1367)
 - Test value 4 ... 80: Before TDC.

Note:

If the ignition timing displayed is not within the tolerance range, you first of all have to set the ignition timing before testing idling speed so long as the system is still in "Basic setting 1".

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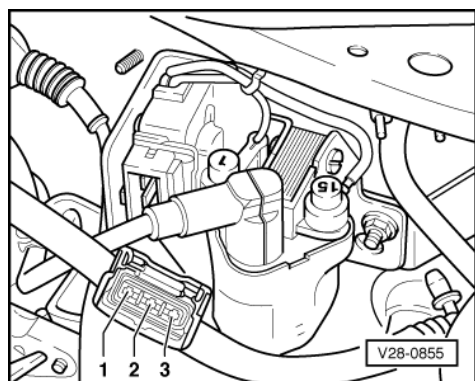
- Set the ignition timing point by turning the distributor at an engine speed of 2000 ... 2500 rpm.
 - Setting 6 ± 10
- Leave engine idling.
- Press the →key.
 - The ignition timing point may vary within the range 2 ... 100 before TDC
- Test idling speed after setting the ignition timing => Page 51 .

1.7 - Testing Hall sender -G40

Special tools, testers and auxiliary equipment required

- ♦ Hand-held multimeter V.A.G 1526 or V.A.G 1526 A
- ♦ Voltage tester V.A.G 1527 B
- ♦ Adapter set V.A.G 1594 A
- ♦ Test box V.A.G 1598/18

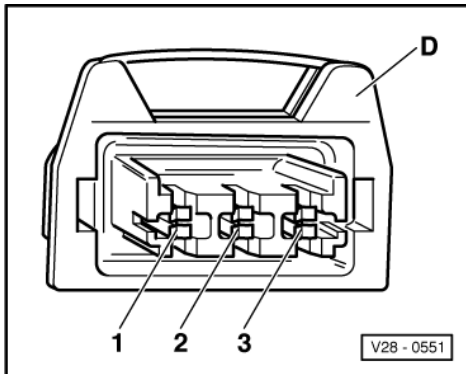
- Remove fuse 17 (the fuel pump must not run when starting the engine otherwise the catalytic converter may be damaged).



- -> Unplug the connector of the power output stage -N70 at the ignition coil.
- Connect voltage tester V.A.G 1527 B between contact 2 (signal) of the connector and engine earth using auxiliary wires from V.A.G 1594.
- Operate starter.
 - The LED should flash.

If the LED does not flicker:

- Switch off ignition.
- Unplug the connector of the Hall sender at the ignition distributor.

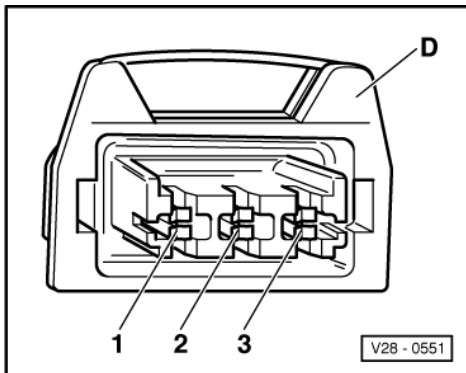


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- Set hand-held multimeter V.A.G 1526 to voltage measuring range (20 V direct current) and connect to contact 1 (earth) and 3 (positive) on connector -D- using test leads from V.A.G 1594 A.
- Switch the ignition on.
 - Specification: at least 9 V
- Switch off ignition.

If the specification is not obtained:

- With the ignition switched off, connect test box V.A.G 1598/18 to connector for engine control unit => Page 47 .

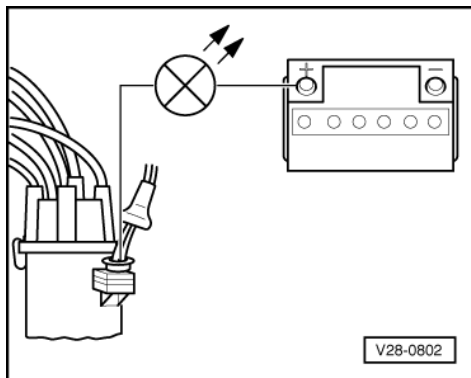


- -> Test for open circuit and short to earth/positive or earth in the following wiring connections:

Connector of -G40 Contact	Test box V.A.G 1598/18 Socket
1 (earth)	35
2 (signal)	44
3 (positive)	45

- Rectify any open/short circuit as necessary.
- If the wiring is OK, fit a new Digifant control unit => Page 48 .

If the specification is not obtained:



- Push back the rubber cover on the plug connection of the Hall sender and plug in the connector at the Hall sender connection.
- -> Connect voltage tester V.A.G 1527 B to the middle wire (contact 2 of the connector) of the Hall sender and to battery positive or B+ on the alternator using auxiliary wires from V.A.G 1594 A.

Note:

On vehicles fitted with air conditioner, connect the clamp of the starting aid connection (+) in the engine compartment.

- Operate starter.
 - The LED should flicker.

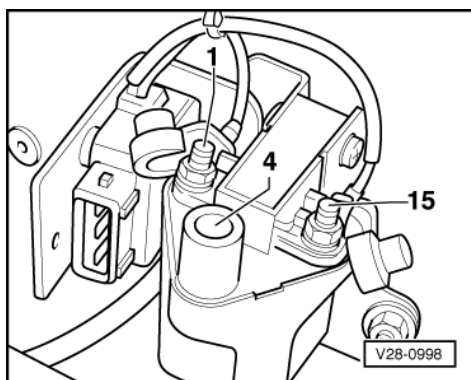
If the LED does not flicker:

- Replace the distributor.

1.8 - Testing ignition coils

Notes:

- ♦ Inspect the wires between the power output stage and ignition coil for corrosion and damage.
- ♦ Testing power output stage => Page 109 .
- Unplug the connector from the power output stage and the ignition wire from the ignition coil.



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- -> Use hand-held multimeter V.A.G 1526 to test primary resistance between terminals 1 and 15.
 - Specification: 0.5 ... 1.5 ω
- Test secondary resistance with hand-held multimeter between terminals 4 and 15.
 - Specification: 5 ... 9 ω

If a specification is not met:

- Replace ignition coil.

1.9 - Testing power output stage

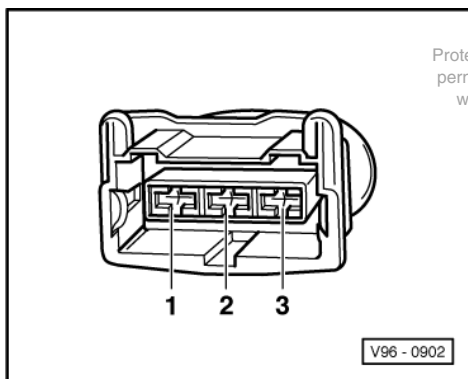
Special tools, testers and auxiliary equipment required

- ◆ Hand-held multimeter V.A.G 1526 or V.A.G 1526 A
- ◆ Voltage tester V.A.G 1527 B
- ◆ Adapter set V.A.G 1594 A
- ◆ Test box V.A.G 1598/18

Test requirements:

- Ignition coil OK; checking =>Page 108 .

Testing power supply



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- Unplug the connector from the power output stage and the main ignition wire from the ignition coil.
- -> Set hand-held multimeter V.A.G 1526 to voltage measuring range (20 V direct current) and connect it as follows using test leads from V.A.G 1594 A.
 - Between contact 1 (positive) and engine earth
 - Between contact 1 (positive) and contact 3 (earth)
- Switch the ignition on.
 - Specification: approx. battery voltage

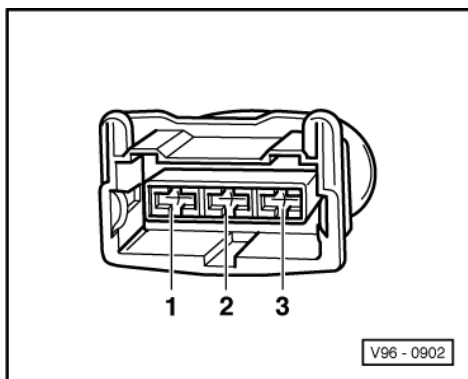
If the specification is not obtained:

- Eliminate open circuit or short circuit using the current flow diagram.

Testing actuation

Test requirements:

- Hall sender OK, checking => Page 106 .
- Remove fuse 17 (the fuel pump must not run when starting the engine otherwise the catalytic converter may be damaged).

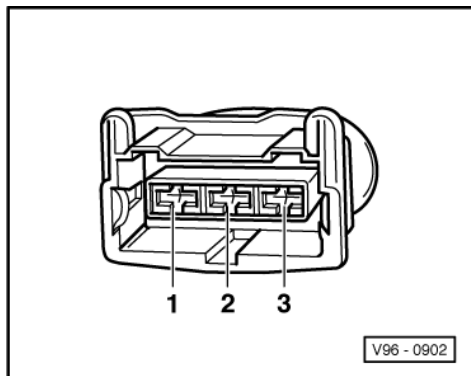




- -> Connect voltage tester V.A.G 1527 B between contact 2 (signal) and 3 (earth) of the connector using auxiliary wires from V.A.G 1594.
- Operate starter.
 - The LED should flash.

If the LED does not flicker:

- With the ignition switched off, connect test box V.A.G 1598/18 to connector for engine control unit => Page 47 .



- -> Test for open circuit in the following wiring connections:

Connector for -N70 Contact	Test box V.A.G 1598/18 Socket
2	7

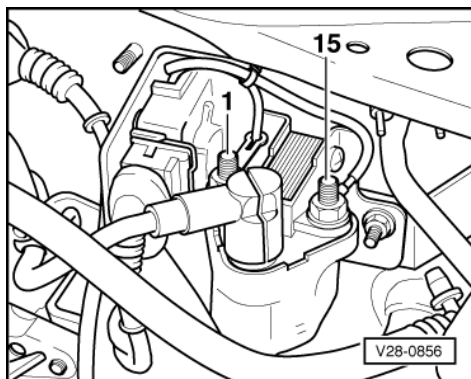
- Rectify open circuit, if necessary
- In addition, test the Hall sender => Page 106 .
- If the wiring and Hall sender are OK, fit a new Digifant control unit => Page 48 .

Notes:

- ♦ After replacing the Digifant control unit, it is necessary to adapt the control unit and throttle valve potentiometer to each other => Page 89 .
- ♦ After replacing the Digifant control unit on vehicles fitted with an automatic gearbox, it is necessary to adapt the automatic gearbox control unit and the throttle valve potentiometer to each other => Page 89 .

If the LED flickers:

- Switch off ignition.
- Plug in the connector and the ignition wire at the ignition coil again.



- -> Connect voltage tester V.A.G 1527 B to contacts 1 and 15 of the ignition transformer using auxiliary wires and terminals.

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Warning

During the following test do not touch the terminals of the ignition transformer or test wires.

- Operate starter.
 - The LEDs should flash.

If LED does not flash:

- Fit a new ignition coil with output stage.

1.10 - Testing intake air temperature sensor -G42

Note:

Fitting location for the intake air sender: In air flow meter -G19.

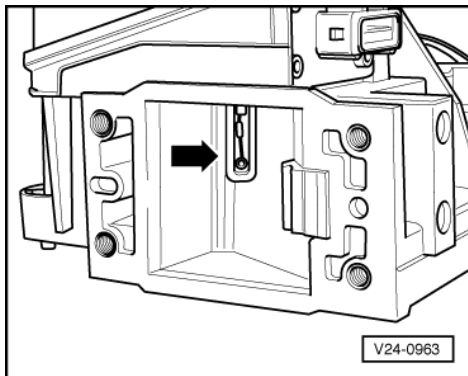
Special tools, testers and auxiliary equipment required

- ◆ Fault reader V.A.G 1551 (or vehicle system tester V.A.G 1552) with wire V.A.G 1551/1
- ◆ Adapter set V.A.G 1594 A
- ◆ Test box V.A.G 1598/18
- ◆ Chilling spray (commercially available)

- Connect fault reader V.A.G 1551 (V.A.G 1552) and select the engine electronics control unit using "Address word" 01. Engine must not be running.
(Connect fault reader and select engine electronics control unit => Page 1.)

Read measured value block 2
1 2 3 4

-> Read measured value block, display group 002 => Page 24 .



- -> Lift the top part of the air filter and spray the intake air temperature sender -G42 with the refrigerant spray.
- Test display in display zone 4.
 - Specification: The temperature value should drop

Note:

The illustration show the intake air temperature sender in the air flow meter when removed.

- Press the ➡key.

-> Indicated on display:

Rapid data transfer HELP
Select function XX

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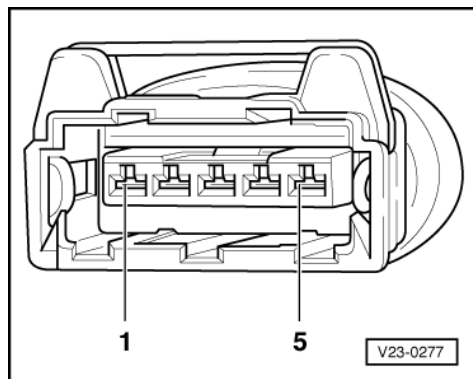
- Enter "06" for "End output" function and confirm entry with Q key.

Note:

If the intake air temperature sender is faulty, the Digifant control unit displays a particular substitute figure.

If there is no change to the readout in display zone 4:

- With the ignition switched off, connect test box V.A.G 1598/18 to connector for engine control unit => Page 47 .



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

Connector of -G19 Contact	Test box V.A.G 1598/18 Socket
1	37
4	35

- Rectify any open/short circuit as necessary.
- If the wiring and intake air temperature sender are OK, fit a new Digifant control unit => Page 48 .

Notes:

- ♦ After replacing the Digifant control unit , it is necessary to adapt the control unit and throttle valve potentiometer to each other =>Page 89 .
- ♦ After replacing the Digifant control unit on vehicles fitted with an automatic gearbox, it is necessary to adapt the automatic gearbox control unit and the throttle valve potentiometer to each other => Page 89 .

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1.11 - Testing coolant temperature sender -G62

Special tools, testers and auxiliary equipment required

- ♦ Fault reader V.A.G 1551 (or vehicle system tester V.A.G 1552) with wire V.A.G 1551/1
- ♦ Adapter set V.A.G 1594 A
- ♦ Test box V.A.G 1598/18

Test requirements:

- Engine cold
- Connect fault reader V.A.G 1551 (V.A.G 1552) and select the engine electronics control unit using "Address word" 01. The engine must be running at idle speed
(Connect fault reader and select engine electronics control unit => Page 1 .)

Read measurement block 1
1 2 3 4

- > Read measured value block, display group 001 => Page 22 .
- Test display in display zone 2 (coolant temperature).

- Specification: Readout uniform and with no interruptions
- Press the ➡key.

-> Indicated on display:

Rapid data transfer HELP
 Select function XX

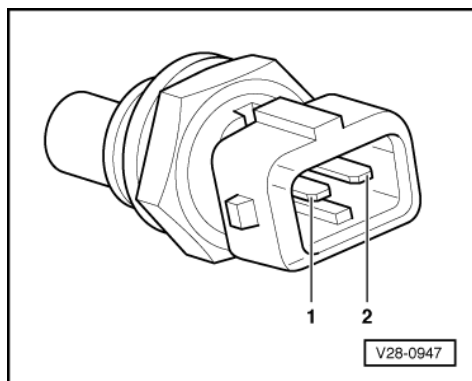
- Enter "06" for "End output" function and confirm entry with Q key.

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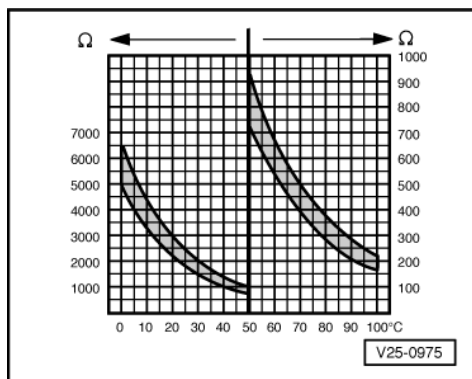
If the coolant temperature sender is faulty, the Digifant control unit displays a particular substitute figure.

If engine running problems occur in certain temperature ranges and the readout in display zone 2 does not rise evenly and without interruptions, there is a sporadic interruption to the temperature signal. In this case:

- Unplug connector on coolant temperature sender.



- -> Set hand held multimeter V.A.G 1526 to resistance measuring range and connect to the contacts 1 and 2 of the connector using test leads from V.A.G 1594 A.



-> Specifications:

Coolant temperature	Resistance
approx. 20 °C	approx. 2.5 kΩ
approx. 80 °C	approx. 330 Ω

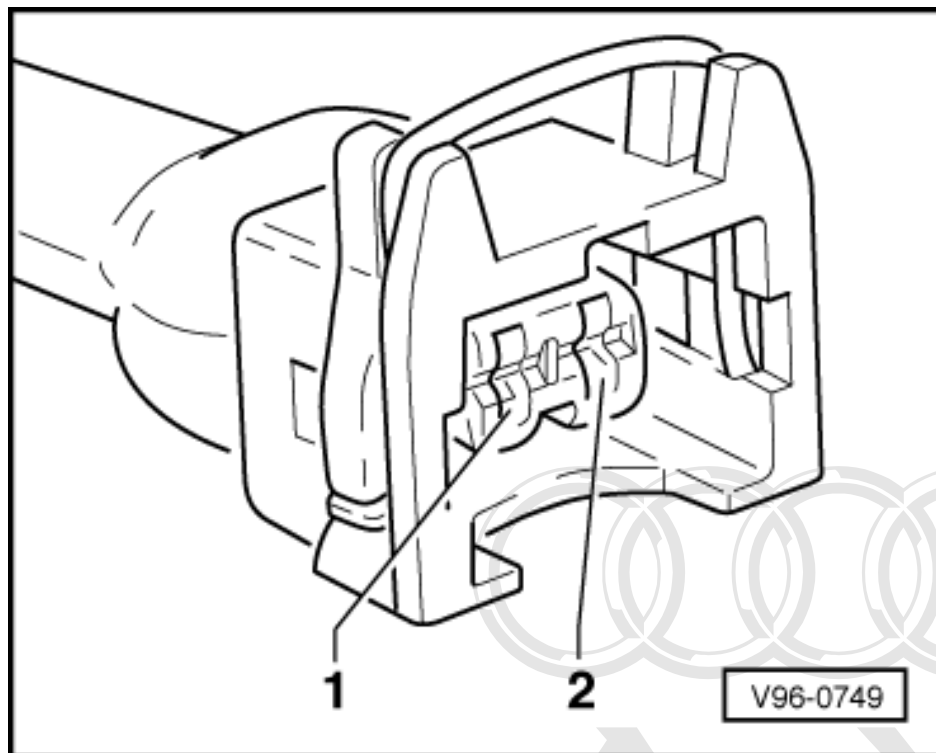
If the specified values are not obtained:

- Replace coolant temperature sender.

If the specified values are attained:



- With the ignition switched off, connect test box V.A.G 1598/18 to connector for engine control unit => Page 47 .



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

Connector of -G62 Contact	Test box V.A.G 1598/18 Socket
1	12
2	35

- Rectify any open/short circuit as necessary.
- If the wiring and coolant temperature sender are OK, fit a new Digifant control unit => Page 48 .

Notes:

- ♦ After replacing the Digifant control unit , it is necessary to adapt the control unit and throttle valve potentiometer to each other => Page 89 .
- ♦ After replacing the Digifant control unit on vehicles fitted with an automatic gearbox, it is necessary to adapt the automatic gearbox control unit and the throttle valve potentiometer to each other => Page 89 .

1.12 - Testing control unit power supply

The voltage for the Digifant control unit is supplied through the current supply relay for Digifant control unit - J176.

Note:

Fitting location of current supply relay for Digifant control unit -J176: On auxiliary relay carrier III in passenger footwell, contact position 1

Special tools, testers and auxiliary equipment required

- ♦ Hand-held multimeter V.A.G 1526 or V.A.G 1526 A
- ♦ Adapter set V.A.G 1594 A

♦ Test box V.A.G 1598/18

- Connect fault reader V.A.G 1551 and select engine electronics control unit => Page 1 .

Read	measured	value	block	2
1	2	3	4	

- > Read measured value block, display group 002 => Page 24 .
- Test display in display zone 3.
 - Specification: approx. battery voltage
- Press the =>key.

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

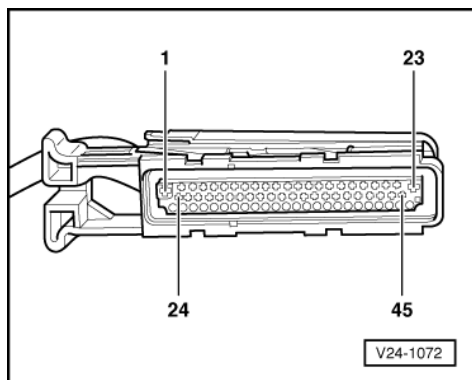
- Enter "06" for "End output" function and confirm entry with Q key.

If the specification is not obtained:

- Carry out the following tests:

Testing power supply

- With the ignition switched off, connect test box V.A.G 1598/18 to connector for engine control unit => Page 47 .



- -> Set hand-held multimeter V.A.G 1526 to voltage measuring range (20 V direct current) and connect to contact 23 of the test box and to engine earth using test leads from V.A.G 1594 A.
- Switch the ignition on.
 - Specification: approx. battery voltage

If the specification is not obtained:

- Test the wiring between the plug connection of the Digifant control unit and the current supply relay -J176 according to the current flow diagram.

If the wiring is OK:

- Test the voltage supply of the current supply relay -J176 => Page 116 .
- Test the actuation of the current supply relay -J176 => Page 117 .
- If the voltage supply as well as actuation of the current supply relay are OK, replace the current supply relay.

Testing earth supply

Test requirements:

- Voltage supply at contact 23 OK => Page 115 .



- Set hand held multimeter V.A.G 1526 to voltage measuring range (20 V direct current) and connect it as follows:

Test box V.A.G 1598/18 socket	Specification
23 + 1 (earth)	approx. battery voltage
23 +42 (earth)	approx. battery voltage
23 +35 (earth)	approx. battery voltage

- Switch the ignition on.

If the specified values are not obtained:

- Test the wiring between the plug connection of the Digifant control unit and the earth points according to the current flow diagram.
- Rectify open circuit, if necessary

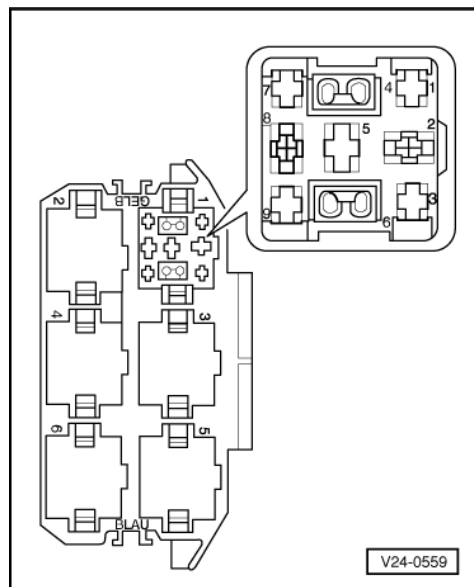
1.13 - Testing current supply relay -J176

Note:

Fitting location of current supply relay for Digifant control unit -J176: On auxiliary relay carrier III in passenger footwell, contact position 1

Special tools, testers and auxiliary equipment required

- ♦ Hand-held multimeter V.A.G 1526 or V.A.G 1526 A
- ♦ Adapter set V.A.G 1594 A



- Remove the current supply relay.

Testing voltage supply

- -> Set hand-held multimeter V.A.G 1526 to voltage measuring range (20 V direct current) and connect it as follows:

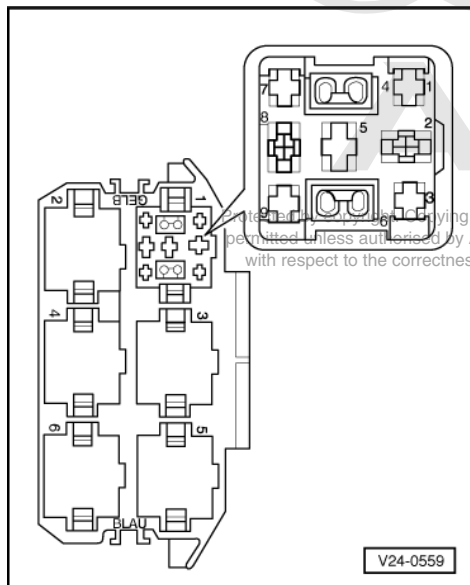
Position of the -J176 Contact	Specification
2 (positive) + earth	approx. battery voltage
2 (positive) + 4 (earth)	approx. battery voltage

- Switch the ignition on.

If the specified values are not obtained:

- Test the wiring connections for open circuit and short circuit according to the current flow diagram.

Testing actuation



- -> Set hand-held multimeter V.A.G 1526 to voltage measuring range (20 V direct current) and connect to contact 8 (positive) and 4 (earth) using test leads from V.A.G 1594 A.
- Switch the ignition on.
 - Specification: approx. battery voltage

If the specification is not obtained:

- Test the wiring connections for open circuit and short circuit according to the current flow diagram.

1.14 - Testing knock sensor -G61

Notes:

- ♦ The knock sensor itself cannot be tested electrically => interrogate fault memory, from Page 4.
- ♦ It is important that the knock sensor is tightened to the exact torque of 20 Nm if it is to operate properly.
- ♦ Inspect the plug connections for traces of corrosion.
- ♦ Use only gold plated contacts when repairing the contacts in the plug connectors for the knock sensors.

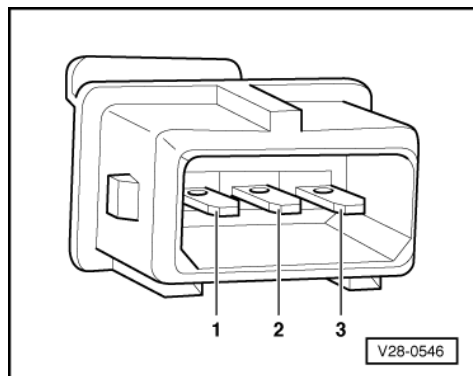
Special tools, testers and auxiliary equipment required

- ♦ Hand-held multimeter V.A.G 1526 or V.A.G 1526 A
- ♦ Adapter set V.A.G 1594 A
- ♦ Test box V.A.G 1598/18



Testing wiring of knock sensor

- Separate the plug connection of the knock sensor in the engine compartment => -Pos. **38**.

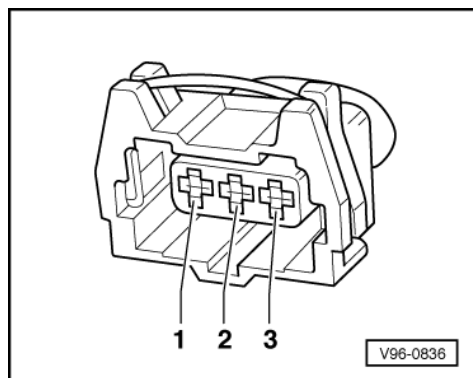


- -> Set hand held multimeter V.A.G 1526 to resistance measuring range and connect to the contacts of the connector using test leads from V.A.G 1594 A.
 - Specification: $\infty \Omega$
 - There must be no connection between any of the wires).
- If connection exists at the wire, replace the knock sensor.

Testing wiring from the knock sensor to the Digifant control unit

- With the ignition switched off, connect test box V.A.G 1598/18 to connector for engine control unit => Page **47**.

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

Connector of -G61 Contact	Test box V.A.G 1598/18 Socket
1 (signal)	36
2 (earth)	34
3 (screening)	9

- Rectify any open/short circuit as necessary.