Audi 80 1992 ➤

Digifant Fuel Injection and Ignition System > 06.93									
Engine ID	ABK								

Edition 03.1998

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

List of Workshop Manual Repair GroupsList of Workshop Manual Repair GroupsList of Workshop Manual Repair Groups

Audi 80 1992 ➢

Digifant Fuel Injection and Ignition System > 06.93

Repair Group

01 - Self-diagnosis

24 - Mixture preparation, Injection

28 - Ignition system

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

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.

All rights reserved.
No reproduction without prior agreement from publisher.

Copyright © 2010 Audi AG, Ingolstadt

Contents

01 - Self-diagnosis 1
1 Self-diagnosis 1
1.1 Self-diagnosis 1
1.2 Technical data of self-diagnosis 1
1.3 Safety precautions 1
1.4 Connecting fault reader V.A.G 1551 and selecting control unit for engine electronics 1
2 Interrogating and erasing fault memory 4
2.1 Interrogating and erasing fault memory 4
2.2 Fault table 5
3 Final control diagnosis 9
3.1 Final control diagnosis 9
4 Basic setting 11
4.1 Basic setting 11
5 Encoding control unit 12
5.1 Encoding control unit 12
6 Reading measured value block 13
6.1 Reading measured value block 13
7 Testing wiring connections 22
7.1 Testing wiring connections 22
7.2 Testing voltage supply for "black" diagnostic connector 23
7.3 Testing wiring connection between "white" diagnostic connector and engine control unit . . 23
7.4 Testing cable connection of coding connector 26

24 - Mixture preparation, Injection 28
1 Servicing Digifant fuel injection system 28
1.1 Servicing Digifant fuel injection system 28
1.2 Safety precautions 28
1.3 Rules for cleanliness 28
1.4 Technical data 29
1.5 Overview of fitting locations 30
1.6 Removing and installing parts of the fuel injection system 34
1.7 Dismantling and assembling air cleaner 37
1.8 Dismantling and assembling fuel rail with injectors 39
1.9 Testing wiring and components with test box V.A.G 1598 A and adapter 1598/9 40
1.10 Replacing control unit for engine electronics 41
1.11 Testing idling speed 43
1.12 Testing system pressure, fuel pressure regulator and holding pressure 45
1.13 Testing fuel pump relay -J17 and actuation 47
1.14 Testing injectors 50
1.15 Removing and installing injectors 54
1.16 Testing cold start valve -N17 57
1.17 Testing idling stabilisation valve -N71 61
1.18 Testing acceleration/full throttle enrichment and fuel cut-off in overrun 64
1.19 Testing air flow meter -G19 64
2 Testing lambda control 67
2.1 Testing lambda control 67
2.2 Engine running problems after cold start 68
2.3 Testing lambda probe -G39 and lambda control 69
2.4 Testing lambda probe heater -Z19 70
3 Testing tank breather 72
3.1 Testing tank breather 72
3.2 Testing solenoid valve 1 for activated charcoal filter -N80 72

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

4 Testing throttle valve potentiometer -G69 75
4.1 Testing throttle valve potentiometer -G69 75
4.2 Adapting Digifant control unit -J169 and throttle valve potentiometer -G69 to each other . . 79
4.3 Adapting automatic gearbox control unit and throttle valve potentiometer -G69 to each other 79
4.4 Basic setting of the throttle valve 80
4.5 Testing and adjusting closing damper 80
5 Testing intake air preheater 81
5.1 Testing intake air preheater 81
5.2 Connection diagram for vacuum hoses 82
6 Testing auxiliary signals 85
6.1 Testing auxiliary signals 85
6.2 Testing engine speed increase for air conditioner 85
6.3 Testing AC compressor shutoff 86
6.4 Testing engine speed signal 87
6.5 Testing vehicle speed signal 87
6.6 Testing fuel consumption signal 88
6.7 Testing wiring connection to automatic gearbox control unit 88
6.8 Testing start signal 89

28 - Ignition system 91
1 Testing ignition system 91
1.1 Testing ignition system 91
1.2 Safety precautions 91
1.3 Adjustment data, spark plugs 91
1.4 Servicing ignition system 92
1.5 Installing distributor 95
1.6 Testing and adjusting ignition timing 96
1.7 Testing Hall sender -G40 97
1.8 Testing ignition transformer -N152 99
1.9 Testing output stage for ignition transformer 100
1.10 Testing intake air temperature sensor -G42 103
1.11 Testing coolant temperature sensor -G62 104
1.12 Testing voltage supply for control unit 106
1.13 Testing current supply relay -J176 108
1.14 Testing knock sensor -G61 110

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

01 - Self-diagnosis

1 - Self-diagnosis

1.1 - Self-diagnosis

1.2 - Technical data of self-diagnosis

Equipment

- Fault memory: permanent memory (up to 4 different faults can be stored simultaneously) 1)
- Rapid data transfer

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

1.3 - Safety precautions

Note the following points on vehicles equipped with a passenger airbag when carrying out a road test which involves use of testing and measuring equipment:

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Attention

- **Always attach testers and measuring instruments to the back seat and have a second person operate them from there.**
- **Operation of testers and measuring instruments 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).**

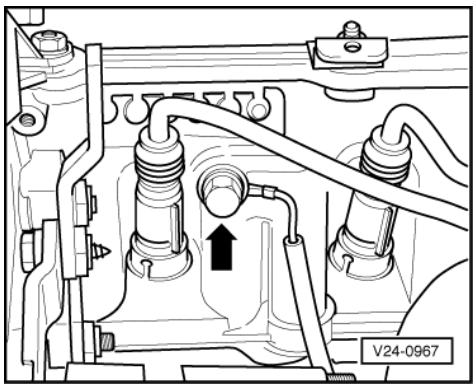
1.4 - Connecting fault reader V.A.G 1551 and selecting control unit for engine electronics

Test requirements:

- Supply voltage of vehicle electrical system OK
- Fuses OK

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

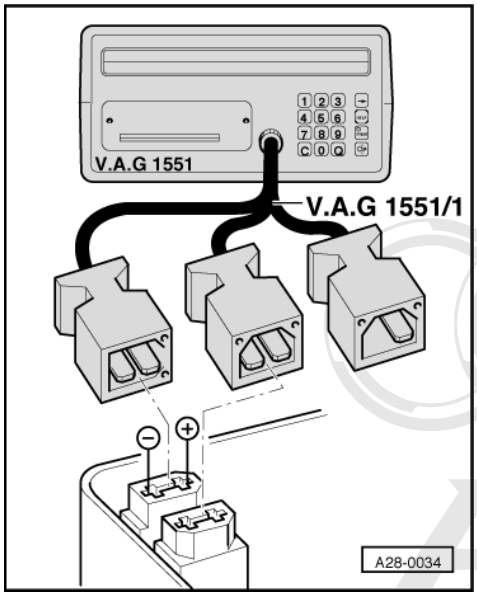
- Fuel pump relay -J17 and current supply relay -J176 OK. Testing => Page 108 .
- Earth connections checked.



- Inspect following earth connections for corrosion and poor connection before interrogating the fault memory, final control diagnosis, engine basic setting, test of cables and also before replacing any components:

- -> Earth attachment point at left of cylinder head -arrow-.
- Battery earth strap and earth strap between engine and side member and between battery box and gearbox.

- Repair any damaged earth connections.



- Remove cover from relay panel with fuse holder in 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 cable V.A.G1551/1:
- With the ignition switched off, connect black connector to black diagnostic connection.

Copyright by AUDI AG. Reproduction, duplication and dissemination to third parties without permission is prohibited. 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.

-> Readout 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 23 .

- 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.
- Press key 1 for "Rapid data transfer".

-> Readout 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.

- Press keys 0 and 1 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).

```
0337906022EE     Digifant     1.6
1003      □
Coding 11
```

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)

- 037 906 022 EE	Part no.; assignment => Parts catalogue
- Digifant 1.6	Digifant fuel injection and ignition system
- 1003	Data status (software status) of control unit
- Coding 11	Coding of control unit=>Page 12

Note:

If no communications can be established with the control unit =>Page 23 .

- 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 can display the control unit identification again.

Available functions

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Fault reader V.A.G 1551 fault reader or vehicle system tester V.A.G 1552		Ignition on, engine off	Engine idling	Vehicle running	Page
Address words					
01	Engine electronics	yes	yes	yes	1
00	Automatic test routine	yes	yes	yes	3
Functions					
01	Interrogate control unit version	yes	yes	yes	3
02	Interrogate fault memory	yes	yes	yes	4
03	Final control diagnosis	yes	no	no	9
04	Basic setting	no	yes	no	11
05	Erase fault memory	yes	yes	yes	4
06	End output	yes	yes	yes	4

Fault reader V.A.G 1551 fault reader or vehicle system tester V.A.G 1552		Ignition on, engine off	Engine idling	Vehicle running	Page
08	Read measured value block	yes	yes	yes	13

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 control unit for engine electronics using "Address word" 01. The engine must be running at idle speed
(Connect fault reader and select control unit for engine electronics => Page 1 .)

Note:

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

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

-> Readout on display:

```
Rapid data transfer      HELP
Select function XX
```

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

-> Readout on display:

```
No fault detected
```

- Press the ⇒key.

Note:

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

- Perform final control diagnosis => Page 13 .

or

-> Readout on display:

```
X faults detected
```

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 displaying and printing out the last fault, the faults should be rectified according to fault table => Page 5 onwards.
- Press the ⇒key.

-> Readout on display:

```
Rapid data transfer      HELP
Select function XX
```

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

Notes:

-> Readout on display:

```
Attention
Fault memory was not interrogated
```

Procedure 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.

-> Readout on display:

```
Rapid data transfer
Fault memory is erased
```

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

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.

- Road test the vehicle. Conditions:
  - Duration at least 5 minutes
  - Coolant temperature at least 80 oC
  - Engine speed above 3000 rpm
  - Fully depress accelerator pedal briefly
- 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.

-> Readout on display:

```
Rapid data transfer     HELP
Select function XX
```

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

-> Readout on display:

```
Rapid data transfer     HELP
Enter address word XX
```

- Switch off ignition and detach diagnostic connector.

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

2.2 - Fault table

Notes:

- The table below lists all the possible faults that can be detected by the Digifant control unit -J169 and which may appear on V.A.G 1551 or V.A.G1552 when the fault memory is interrogated. The fault table lists the faults by 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 road test and before interrogating the fault memory, all existing faults will be displayed only 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". In this case, "/SP" appears on the right of the V.A.G 1551 display.

- Faults in the area of the injectors, the knock control and the lambda control are not detected by the self-diagnosis.

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
00513 Engine speed sensor -G28 No signal	- Voltage or earth supply to Hall sensor -G40 faulty	- Engine cuts out or will not start (fuel pump and injectors are switched off)	- Test Hall sensor -G40=> Page 97
	- Open circuit or short circuit to earth or positive in signal wire between -G40 and engine control unit		
	- Hall sensor -G40 defective		
	- Faulty signal input in engine control unit (control unit defective)		- Replace engine control unit =>Page 41

Notes on fault code 00513:

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

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
00518 Throttle valve potentiometer -G69 Open circuit/short to earth1) Implausible signal1)	- Voltage supply for -G69 defective	- Loss of power - Driving errors	- Test throttle valve potentiometer -G69=> Page 75
	- 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)		- Replace engine control unit =>Page 41
	Continued ▼		

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

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
00518 Throttle valve potentiometer -G69 Short to positive 1) Implausible signal1)	(Fault 00518 continued) - Earth connection to -G69 defective	- Loss of power - Driving errors	- Test throttle valve potentiometer -G69=> Page 75
	- Short to positive in signal wire between -G69 and engine control unit		
	- -G69 defective		

	- Faulty signal input in engine control unit (control unit defective)		- Replace engine control unit =>Page 41

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

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
00522 Coolant temperature sensor -G62 Implausible signal 1)	- Loose contact or corrosion due to moisture in connector plug	- Cold start problems at very low temperatures - Driving errors in warm-up phase	- Test coolant temperature sensor -G62=> Page 104
Open circuit/short to positive 1)	- Earth connection to - -G62 defective		- 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 41

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

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
00523 Intake air temperature sensor -G42 Short circuit to earth 1)	- Short circuit to earth	- Reduced power	- Test intake air temperature sensor -G42 => Page 103
Open circuit/short 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 41

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

V.A.G 1551 print-out	Possible cause 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 110
	- 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		

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by Audi. Audi does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by Audi AG.

	- -G61 defective		
	- Faulty signal input in engine control unit (control unit defective)		- Replace engine control unit =>Page 41

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
00525 Lambda probe -G39 No signal1)	- Open circuit or short in wiring between -G61 and engine control unit Continued ▾	- Exhaust values not OK - Lambda control switches to open loop control	- Rectify open circuit or short circuit.

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

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
00525 Lambda probe -G39 No signal1)	(Fault 00525 continued) - Wiring of lambda probe heater	- Exhaust values not OK - Lambda control switches to open loop control	- Rectify open circuit or short circuit.
	- Short to earth or short to screening in lambda probe signal wire		- Read measured value block, display group 001, display zone 3. Readout constant between 0.40 V and 0.50 V => Page 13 onwards.
	- -G39 defective		- Test heater for lambda probe -Z19 => Page 70
Short to positive 1)	- Short to positive in signal wire of lambda probe		- Test lambda probe -G39 and lambda control => Page 69

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

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
00532 Supply voltage Signal too large 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 block,display Group 002, display zone 3=> Page 19
Signal too small 1)	- Current supply relay for engine control unit faulty - Poor earth connection to engine control unit - Battery discharged - Current drain with ignition off	- Voltage less than 6 V - Engine will not run	- Test power supply to engine control unit => Page 106 . - Read measured value block,display Group 002, display zone 3 => Page 19 - Check battery charge level

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

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

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

00545 Engine/gearbox electrical connection No signal	- Open circuit or short circuit to positive or earth - Automatic gearbox control unit -J 217 faulty	- Cold starting problems	- Rectify open circuit or short circuit. => Page 88

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
00552 Air flow meter potentiometer - G19 Open circuit/short to earth 1) Short to positive 1)	- Air flow meter -G19 faulty	- Reduced power - Jolting - Poor acceleration	- Test air flow meter -G19 => Page 64
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 relevant component.

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
65535 Control unit faulty	- Earth connection to engine control unit at contacts 1, 28 and 35	- 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 41
	- Signal communication problems between fault reader and engine control unit	- None	- Erase fault memory and continue to observe vehicle

3 - Final control diagnosis

3.1 - Final control diagnosis

The final control diagnosis actuates 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
4 Cold start valve -N17 1)

1) Only on vehicles with cold start valve

Notes:

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- Before initiating final control diagnosis, the engine must be switched off for at least 2 minutes. If this time period is not observed, the engine may no longer fire as the current supply relay -J176 remains actuated. As a remedy, remove current supply relay -J176 (on auxiliary relay carrier at front left below dash panel, position 14) from the auxiliary relay carrier for a few seconds.

- It is only possible to carry out a complete final control diagnosis once each time after the ignition has been switched on.
- To repeat the 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 actuated. In order to start the engine it is necessary to switch the ignition off and back on again.

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

-> Readout on display:

```
Rapid data transfer      HELP
Select function XX
```

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

-> Readout on display:

```
Final control diagnosis
Fuel pump relay -J17
```

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

If the relay does not respond:

- Test actuation of the fuel pump relay -J17 => Page 48 .
- Press the ⇒key.

-> Readout 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:

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- Test idling stabilisation valve -N71 => Page 61 .
- Press the ⇒key.

-> Readout 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 72 .
- Press the ⇒key.

-> Readout on display:

```
Final control diagnosis
Cold start valve -N17
```

The injector valve should click.

Note:

Press the ⇒ key no later than after the cold start valve has operated two or three times.

If the injector does not click:

- Test actuation of the cold start valve -N17 => Page 57 .
- Press the ⇒key.

-> Readout 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 performs the following functions:

- The ignition angle control is blocked and the ACF valve is closed.
- The learned values for idling speed 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 performed if the test requirements are met.

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.

-> Readout 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.

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

-> Readout on display:

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

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

-> The readout in display group number 000 appears in 10 display zones; explanation => Page 12 .

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

Note:

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

- If the specified values are attained in all display zones, press the ⇒ key and end the output => Page 4 .

Notes:

- If the engine cuts out after entering "04" for the function "Start basic setting", it may run at fast idling speed for up to 4 minutes after being started again. Wait until engine speed has dropped before entering "04" again for the function "Start basic setting".
- ```
  Function unknown or cannot
  be carried out at present.
  ```

  -> Readout on display:
  - Interrogate the control unit version => Page 1 .
  - The test requirements are not met. Measures in event of deviations from the specified values and fault-finding => Reading measured value block, Test table on Page 16 .

Data stored in any form from Audi Self-Study Programmes is intended for training purposes only and is supplied under the condition that AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Display group 000

System in basic setting 0 ⇒ 10	Readout on display	Specification	Corresponds to
1	Engine speed	211 ... 186	770 ... 870 rpm
2	Injection time (figure computed internally by control unit); ignore	3 ... 7	1.5 ... 3.5 ms
3	Throttle valve potentiometer voltage	10 ... 130	0.2 ... 2.6 V
4	Probe status counter	0 ... 10	-
5	Lambda control time counter; ignore	0	-
6	Lambda probe voltage (varies)	230 ... 80	0.1 ... 1.1 V
7	Engine load; ignore	20 ... 150	-
8	Coolant temperature	0 ... 8	+ 85 ... 115 oC
9	Engine control unit supply voltage	115 ... 150	10.8 ... 14 V
10	Intake air temperature	15 ... 70	+ 65 ... 12 oC

Note:

If the setting conditions are met (readouts within tolerance range), the engine control unit is switched into the setting mode. Idling speed and CO content are set automatically in this case.

5 - Encoding control unit

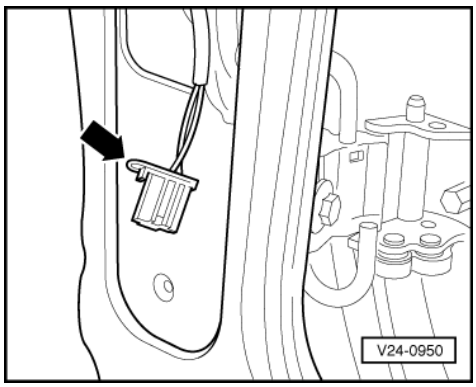
5.1 - Encoding control unit

Attention
Always start by displaying the control unit identification =>Page 3 . and printing it out as required.

Note:

-> If the control unit identification displays a coding which does not correspond to the vehicle or if the engine control unit has been replaced, it is then necessary to code the control unit.

```
0337906022EE     Digifant     1.6
1003
Coding 11
```
```



-> The engine control unit is coded at the coding connector -arrow- (behind the trim panel at the bottom of the A pillar).

Coding versions

Coding	For vehicles	Bridge between contacts of coding connector
01	Without cold start valve	1 + 5
11	With cold start valve	-

- Remove trim panel at bottom of A pillar:

=> General body repairs; Repair group 70; Trim panels; Removing and installing A- pillar trim Trim panels Removing and installing A- pillar trim

- Insert a cable bridge between contacts 1 + 5 of the coding connector / remove the cable bridge as appropriate.

Note:

The contact designation is stamped on the coding connector.

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

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

```
0337906022EE     Digifant     1.6
1003      □
Coding 01
```

If the appropriate coding is not displayed:

- Test the wiring connection of the coding connector => Page 26 .

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

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:

- A second mechanic is required if displayed values are to be read out while driving.
- Observe safety precautions => Page 1

-> Readout 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 "Read measured value block" and confirm entry with Q key.

-> Readout on display:

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

- Enter the display group number. =>List of available display group numbers, Page 14 .
- Confirm input with the Q key.

-> Readout in display for display group 000:

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

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

-> Readout in display for display group 001 (example):

```
Read 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 C key.

- If the specified values are attained in all display zones, press the ⇒ key and end the output => Page 4 .
- If the specifications are not attained in display group 000 => test table, Page 16 .
- If the specifications are not attained in display groups 001... 005 => appropriate test table, Page 18 onwards.

List of available display group numbers

Display group number	Readout 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 supply voltage 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 time 10 = Engine speed

Notes:

- Display zone 6 shows how long the lambda control is switched off for a certain time in certain operating conditions (e.g. fuel shut-off in overrun). This shut-off 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 zone 7 shows how often the lambda probe supplies either a signal which cannot be analysed or no signal at all. The readout is incremented with every ignition.

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Display group number	Readout on display	Designation
001	Read measured value block 1 1 2 3 4	1 = Coolant temperature 2 = Engine speed 3 = Lambda probe voltage 4 = Injection time
002	Read measured value block 2 1 2 3 4	1 = Coolant temperature 2 = Engine speed 3 = Throttle valve angle 4 = Engine load signal
003	Read measured value block 3 1 2 3 4	1 = Coolant temperature 2 = Engine speed 3 = Intake air temperature 4 = Engine control unit supply voltage

Display group number	Readout on display	Designation
004	Read measured value block 4 1 2 3 4	1 = Coolant temperature 2 = Engine speed 3 = Computed ignition timing point 4 = Engine load signal
005	Read measured value block 5 1 2 3 4	1 = Coolant temperature 2 = Engine speed 3 = Throttle valve angle 4 = Engine control unit supply voltage

Display group 000

Read measured value block ⇒ Readout on display

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

Test table, display group 000

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1	Varies from tolerance range	- Intake air temperature sensor -G42 faulty - Wiring defect between intake air temperature sensor -G42 and engine control unit	- Interrogate fault memory =>Page 103
2	Varies from tolerance range	- Alternator defective - Battery discharged (current drain) - Poor earth connection to engine control unit - Current supply relay for engine control unit faulty	- Test power supply => Page 106
3	Varies from tolerance range	- Coolant temperature sensor -G62 defective - Wiring defect between coolant temperature sensor -G62 and engine control unit	- Interrogate fault memory =>Page 104

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
4	Varies from tolerance range	- Poor idling (not running on all cylinders)	- Test spark plugs => Page 50
		- Air flow meter -G19 faulty	- Interrogate fault memory =>Page 64
		- Idling stabilisation valve -N71 defective - Wiring defect between idling stabilisation valve -N71 and engine control unit	- Test idling stabilisation valve -N71 => Page 61 .
		- Intake system drawing in unmetered air	- Test air intake system for leaks => vacuum connections, Page 82
		- Loads switched on, e.g. air conditioner is on; steering wheel is at full lock; 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	Varies from tolerance range	- Injector defective - Defective spark plug	- Test injectors => Page 91
		- Air intake system drawing in large quantities of unmetered air	- Test air intake system for leaks => vacuum connections, Page 82
		- Coolant temperature sensor -G62 defective	- Interrogate fault memory =>Page 104
		- Solenoid valve 1 for activated charcoal filter -N80 faulty	- Perform final control diagnosis =>Page 9 .
		- Lambda probe -G39 dirty	- Interrogate fault memory =>Page 70
(cont.) ▼		- Lambda probe heater -Z19 faulty	- Test lambda probe heater -Z19 => Page 70

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
5	Varies from tolerance range	- Fuel system pressure too high or too low	- Test fuel pressure regulator and holding pressure => Page 45
	Constantly at readout between 0 and 3	- Short to positive caused by: - - Lambda probe -G39 - - Lambda probe wire - - Engine control unit	- Test lambda probe -G39 => Page 70
	Constantly at readout between 164 and 168	- Open circuit caused by: - - Lambda probe -G39 - - Lambda probe wire - - Engine control unit	
	Constantly at readout above 230	- Short to earth caused by: - - Lambda probe -G39 - - Lambda probe wire - - Engine control unit	

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
6	...	Ignore	
7	Varies from tolerance range or	- Fault in fault memory	- Interrogate fault memory =>Page 4
	Readout at constant 127	- Lambda probe heater -Z19 faulty	- Test lambda probe heater -Z19 => Page 70
		- Open circuit in wiring between engine control unit -J169 and lambda probe -G39	- Test lambda probe -G39 => Page 70
8	Varies from tolerance range	- Throttle valve potentiometer -G69 defective - Wiring defect between throttle valve potentiometer -G69 and engine control unit	- Interrogate fault memory =>Page 75

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Note on display zone 7:

If 127 appears in the display then the lambda control has switched to open loop control.

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
9	...	Ignore	
10	Varies 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	- Code engine control unit =>Page 12
		- Idling stabilisation valve -N71 is sticking or stiff	- Perform final control diagnosis =>Page 61 .
		- Throttle valve potentiometer -G69 defective	- Test throttle valve potentiometer -G69 => Page 75 or display group 002, display zone 3

Display group 001

Read measured value block 1 ⇒	◂ Readout on display

95 oC	820 rpm	0.75 V	2.0 ms	
				Injection time (value computed internally by control unit at idling speed) ▪ 1.5 ... 3.5 ms OK
			Lambda probe voltage (varies) ▪ 0.1 ... 1.1 V	
		Engine speed (idling speed) ▪ 770 ... 870 rpm OK		
	Coolant temperature			

Test table, display group 001

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1	Greater than 115 oC or less than 85 oC 1)	- Coolant temperature sensor -G62 defective - Wiring defect between coolant temperature sensor -G62 and engine control unit -J169	- Interrogate fault memory =>Page 104
2	Greater than 870 rpm	- Throttle valve potentiometer -G69 - defective	- Test throttle valve potentiometer -G69 => Page 75 or display group 003, display zone 3
		- Idling stabilisation valve -N71 is sticking or stiff	- Perform final control diagnosis =>Page 61 .
		- Air intake system drawing in large quantities of unmetered air	- Test air intake system for leaks => vacuum connections, Page 82
(cont.) ▼		- Unmetered air at 2nd stage of throttle valve	- Perform basic setting of throttle valve => Page 80

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted without the prior written consent of 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.

1) Vehicle at operating temperature.

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
2	Greater than 870 rpm	- Incorrect throttle cable setting	- Adjust throttle cable => 4-cyl. injection engine (2-valve), Mechanical components, Repair Group 20, Removing and installing parts of fuel supply system, Adjusting throttle cable
	Less than 770 rpm	- Idling stabilisation valve -N71 is sticking or stiff	- Perform final control diagnosis =>Page 61 .
		- Loads switched on, e.g. air conditioner is on; steering wheel is at full lock; 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"
3	Varies from tolerance range	- Injector defective - Defective spark plug - Cold start valve -N17 faulty	- Test injectors => Page 57
(cont.) ▼		- Air intake system drawing in large quantities of unmetered air	- Test air intake system for leaks => vacuum connections, Page 82

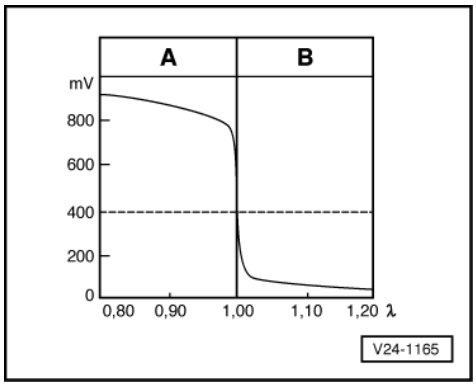
Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
3	Varies from tolerance range	- Coolant temperature sensor -G62 defective	- Interrogate fault memory =>Page 104
		- Solenoid valve 1 for activated charcoal filter -N80 faulty	- Perform final control diagnosis =>Page 72
		- Lambda probe -G39 dirty	- Interrogate fault memory =>Page 70
		- Lambda probe heater -Z19 faulty	- Test lambda probe heater -Z19 => Page 70
		- Fuel system pressure too high or too low	- Test fuel pressure regulator and holding pressure => Page 45
(cont.) ▼	Constant readout of 1.60 V	- Short to positive caused by: - - Lambda probe -G39 - - Lambda probe wire - - Engine control unit	- Test lambda probe -G39 => Page 70

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 in wiring caused by: - Lambda probe -G39 - - Lambda probe wire - - Engine control unit	- Test lambda probe -G39 => Page 70
	Constant readout of 0.00 V	- Short circuit to earth caused by: - Lambda probe -G39 - - Lambda probe wire - - Engine control unit	
4	... ms	Injection time (value computed internally by control unit at idling speed)	

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Note on display zone 3:

Probe voltage U in V

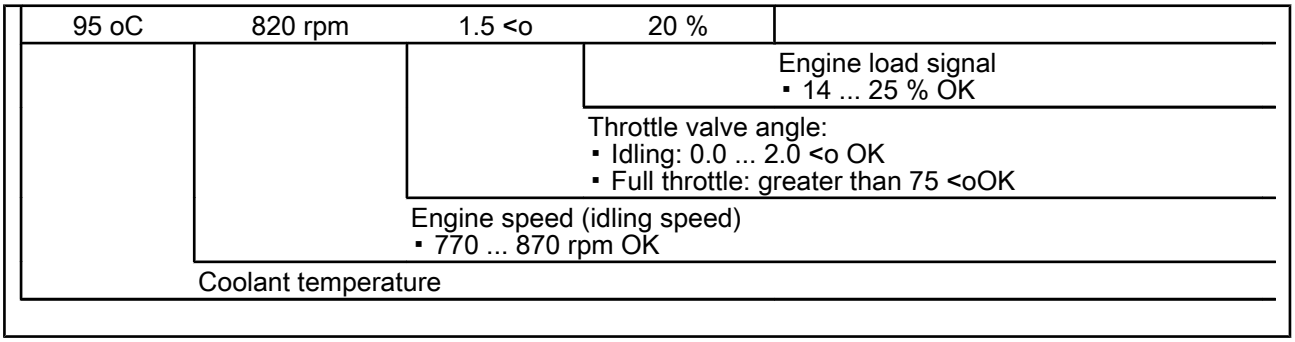


Air ratio

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

Display group 002

Read measured value block 2	⇒	◂ Readout on display



Test table, display group 002

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1	... oC	Coolant temperature => Display group 001, display zone 1	
2	... rpm	Engine speed => Display group 001, display zone 2	
3	Greater than 2 <o during idling	- -G69 throttle valve potentiometer defective	- Interrogate fault memory =>Page 75
		- Incorrect throttle cable setting	- Adjust throttle cable => 4-cyl. injection engine (2-valve), Mechanical components, Repair Group 20, Removing and installing parts of fuel supply system, Adjusting throttle cable
		- Throttle valve sticking	- Eliminate cause
	Less than 75 <o at full throttle	- -G69 throttle valve potentiometer defective	- Interrogate fault memory =>Page 75
		- Incorrect throttle cable setting	- Adjust throttle cable => 4-cyl. injection engine (2-valve), Mechanical components, Repair Group 20, Removing and installing parts of fuel supply system, Adjusting throttle cable

Note on display zone 3:

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

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
4	Varies from tolerance range	- Poor idling (not running on all cylinders)	- Test spark plugs => Page 50
		- Air flow meter -G19 faulty	- Interrogate fault memory =>Page 64
		- Idling stabilisation valve -N71 defective - Wiring defect between idling stabilisation valve -N71 and engine control unit	- Test idling stabilisation valve -N71 => Page 61 .
		- Intake system drawing in unmetered air	- Test air intake system for leaks => vacuum connections, Page 82

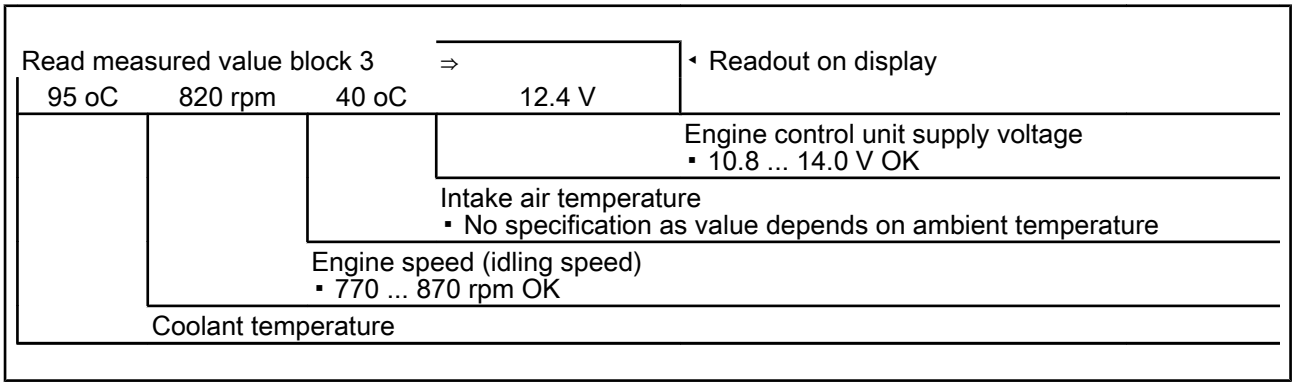
Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

		- Loads switched on, e.g. air conditioner is on; steering wheel is at full lock; 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 from the air flow meter signal on the basis of the intake manifold vacuum.

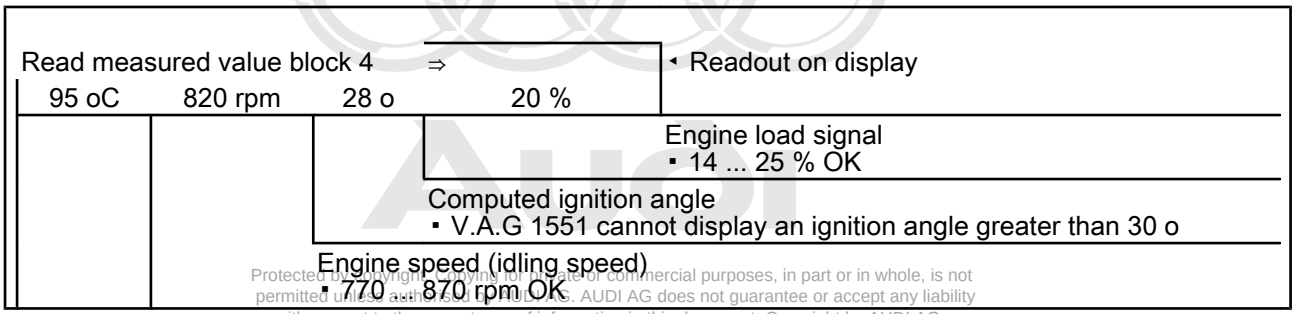
Display group 003



Test table, display group 003

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1	... oC	Coolant temperature => Display group 001, display zone 1	
2	... rpm	Engine speed => Display group 001, display zone 2	
3	Differs from ambient temperature	- Intake air temperature sensor -G42 faulty - Wiring defect between intake air temperature sensor -G42 and engine control unit	- Interrogate fault memory =>Page 103
4	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 engine control unit faulty	- Test power supply => Page 106

Display group 004



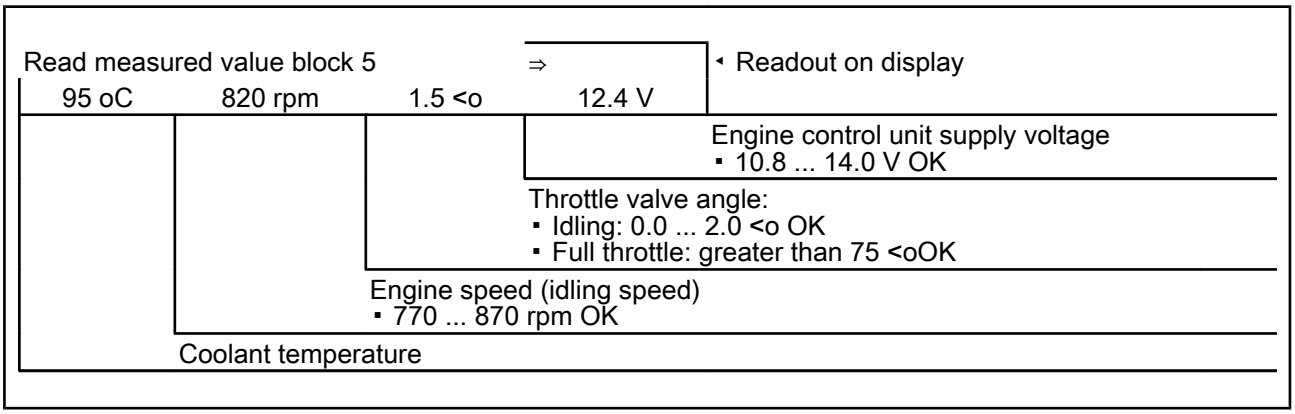
Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Coolant temperature

Test table, display group 004

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1	... oC	Coolant temperature => Display group 001, display zone 1	
2	... rpm	Engine speed => Display group 001, display zone 2	
3	o	Ignition angle, V.A.G 1551 cannot display an ignition angle greater than 30 o	
4	... %	Engine load signal => Display group 002, display zone 4	

Display group 005



Test table, display group 005

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1	... oC	Coolant temperature => Display group 001, display zone 1	
2	... rpm	Engine speed => Display group 001, display zone 2	
3	... <o	Throttle valve angle => Display group 002, display zone 3	
4	... V	Engine control unit voltage supply => Display group 003, display zone 4	

7 - Testing wiring connections

7.1 - Testing wiring connections

Attention
Switch off ignition before testing wiring.

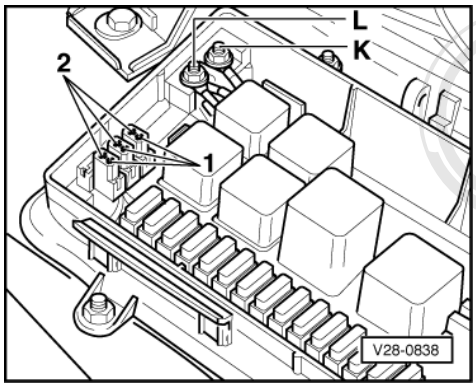
Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Special tools, testers and auxiliary equipment required

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

- Test box V.A.G 1598 with adapter V.A.G 1598/9

7.2 - Testing voltage supply for "black" diagnostic connector



-> Fitting location of diagnostic connectors: In relay panel with fuse holder in plenum chamber

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

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

Contact assignment for "black" diagnostic connector:

1 - Earth
2 - Terminal 30 (protected by fuse 21)

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

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

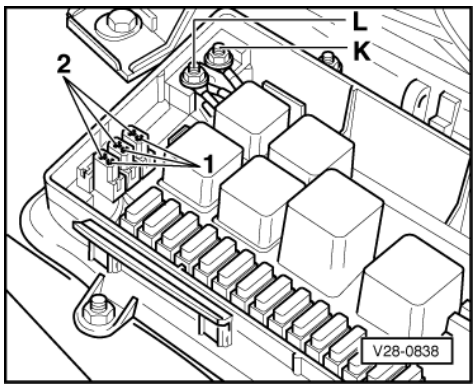
- Specified value: approx. battery voltage in each case

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 connection between "white" diagnostic connector and engine control unit



-> Fitting location of diagnostic connectors and K and L cable 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

Note:

The wiring between the "white" diagnostic connector and the engine control unit is routed via wiring junctions K and L in the relay panel with fuse holder.

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

White diagnostic connector contact	Cable junction	Digifant control unit -J169 contact
1	L	17
2	K	36

Testing wiring connection of white diagnostic connector for short to positive or earth

Note:

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

-> Readout on display:

```
Rapid data transfer
Fault in communication build-up
```

or

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

or

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

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

or

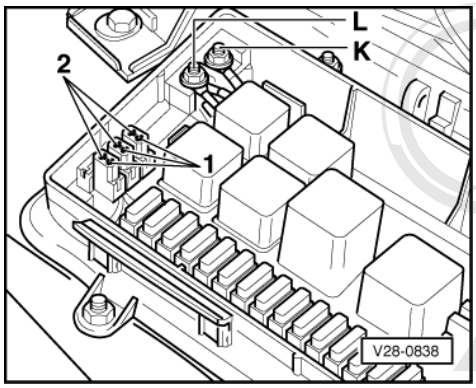
```
Rapid data transfer     HELP
L wire not switching to earth
```

or

```
Rapid data transfer     HELP
L wire not switching to positive
```

Cables with different cable colours are connected to the cable junctions:

- Switch off ignition.
- Identify colours of cables between white diagnostic connector and engine control unit.



- -> One by one, disconnect from wiring junctions K and L all other wires for vehicle systems with diagnostic capability ("Rapid data transfer").

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

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

- Each time a wire for a particular vehicle system has been disconnected, start the engine, allow it to run at idling speed and enter address word 01 for "Engine electronics" again => Page 1 .
- If the control unit identification appears on the display, use the current flow diagram to check the wire to the last control unit that was disconnected.
- If no wiring faults are found, renew the last control unit that was disconnected, as appropriate, and re-connect all wires to wiring junctions K and L.

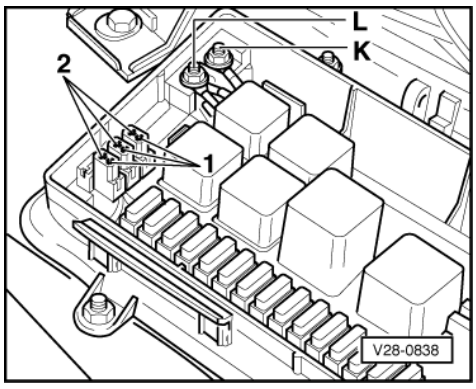
-> Readout on display:

```
Control unit does not answer     HELP
```

Wiring connection to control unit has been interrupted.

Cables with the same cable colours are connected to the cable junctions:

- Switch off ignition.



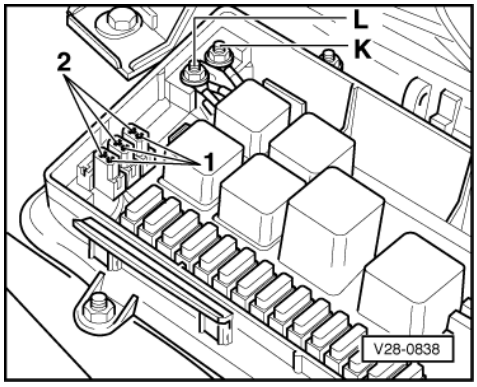
- -> Disconnect all wiring connections from wiring junctions K and L.
- With the ignition switched off, use adapter V.A.G 1598/9 to connect test box V.A.G 1598 A to plug connection of engine control unit (control unit remains disconnected) => Page 40 .
- Determine the wiring connections to the engine control unit and connect the cables back to the cable junctions K and L.

White diagnostic connector contact	Cable junction	V.A.G 1598 A socket
1	L	17

White diagnostic connector contact	Cable junction	V.A.G 1598 A socket
2	K	36

- Disconnect the test box and plug in the connector at the engine control unit.
- Start the engine, allow it to run at idling speed and enter address word 01 for "Engine electronics" again => Page 1 .

- If after doing this the control unit identification is not displayed again, replace the engine control unit.
- Reconnect all the cables at the cable junctions K and L.
- Interrogate the fault memory; if the control unit identification is displayed, the fault is not at the engine control unit.
- Switch off ignition.



- -> Determine one after the other all the cable connections between the control units and the cable junctions K and L, as described for the engine control unit.
- Connect the cables one after the other to the cable junctions K and L:

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

- Each time after re-establishing the cable connection to a vehicle system, start the engine, allow it to run at idling speed and enter address word 01 for "Engine electronics" again => Page 1 .

- If the control unit identification is displayed, switch off the ignition.
- Determine cable connection of the next control unit to the cable junctions K and L and re-establish connection.
- If the control unit identification is displayed, renew the last control unit that was disconnected and reconnect all wires to wiring junctions K and L.

7.4 - Testing cable connection of coding connector

The following test only needs to be carried out if the correct coding does not appear in the display of the fault reader V.A.G 1551 despite correctly carrying out the procedure when coding the engine control unit.

- With the ignition switched off, use adapter V.A.G 1598/9 to connect test box V.A.G 1598 A to plug connection of engine control unit (control unit remains disconnected) => Page 40 .

Coding 11

- Test the following wiring connections for short circuit to earth and positive:

Coding connector contact	Test box V.A.G 1598 A socket
1	21
2	22

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Coding connector contact	Test box V.A.G 1598 A socket
5	20

- Eliminate any short circuit.

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

Coding 01

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- Check for open circuit in the following wiring connections:

Test box V.A.G 1598 A	
Socket	Socket
20	21

- Rectify any open circuit.

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

If the wiring connections are OK, but the correct coding still does not appear in the display of fault reader V.A.G 1551:

- Replace Digifant control unit => Page 41 .

Notes:

- After replacing the Digifant control unit, it is necessary to adapt the control unit and throttle valve potentiometer to each other => Page 79 .
- 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 79 .

24 - Mixture preparation, Injection

1 - Servicing Digifant fuel injection system

1.1 - Servicing Digifant fuel injection system

1.2 - Safety precautions

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Attention
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 cables.
- If the engine is to be turned at starter speed without starting, e.g. when testing the compression pressure, disconnect the plug from the Hall sensor (distributor).

Note the following points on vehicles equipped with a passenger airbag when carrying out a road test which involves use of testing and measuring equipment:

Attention
- **Always attach testers and measuring instruments to the back seat and have a second person operate them from there.**
- **Operation of testers and measuring instruments 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).**

1.3 - Rules for cleanliness

When working on the fuel supply/injection system, pay careful attention to the following 5 cleanliness rules:

- 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 opened 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.

1.4 - Technical data

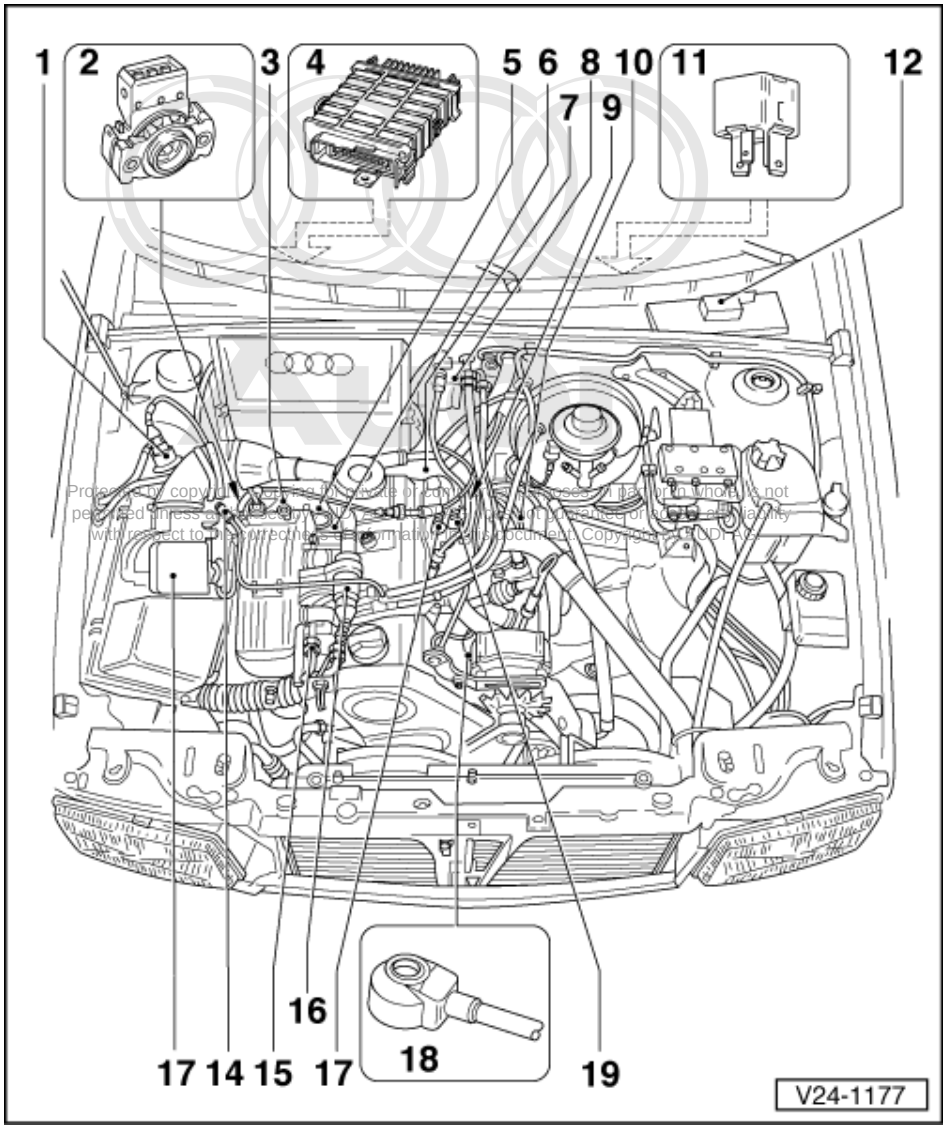
Engine code letters			ABK (2.0 l / 85 kW engine)
Digifant control unit	Part no.		=>Parts list
	Engine speed limitation	rpm	6400 ... 6500
Idling speed adjustment	Idling speed	rpm	770 ... 870 1)
	CO content at test pipe	% vol.	0.6 + 0.4
	Workshop at altitude above 300 m, add	% vol.	0.2 for each 100 m increase in altitude
Fuel pressure regulator	Fuel pressure at idling		
	Vacuum hose	connected	approx. 2.5 bar
		disconnected	approx. 3.0 bar
	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) Current figures:

=> "Emissions Test" binder

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

1.5 - Overview of fitting locations



1 Solenoid valve 1 for activated charcoal filter -N80
- Testing => Page 9

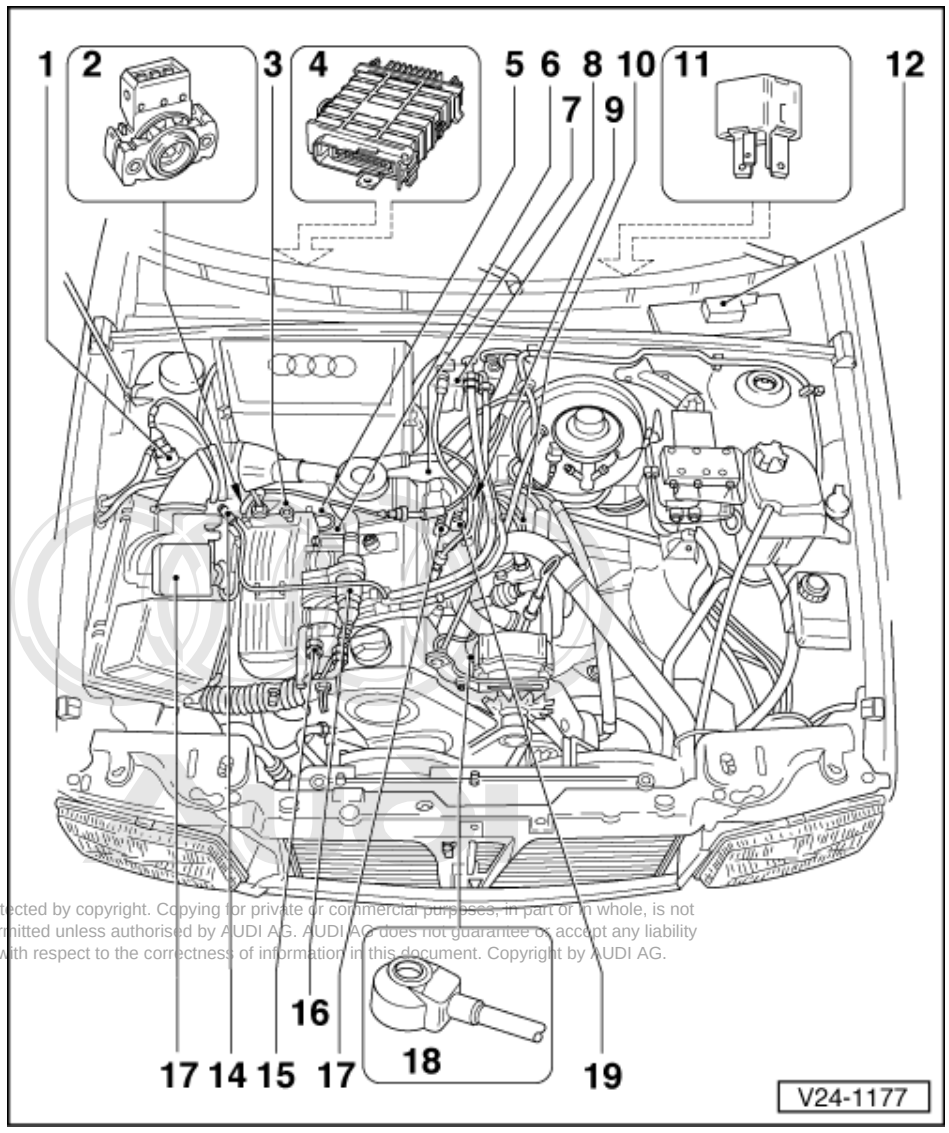
2 Throttle valve potentiometer -G69
- Testing => Page 75

3 Throttle valve connection

4 Digifant control unit -J169
- Removing and installing => Page 41

5 Fuel pressure regulator

6 Connector
- For wiring of injectors



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

7 Connector

- For knock sensor 1 -G61

8 Ignition transformer -N152

- With output stage for transformer

9 Distributor -O

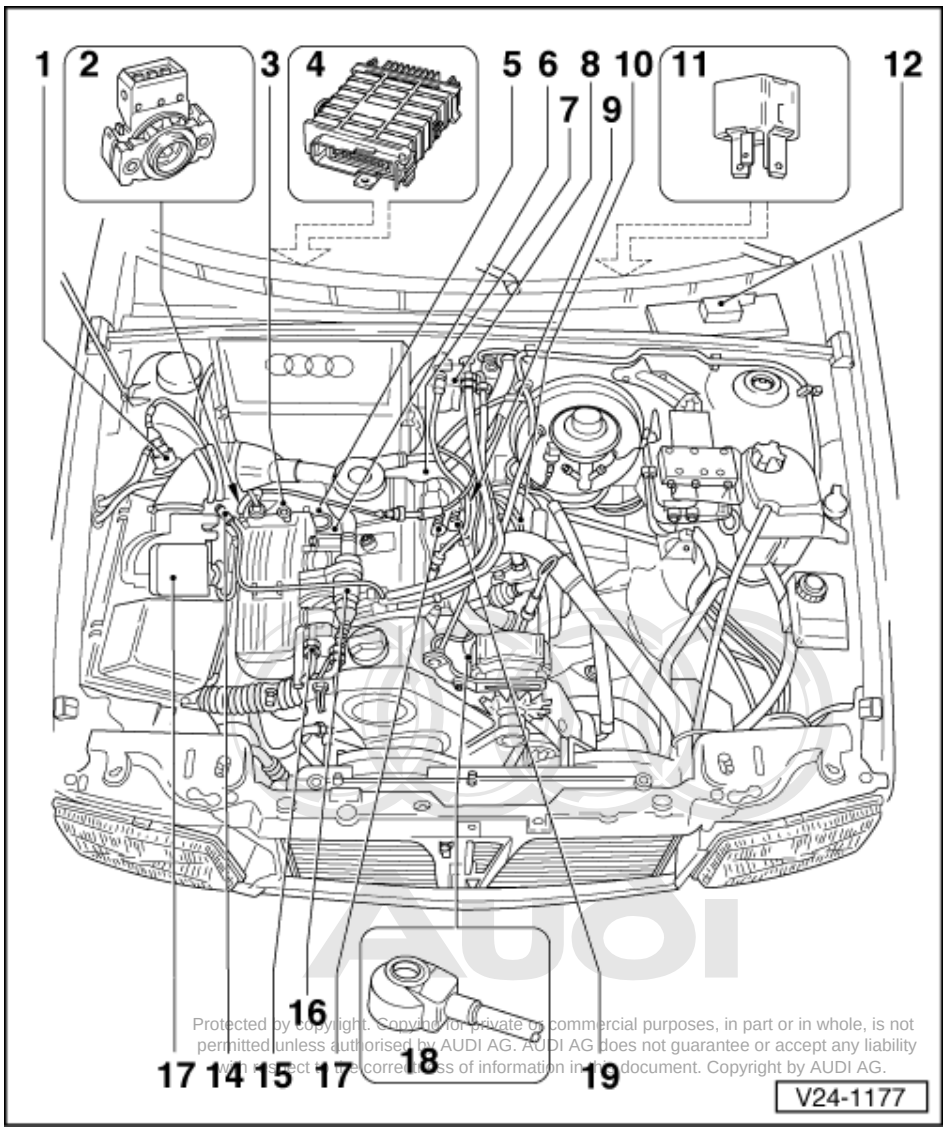
- With Hall sensor -G40

10 Connector

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

11 Current supply relay -J176

- For Digifant control unit
- On auxiliary relay carrier at front left below dash panel, position 14



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

12 Relay panel with fuse holder

- With diagnostic connections
- With fuel pump relay -J17 at position 10

13 Air flow meter -G19

- With intake air temperature sensor -G42
- Testing => Page 64

14 Cold start valve -N17

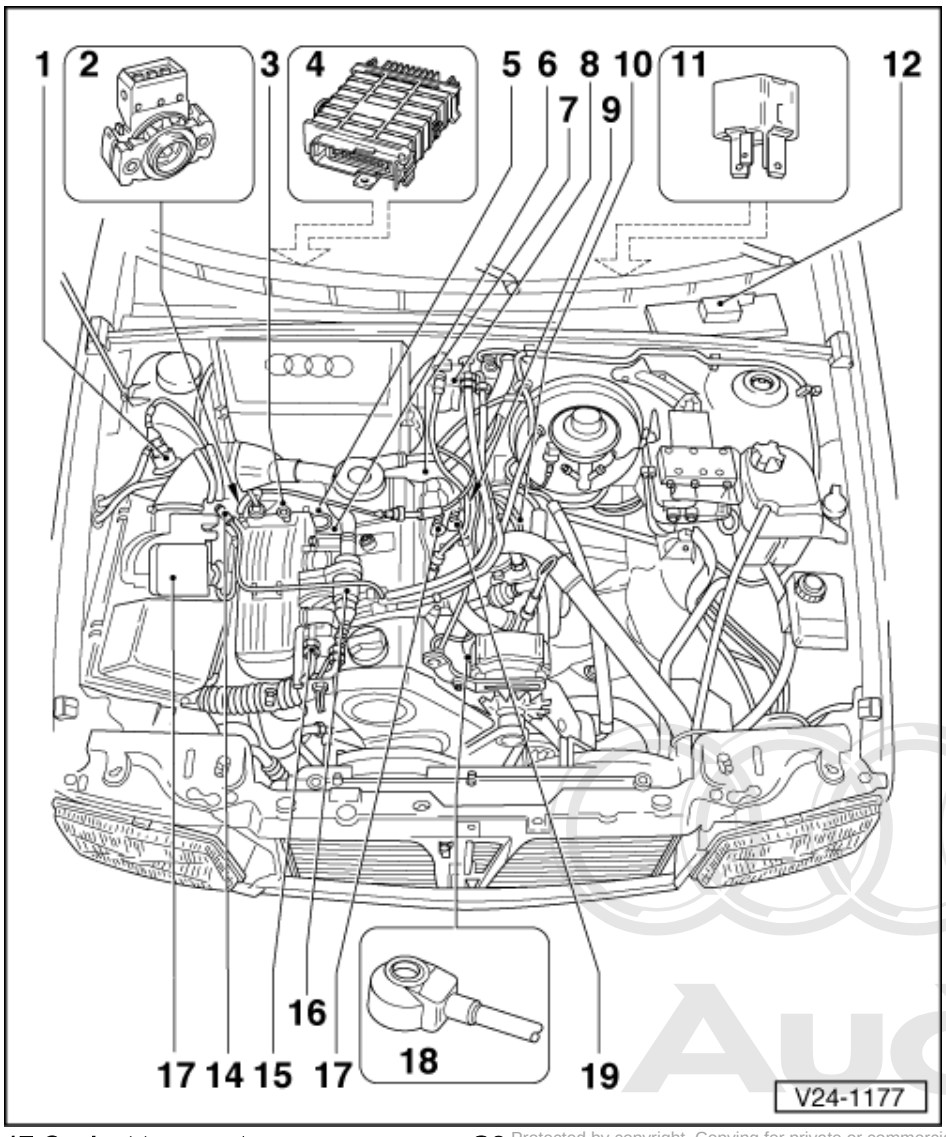
- Not fitted on all versions
- Pay attention to coding of engine control unit => Page 12

15 Injector -N30... -N33

- With noise insulator

16 Idling stabilisation valve -N71

- Testing => Page 61



17 Coolant temperature gauge sensor -G2

- 3-pin
- With overheating warning switch -F14

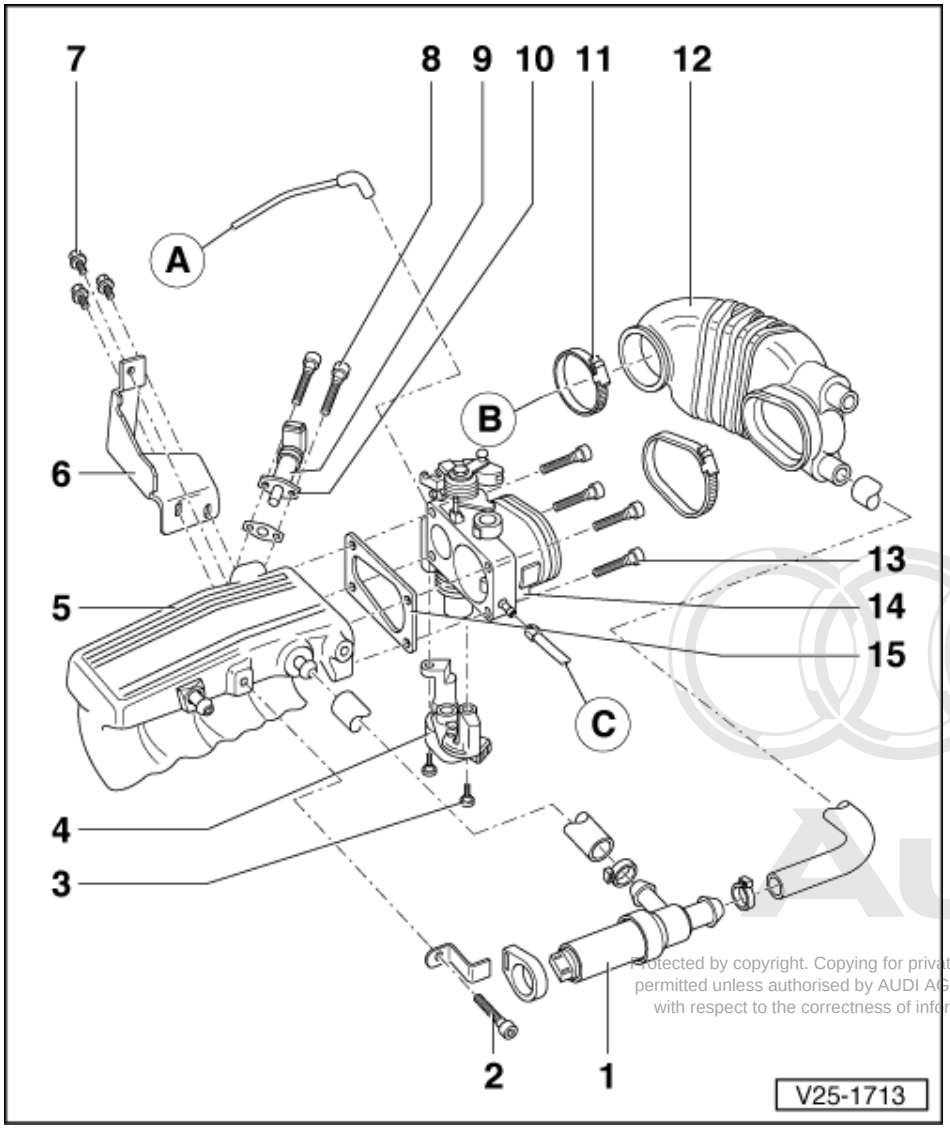
18 Knock sensor 1 -G61

19 Coolant temperature sensor -G62

- 2-pin
- Resistance values => Page 104

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

1.6 - Removing and installing parts of the fuel injection system

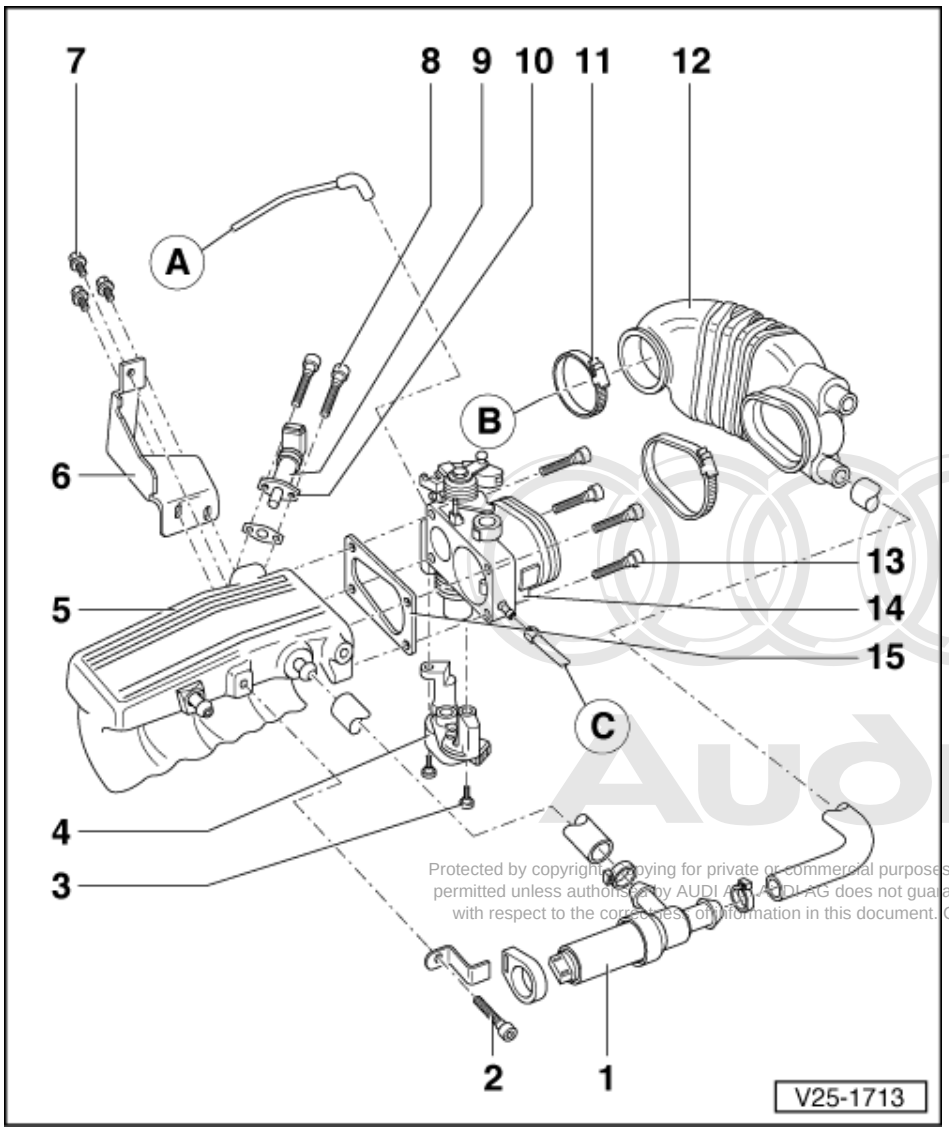


A - => Page 37
B - => Page 37
C - => Page 39

1 Idling stabilisation valve -N71
- Testing => Page 61

2 10 Nm
3 10 Nm

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

4 Throttle valve potentiometer -G69

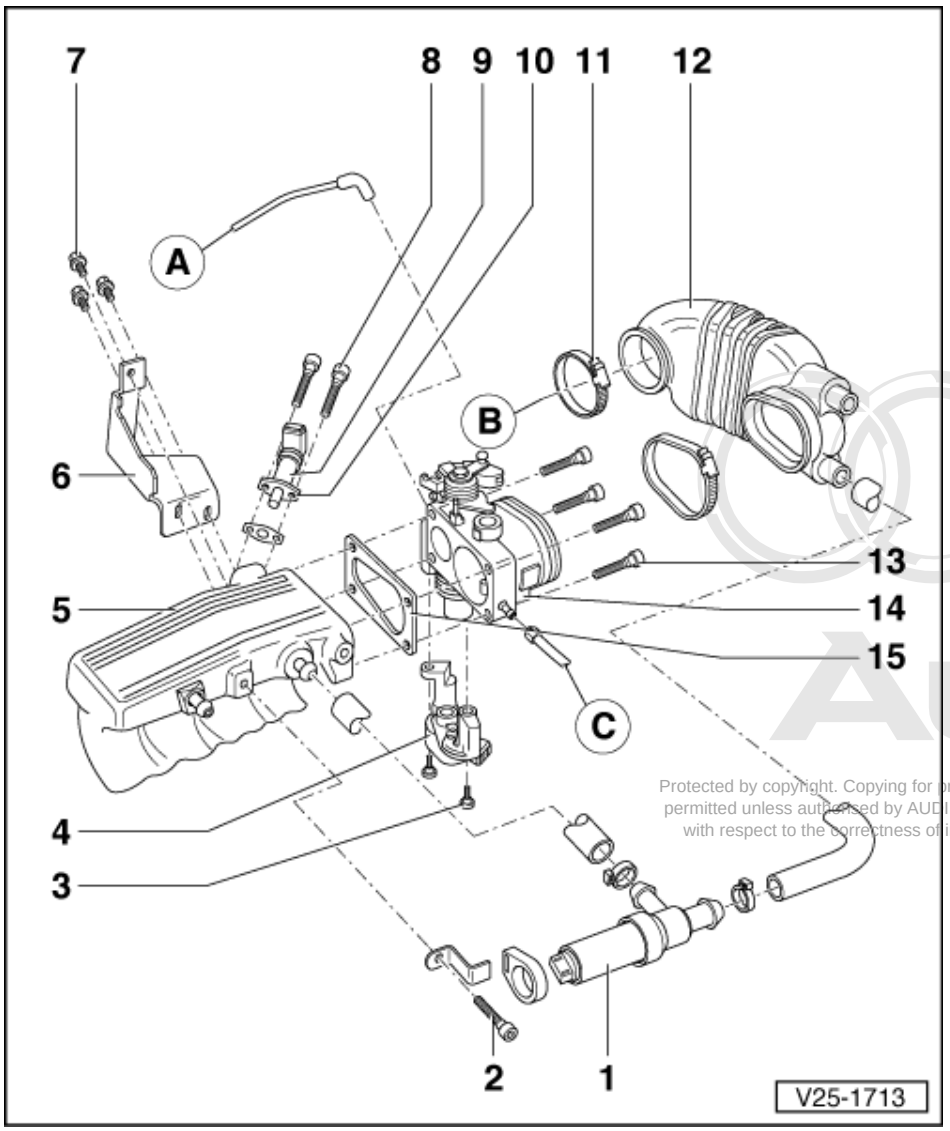
- With bracket
- Testing => Page 75
- After renewing:
  Adapt Digifant control unit and throttle valve potentiometer to each other => Page 79

5 Intake manifold

6 Heat shield

7 10 Nm

8 10 Nm



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

9 Cold start valve -N17

- Not fitted on all versions
- Pay attention to coding of engine control unit => Page 12
- Testing => Page 57

10 Gasket

- Replace

11 Clip

12 Intake hose

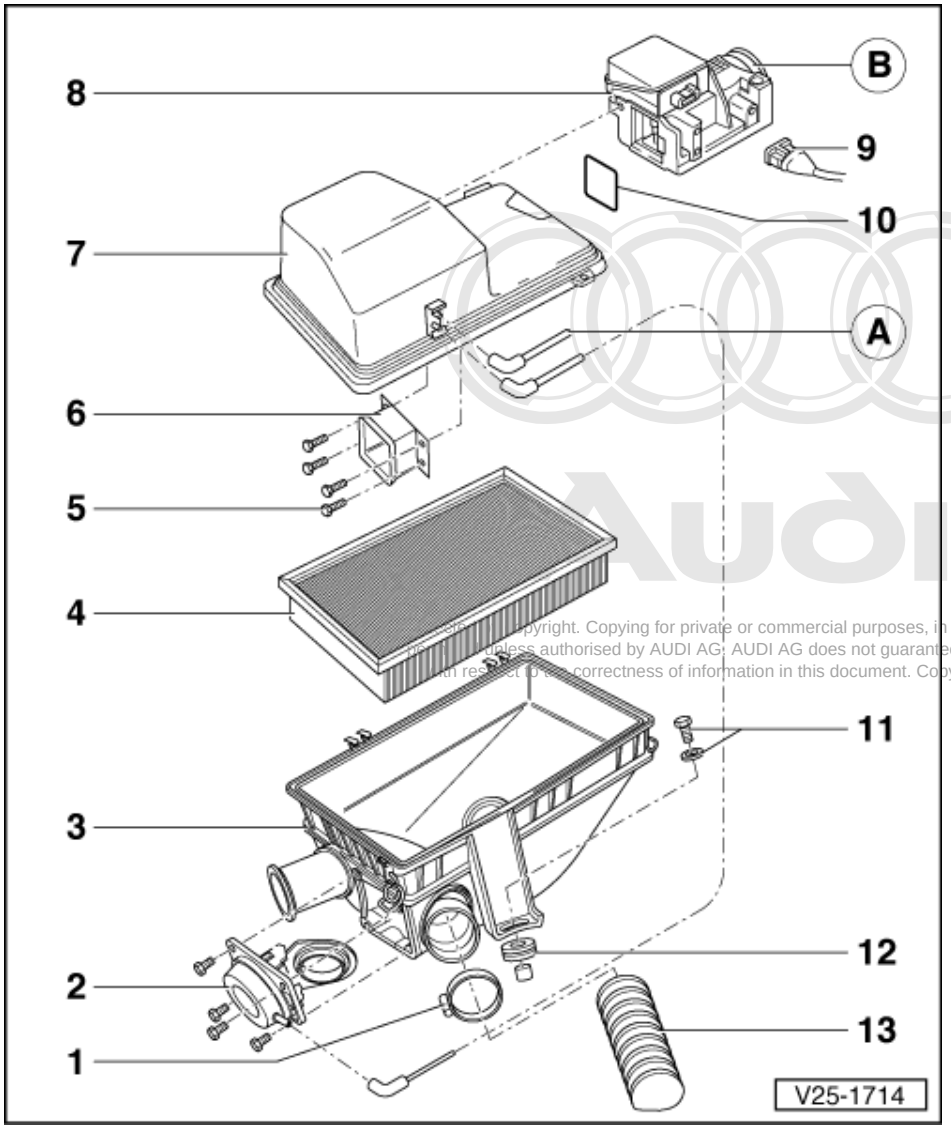
13 25 Nm

14 Throttle valve body

15 Gasket

- Replace

1.7 - Dismantling and assembling air cleaner

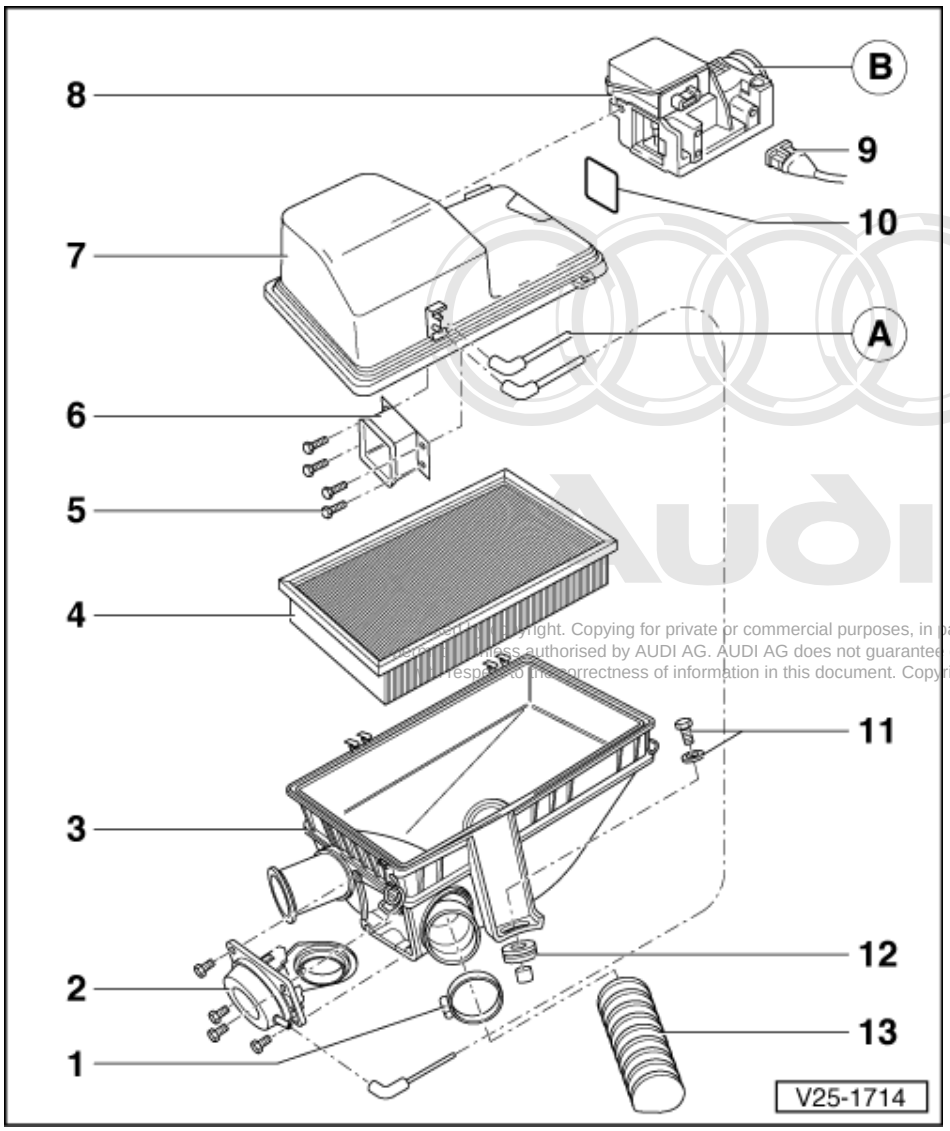


Copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

A - => Page 34
B - => Page 34

1 Clip
2 Vacuum unit
- Testing => Page 81

3 Bottom part of air cleaner
4 Filter element
5 5 Nm
6 Air duct
7 Top part of air cleaner



Copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

8 Air flow meter -G19

- With intake air temperature sensor -G42
- Testing => Page 64

9 Connector

10 Rubber seal

11 20 Nm

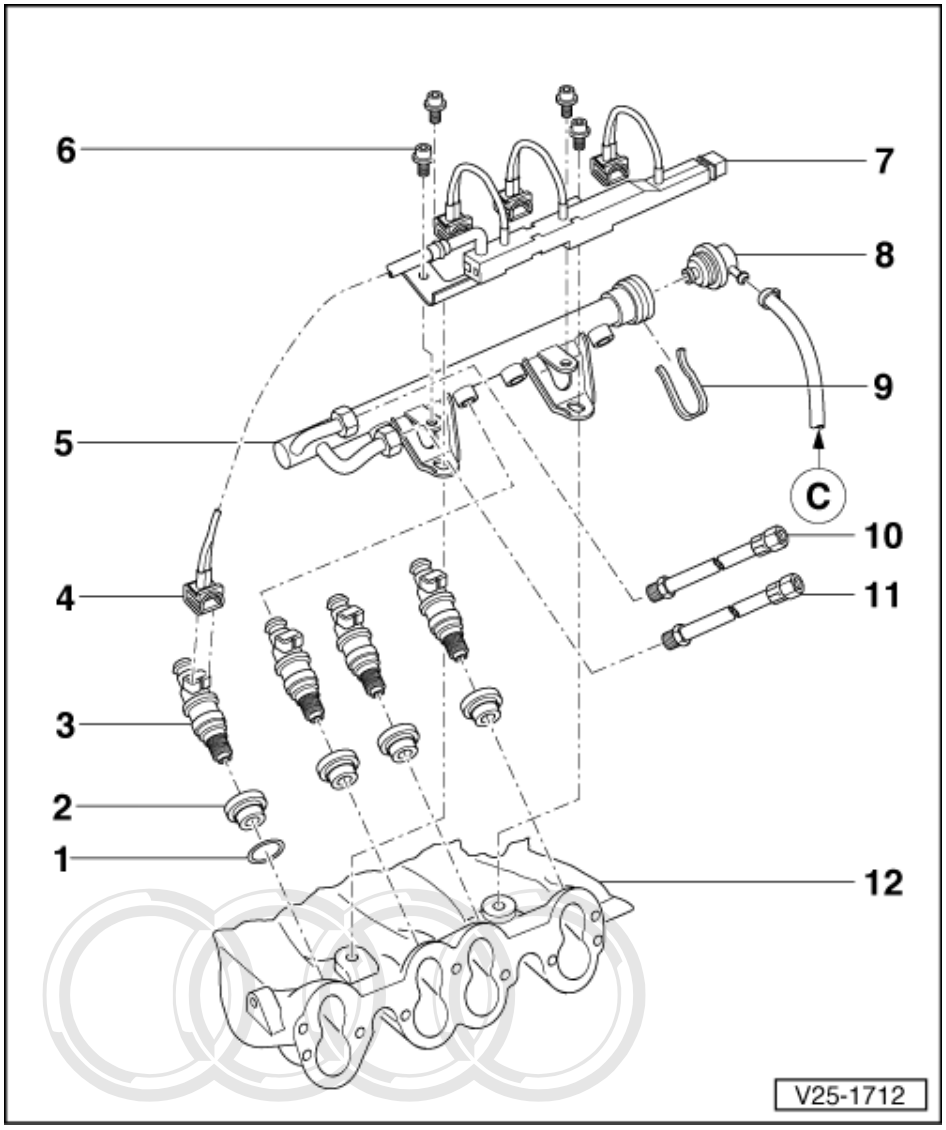
12 Rubber washer

- With bush

13 Hose

- To exhaust manifold

1.8 - Dismantling and assembling fuel rail with injectors



C - => Page 34

1 O-ring
- Replace if damaged

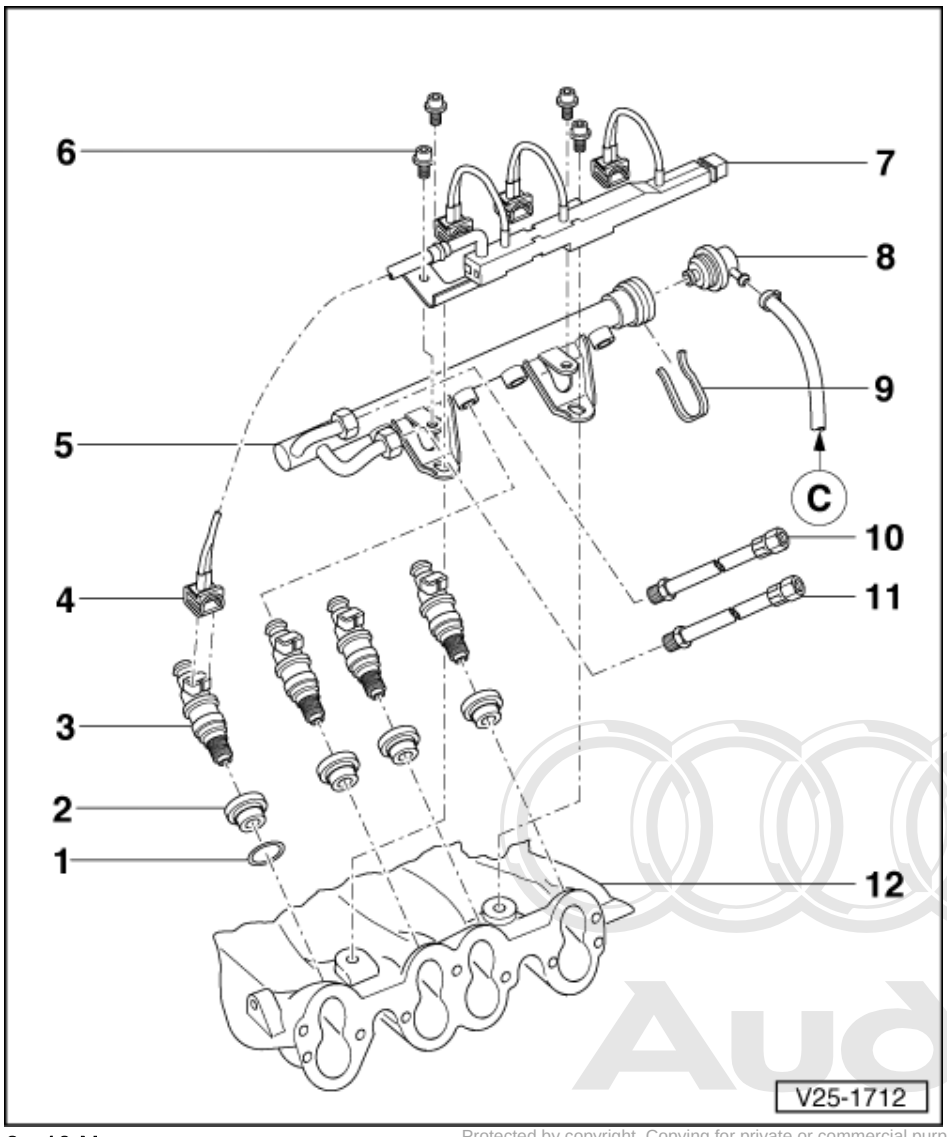
2 Nozzle insert

3 Injector -N30... -N33
- Testing => Page 50
- Removing and installing => Page 54

4 Connector
- Switch off ignition before pulling off or attaching connector

5 Fuel rail
- Removing and installing => Removing and installing injectors, Page 54

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

6 10 Nm
7 Cable guide
- For injectors

8 Fuel pressure regulator
- Testing system pressure, fuel pressure regulator and holding pressure => Page 45

9 Clamp
10 Return pipe
- Tighten to 25 Nm

11 Supply pipe
- Tighten to 25 Nm

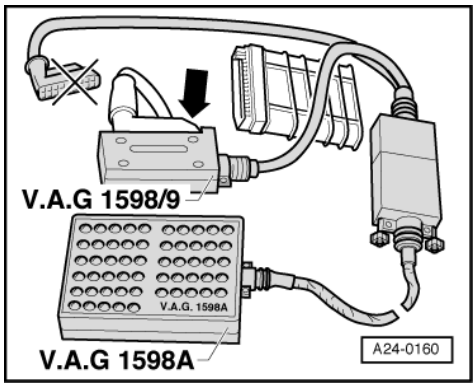
12 Intake manifold

1.9 - Testing wiring and components with test box V.A.G 1598 A and adapter 1598/9

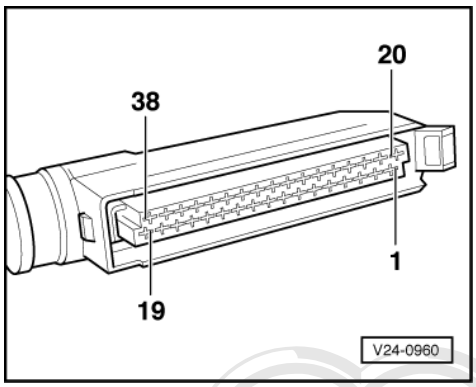
Notes:
- Allow 30 seconds after switching off ignition before detaching or attaching connector of engine control unit.
- Test box V.A.G 1598 A must not be connected when performing diagnosis with fault reader V.A.G 1551.
- Use hand-held multimeter V.A.G 1526 or multimeter V.A.G 1715 and voltage tester V.A.G 1527 B for the tests.

- To connect the test equipment to the test box, use auxiliary cables from adapter cable set V.A.G 1594 A.
- The contact numbers of the plugs correspond to the socket numbers in the test box.

- Switch off the ignition.



- Remove the engine control unit and lock it in the service position => Page 41 .
- -> With the ignition switched off, connect test box V.A.G 1598 A only to plug connection of the engine control unit (control unit remains disconnected) using adapter V.A.G 1598/5.



Notes:

- -> Contact assignment at plug connection of Digifant control unit -J169.
- The contact layout is identical to the socket layout on test box V.A.G1598 A.

1.10 - Replacing control unit for engine electronics

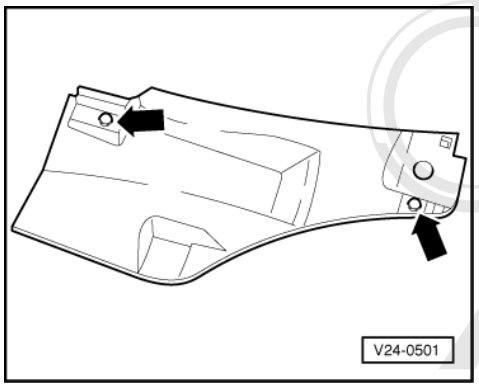
Special tools, testers and auxiliary equipment required

- Fault reader V.A.G 1551 with cable V.A.G 1551/1

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

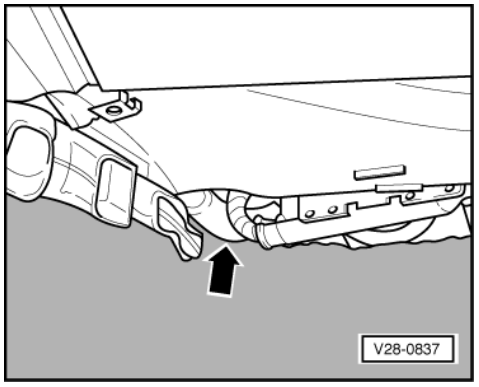
Removing

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

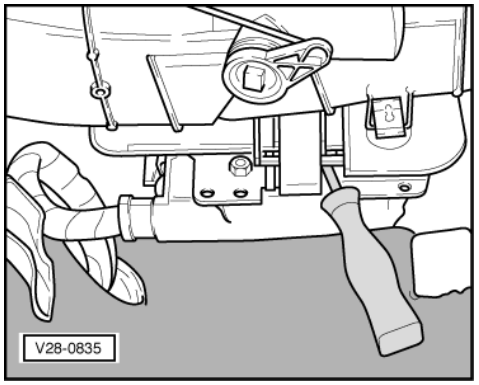


- -> Remove the cover below the glove compartment -arrows-.
- Unscrew the plastic clasp for the cover.

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



- -> On vehicles with air conditioner, disconnect condensation hose -arrow-.



- -> Insert a screwdriver next to retaining clip between control unit support bracket and plastic holder.
- Twist screwdriver as far as necessary to disengage lugs on support bracket (above retaining clip) from locating hole in plastic holder.
- Pull control unit down slightly and remove screwdriver.
- Pull the control unit down 3 ... 4 cm. In this position, the control unit engages in a second opening (service position).

- Disengage retaining clip and unplug control unit connector.

Notes:

- Allow 30 seconds after switching off ignition before detaching or attaching connector of engine control unit.
- With the control unit in the service position, test box V.A.G 1598 A can be connected to the engine wiring harness with adapter V.A.G 1598/9 for measurement and test work.

- To release the control unit, pull open the retaining clip and unplug the control unit connector.

Note:

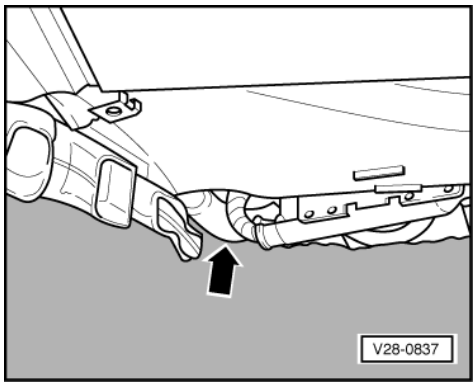
The following steps are only necessary if the control unit has to be removed completely.

- Release the catch as described and pull the control unit carefully down and out of the plastic holder.
- When removing the control unit on vehicles fitted with an air conditioner, carefully press the disconnected condensation hose far enough to one side so that the side flange of the control unit does not damage the drain hose.

Installing

Notes:

- Allow 30 seconds after switching off ignition before detaching or attaching connector of engine control unit.



- -> On vehicles fitted with an air conditioner, first check whether the condensation drain hose -arrow- is connected before installing the cover below the glove box.

- Encode control unit => Page 12 .
- Perform basic setting => Page 11 .

1.11 - Testing idling speed

Notes:

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

Test requirements:

- 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

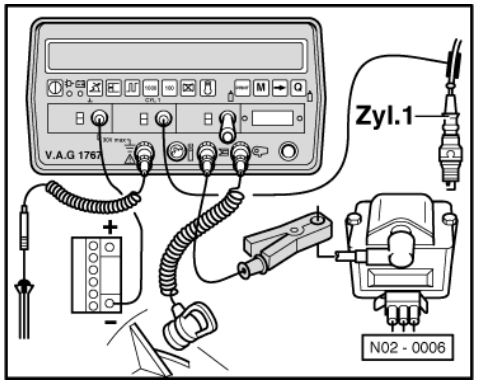
=> 4-cyl. injection engine (2-valve), Mechanical components; Repair group 20; Removing and installing parts of fuel supply system, Adjusting throttle cable Removing and installing parts of fuel supply system, Adjusting throttle cable

Special tools, testers and auxiliary equipment required

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

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

- Ignition tester V.A.G 1767 or V.A.G 1367 with trigger 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:

- The TDC sender of ignition tester V.A.G 1367 must be inserted into the gearbox housing as far as the stop.
- The ignition timing is indicated directly on V.A.G 1767 (or V.A.G1367). It is not necessary to strobe the ignition timing notches.

- Connect fault reader V.A.G 1551 and select control unit for engine electronics => 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. Road test the vehicle and interrogate the fault memory again to make sure it is clear.

- Leave engine idling.

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

-> Readout on display:

```
Rapid data transfer     HELP
Select function XX
```

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

-> Readout on display:

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

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

-> Readout on display:

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

Note:

The displays on fault reader V.A.G 1551 are not relevant for these tests, and can be disregarded.

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

Note:

If the displayed ignition timing point is not within the tolerance range, first set the ignition timing while the system is still in "basic setting 1" before testing the idling speed.

- Set the ignition timing point by turning the distributor at an engine speed of 2000 ... 2500 rpm.

-Setting 6 ±1°

- Leave the engine idling for at least 1 minute.
- Press the ⇒key to exit basic setting. The electric radiator fan must not be running at this point.
- Read off the idling speed on the ignition tester V.A.G 1767 (or V.A.G 1367).
  - Specified value: 770 ... 870 rpm 1

1) Current values:

=> "Emissions Test" binder

-> Readout on display:

```
Rapid data transfer      HELP
Select function XX
```

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

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.

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 82 .
- Test idling stabilisation valve => Page 61

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.

Special tools, testers and auxiliary equipment required

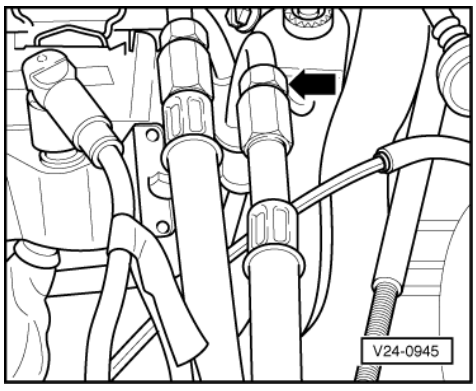
- Pressure tester V.A.G 1318
- Adapter V.A.G 1318/7
- Adapter V.A.G 1318/15

Test requirements:

- Fuel pump relay OK; testing =>Page 47 .
- Fuel pump OK; testing:

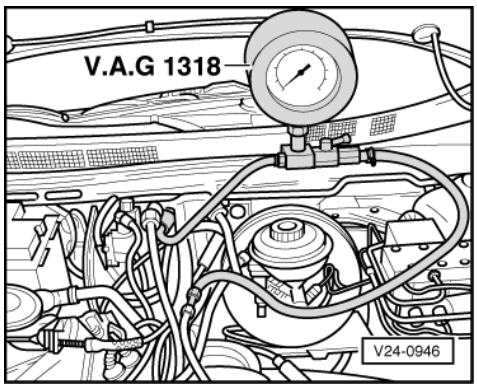
=> 4-cyl. Injection engine (2-valve), Mechanical components; Repair group 20; Removing and installing parts of fuel supply system, Testing fuel pump Removing and installing parts of fuel supply system, Testing fuel pump

- Battery voltage at least 11 V



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

- -> Slacken the union -arrow- of the fuel supply line.



- -> Connect pressure tester V.A.G 1318 to the fuel supply line using adapters V.A.G 1318/7 and V.A.G 1318/15.

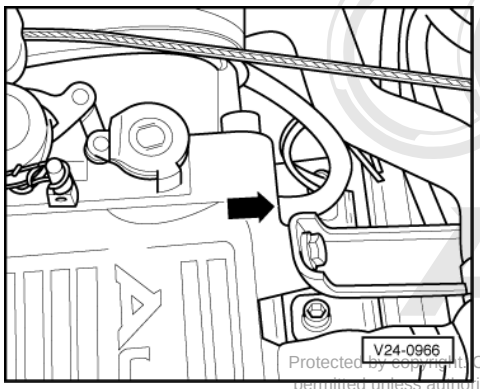
Note:

The shut-off cock of the pressure gauge must be open (lever pointing in direction of flow).

- Start engine and run at idling speed.
- Measure the fuel pressure.
  - Specified value: approx. 2.5 bar

Note:

If no fuel pressure is built up, check whether the fuel supply and return lines have been mixed up.



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 information in this document. Copyright by AUDI AG.

- -> Pull vacuum hose off fuel pressure regulator.
  - The fuel pressure should rise to approx. 3.0 bar.
- Switch off ignition.
- Check 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 bar:

- Start engine and run at idling speed.
- After the pressure has built up, switch off the ignition and at the same time pinch off the return hose at the fuel rail.
- Watch pressure drop on gauge.

If the pressure does not drop:

- Replace the fuel pressure regulator

If the pressure drops again:

- Check pipe connections, O-rings on fuel rail and injectors for leaks.
- Test cold start valve => Page 57 .
- Test pressure tester 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:

Drain off fuel at the pressure tester before removing the pressure tester.

1.13 - Testing fuel pump relay -J17 and actuation

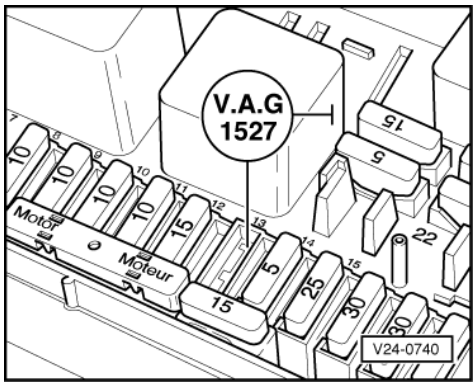
Note:

Fitting location of fuel pump relay: on relay panel with fuse holder in plenum chamber, position 10.

Special tools, testers and auxiliary equipment required

- Voltage tester V.A.G 1527 B
- Adapter cable set V.A.G 1594 A
- Test box V.A.G 1598 A with adapter V.A.G 1598/9

Testing operation of the fuel pump relay



- Remove cover from relay panel with fuse holder in plenum chamber.
- -> Pull out fuse 13 and connect voltage tester V.A.G 1527 B between earth and the rear contact for fuse 13 using auxiliary cables from V.A.G 1594 A.

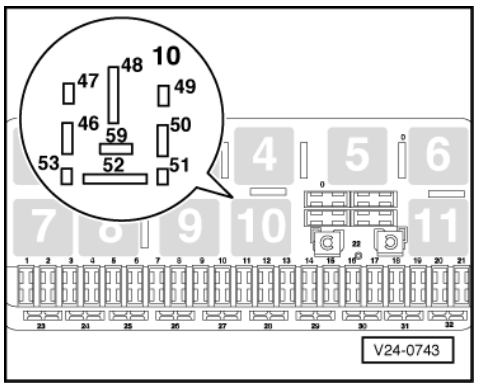
- Operate starter briefly.
  - The fuel pump relay must be heard and felt to respond and the LED should light up.

If the relay does not respond:

- Test actuation => Page 48

If the relay responds but the LED does not come on:

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



- Remove the fuel pump relay.
- -> Test the connection from fuse 13 to contact 52 in contact position 10 for open circuit according to the current flow diagram.
- If necessary replace the relay panel.
- If no open circuit can be found, replace the fuel pump relay.
- Re-insert the fuel pump relay and fuse 13.
- Take out auxiliary fuse 25.
- Connect voltage tester V.A.G 1527 B between earth and one of the two contacts for fuse 25 using auxiliary cables from V.A.G 1594 A.

- Operate the starter briefly.
  - The fuel pump relay must be heard and felt to respond and the LED should light up.

If the relay does not respond:

- Test actuation => Page 48

If the relay responds but the LED does not come on:

- Repeat the test at the other contact for fuse 25.

If LED still does not light:

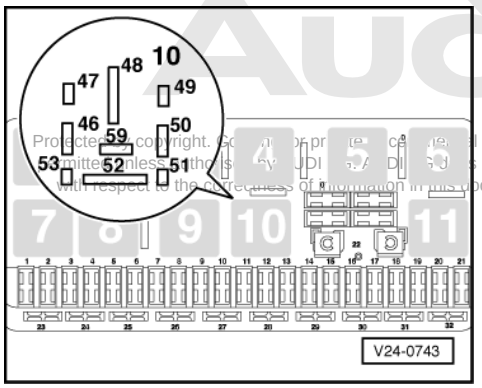
- Disconnect the fuel pump relay.
- Test the wiring connection between fuel pump relay base contact 59 and auxiliary fuse 25 for open circuit using the current flow diagram.
- Rectify any open circuit in the wiring.
- If wiring connection is OK, replace the fuel pump relay.
- Re-insert auxiliary fuse 25.

Testing voltage supply and actuation of the fuel pump relay

- Remove cover from relay panel with fuse holder in plenum chamber.
- Take out the fuel pump relay.

Testing voltage supply

- Switch the ignition on.



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

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

Contacts	Specification
46 + 50	approx. battery voltage
48 + 50	approx. battery voltage

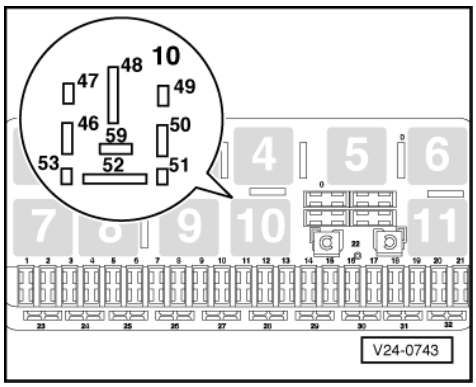
- Switch off the ignition.

If the specified values are not obtained:

- Test the wiring connections.

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

Testing actuation

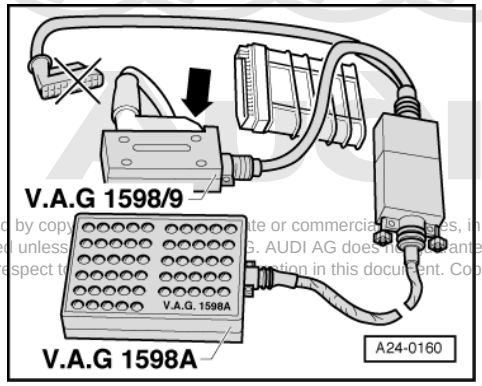


- -> Connect voltage tester V.A.G 1527 B as follows:

Fuel pump relay base	
Contact	Contact
46	47

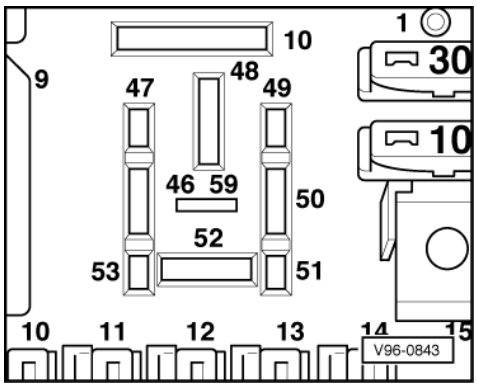
- Switch the ignition on.
  - The LED should come on for about 1 second.
- Operate the starter.
  - The LED should come on and remain on during starting.

If the LED does not light up:



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- -> With the ignition switched off, use adapter V.A.G 1598/9 to connect test box V.A.G 1598 A only to the plug connection of the engine control unit (control unit remains disconnected) => Page 40 .



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

Fuel pump relay base Contact	Test box V.A.G 1598 A Socket
47	24

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

1.14 - Testing injectors

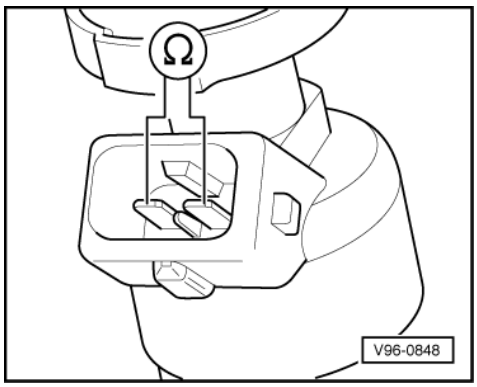
Special tools, testers and auxiliary equipment required

- Hand-held multimeter V.A.G 1526 or V.A.G 1526 A
- Voltage tester V.A.G 1527 B
- Adapter cable set V.A.G 1594 A
- Test box V.A.G 1598 A with adapter cable V.A.G 1598/9

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Testing internal resistance

- Unplug connector on injector to be checked.



- -> Set hand-held multimeter V.A.G 1526 to resistance measuring range and connect it to the contacts of the injector that is to be tested using test cables 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:

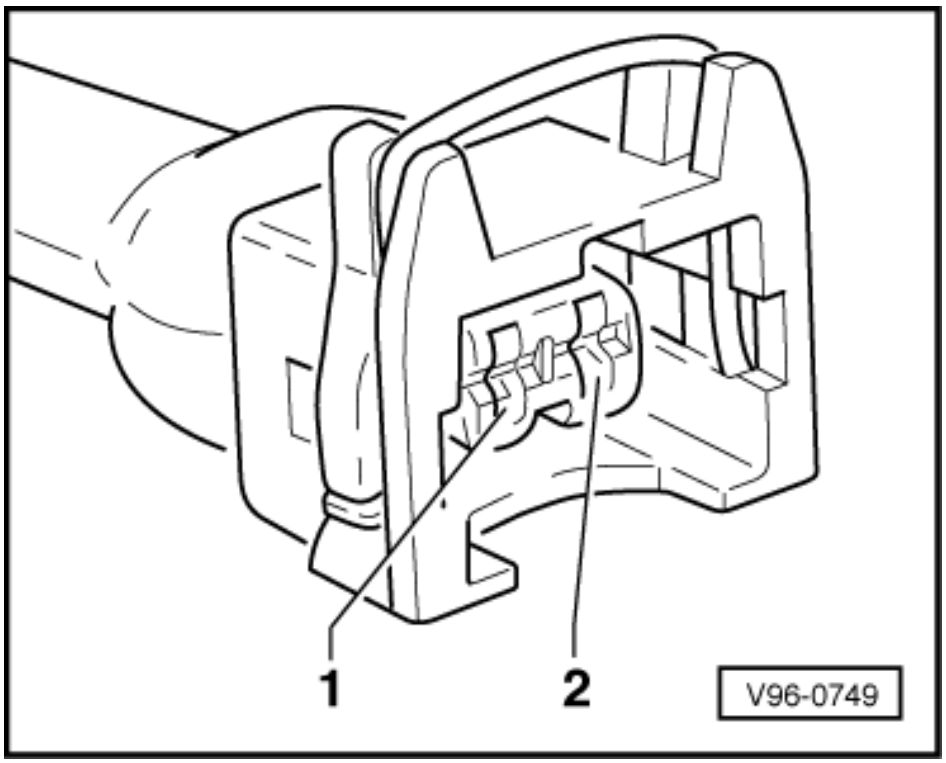
- Replace the injector => Page 54 .

Testing voltage supply

Test requirements:

- Fuse 28 OK
- Fuel pump relay OK, testing =>Page 47 .

- Unplug the connector at the cold start valve.
- Unplug the connector on the injector that is to be checked.



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

Injector plug connection Contact	Measure to
1	Engine earth

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

If the LED does not light up:

- Test the wiring connection between contact 1 and fuse 28 for open circuit using the current flow diagram.
- Rectify any open circuit in the wiring.

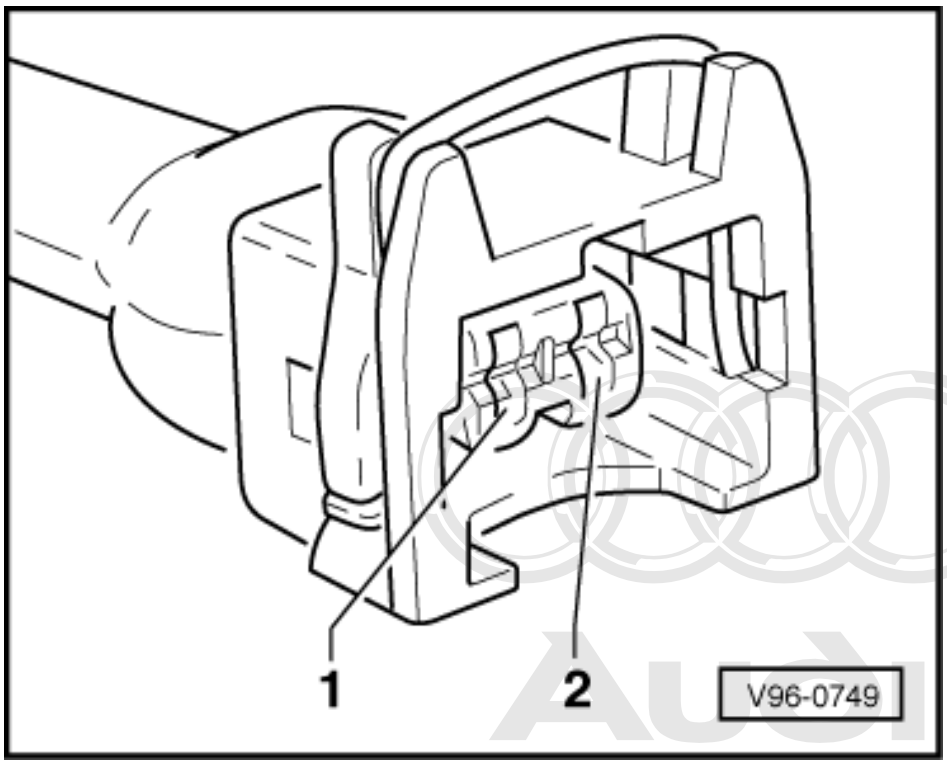
Testing actuation

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Test requirement:

- Hall sensor G40 OK; testing => Page 97 .

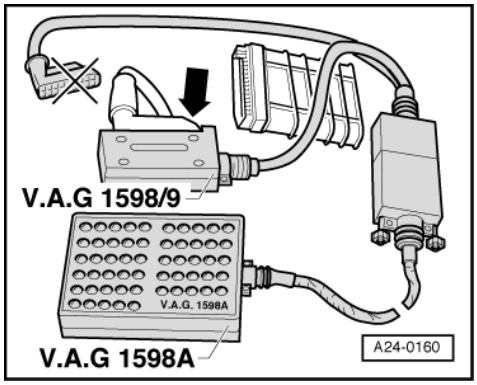
- Unplug the connector on the injector that is to be checked.



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

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

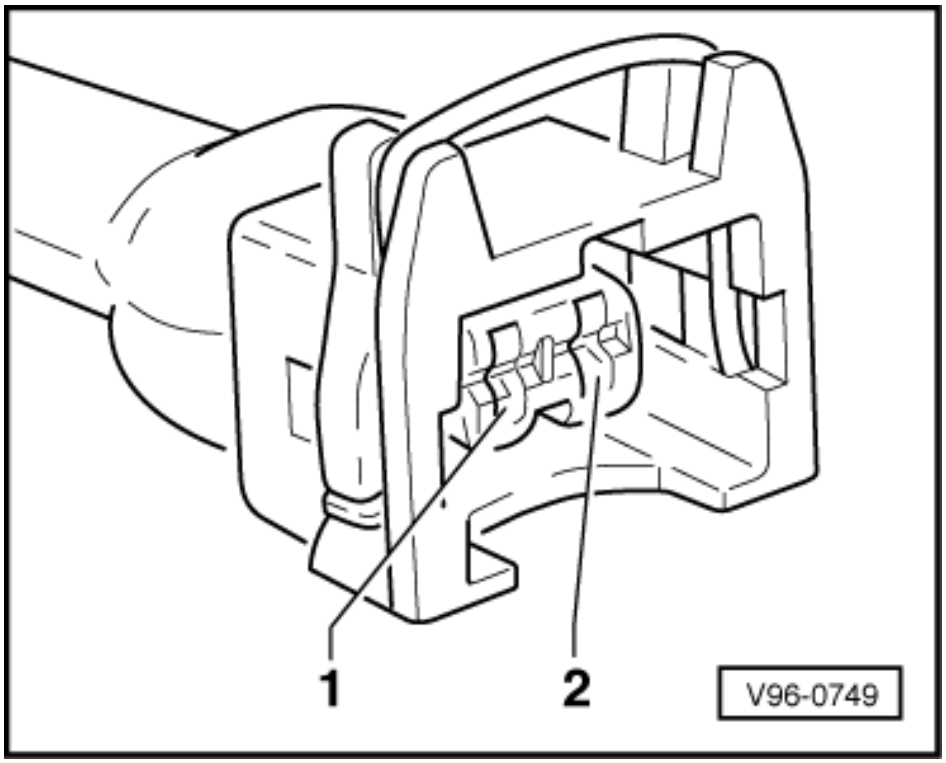
Injector plug connection Contact	Measure to
2	Battery positive



- 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, use adapter V.A.G 1598/9 to connect test box V.A.G 1598 A only to the plug connection of the engine control unit (control unit remains disconnected) => Page 40 .



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

Injector plug connection Contact	Test box V.A.G 1598 A Socket
2	2

- Rectify any open/short circuit as necessary.

If the wiring connection is OK, but the LED does not flash or comes on continuously:

- Test the voltage supply to the Digifant control unit => Page 106 .

Testing spray pattern and leak-tightness

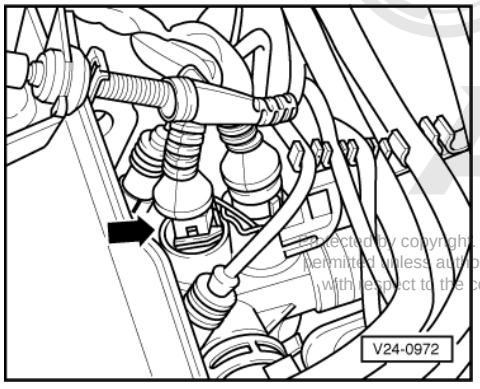
Special tools, testers and auxiliary equipment required

- Tester for fuel injection quantity V.A.G 1602

Test requirements:

- Connector unplugged from cold start valve

- Remove the fuel rail together with the injectors => Removing and installing injectors, Page 54 .

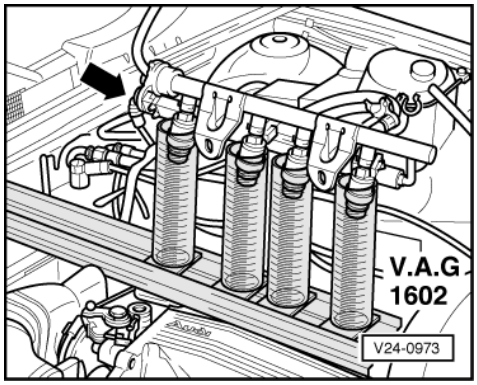


Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- -> Unplug connector from coolant temperature sensor -G62 -arrow-.
- Attach the fuel supply and return pipes to the fuel rail.
- If fitted, detach the cold start valve with connected fuel line from the intake manifold.

Note:

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



- -> Plug in the connector at the line guide and the connectors at the injectors.
- Insert the injectors in the openings of measuring device V.A.G 1602.
- Operate the starter.
  - The injectors should eject fuel with even pulsations
- Unplug the connectors from the injectors.
- Switch the ignition on for about 5 seconds and check the injectors for leaks.
  - No more than 2 drops per minute should flow out from each injector.

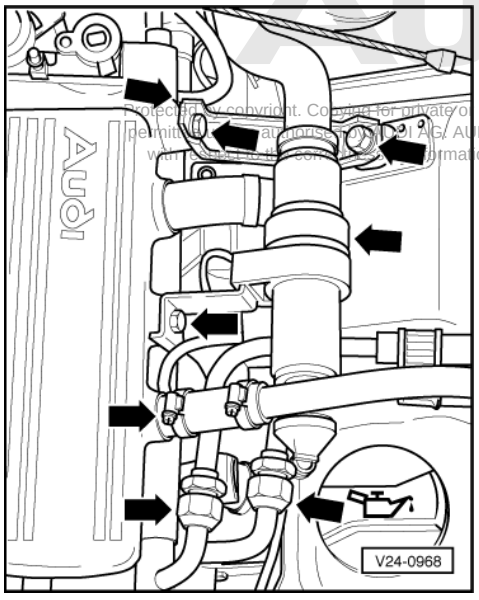
Notes:

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

1.15 - Removing and installing injectors

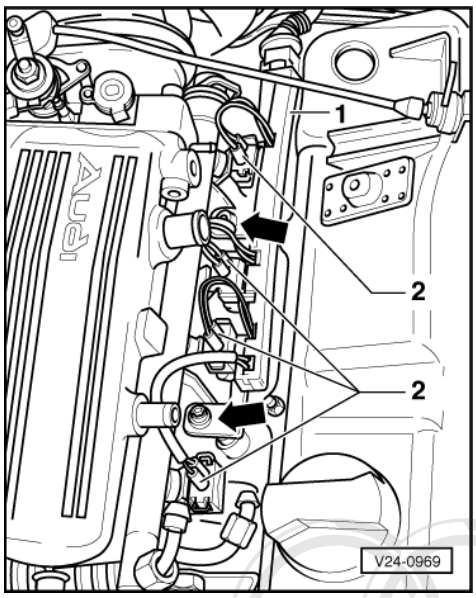
Removing

- Remove intake hose between air flow meter and throttle valve connection.
- Detach the throttle cable at the throttle valve connection, at the support bracket and at the fuel pipes (do not remove the push-in lock). Lay the throttle cable to the side.



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

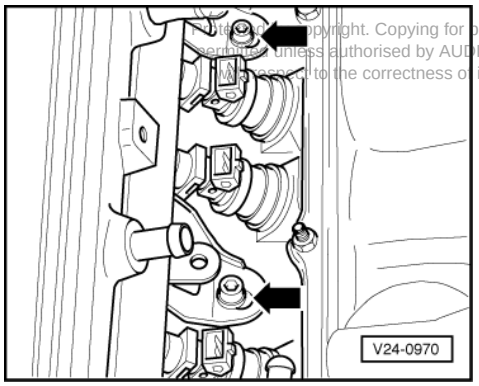
- -> Detach the vacuum line to the brake servo unit, the idling speed stabilisation valve with bracket and the strut of the intake manifold/cylinder head cover -arrows-.
- Disconnect the two thin vacuum lines from the throttle valve connection.
- Remove the heat shield for the throttle valve potentiometer at the side of the throttle valve connection.
- Detach the throttle valve connection at the intake manifold and place it to the rear.
- If fitted, unplug the connector at the cold start valve.



- Detach the cold start valve with connected fuel line from the intake manifold.

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

- Loosen the fuel supply and return pipes at the fuel rail.
- -> Unplug the connectors -2- at the injectors and the connector at the line guide for the injectors -1-.
- Unscrew the bolts -arrows- attaching the line guide for the injectors at the fuel rail.



Copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

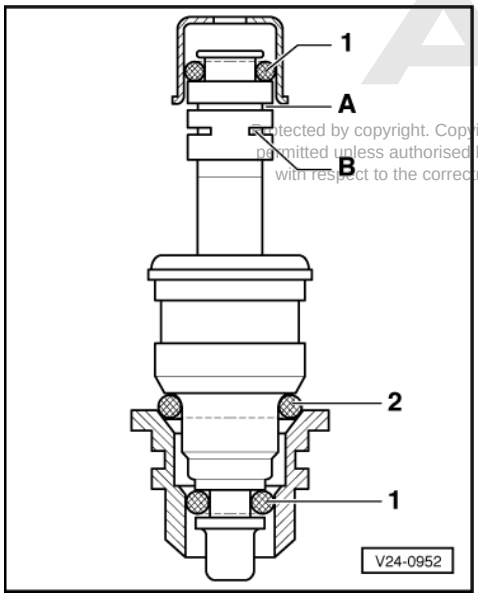
- Pull out the line guide for the injectors.
- Push on the retaining clips with Part No. 035 906 037 at the injector/fuel rail connection.
- -> Unscrew the fuel rail from the intake manifold -arrows-.

- Pull the fuel rail together with the injectors out of the intake manifold.
- Pull the retaining clips at the injector/fuel rail connection back off and pull the injectors out of the fuel rail.

Installing

Note:

Replace any damaged O-rings and the nozzle inserts (in the intake manifold) of the injectors.



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

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

Note:

Pushing the injectors into the fuel rail as far as the second notch -B- and securing them with the retaining clips will result in the injection noises being transmitted.

- Insert the fuel rail at the intake manifold with the secured injectors and press it home at the large O-ring -2-.

- Insert the securing bolts, press the fuel rail slightly towards the intake manifold and tighten the bolts.
- Remove the retaining clips at the injector/fuel line connection.

Note:

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

Remaining installation is carried out in the reverse order:

Tightening torques

Component	Nm
Idling stabilisation valve with bracket to intake manifold	10
Strut of intake manifold/cylinder head cover	10
Throttle valve connection to intake manifold	25
Fuel supply and return pipe to fuel rail	25

1.16 - Testing cold start valve -N17

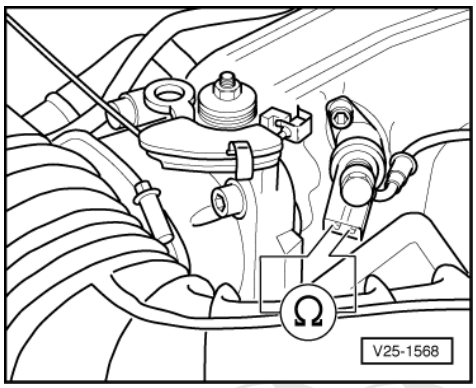
Special tools, testers and auxiliary equipment required

- 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 A with adapter cable V.A.G 1598/9

Testing internal resistance

Note:

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



- Unplug the connector at the cold start valve.
- -> Set hand-held multimeter V.A.G 1526 to resistance measuring range and connect to valve contacts using auxiliary cables from V.A.G 1594 A.
  - Specified value: 8 ... 15 ω

If the specification is not obtained:

- Replace the cold start valve.

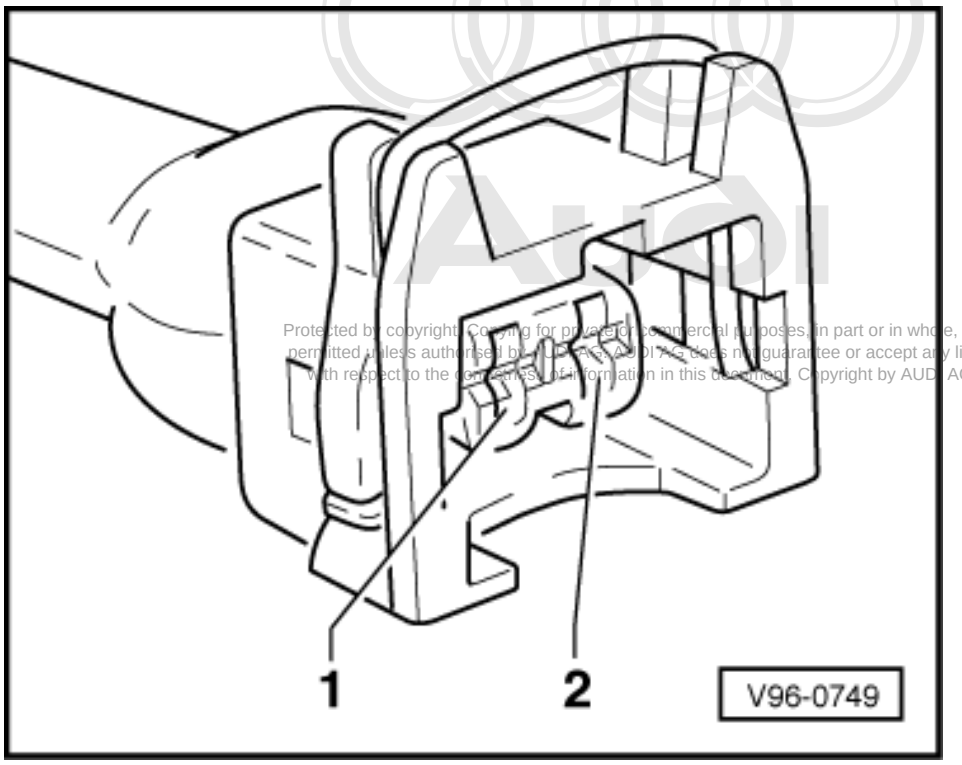
Testing voltage supply and actuation

Test requirements:

- Fuse 27 OK
- Start signal present; testing => Page 89

Copyright by AUDI AG. Reproduction or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- Unplug the connectors from all the injectors.
- Unplug the connector at the cold start valve.



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

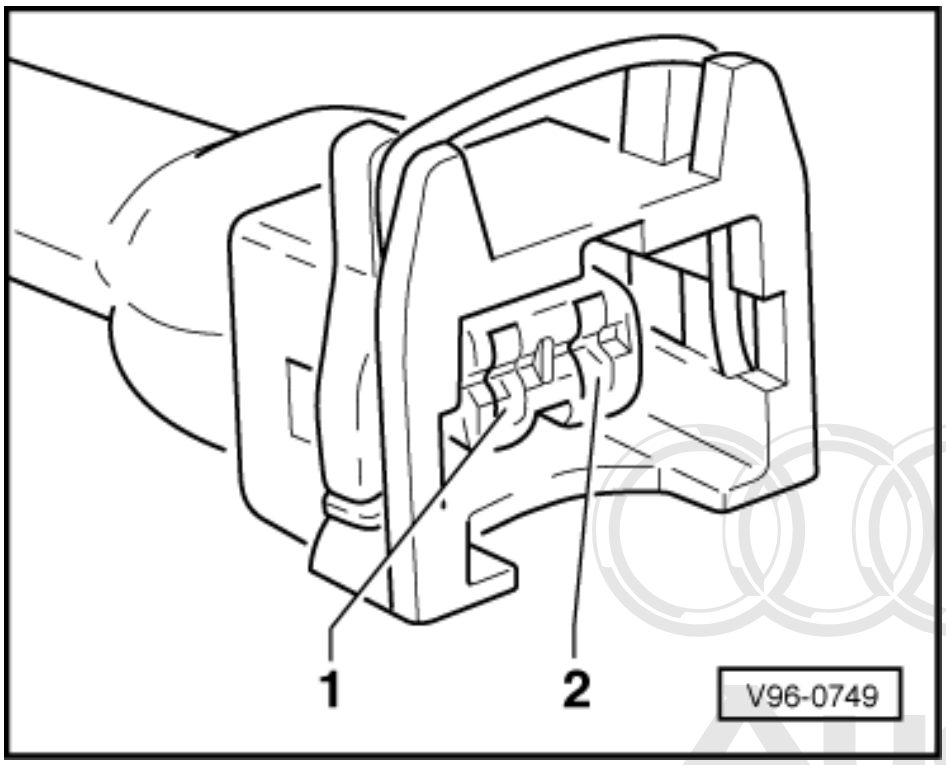
- -> Connect voltage tester V.A.G 1527 B as follows with auxiliary leads from V.A.G 1594 A:

Plug connection of -N17 Contact	Measure to
1	Engine earth

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

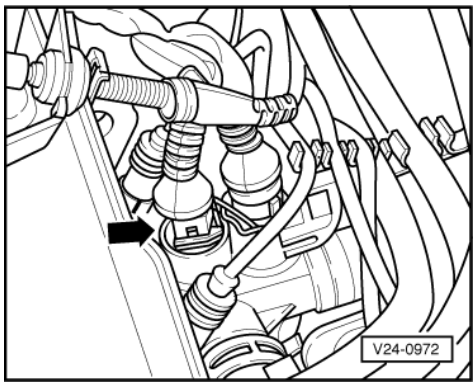
If the LED does not light up:

- Eliminate open wiring according to current flow diagram



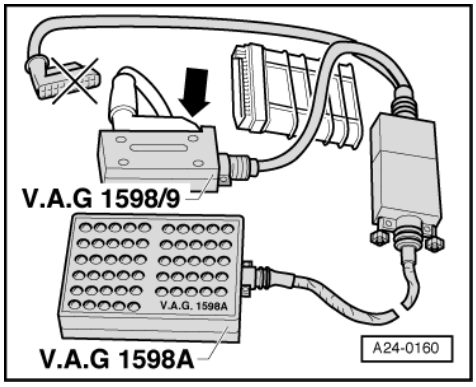
- -> Connect voltage tester V.A.G 1527 B between contacts 1 and 2 of the plug connection of the cold start valve using auxiliary cables from V.A.G 1594 A.

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

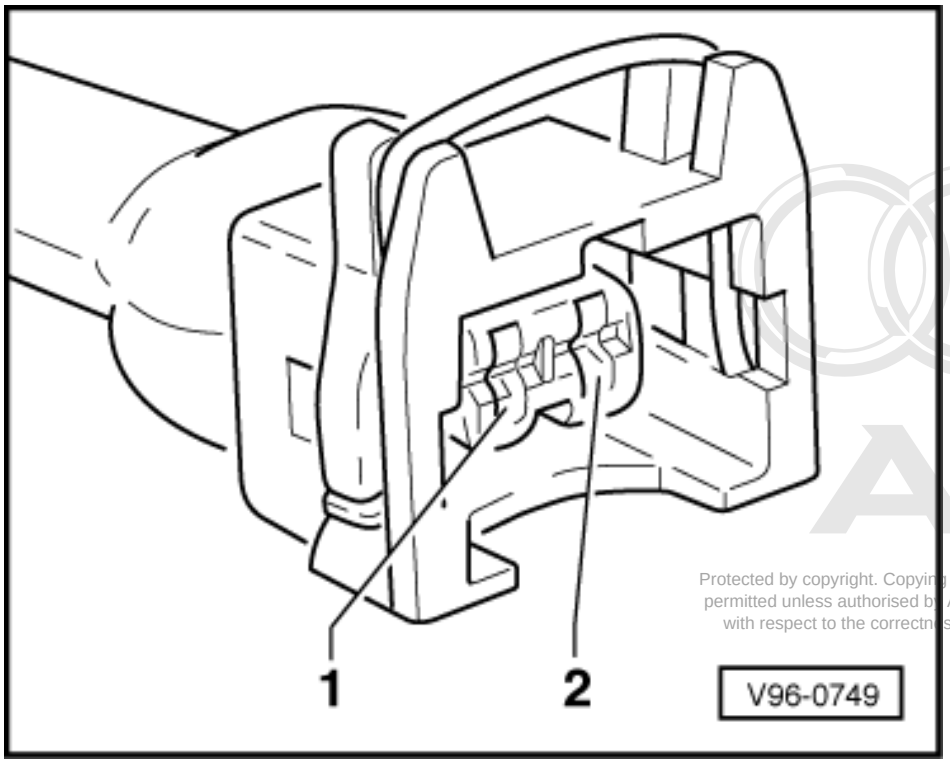


- -> Unplug the connector from the coolant temperature sensor -G62 -arrow-.
- Operate the starter.
  - The LED should light up for 1 ... 4 seconds.

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



- -> With the ignition switched off, use adapter V.A.G 1598/9 to connect test box V.A.G 1598 A only to the plug connection of the engine control unit (control unit remains disconnected) => Page 40 .



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

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

Plug connection of -N17 Contact	Test box V.A.G 1598 A Socket
2	5

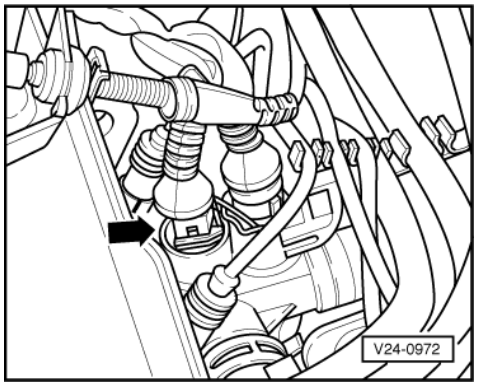
- If the wiring is OK, but the valve is not actuated, renew the Digifant control unit => Page 41 .

Notes:

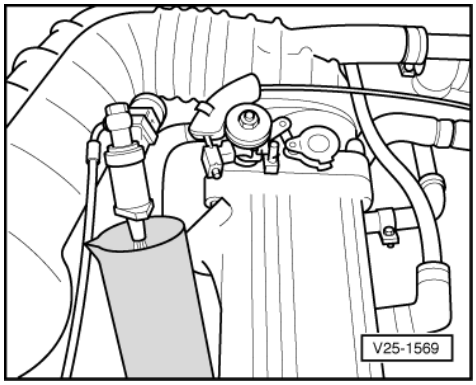
- After replacing the Digifant control unit, it is necessary to adapt the control unit and throttle valve potentiometer to each other => Page 79 .
- After replacing the Digifant control unit on vehicles fitted with an automatic gearbox, it is necessary to adapt the automatic gearbox control unit and the throttle valve potentiometer to each other => Page 79 .

Testing spray pattern, injection time and leak-tightness of cold start valve

- Unplug the connectors from all the injectors.



- -> Unplug the connector from coolant temperature sensor -G62 -arrow-.



- -> Detach the cold start valve with connected fuel line from the intake manifold.
- Loosen the fuel supply line at the fuel rail.
- Turn the cold start valve with the fuel supply line and hold the cold start valve in a measuring glass.

- Reconnect the fuel supply line to the fuel rail.
- Operate the starter.
  - The cold start valve should eject a pulsating spray in a uniform cone for 1 ... 4 seconds.
- Dry off the cold start valve at the nozzle.
  - No drop should drip from the cold start nozzle within 1 minute. The cold start valve must also not be moist on the outside.

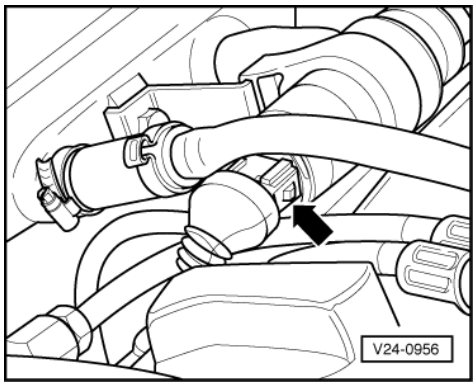
1.17 - Testing idling stabilisation valve -N71

Special tools, testers and auxiliary equipment required

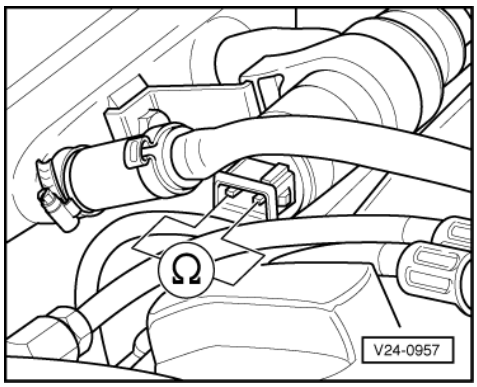
- Hand-held multimeter V.A.G 1526 or V.A.G 1526 A
- Voltage tester V.A.G 1527 B
- Fault reader V.A.G 1551 (or vehicle system tester V.A.G 1552) with cable V.A.G 1551/1
- Adapter cable set V.A.G 1594 A
- Test box V.A.G 1598 A with adapter cable V.A.G 1598/9

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Testing internal resistance



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



- -> Set hand-held multimeter V.A.G 1526 to resistance measuring range and connect it to the valve contacts using test leads from V.A.G 1594 A.
  - Specified value: 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:
- Replace the idling stabilisation valve.

Mechanical inspection
- Remove the idling stabilisation valve
- Check the piston slide for signs of scoring (visual inspection).

Note:
Never use a screwdriver or similar tool to move the piston slide when testing for freedom of movement.
- Plug in the connector at the removed idling stabilisation valve

- Switch the ignition on.
- Start final control diagnosis and actuate idling stabilisation valve -N71 => Page 9 .
- Check whether piston slide moves properly from stop to stop.

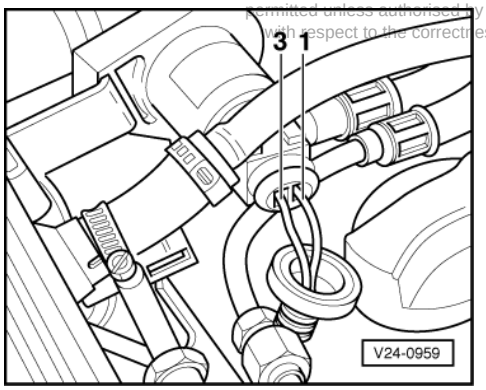
If scoring is found which impairs freedom of movement or if piston slide does not move freely (sticking, sluggish or not moving from stop to stop):
- Renew the idling stabilisation valve.

If the idling stabilisation valve does not react during the final control diagnosis:
- Test the voltage supply => Page 63 .

Testing voltage supply
Test requirement:
- Fuse 27 OK

- Push back the protective cap at the plug connection.

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



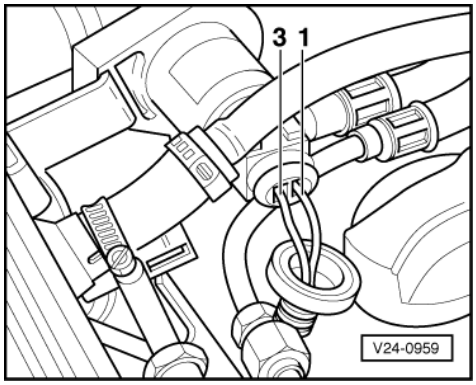
- -> Set hand-held multimeter V.A.G 1526 to voltage measuring range (20 V direct current) and connect it to engine earth and contact 1 using auxiliary leads from V.A.G 1594 A.
- Switch the ignition on.
  - Specified value: approx. battery voltage

If the specification is not obtained:

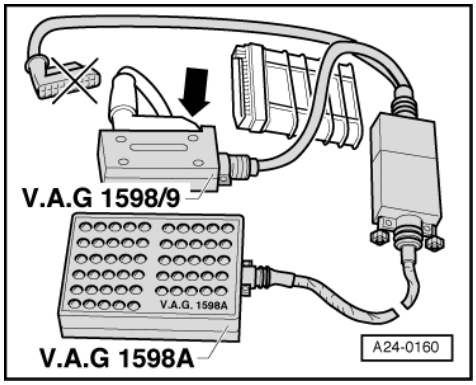
- Use current flow diagram to eliminate open circuit in wiring/short circuit.

Testing actuation of idling stabilisation valve

- Push back the protective cap at the plug connection.



- -> Connect voltage tester V.A.G 1527 B between contacts 1 (positive) and 3 (signal) of the plug connection.
- Connect fault reader V.A.G 1551 (V.A.G 1552) and select the control unit for engine electronics using "Address word" 01. The engine must not be running.
  (Connecting fault reader and selecting control unit for engine electronics => Page 1 .)
- Start final control diagnosis and actuate idling stabilisation valve -N71 => Page 9 .
  - The LED should flash.



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

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

- -> With the ignition switched off, use adapter V.A.G 1598/9 to connect test box V.A.G 1598 A only to the plug connection of the engine control unit (control unit remains disconnected) => Page 40 .

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

Plug connection of -N71 Contact	Test box V.A.G 1598 A Socket
3	23

- Rectify any open/short circuit as necessary.

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

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

Note:

The following test checks the fuel cut-off in overrun. If this test is OK then the acceleration and full throttle enrichment are also OK.

Special tools, testers and auxiliary equipment required

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

Reproduction or copying of this document in any form, in whole or in part, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

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

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

  -> Read measured value block, display group 001 => Page 17 .
- 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.

- Check display in display zone 4.
  - Specified value: 1.5 ... 3.5 ms
- Increase the engine speed by revving up to at least 3000 rpm (=> display zone 2) and release the throttle mechanism again.
- Read off the injection time in display zone 4:
  - Specified value:
    The injection time should rise, drop off to 0.0 ms and rise again to the reading previously obtained.

If the readout 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 79
- Adapt the automatic gearbox control unit -J217 and the throttle valve potentiometer to each other => Page 79
- Test the throttle valve potentiometer => Page 75 .

1.19 - Testing air flow meter -G19

Note:

If the air flow meter is recognised as faulty then 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 cable V.A.G 1551/1
- Adapter cable set V.A.G 1594 A
- Test box V.A.G 1598 A with adapter V.A.G 1598/9

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

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

  -> Read measured value block, display group 002 => Page 19 .

- Do not continue with the test until the coolant temperature has reached 80 °C.

- Check the display in display zone 4.
  - Specified value: 14 ... 25 %
- Press the ⇒key.

-> Readout 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 attained or exceeded:

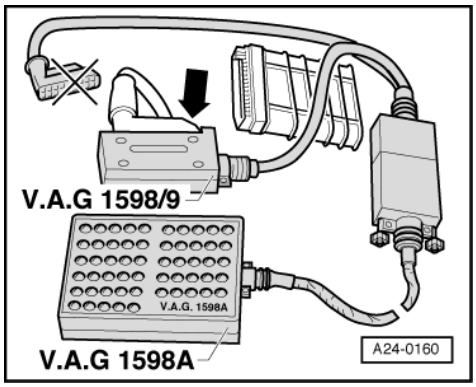
- Test the idling stabilisation valve => Page 61 .
- Test the intake air system for leaks.
- If no faults are found, continue with the test described below.

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

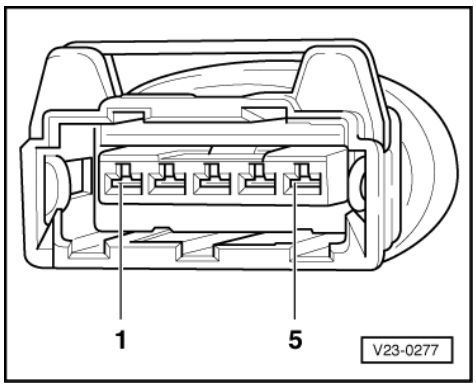
Notes:

- 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 plug connection at the air flow meter is not assigned.

Testing wiring connection



- -> With the ignition switched off, use adapter V.A.G 1598/9 to connect test box V.A.G 1598 A only to the plug connection of the engine control unit (control unit remains disconnected) => Page 40 .



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

Plug connection of -G19 Contact	Test box V.A.G 1598 A Socket
2	13

Plug connection of -G19 Contact	Test box V.A.G 1598 A Socket
3	15
4	28

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

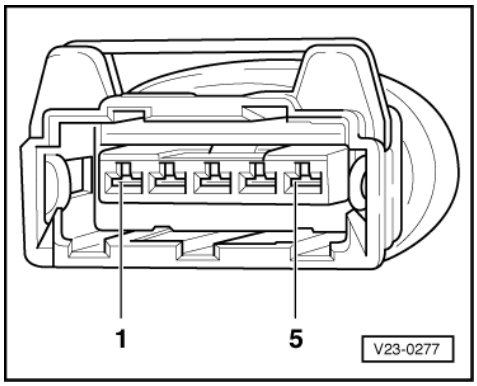
Testing voltage supply

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Test requirements:

- Wiring OK
- Engine control unit connected

- Unplug the 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 plug connection of the air flow meter using auxiliary cables from V.A.G 1594 A.
- Switch the ignition on.
  - Specified value: approx. 5 V.

If the specification is not obtained:

- Replace the Digifant control unit => Page 41 .

Notes:

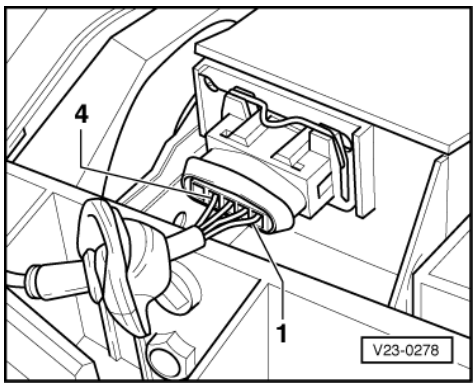
- After replacing the Digifant control unit, it is necessary to adapt the control unit and throttle valve potentiometer to each other => Page 79 .
- After replacing the Digifant control unit on vehicles fitted with an automatic gearbox, it is necessary to adapt the automatic gearbox control unit and the throttle valve potentiometer to each other => Page 79 .

Testing signal voltage

Test requirements:

- Wiring OK
- Air mass meter connected

- Push back the rubber grommet at the plug connection of the 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 plug connection of the air flow meter using auxiliary cables from V.A.G 1594 A.
- Start the engine and run it at idling speed.
  - Specified value: 0.5 ... 1.5 V
- Increase the engine speed and observe the change in voltage.
  - Specified value:
    With increasing engine speed, and thus increasing air throughput, the signal voltage increases proportionally up to approx. 4.5 V at maximum revs.

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

- Renew the air mass meter.

2 - Testing lambda control

2.1 - Testing lambda control

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 (λ = 1.0), there is a voltage jump from 0.7...1.1 V to 0.0...0.3 V or vice versa.

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Because of the sharp voltage jump the lambda control cannot maintain a constant ideal mixture composition of λ = 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 recognised a fault in the injection system => interrogate fault memory).
- 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 stored regarding lambda probe. Rectify any present faults and erase the fault memory as necessary.

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

- Ambient temperature (summer or winter)
- Operating conditions after starting
- Operation of probe heater

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 cable V.A.G 1551/1

Test vehicle under cold start conditions:

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

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

  -> Read measured value block, display group 001 => Page 17 .

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

Readout if engine cold or lambda control not running: 0.45...0.50 V.

- Carry out a road test.

Attention
Secure the fault reader to the rear seat and operate it from this location. Always observe the relevant safety precautions when doing this.
Page 28

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not
allowed 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.

- Observe the readout in display zone 3.

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

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

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 69

2.3 - Testing lambda probe -G39 and lambda control

Note:

A fault which relates to the lambda controlis not stored in the fault memory. It is only possible to detect operation of the lambda control by connecting a disturbance variable:

=> Maintenance Booklet

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 cable V.A.G 1551/1
- Adapter cable set V.A.G 1594 A
- Test box V.A.G 1598 A with adapter V.A.G 1598/9

Test requirements:

- No leaks in exhaust system between catalytic converter and cylinder head.
- Lambda probe heater OK, testing => Page 70

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

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

  -> Read measured value block, display group 001 => Page 17 .
- Do not proceed with the test until the following conditions are met:
  - Readout in display zone 1 greater than 80 oC
- Read off the value in display zone 3:
  - Specified value: varies between 0.1 and 1.1 V.
- If the lambda probe voltage fluctuates very slowly, test the lambda probe heating => Page 70 .
- 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. Test the wiring connection => Page 69 .
- Press the ⇒key.

-> Readout on display:

```
Rapid data transfer      HELP
Select function XX
```

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

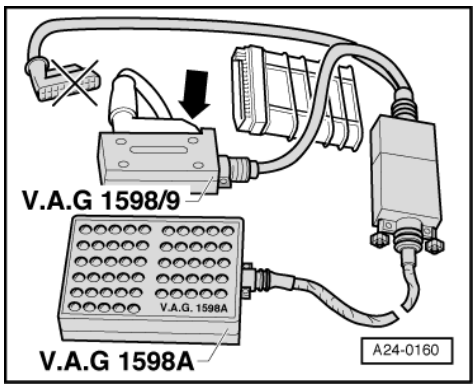
If the specification is not obtained:

- Test the lambda probe => Page 70

Testing wiring connection

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

If the specification is not obtained:



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. Otherwise liability to compensation or prosecution. All rights reserved with respect to the correctness of information in this document. Copyright by AUDI AG.

- -> With the ignition switched off, use adapter V.A.G 1598/9 to connect test box V.A.G 1598 A only to the plug connection of the engine control unit (control unit remains disconnected) => Page 40 .

- Test the wiring connection of lambda probe -G39 to socket 16 on test box V.A.G 1598 A for open circuit.
- Rectify any open circuit in the wiring.

Testing lambda probe

- Switch off the ignition.
- Separate the plug connection for the signal wire of the lambda probe => -Item 31 .
- Set hand-held multimeter V.A.G 1526 to resistance measuring range and connect it to the plug connection to the lambda probe and engine earth using test cables from V.A.G 1594 A.
  - Specified value: ∞ ω

If the specification is not obtained:

- Replace the new Lambda probe.

2.4 - Testing lambda probe heater -Z19

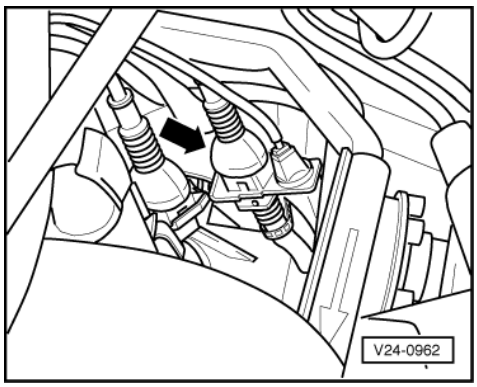
Special tools, testers and auxiliary equipment required

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

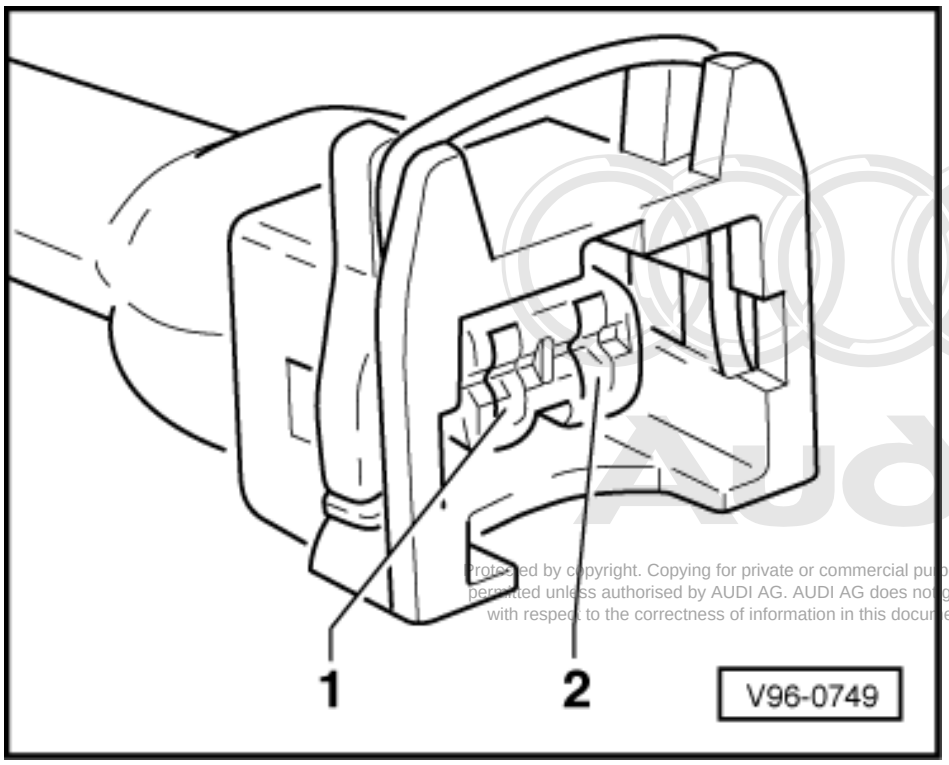
Test requirements:

- Fuse 25 OK
- Fuel pump relay OK
- Engine cold

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



- -> Separate the plug connection to the lambda probe heater.



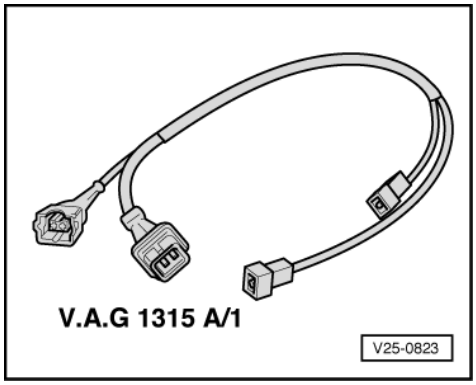
Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- -> 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 plug connection to the engine control unit using auxiliary cables from V.A.G 1594 A.
- Start the engine and run it at idling speed.
  - Specified value: approx. battery voltage

If the specification is not obtained:

- Rectify open circuit in wiring.

If the specification is obtained:



- -> Connect the test cable V.A.G 1315 A/1 to the plug connection for the lambda probe heater.
- Set the hand-held multimeter V.A.G 1526 to the current measuring range (10 A) and connect it to the terminals of the test cable V.A.G 1315 A/1 using the auxiliary cables from V.A.G 1594 A.
- Start the engine and run it at idling speed.
  - Specified value: 0.5 ... 3.0 (the current decreases as the lambda probe warms up)

If the specification is not obtained:

- Test the lambda probe => Page 70

3 - Testing tank breather

3.1 - Testing tank breather

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

Notes:

- Solenoid valve 1 for the activated charcoal filter is closed under the following conditions:
  At idling speed and while the lambda control is inactive.
- Fitting location => Item 30 .

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 cable V.A.G 1551/1
- Adapter cable set V.A.G 1594 A
- Test box V.A.G 1598 A with adapter V.A.G 1598/9

Testing for leaks

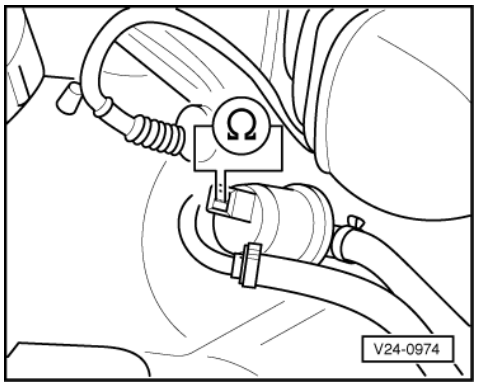
ACF solenoid valve -N80 remains closed when deenergised.

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- Disconnect hoses from ACF valve but leave the electrical connector plugged in.
- Start final control diagnosis and actuate ACF valve => Page 9.
- While final control diagnosis is running, blow into solenoid valve to check whether it opens properly. If necessary, replace the ACF valve.

Testing internal resistance

- Unplug the connector at the ACF valve.



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

If the specification is not obtained:

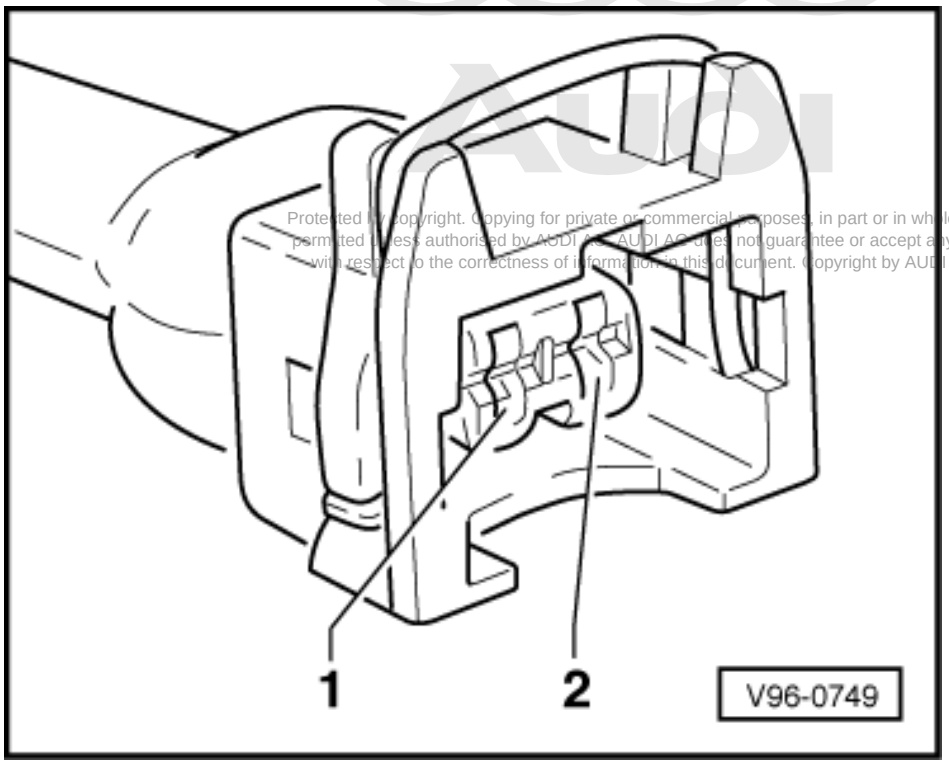
- Fit a new ACF valve.

Testing voltage supply

Test requirements:

- Fuse 27 OK

- Unplug the connector at the ACF valve.



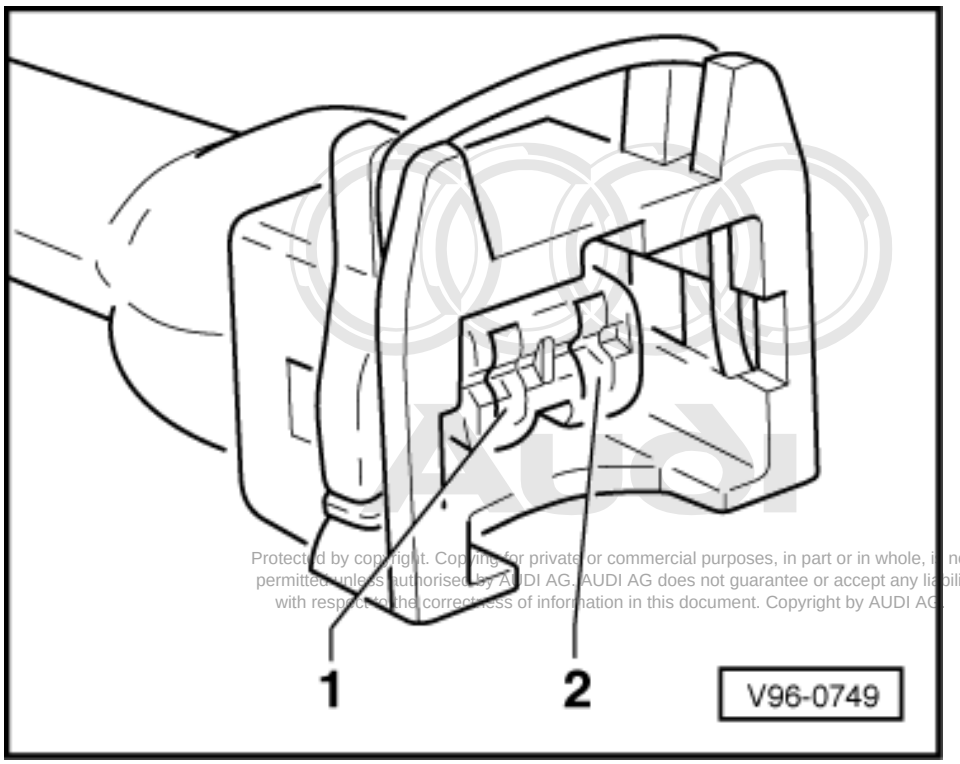
Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- -> Connect voltage tester V.A.G 1527 B between contact 1 (positive) of the plug connection of the ACF valve and engine earth using auxiliary cables from V.A.G 1594 A.
- Switch the ignition on.
  - The LED should light up.

If the LED does not light up:

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

Testing actuation

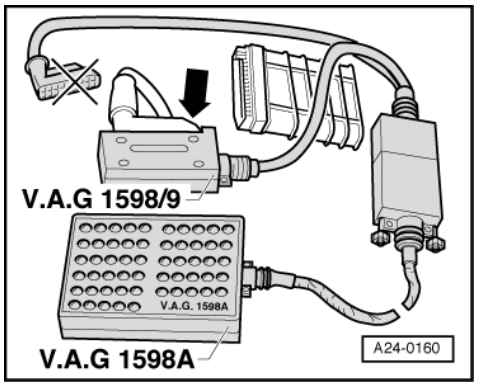


Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Test requirement:

- Fuse 27 OK

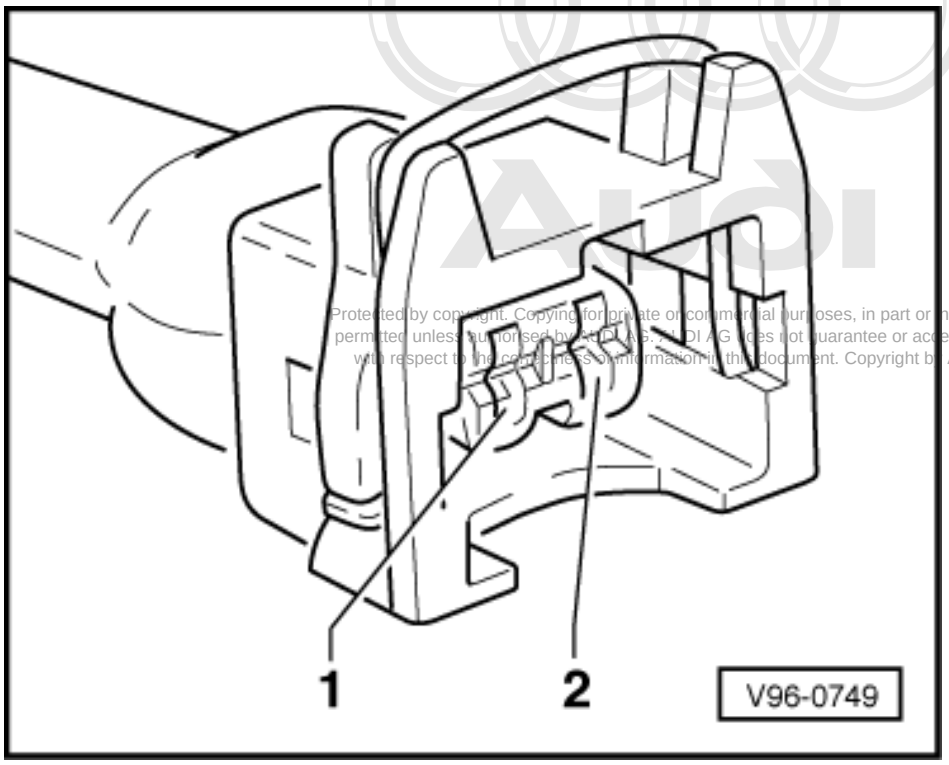
- Unplug the connector at the ACF valve.
- -> Connect voltage tester V.A.G 1527 B between the contacts of the plug connection of the ACF valve using auxiliary cables from V.A.G 1594 A.
- Connect fault reader V.A.G 1551 (V.A.G 1552) and select the control unit for engine electronics using "Address word" 01. The engine must not be running.
  (Connecting fault reader and selecting control unit for engine electronics => Page 1 .)
- Start final control diagnosis and actuate the ACF valve => Page 9 .



- The LED should flash.

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

- -> With the ignition switched off, use adapter V.A.G 1598/9 to connect test box V.A.G 1598 A only to the plug connection of the engine control unit (control unit remains disconnected) => Page 40 .



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

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

Plug connection of -N80 Contact	Test box V.A.G 1598 A Socket
2	26

- Rectify any open/short circuit as necessary.
- If the wiring is OK, replace the Digifant control unit => Page 41 .

Notes:

- After replacing the Digifant control unit, it is necessary to adapt the control unit and throttle valve potentiometer to each other => Page 79 .
- 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 79 .

4 - Testing throttle valve potentiometer -G69

4.1 - Testing throttle valve potentiometer -G69

The throttle valve potentiometer for vehicles fitted with a manual gearbox features a 3-pin plug connection. The Digifant control unit is supplied with the following information:

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

Throttle valve fully open.
-Fuel injection quantity for full load enrichment

The throttle valve potentiometer on vehicles fitted with an automatic gearbox features a 4-pin plug connection. Testing the throttle valve potentiometer:

=> Automatic gearbox 097; Repair group 01; Electrical test of automatic gearbox 097 Electrical test of automatic gearbox 097

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 cable V.A.G 1551/1
- Adapter cable set V.A.G 1594 A
- Test box V.A.G 1598 A with adapter V.A.G 1598/9

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

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

  -> Read measured value block, display group 002 => Page 19 .
- Read off the throttle valve angle in display zone 3:
  - Specification for accelerator not depressed: 0.0 ... 2.0 <o
  - Specification for accelerator fully depressed: Greater than 75.0 <o

Note:

When the throttle valve is opened smoothly the readout in display zone 3 should rise evenly without interruption.

- Press the ⇒key.

-> Readout on display:

```
Rapid data transfer      HELP
Select function XX
```

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

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

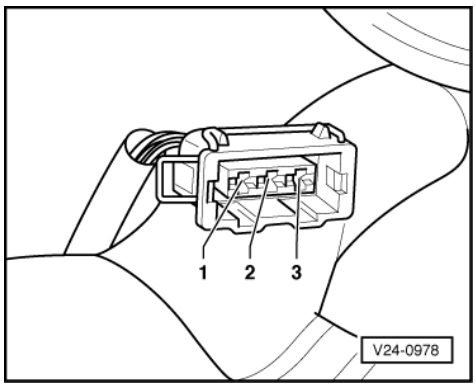
If the specified values are not obtained:

- Continue the test according to the table:

Readout	Possible cause of fault	Continue with
Remains at 0.0 <o when throttle valve is opened and at full throttle	Open circuit or short circuit to earth caused by: Throttle valve potentiometer, cable, Digifant control unit	Test A => Page 76
Already greater than 75.0 <o during idling	Short to positive caused by: Throttle valve potentiometer, cable, Digifant control unit	Test B => Page 78

Test A

- Unplug the connector at the throttle valve potentiometer.

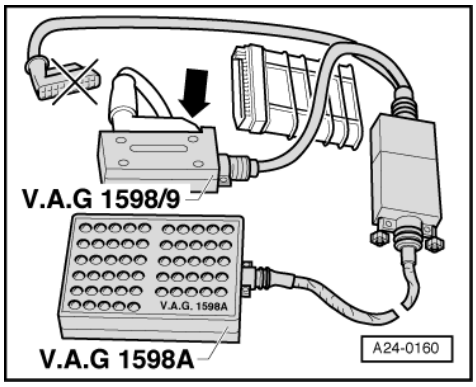


- -> Use auxiliary cables from V.A.G 1594 A to bridge contacts 2 and 1 in the plug connection of the throttle valve potentiometer.

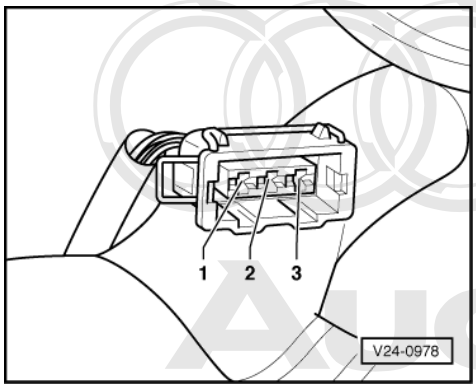
If the readout rises to more than 75.0 <o:

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

If the readout remains at 0.0 <o:



- -> With the ignition switched off, use adapter V.A.G 1598/9 to connect test box V.A.G 1598 A only to the plug connection of the engine control unit (control unit remains disconnected) => Page 40 .



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

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Plug connection of -G69 Contact	Test box V.A.G 1598 A Socket
1	34 (positive)
2	33 (signal)

Plug connection of -G69 Contact	Test box V.A.G 1598 A Socket
3	28 (earth)

- Rectify any open/short circuit as necessary.
- If the wiring is OK, replace the Digifant control unit => Page 41 .
- Interrogate the 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 79 .
- 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 79 .

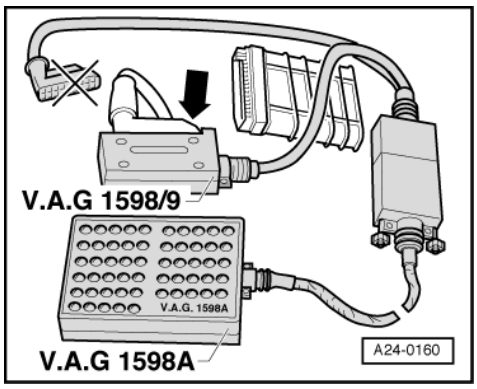
Check B

- Unplug the connector at the throttle valve potentiometer.

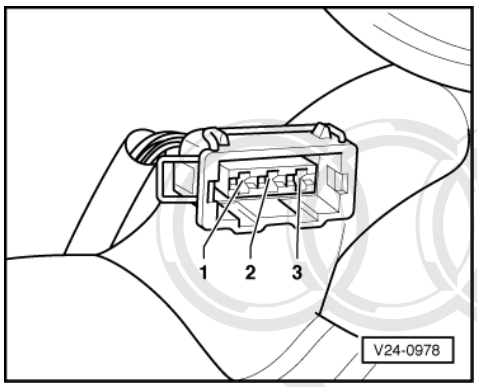
If the readout drops to 0.0 <o:

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

If the readout remains above 75.0 <o:



- -> With the ignition switched off, use adapter V.A.G 1598/9 to connect test box V.A.G 1598 A only to the plug connection of the engine control unit (control unit remains disconnected) => Page 40 .



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

Plug connection of -G69 Contact	Test box V.A.G 1598 A Socket
1	34 (positive)

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Plug connection of -G69 Contact	Test box V.A.G 1598 A Socket
2	33 (signal)
3	28 (earth)

- Rectify any open/short circuit as necessary.
- If the wiring is OK, replace the Digifant control unit => Page 41 .
- Interrogate the 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 79 .
- 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 79 .

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

Note:

The Digifant control unit and the throttle valve potentiometer need to be adapted to each other after performing the following work:

- Replacing Digifant control unit
- Removing and installing or replacing the throttle valve potentiometer

- Plug in the connector at the throttle valve potentiometer.
- Initiate basic setting => Page 11 .
- On vehicles fitted with an automatic gearbox, it is also necessary to adapt the automatic gearbox control unit and the throttle valve potentiometer to each other => Page 79 .

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

Note:

The automatic gearbox control unit and the throttle valve potentiometer need to be adapted to each other after performing the following work:

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- Replacing the automatic gearbox control unit
- Removing and installing or replacing the throttle valve potentiometer

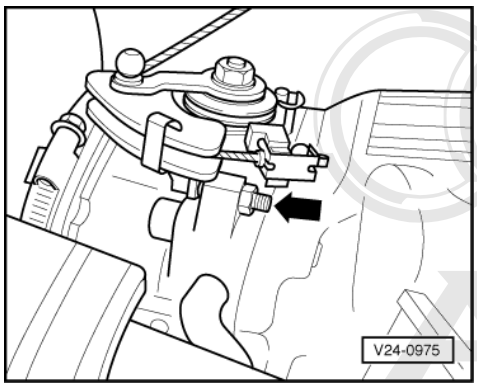
- Plug in the connector at the throttle valve potentiometer.
- Initiate basic setting:

=> Automatic gearbox 097; Repair group 01; Self-diagnosis of automatic gearbox 097; Initiating basic setting
Self-diagnosis of automatic gearbox 097 Initiating basic setting

4.4 - Basic setting of the throttle valve

Note:

The limiting screw is factory-set and its position must not be altered. If the screw is turned inadvertently, carry out the setting procedure described below and then lock the screw again with locking paint.



- -> Unscrew the limiting screw -arrow- until there is a gap between the limiting screw and the stop.
- Then screw the limiting screw back in until it touches the stop.

Copyright by AUDI AG. Duplication or distribution, for any purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Note:

Place a thin sheet of paper between the limiting screw and the stop in order to accurately determine the actual contact point of the limiting screw and the stop. Keep moving the piece of paper whilst turning the limiting screw at the same time in order to determine the exact contact point.

- Screw in the limiting screw a further 1/2 turn from the established contact point.
- Mark the screw with locking paint.
- Test the idling speed => Page 43

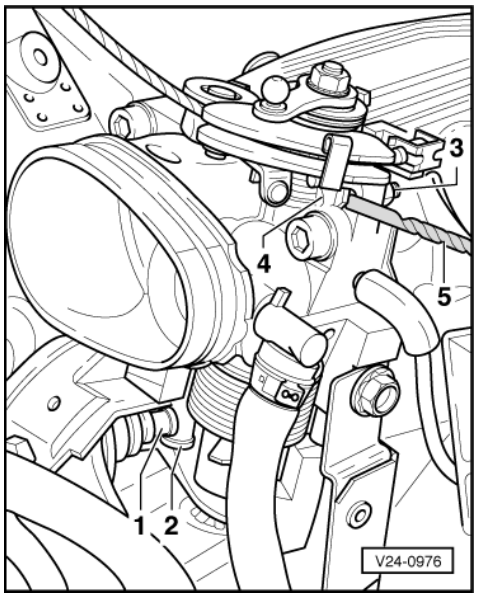
4.5 - Testing and adjusting closing damper

Vehicles with manual gearbox

Test requirement:

- Basic setting of throttle valve OK

Testing



- -> Open throttle valve stage I and close it again until plunger -1- of the closing damper touches roller -2-.
- In this position, check the size of the gap between limiting screw -3- and throttle valve lever -4- with a drill bit.
  - Specified value: 2.5 ... 3.5 mm

Adjusting

- Clamp a ø 3 mm drill bit between limiting screw -3- and throttle valve lever -4-.
- Set the closing damper so that the plunger -1- of the closing damper is just touching the roller -2-.

5 - Testing intake air preheater

5.1 - Testing intake air preheater

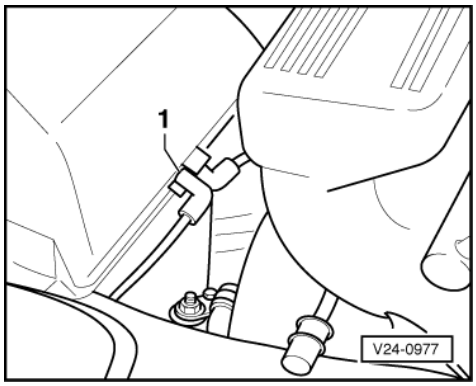
Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Test requirement:

- Engine cold (intake air temperature below + 20 oC).

- Lift the air cleaner cover with the air flow meter and take out the filter element.
- Check the position and ease of movement of the control flap in the air cleaner housing.
  - The control flap should seal off the warm air connection.
- Start the engine and run it at idling speed.
  - The control flap should seal off the cold air connection.

If the control flap does not react as described:



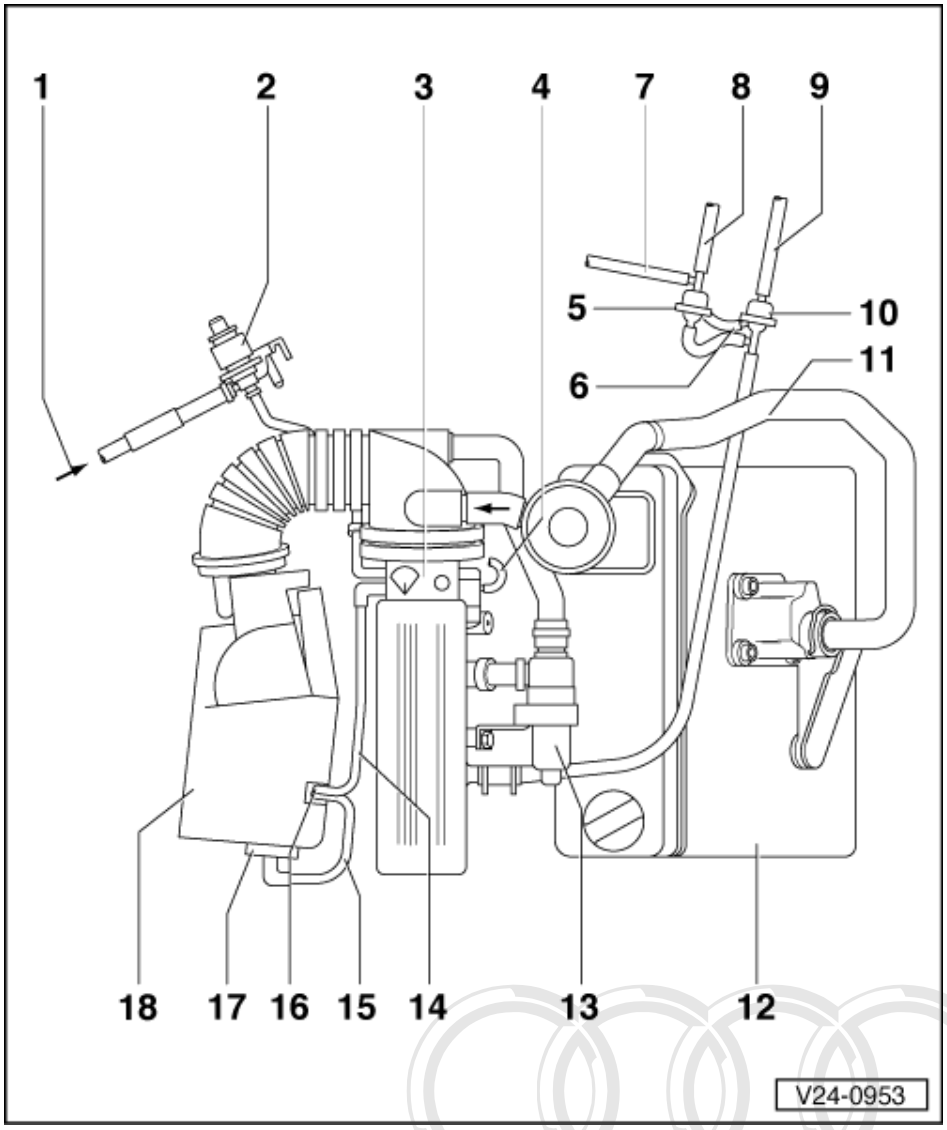
- -> Disconnect the vacuum lines at the thermostat -1- and join them together.
  - If the warm air connection remains closed then the vacuum unit is faulty.
  - If the control flap now seals off the cold air connection then the thermostat is faulty.

Note:

When the engine is running, the position of the control flap depends on the temperature of the thermostat:

Temperature	Position
Below 20 oC	Thermostat open
	Cold air connection closed
Above 30 oC	Thermostat closed
	Warm air connection closed

5.2 - Connection diagram for vacuum hoses

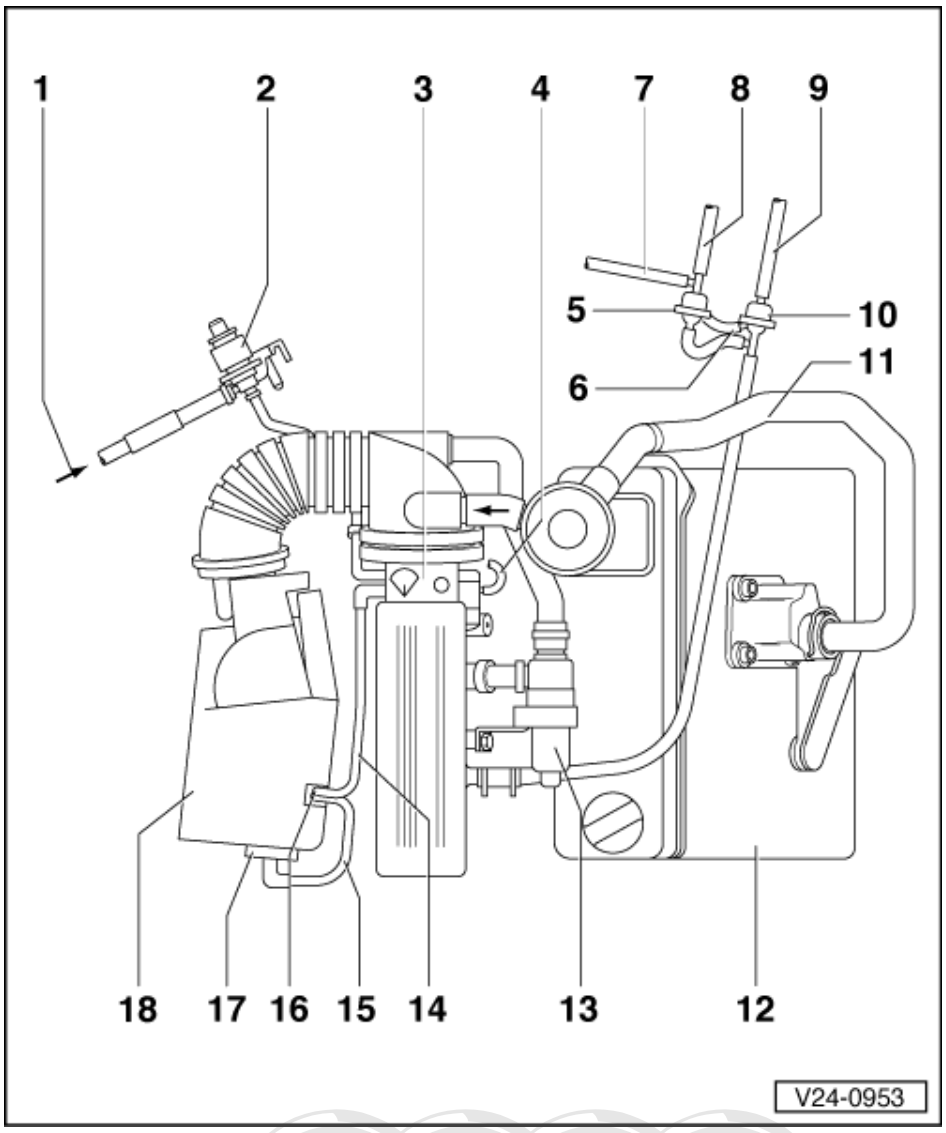


1 From activated charcoal filter
- Servicing activated charcoal filter

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

2 Solenoid valve 1 for activated charcoal filter -N80
3 Throttle valve connection
4 To fuel pressure regulator
5 Non-return valve
- For air conditioner

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



6 Connection for differential lock
- Only on 4WD models
- Dummy plug on FWD models

7 To two-way valve
- For fresh air/recirculated air flap

8 To vacuum reservoir
- For air conditioner

9 To brake servo

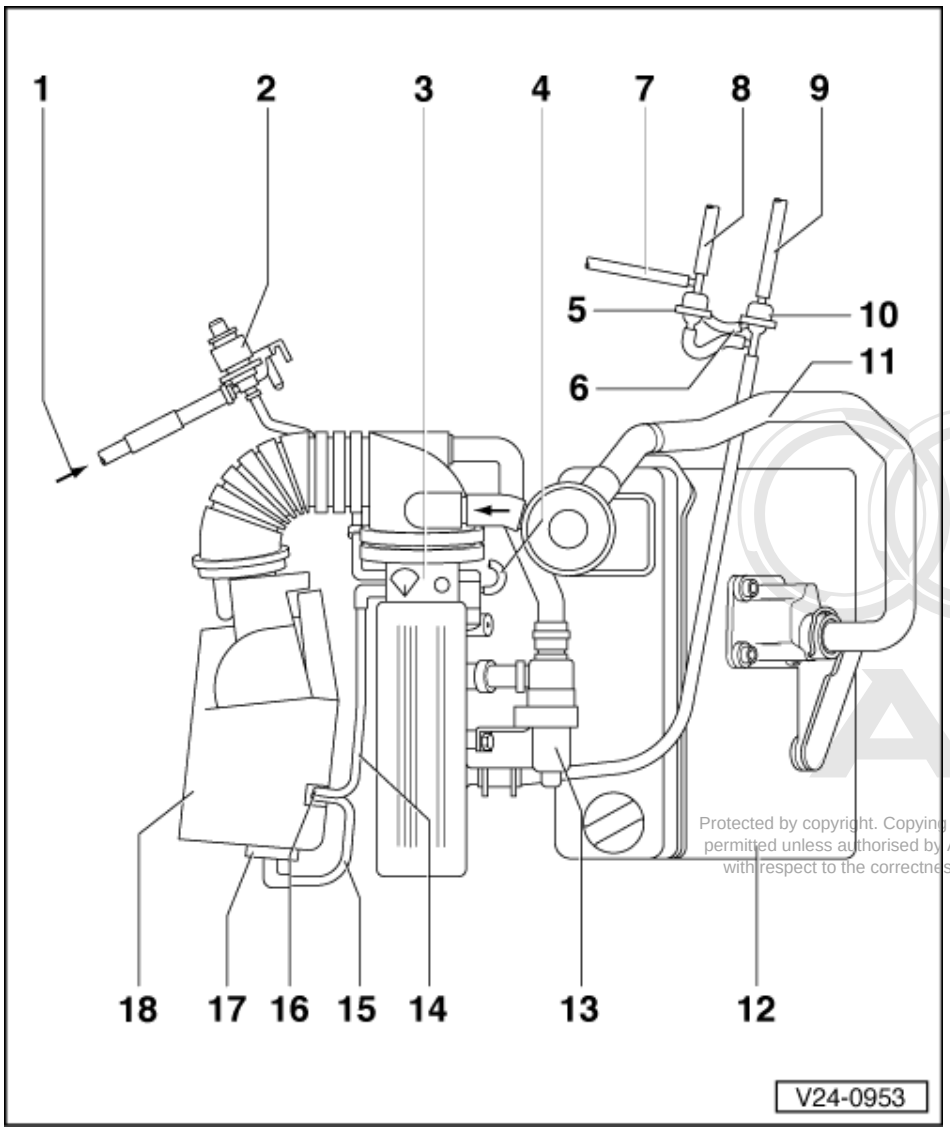
10 Non-return valve

11 Crankcase breather

12 Cylinder block

13 Idling stabilisation valve -N71

Reproduction or copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

14 From throttle valve connection to thermostat for intake air preheater

15 From thermostat to vacuum unit for intake air preheater

16 Thermostat

- For intake air preheater
- Fitting location: brass hose connection to vacuum unit for intake air preheater
- Testing intake air preheater => Page 81

17 Vacuum unit

- For intake air preheater

18 Air cleaner

6 - Testing auxiliary signals

6.1 - Testing auxiliary signals

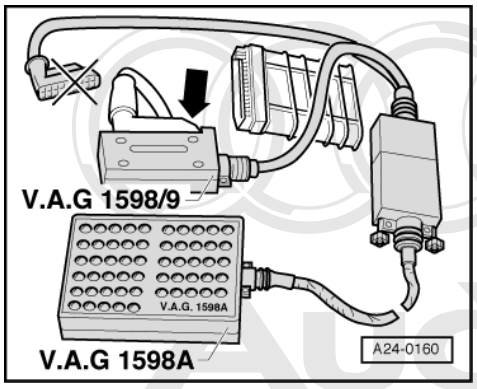
6.2 - Testing engine speed increase for air conditioner

Note:

The Digifant control unit opens the idling stabilisation valve slightly more if voltage is supplied to pin 32 of the Digifant control unit by the air conditioner. This is the case if:

- The AC button is pressed on a manual air conditioner;
- Higher heating or cooling power 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 cable set V.A.G 1594 A
- Test box V.A.G 1598 A with adapter V.A.G 1598/9

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- -> With the ignition switched off, use adapter V.A.G 1598/9 to connect test box V.A.G 1598 A only to the plug connection of the engine control unit (control unit remains disconnected) => Page 40 .

- Set hand-held multimeter V.A.G 1526 to voltage measuring range (20 V direct current) and connect it to contacts 32 and 35 using auxiliary leads from V.A.G 1594 A.
- Switch the ignition on.
- Switch off the air conditioner.
  - Specified value: less than 1.5 V
- Switch on the air conditioner:
  - Manually controlled air conditioner: press the "AC" button.
  - Fully automatically controlled air conditioner: press the "AUTO" button, set the temperature to "LO" and the blower speed to "HI".
  - Specified value: greater than 8 V

If the specified values are not obtained:

- Test the wiring connection between contact 32 of the plug connection of the Digifant control unit and the air conditioner switch -E30 (manual AC) or the operating and display unit -E87 (fully automatic AC) for open circuit or short circuit according to the current flow diagram.

- If the wiring connection is OK, test the air conditioner system:

6.3 - Testing AC compressor shutoff

Note:

The compressor shutoff for the air conditioner operates in both directions ("In" and "Out")

- In: Voltage is supplied to pin 12 just before the air conditioner compressor is switched on. The Digifant control unit opens the idling stabilisation valve slightly more in order to compensate for the additional load as a result of the faster idling speed.
- Out: When accelerating from standing or low speed, the AC compressor is switched off for up to 12 seconds by the Digifant control unit. If the accelerator pedal is released before this, the time is reduced to at least 3 seconds.
  In addition, the compressor is switched off during starting and if there are any faults in the idling speed stabilisation.

Special tools, testers and auxiliary equipment required

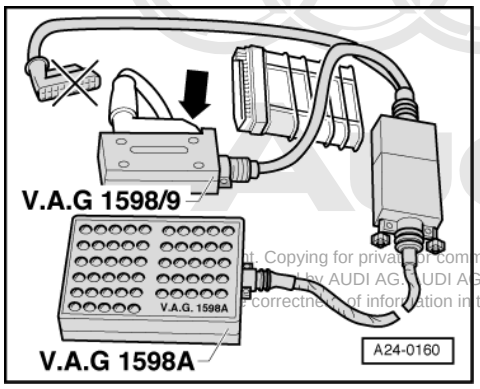
- Hand-held multimeter V.A.G 1526 or V.A.G 1526 A
- Adapter cable set V.A.G 1594 A
- Test box V.A.G 1598 A with adapter V.A.G 1598/9

Test requirements:

- Air conditioner OK
- No faults stored in fault memory
- Vehicle is at room temperature (warmer than + 15 oC)

- Start the engine and run it at idling speed.
- Switch on the air conditioner (the AC compressor must run).
  - Manually controlled air conditioner: press the "AC" button.
  - Fully automatically controlled air conditioner: press the "AUTO" button, set the temperature to "LO" and the blower speed to "HI".
- Briefly operate full throttle, the engine does not need to reach maximum revs.
- Check visually to determine whether the AC compressor stops for a few seconds.

If the AC compressor is not switched off:



Copyright. Copying for private or commercial purposes, in part or in whole, is not permitted by AUDI AG. AUDI AG does not guarantee or accept any liability with correctness of information in this document. Copyright by AUDI AG.

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

Vehicles with manually controlled air conditioner:

- -> With the ignition switched off, use adapter V.A.G 1598/9 to connect test box V.A.G 1598 A only to the plug connection of the engine control unit (control unit remains disconnected) => Page 40 .

- Set hand-held multimeter V.A.G 1526 to voltage measuring range (20 V direct current) and connect it to contacts 12 and 35 using auxiliary leads from V.A.G 1594 A.
- Switch the ignition on.
- Switch on the air conditioner by pressing the "AC" button.

- Specified value: greater than 8 V (after approx. 10 seconds)

If the specified values are not obtained:

- Test the wiring connection between contact 12 of the plug connection 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

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 vehicle speed signal

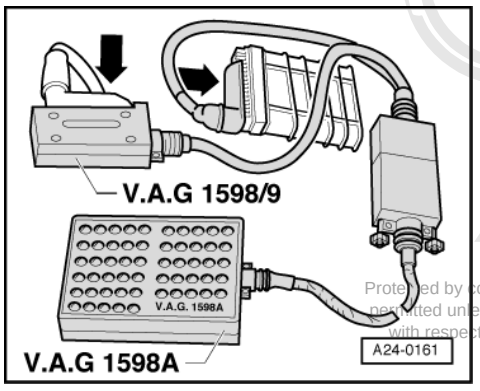
Special tools, testers and auxiliary equipment required

- 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 cable V.A.G 1551/1
- Adapter cable set V.A.G 1594 A
- Test box V.A.G 1598 A with adapter V.A.G 1598/9

Test requirement:

- Speedometer OK, testing:

=> Electrical system; Repair group 90; Testing dash panel insert components; Testing speedometer sender signal at dash panel wiring harness Testing dash panel insert components Testing speedometer sender signal at dash panel wiring harness



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- -> With the ignition switched off, use adapter V.A.G 1598/5 to connect test box V.A.G 1598 A to the plug connection of the engine control unit and also to the engine control unit => Page 40 .
- Connect voltage tester V.A.G 1527 B to sockets 10 and 19 on test box V.A.G 1598 A using test leads from V.A.G 1594 A.

- Turn the front left wheel or drive the vehicle a short distance.
  - The LED should flash.

If LED does not flash:

- Test the wiring connection between contact 10 of the plug connection 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.
- 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" then replace the Digifant control unit => Page 41 .

Notes:

- After replacing the Digifant control unit, it is necessary to adapt the control unit and throttle valve potentiometer to each other => Page 79 .
- 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 79 .

6.6 - Testing fuel consumption signal

Notes:

- The trip computer in the dash panel insert is actuated by the Digifant control unit.
- The fuel consumption signal is calculated directly from the injection time and the ventilation rate of the tank breather system.
- The fuel consumption signal is used by the trip computer in the dash panel insert for displaying the fuel consumption.
- Testing wiring connection:

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

6.7 - Testing wiring connection to automatic gearbox control unit

Signal wire for gearshift

Notes:

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- Only carry out the following test if fault code 00545 appears on V.A.G 1551.
- This signal causes the ignition timing to be briefly retarded during gearshifts to ensure a smoother gear change.

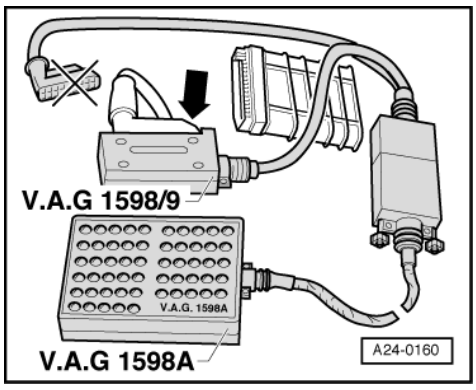
Special tools, testers and auxiliary equipment required

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

- Test box V.A.G 1598 A with adapter V.A.G 1598/9

Test requirement:

- Battery voltage OK.
- Coding of engine control unit OK => Page 12 .



- -> With the ignition switched off, use adapter V.A.G 1598/9 to connect test box V.A.G 1598 A only to the plug connection of the engine control unit (control unit remains disconnected) => Page 40 .

- Connect voltage tester V.A.G 1527 B to contacts 14 and 35 on test box V.A.G 1598 A 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 14 of the plug connection of the Digifant control unit and the automatic gearbox control unit for open circuit or short circuit to earth.

- If the wiring connection is OK, test the automatic gearbox control unit:

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

If the LED lights up:

- Replace the Digifant control unit => Page 41 .

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Notes:

- After replacing the Digifant control unit, it is necessary to adapt the control unit and throttle valve potentiometer to each other => Page 79 .
- 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 79 .

6.8 - Testing start signal

Terminal 50 signal

Notes:

- During starting, a terminal 50 signal is supplied to pin 25 of the Digifant control unit.

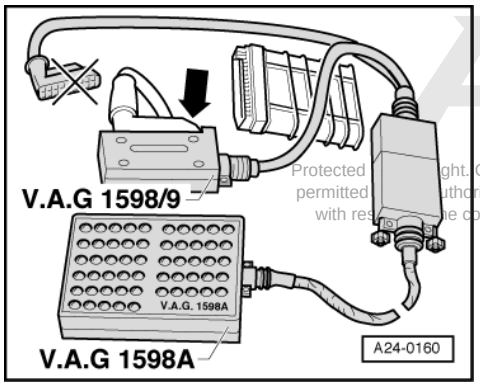
- Once the engine has started, the earth connection is made via the starter winding to pin 25 on models with a manual gearbox. On models with an automatic gearbox, pin 25 is open after starting.

Special tools, testers and auxiliary equipment required

- Hand-held multimeter V.A.G 1526 or V.A.G 1526 A
- Adapter cable set V.A.G 1594 A
- Test box V.A.G 1598 A with adapter V.A.G 1598/9

Test requirement:

- Battery voltage OK.



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- -> With the ignition switched off, use adapter V.A.G 1598/9 to connect test box V.A.G 1598 A only to the plug connection of the engine control unit (control unit remains disconnected) => Page 40 .

- Set hand-held multimeter V.A.G 1526 to voltage measuring range (20 V direct current) and connect it to contacts 25 and 35 using auxiliary leads from V.A.G 1594 A.
- Operate the starter.
  - Specified value: approx. battery voltage
- If the specification is not achieved, test the wiring connection according to the current flow diagram.

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:

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- 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.
- To operate the engine at starter speed without it actually starting, e.g. for compression pressure test, unplug the connector from the power output stage at the ignition coil and remove fuse 13. 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 which have an actual or suspected fault in the ignition system must not be towed unless the connector is unplugged at the power output stage.
- Do not connect a capacitor to terminal 1 (-).
- Do not replace the 1 kω distributor rotor (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 - Adjustment data, spark plugs

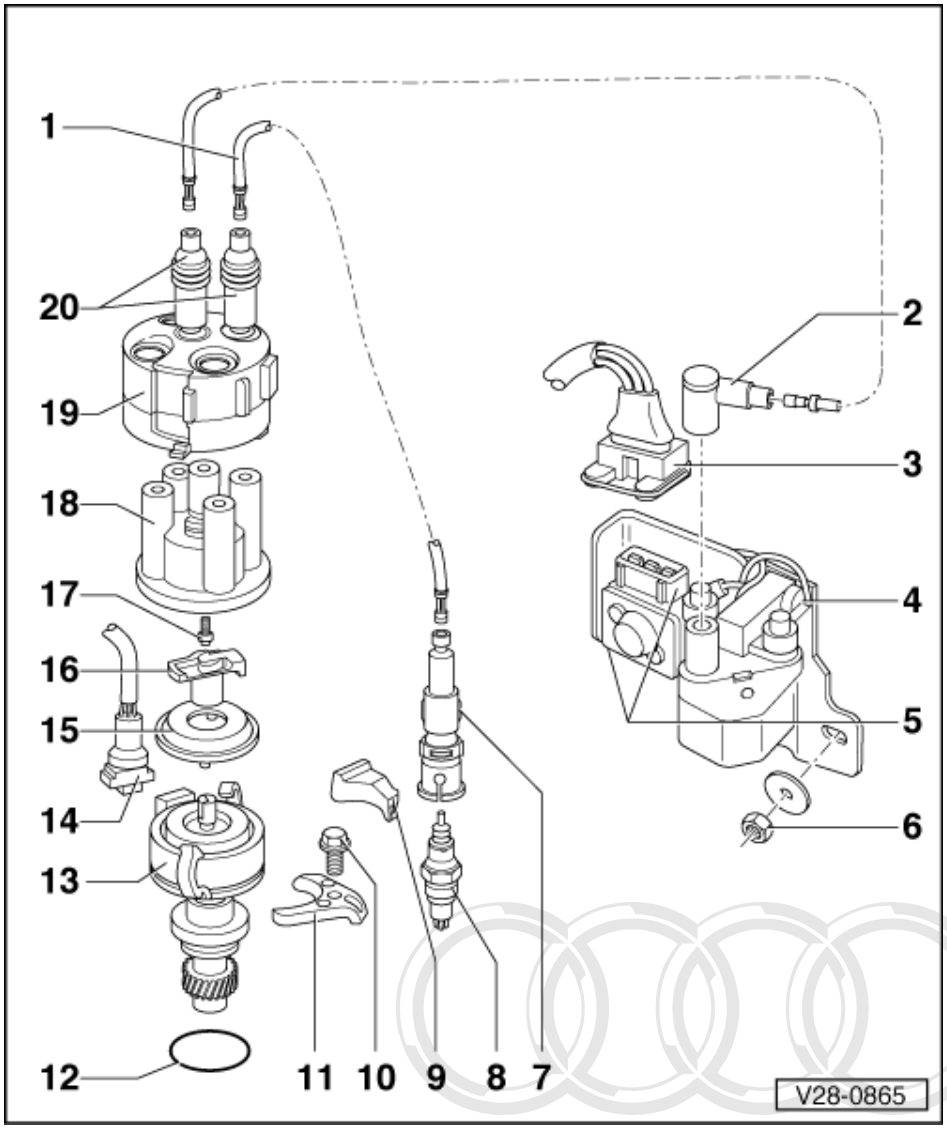
Engine code letters			ABK (2.0 l / 85 kW engine)
Digifant control unit	Part no.		=>Parts list
Ignition timing 1)	Test value	o BTDC	4 ... 8
	Setting	o BTDC	6 ± 1
	Engine speed	rpm	2000 ... 2500
Firing order			1-3-4-2
Spark plugs 2)	Tightening torque	Nm	30

1) Engine oil temperature at least 80 oC

2) Current values:

=> "Emissions test" binder

1.4 - Servicing ignition system



1 Ignition cable
- Check for continuity

2 Interference suppression connector
- 0.6...1.4 kω

3 Connector
- Press wire lock to unplug

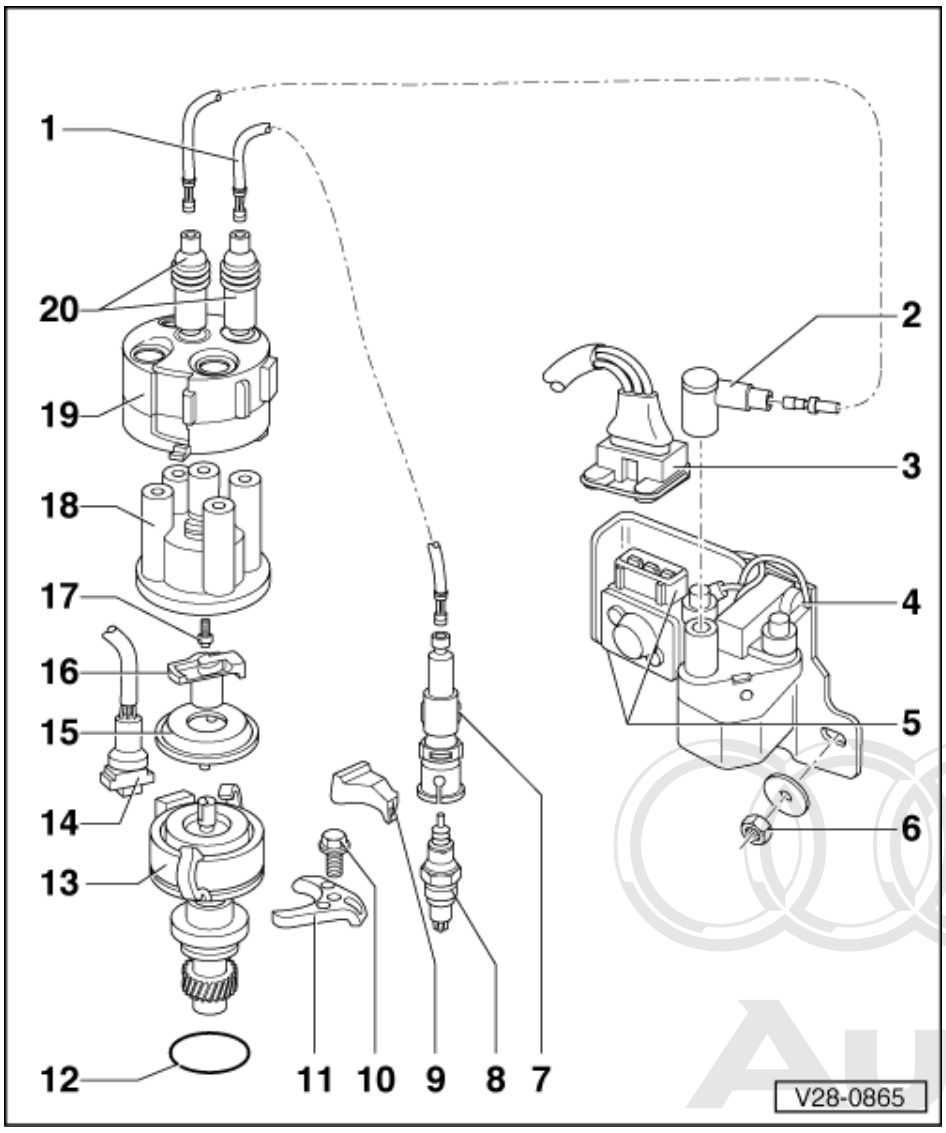
4 Ignition transformer -N152
- Testing => Page 99

5 Output stage for ignition transformer
- Testing => Page 100

6 10 Nm

7 Spark plug connector
- 4...6 kω

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



8 Spark plug - 30 Nm

- Type and electrode gap

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

=> "Emissions test" binder

9 Locking cap

10 25 Nm

11 Clamp

12 O-ring

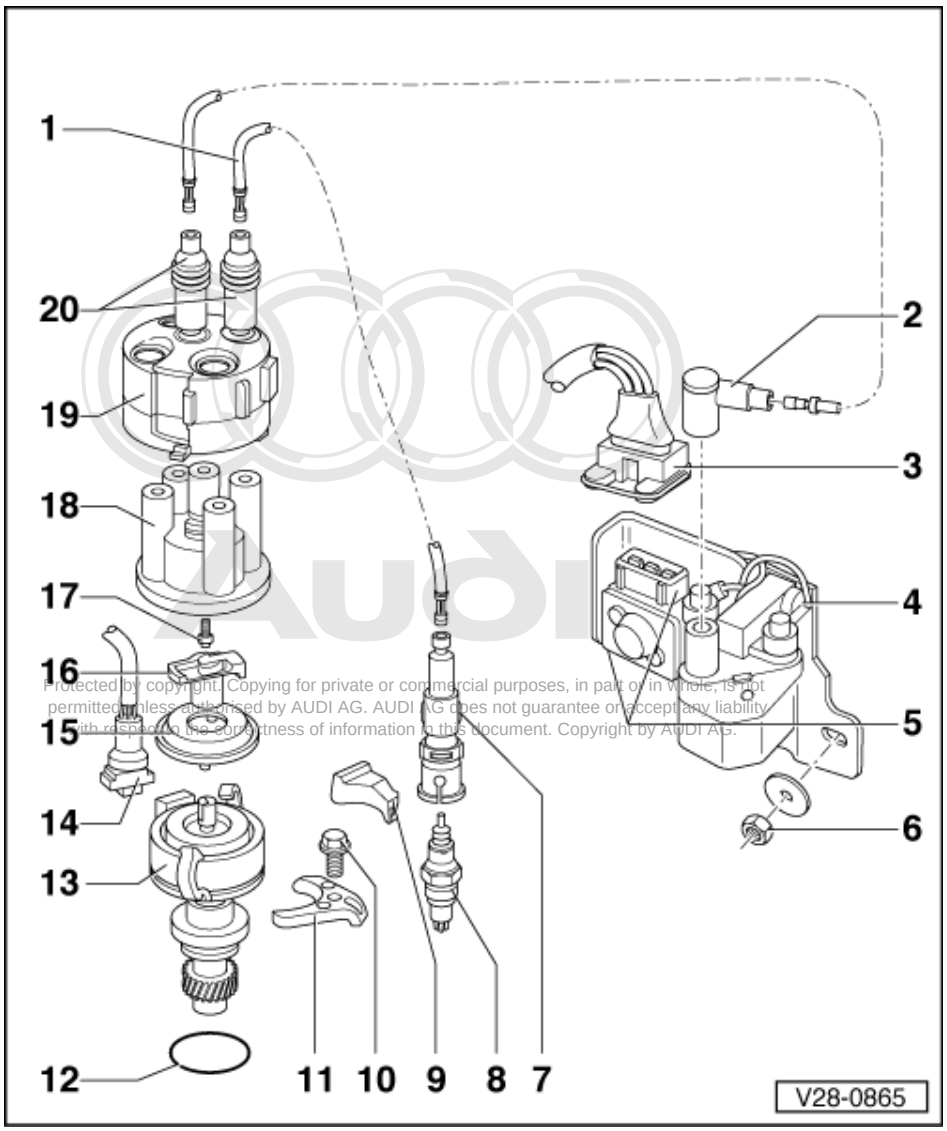
- Replace if damaged

13 Distributor

- Installing => Page 95
- Checking and adjusting ignition timing => Page 96
- Testing Hall sensor
  => Page 97

14 Connector

- Press wire lock to unplug



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.

15 Dust cap

16 Distributor rotor arm

- 0.6...1.4 kω

17 Carbon brush with spring

- Inspect for wear, damage and ease of movement

18 Distributor cap

- Check for cracks and signs of tracking
- Inspect wear on contacts
- Clean before fitting

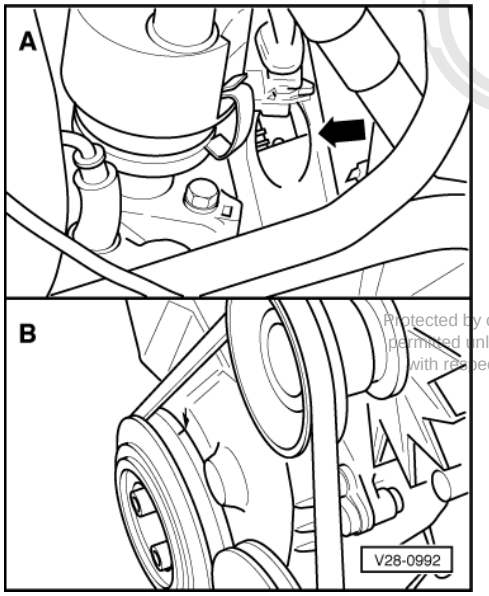
19 Screening

- For radio interference suppression

20 Interference suppression connector

- 0.6...1.4 kω

1.5 - Installing distributor



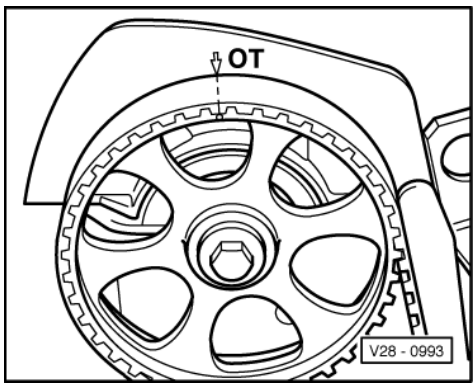
Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Engine installed:

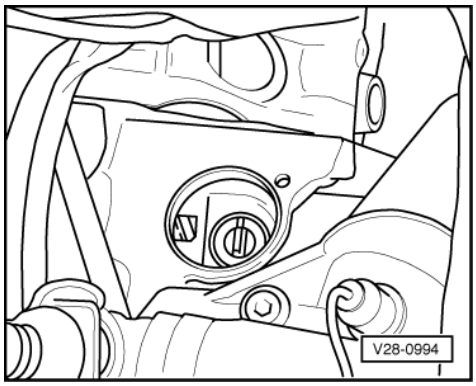
- -> Position flywheel or drive plate to TDC of cylinder no. 1.

Engine removed:

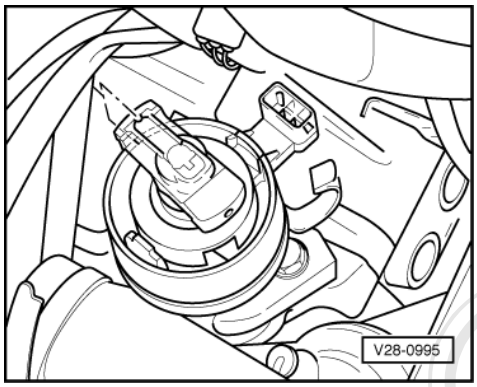
- The marking on the vibration damper (belt pulley) should be aligned with the arrow on the toothed belt guard.



- -> The marking on the camshaft sprocket should be aligned with the arrow on the top toothed belt guard.



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



- -> Position distributor rotor arm so that it points toward the marking for cylinder 1 on the distributor housing.
- Insert the distributor rotor.
- Before fitting, clean distributor cap and check for cracks and signs of tracking, replace if necessary.
- Check and adjust ignition timing => Page 96

1.6 - Testing and adjusting ignition timing

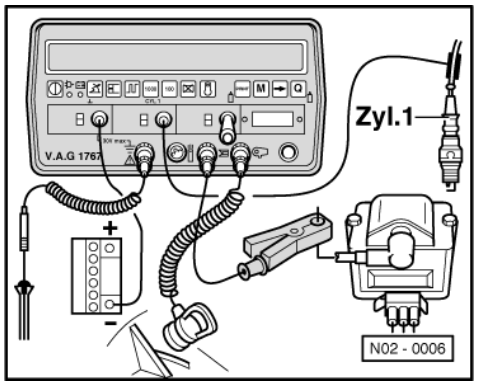
Note:

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Only adjust the ignition timing if the timing point differs when testing the idling speed => Page 43 .

Special tools, testers and auxiliary equipment required

- Fault reader V.A.G 1551 (or vehicle system tester V.A.G 1552) with cable V.A.G 1551/1
- Ignition tester V.A.G 1767 or V.A.G 1367 with trigger 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:

- The TDC sender of ignition tester V.A.G 1367 must be inserted into the gearbox housing as far as the stop.
- The ignition timing is indicated directly on V.A.G 1767 (or V.A.G 1367). It is not necessary to strobe the ignition timing notches.

- Connect fault reader V.A.G 1551, enter address word 01 for "Engine electronics", confirm the entry and move to the next step => Page 1 .
- Interrogate the fault memory and erase it => Page 4 .
- Leave the engine idling.

-> Readout on display:

```
Rapid data transfer      HELP
Select function XX
```

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

-> Readout on display:

```
Basic 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 ignition tester V.A.G 1767 (or V.A.G 1367).
  - Test value: 4 ... 8o BTDC

Note:

If the displayed ignition timing point is not within the tolerance range, first set the ignition timing while the system is still in "basic setting 1" before testing the idling speed.

- Set the ignition timing point by turning the distributor at an engine speed of 2000 ... 2500 rpm.
  -Setting 6 ±1o

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

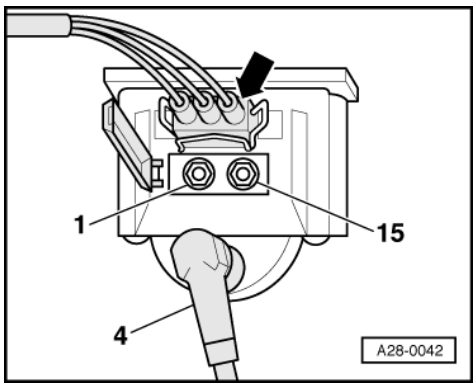
- Leave engine idling.
- Press the ⇒key.
  - The ignition timing may vary within the range 2 ... 10 o BTDC
- Test the idling speed after adjusting the ignition timing => Page 43 .

1.7 - Testing Hall sender -G40

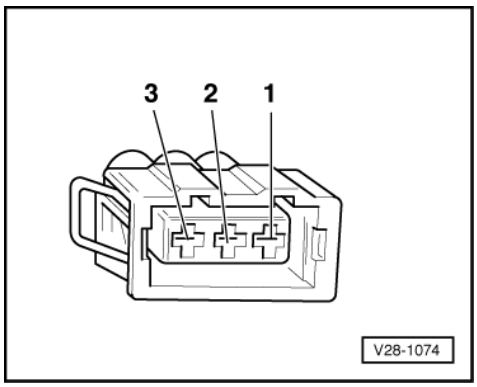
Special tools, testers and auxiliary equipment required

- Hand-held multimeter V.A.G 1526 or V.A.G 1526 A
- Voltage tester V.A.G 1527 B
- Adapter cable set V.A.G 1594 A
- Test box V.A.G 1598 A with adapter V.A.G 1598/9

- Remove fuse 13 (the fuel pump must not run when starting the engine, as otherwise the catalytic converter may be damaged).



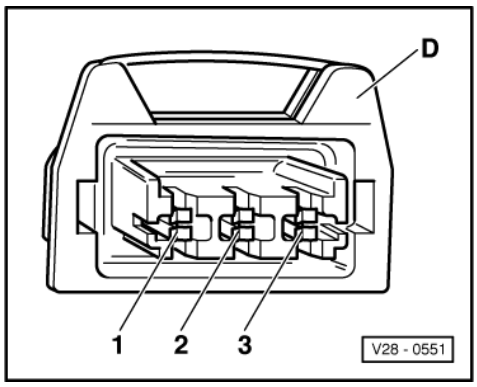
- -> Unplug the connector of the power output stage at the ignition transformer.



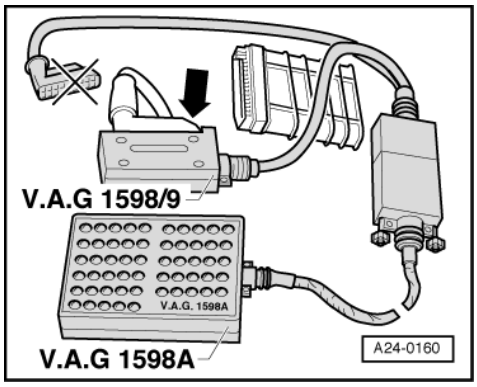
- -> Connect voltage tester V.A.G 1527 B between contact 2 (signal) of the plug connection and engine earth using auxiliary cables from V.A.G 1594.
- Operate the starter.
  - The LED should flicker.

If the LED does not flicker:

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



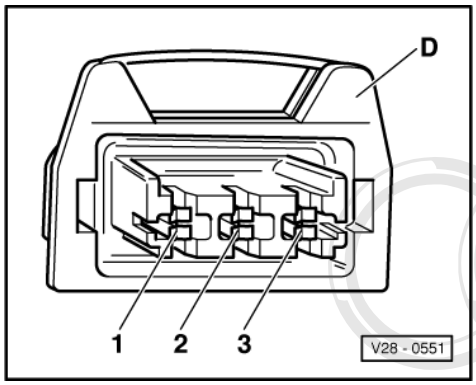
- -> Set hand-held multimeter V.A.G 1526 to voltage measuring range (20 V direct current) and connect it to contact 1 (earth) and contact 3 (positive) of plug connection -D-.
- Switch the ignition on.
  - Specified value: at least 9 V
- Switch off the ignition.



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

If the specification is not obtained:

- -> With the ignition switched off, use adapter V.A.G 1598/9 to connect test box V.A.G 1598 A only to the plug connection of the engine control unit (control unit remains disconnected) => Page 40 .



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

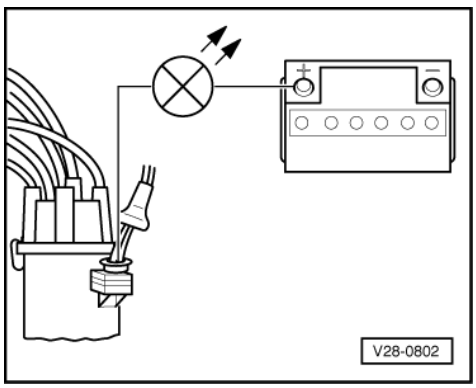
Plug connection of -G40 Contact	Test box V.A.G 1598 A Socket
1 (earth)	28
2 (signal)	37
3 (positive)	38

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- Rectify any open/short circuit as necessary.
- If the wiring is OK, replace the Digifant control unit => Page 41 .

If the specification is not obtained:

- Push back the rubber cover on the plug connection of the Hall sensor and plug in the connector at the Hall sensor connection.



- -> Connect voltage tester V.A.G 1527 B to the middle cable (contact 2 of the plug connection) of the Hall sensor and to battery positive or B+ at the alternator using auxiliary cables from V.A.G 1594 A.
- Operate the starter.
  - The LED should flicker.

If the LED does not flicker:

- Replace the distributor.

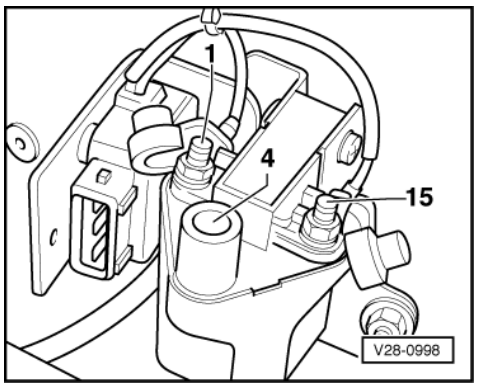
1.8 - Testing ignition transformer -N152

Notes:

- Inspect the cables between power output stage and ignition transformer for corrosion and damage.

- Testing output stage for ignition transformer => Page 100 .

- Unplug the connector from the power output stage and the ignition cable from the ignition transformer.



- -> Test the primary resistance with hand multimeter V.A.G 1526 A between terminals 1 and 15.
  - Specified value: 0.7 ω
- Test the secondary resistance with a hand-held multimeter between terminals 4 and 15.
  - Specified value: 3 ... 4 kω

If a specification is not met:

- Replace the ignition transformer.

1.9 - Testing output stage for ignition transformer

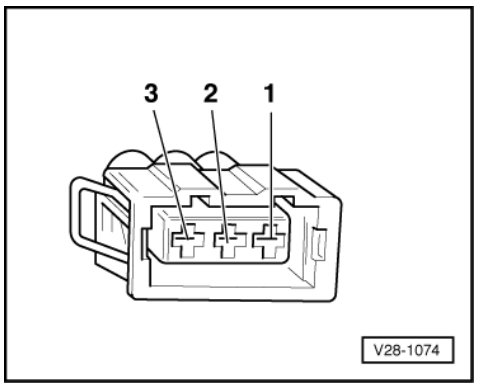
Special tools, testers and auxiliary equipment required

- Hand-held multimeter V.A.G 1526 or V.A.G 1526 A
- Voltage tester V.A.G 1527 B
- Adapter cable set V.A.G 1594 A
- Test box V.A.G 1598 A with adapter V.A.G 1598/9

Test requirement:

- Ignition transformer OK; testing =>Page 99 .

Testing voltage supply



- Separate the plug connection from the power output stage and the main ignition cable from the ignition transformer.
- -> Set hand-held multimeter V.A.G 1526 to voltage measuring range (20 V direct current) and connect it as follows using auxiliary leads from V.A.G 1594 A.
  - Between contact 3 (positive) and engine earth

Audi
Use of this document, or any part thereof, for any purpose other than private, non-commercial use by the purchaser, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- Between contact 3 (positive) and contact 1 (earth)

- Switch the ignition on.
  - Specified value: approx. battery voltage in each case

If the specification is not obtained:

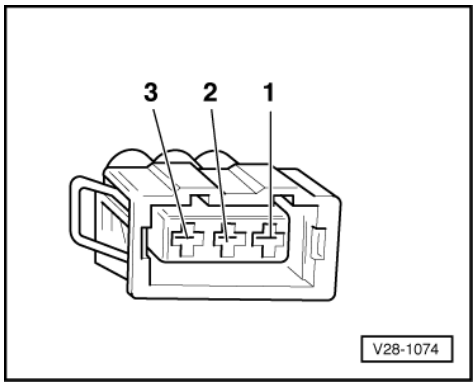
- Eliminate the open circuit using the current flow diagram.

Testing actuation

Test requirement:

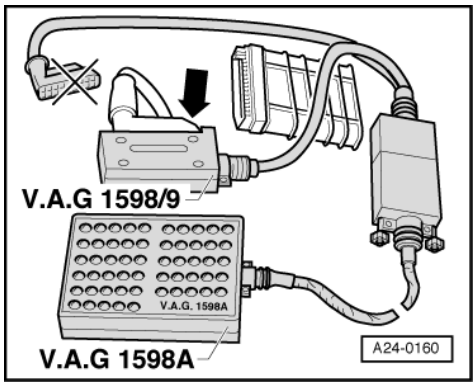
- Hall sensor OK, testing => Page 97 .

- Remove fuse 13 (the fuel pump must not run when starting the engine, as otherwise the catalytic converter may be damaged).



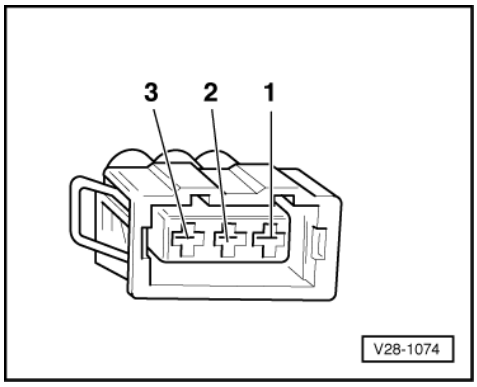
- -> Connect voltage tester V.A.G 1527 B between contact 2 (signal) and contact 3 (positive) of the plug connection using auxiliary cables from V.A.G 1594.
- Operate the starter.
  - The LED should flicker.

If the LED does not flicker:



- -> With the ignition switched off, use adapter V.A.G 1598/9 to connect test box V.A.G 1598 A only to the plug connection of the engine control unit (control unit remains disconnected) => Page 40 .

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.



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

Plug connection of -N152 Contact	Test box V.A.G 1598 A Socket
2	6

- Rectify any open circuit in the wiring.
- Also test the Hall sensor => Page 97 .

- If the wiring and the Hall sensor are OK, replace the Digifant control unit => Page 41 .

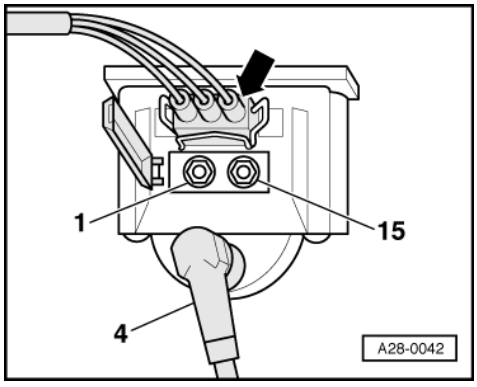
Notes:

- After replacing the Digifant control unit, it is necessary to adapt the control unit and throttle valve potentiometer to each other => Page 79 .
- 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 79 .

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

If the LED flickers:

- Switch off the ignition.
- Plug in the connector and the ignition cable at the ignition transformer again.



- -> Connect voltage tester V.A.G 1527 B to contacts 1 and 15 on the ignition transformer using auxiliary cables and clamps.

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

- Operate the starter.
  - The LEDs should flicker.

If the LEDs do not flicker:
- Replace the output stage with ignition transformer.

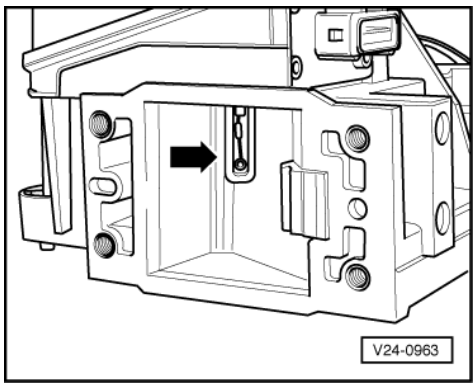
1.10 - Testing intake air temperature sensor -G42

Note:
Fitting location of intake air temperature sensor: 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 cable V.A.G 1551/1
- Adapter cable set V.A.G 1594 A
- Test box V.A.G 1598 A with adapter V.A.G 1598/9
- Temperature reduction spray (commercially available)

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

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

-> Read measured value block, display group 003 => Page 21 .



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

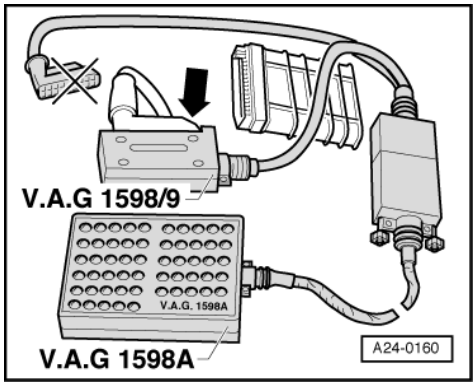
- -> Lift out the top part of the air cleaner and spray the temperature reduction spray onto the intake air temperature sensor -G42.
- Check display in display zone 3.
  - Specified value: The temperature value should drop.

Note:
The illustration shows the intake air temperature sensor in the air flow meter, removed from the vehicle.
- Press the ⇒key.

-> Readout on display:

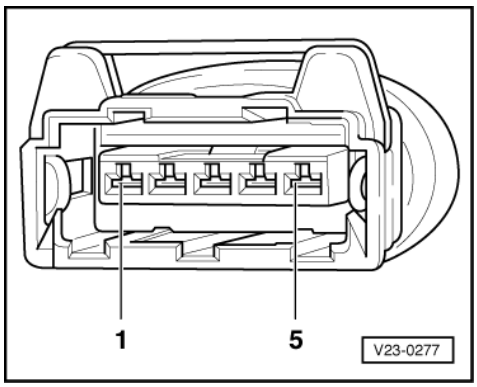
```
Rapid data transfer      HELP
Select function XX
```

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



If there is no change to the readout in display zone 3:

- -> With the ignition switched off, use adapter V.A.G 1598/9 to connect test box V.A.G 1598 A only to the plug connection of the engine control unit (control unit remains disconnected) => Page 40 .



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

Plug connection of -G19 Contact	Test box V.A.G 1598 A Socket
1	30
4	35

- Rectify any open/short circuit as necessary.
- If the wiring and the intake air temperature sensor are OK, replace the Digifant control unit => Page 41 .

Notes:

- After replacing the Digifant control unit, it is necessary to adapt the control unit and throttle valve potentiometer to each other => Page 79 .
- 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 79 .

1.11 - Testing coolant temperature sensor -G62

Special tools, testers and auxiliary equipment required

- Fault reader V.A.G 1551 (or vehicle system tester V.A.G 1552) with cable V.A.G 1551/1
- Adapter cable set V.A.G 1594 A
- Test box V.A.G 1598 A with adapter V.A.G 1598/9

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Test requirement:

- Engine cold

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

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

-> Read measured value block, display group 001 => Page 17 .
- Check display in display zone 1 (coolant temperature).
  - Specified value: uniform increase with no interruptions

- Press the ⇒key.

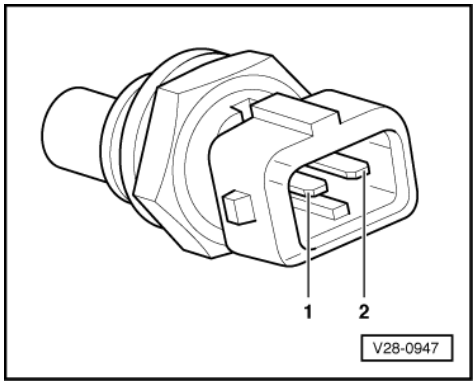
-> Readout on display:

```
Rapid data transfer      HELP
Select function XX
```

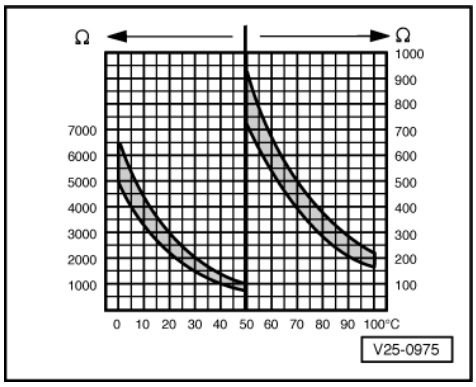
- Enter "06" for "End output" function and confirm entry with Q key.

If engine running problems occur in certain temperature ranges and the readout in display zone 1 does not rise evenly and without interruptions, then there is a sporadic interruption to the temperature signal. In this case:

- Unplug the connector at the coolant temperature sensor.



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



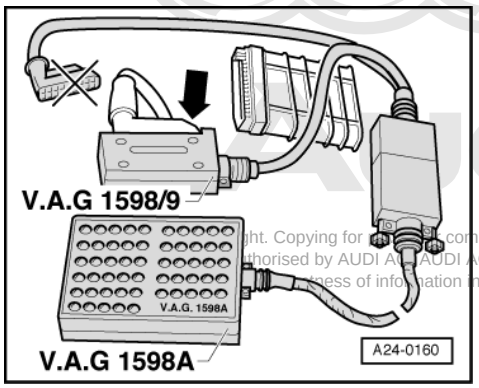
-> Specifications:

Coolant temperature	Resistance
approx. 20 oC	approx. 2.5 kω
approx. 80 oC	approx. 330 ω

If the specified values are not obtained:

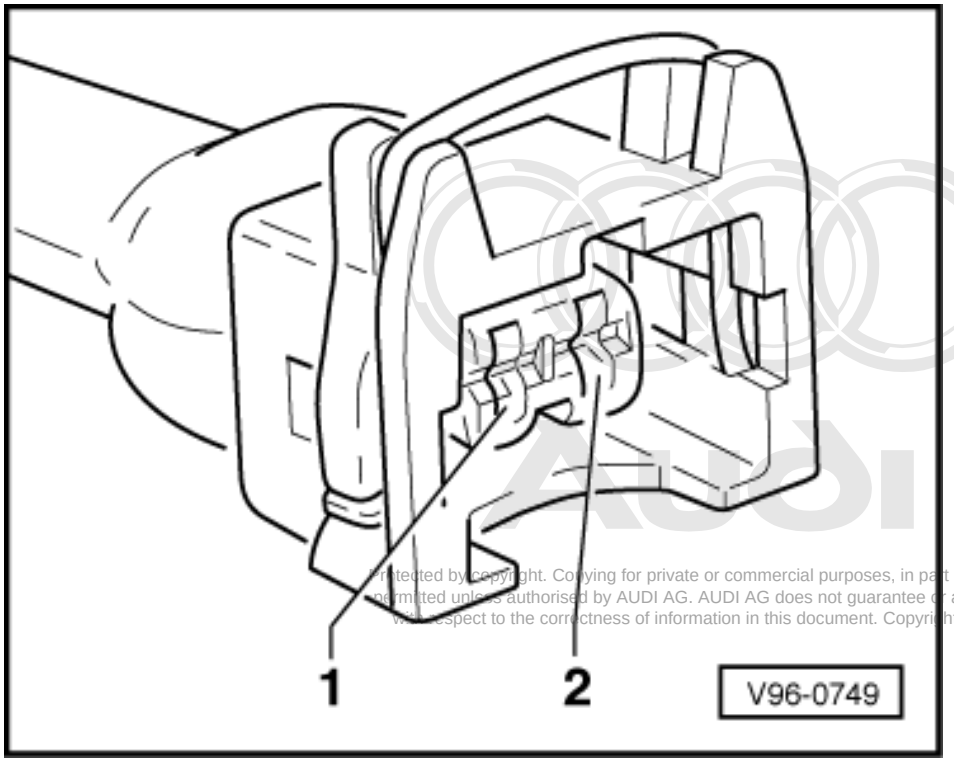
- Replace the coolant temperature sensor.

If the specified values are attained:



ght. Copying for commercial purposes, in part or in whole, is not
thorised by AUDI AG. AUDI AG does not guarantee or accept any liability
ness of information in this document. Copyright by AUDI AG.

- -> With the ignition switched off, use adapter V.A.G 1598/9 to connect test box V.A.G 1598 A only to the plug connection of the engine control unit (control unit remains disconnected) => Page 40 .



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

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

Plug connection of -G62 Contact	Test box V.A.G 1598 A Socket
1	11
2	28

- Rectify any open/short circuit as necessary.
- If the wiring and the coolant temperature sensor are OK, replace the Digifant control unit => Page 41 .

Notes:

- After replacing the Digifant control unit, it is necessary to adapt the control unit and throttle valve potentiometer to each other => Page 79 .
- 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 79 .

1.12 - Testing voltage supply for control unit

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

Note:

Fitting location of current supply relay for the Digifant control unit -J176: On auxiliary relay carrier at front left below dash panel, position 14

Special tools, testers and auxiliary equipment required

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

- Test box V.A.G 1598 A with adapter V.A.G 1598/9

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

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

  -> Read measured value block, display group 003 => Page 21 .
- Check display in display zone 4.
  - Specified value: approx. battery voltage

- Press the ⇒key.

-> Readout on display:

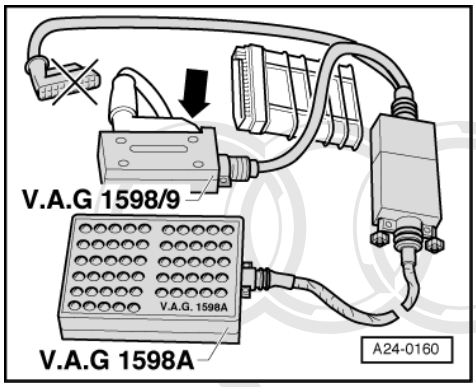
```
Rapid data transfer      HELP
Select function XX
```

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

If the specification is not obtained:

- Carry out the following tests:

Testing voltage supply



- -> With the ignition switched off, use adapter V.A.G 1598/9 to connect test box V.A.G 1598 A only to the plug connection of the engine control unit (control unit remains disconnected) => Page 40 .

- Set hand-held multimeter V.A.G 1526 to voltage measuring range (20 V direct current) and connect it to contact 19 on the test box and engine earth using auxiliary leads from V.A.G 1594 A.
- Switch the ignition on.
  - Specified value: approx. battery voltage

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.

If the specification is not obtained:

- Test the wiring connection between the plug connection of the Digifant control unit and 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 108 .
- Test the actuation of the current supply relay -J176 => Page 109 .
- If the voltage supply and the actuation of the current supply relay are OK, replace the current supply relay.

Testing earth supply

Test requirements:

- Voltage supply at contact 19 OK => Page 107 .

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

Test box V.A.G 1598 A Socket	Specification
19 + 1 (earth)	approx. battery voltage
19 + 28 (earth)	approx. battery voltage
19 +35 (earth)	approx. battery voltage

- Switch the ignition on.

If the specified values are not obtained:

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorized by AUDI AG. Audi does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- Test the wiring connections between the plug connection of the Digifant control unit and the earth points according to the current flow diagram.
- Rectify any open circuit in the wiring.

1.13 - Testing current supply relay -J176

Note:

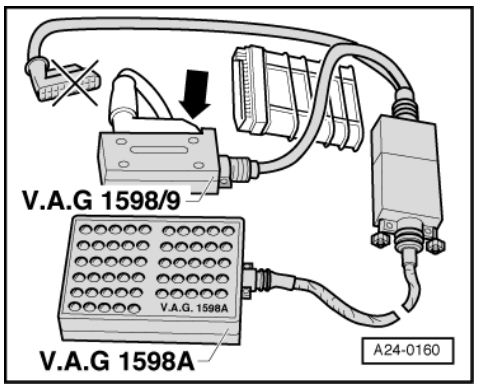
Fitting location of current supply relay for the Digifant control unit -J176: On auxiliary relay carrier at front left below dash panel, position 14

Special tools, testers and auxiliary equipment required

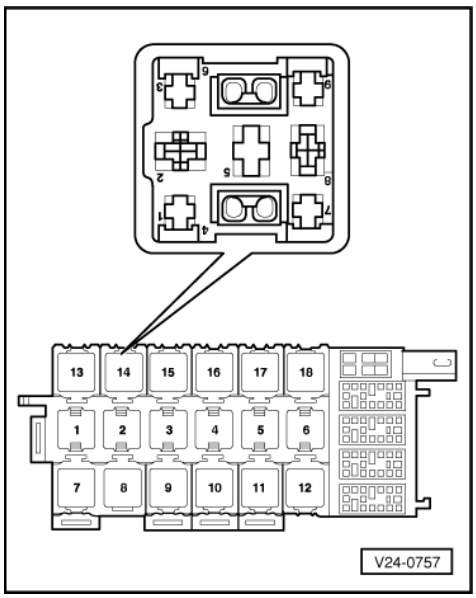
- Hand-held multimeter V.A.G 1526 or V.A.G 1526 A
- Adapter cable set V.A.G 1594 A
- Test box V.A.G 1598 A with adapter V.A.G 1598/9

- Remove the current supply relay

Testing voltage supply



- -> With the ignition switched off, use adapter V.A.G 1598/9 to connect test box V.A.G 1598 A only to the plug connection of the engine control unit (control unit remains disconnected) => Page 40 .



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

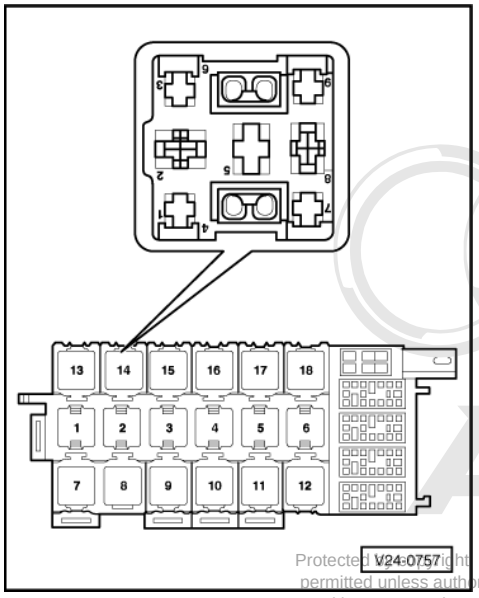
Test box V.A.G 1598 A Socket	Specification
2 (positive) + earth	approx. battery voltage
2 (positive) + 4 (earth)	approx. battery voltage

- 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



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

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

If the specification is not obtained:

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

1.14 - Testing knock sensor -G61

Notes:

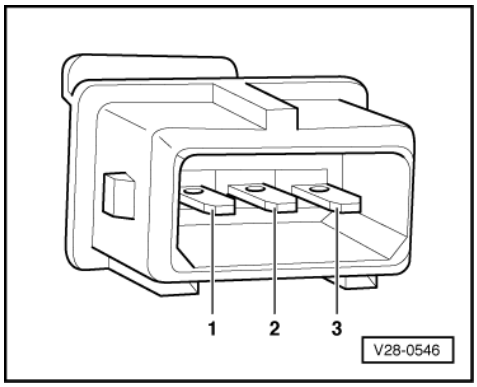
- The knock sensor itself cannot be tested electrically => Interrogating fault memory, Page 4 onwards.
- It is important that the knock sensor is tightened to the exact torque of 20 Nm if it is to operate properly.
- Inspect the plug connections for traces of corrosion.
- Use only gold plated contacts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

Special tools, testers and auxiliary equipment required

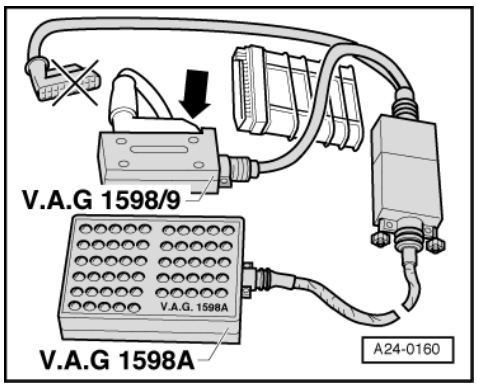
- Hand-held multimeter V.A.G 1526 or V.A.G 1526 A
- Adapter cable set V.A.G 1594 A
- Test box V.A.G 1598 A with adapter V.A.G 1598/9

Testing cable of knock sensor

- Separate the plug connection of the knock sensor in the engine compartment => -Item 31 .



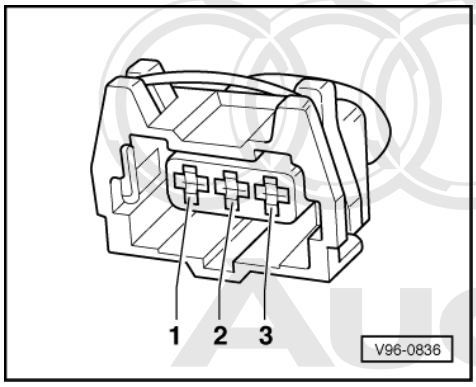
- -> Set hand-held multimeter V.A.G 1526 to resistance measuring range and connect it to the contacts of the plug connection using test leads from V.A.G 1594 A.
  - Specified value: ∞ ω
    (There must be no connection between any of the wires).
- If there is a connection between the wires, replace the knock sensor.



Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Testing cables from knock sensor to Digifant control unit

- -> With the ignition switched off, use adapter V.A.G 1598/9 to connect test box V.A.G 1598 A only to the plug connection of the engine control unit (control unit remains disconnected) => Page 40 .



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

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Plug connection of -G61 Contact	Test box V.A.G 1598 A Socket
1 (signal)	29
2 (earth)	27
3 (screening)	8

- Rectify any open/short circuit as necessary.