

Audi A3 1997 ➤

Motronic fuel injection and ignition system (4-cyl. turbo)

Engine ID	AGU							
-----------	-----	--	--	--	--	--	--	--

Edition 11.1996

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 A3 1997 ➤

Motronic fuel injection and ignition system (4-cyl. turbo)

Repair Group

01 - Self-diagnosis

24 - Mixture preparation, Injection

28 - Ignition system

Audi

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.**

Contents

01 - Self-diagnosis	1
1 Self-diagnosis for the Motronic system	1
1.1 Self-diagnosis for the Motronic system	1
1.2 Technical data for the self-diagnosis	1
1.3 Connecting the V.A.G 1551 fault reader and selecting the engine electronics control unit	2
1.4 Interrogating and erasing fault memory	3
1.5 Fault table	4
1.6 Final control diagnosis	15
1.7 Basic setting	17
1.8 Encoding the control unit	19
1.9 Reading measured value block	20
1.10 Reading measured value block: Display Groups 00 to 10	26
1.11 Reading measured value block: Display Groups 08 to 99	32
24 - Mixture preparation, Injection	43
1 Repairing the Motronic fuel injection system	43
1.1 Repairing the Motronic fuel injection system	43
1.2 Safety precautions	43
1.3 Rules for cleanliness	43
1.4 Technical data	43
1.5 Overview of fitting locations	45
1.6 Wiring and component check with test box V.A.G 1598/22	47
1.7 Replacing the engine control unit	48
1.8 Checking idling speed	49
1.9 Checking fuel pressure regulator and holding pressure	50
1.10 Checking injection quantity, leak tightness and spray pattern of injectors	52
1.11 Checking the injectors	53
1.12 Checking fuel pump relay and actuation	56
1.13 Checking the air mass meter	59
2 Checking the boost pressure system	61
2.1 Checking the boost pressure system	61
2.2 Checking the boost pressure control	61
2.3 Checking solenoid valve for boost pressure control	61
2.4 Checking altitude sensor	63
3 Checking the lambda control	65
3.1 Checking the lambda control	65
3.2 Poor performance after cold start	66
3.3 Checking operation	67
3.4 Checking lambda probe heating	68
3.5 Checking lambda probe signal line and actuation	69
3.6 Removing and installing the lambda probe	70
4 Checking the fuel tank breather system	71
4.1 Checking the fuel tank breather system	71
4.2 Checking the solenoid valve 1 for the activated carbon canister	71
5 Checking the throttle valve control unit - vehicles without CCS	73
5.1 Checking the throttle valve control unit - vehicles without CCS	73
5.2 Adaptation of the throttle valve control unit without CCS	73
5.3 Checking the idling switch without CCS	75
5.4 Checking the throttle valve potentiometer without CCS	76
5.5 Checking the sensor for throttle valve positioner without CCS	78
5.6 Checking throttle valve positioner without CCS	79
6 Checking the throttle valve control unit - vehicles with CCS	80
6.1 Checking the throttle valve control unit - vehicles with CCS	80



6.2	Adaptation of the throttle valve control unit with CCS	80
6.3	Checking the idling switch with CCS	82
6.4	Checking the throttle valve potentiometer with CCS	83
6.5	Checking the sensor for the throttle valve positioner with CCS	85
6.6	Checking the throttle valve positioner with CCS	86
7	Checking auxiliary signals	87
7.1	Checking auxiliary signals	87
7.2	Checking air conditioner compressor shut-off	87
7.3	Checking the engine speed adaptation by switching on the air conditioner	88
7.4	Checking selector lever position on automatic gearbox	89
7.5	Checking engine speed signal	91
7.6	Checking throttle valve positioner	91
7.7	Checking the speed signal	92
7.8	Checking the gearbox intervention signal when changing gear	93
7.9	Checking clutch pedal switch	94
7.10	Checking the power steering pressure switch	95
7.11	Checking the Motronic system/ABS/gearbox data exchange (CAN bus)	96
28	- Ignition system	98
1	Checking ignition system	98
1.1	Checking ignition system	98
1.2	Safety precautions	98
1.3	Technical data	98
1.4	Checking ignition coils	98
1.5	Checking output stages for ignition coils	101
1.6	Checking the intake air temperature sensor	103
1.7	Checking the engine speed sensor	104
1.8	Checking the sensor for coolant temperature	105
1.9	Checking the power supply for the control unit	106
1.10	Checking the knock sensors	106
1.11	Checking the Hall sensor	108



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 for the Motronic system

1.1 - Self-diagnosis for the Motronic system

1.2 - Technical data for the self-diagnosis

Memory

The non-volatile memory in the engine control unit is independent of the power supply

Data output

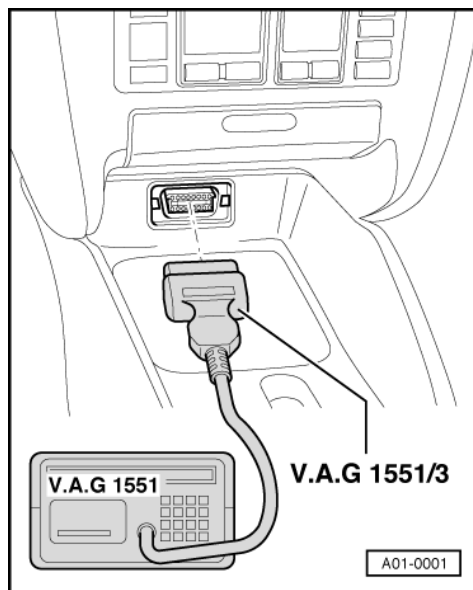
Rapid data transfer

Address words	
Address word 00 Automatic test routine	Switch on ignition or leave engine idling
Address word 01 Engine electronics	Switch on ignition or leave engine idling
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.	
Function 01: Interrogating control unit version	Switch on ignition or leave engine idling
Function 02: Interrogating fault memory	Switch on ignition or leave engine idling
Function 03: Final control diagnosis	Switch on ignition.
Function 04: Basic setting	Leave engine idling, or crank engine with starter for at least 5 seconds, without subsequently switching off the ignition

Functions:	
Function 05: Erasing fault memory	Switch on ignition or leave engine idling
Function 06: End of output	Switch on ignition or leave engine idling
Function 07: Encoding control unit	Switch on ignition.
Function 08: Reading measured value block	Switch on ignition or leave engine idling or drive the car



1.3 - Connecting the V.A.G 1551 fault reader and selecting the engine electronics control unit



Note:

The V.A.G 1552 vehicle system tester may be used instead of the V.A.G 1551 fault reader, however a printout is not possible.

Test conditions

- Battery voltage at least 11 V.
 - Earth connections on engine and gearbox OK.
 - Fuel pump relay OK.
 - Fuses OK.
- -> Unclip the cover for the diagnostic connection.
- Connect the V.A.G 1551 fault reader or V.A.G 1552 vehicle system tester with cable V.A.G 1551/3.

-> Display readout:

V.A.G self-diagnosis	HELP
1 - Rapid data transfer*	
2 - Flash code output*	

* displayed alternately

Note:

If the display remains blank:

=> Operating instructions for the fault reader

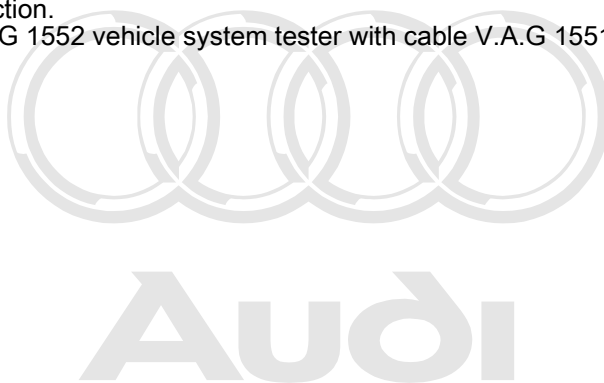
Depending on the function required:

- Switch on the ignition.

or

start the engine => Page **1** , Table "Selectable functions".

- Switch on printer with the Print key
(the indicator lamp in the key lights 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.

- Press key 1 for "Rapid data transfer".

-> Display readout:

Rapid data transfer HELP
 Enter address word XX

Rapid data transfer Q
 01 - Engine electronics

-> Press keys 0 and 1 for the address word "Engine electronics" and confirm entry by pressing the Q key.

-> If the display shows one of the messages reproduced here, perform the fault finding procedure according to the fault finding program for diagnostic wiring.

Rapid data transfer HELP
 Control unit does not answer

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

Rapid data transfer HELP
 Communications fault

Rapid data transfer HELP
 K wire not switching to earth

Rapid data transfer HELP
 K wire not switching to positive

-> The control unit identification appears on the V.A.G 1551 fault reader, e.g.:

06A906018.. 1.8l R4/5VT MOTR HS
 D..□
 Encodierung 04000 WSC 06388

- 06A906018.	Control unit number (see also spare parts program)
- 1.8l	Engine capacity
- R4/5VT	In line engine, 4 cylinders, 5 valves, turbo
- MOTR	Motronic
- HS	MG = Manual gearbox
- AT	AT = Automatic transmission
- D..	Status (software version) of control unit
- Encoding 04000	Control unit encoding
- WSC 06388	Workshop Code from the V.A.G 1551 used to perform the last encoding

- Press the =>key.

-> Display readout:

Rapid data transfer HELP
 Select function XX

1.4 - Interrogating and erasing fault memory

- Connect the V.A.G 1551 fault reader (V.A.G 1552) and select the engine electronics control unit with the "Address word" 01. The engine must be idling.
 (Connecting the fault reader and selecting the engine electronics control unit => Page 2).

-> Display readout:



Rapid data transfer HELP
 Select function XX

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

-> The display will show either the number of faults stored or the message "No fault recognised!".

X faults recognised

If no fault is stored:

- Press the ⇒ key.

If one or more faults are stored:

The stored faults are displayed in sequence and printed out.

-> Then the display will show:

Rapid data transfer HELP
 Select function XX

- Localise and rectify the faults printed out in accordance with the error table => Page 4.
- Press keys 0 and 5 for the function "Erasing fault memory" and confirm entry with the Q key.

-> Display readout:

Rapid data transfer
 Fault memory erased!

Note:

If the ignition is switched off between the interrogation of the fault memory and the erasure of the fault memory, the fault memory will not be erased.

- Press the ⇒key.

-> Display readout:

Rapid data transfer HELP
 Select function XX

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

1.5 - Fault table

Notes:

- ♦ The fault table is arranged according to the 5- digit fault code on the left.
- ♦ Sporadic faults are marked "SP" (sporadic fault) on the V.A.G 1551 display.
- ♦ If a stored fault does not appear within the next 40 engine starts, the fault code will be automatically erased.
- ♦ Before replacing components indicated as being faulty, check the wiring and connectors to these components and the earth connections against the current flow diagram.

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
00282 -V60 throttle valve positioner			



Implausible signal	- Throttle valve sticking - Fault in the wiring for the throttle valve positioner	- Idling speed too high - Idling speed control goes into emergency operating mode - Cruise control system is switched off	- Check the -V60 throttle valve positioner without CCS => Page 86 - Check the cruise control system => Electrical System; Repair Group 96
--------------------	--	---	--

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
00282 -V60 throttle valve positioner Adaptation limit exceeded	- -V60 throttle valve positioner defective	- Idling speed too high - Idling speed control goes into emergency operating mode - Cruise control system is switched off	- Check the -V60 throttle valve positioner without CCS => Page 85 - Check the cruise control system => Electrical System; Repair Group 96

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
00515 -G40 Hall sensor Open circuit/short to positive	- Open circuit or short to positive - Sensor disc out of position - -G40 defective	- No engine power at full throttle - Emission values not OK - High fuel consumption	- Check Hall sensor =>Page 108
Short to earth	- Short to earth - -G40 defective		
00528 F96 altitude sensor Signal too high	- Open circuit or short to positive - -F96 defective	- Possibly poor starting	- Check altitude sensor =>Page 63
Signal too low	- Short to earth - Fault in power supply to -F96 - -F96 defective	- Reduced boost pressure (safety limitation for turbo-charger speed)	

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
00532 Voltage supply Signal too high	- Excess voltage from assisted start - Alternator defective	- Damage to the engine control unit	- Check battery voltage
Signal too low	- Voltage supply less than 10 V for more than 1 second - Poor wiring to engine control unit	- Engine will not start - Engine running problems, engine may even stop - Learning procedure for throttle valve control unit not possible	- Check power supply to control unit =>Page 106



	- Battery discharged - Current drain with ignition off		- Check battery charge level
--	---	--	------------------------------

Notes on fault code 00532:

- ♦ If the fault is shown as a sporadic fault, ignore the fault message on the display. This fault is often stored when the engine is left idling for a long period with a large number of electrical consumers switched on causing the battery to become greatly discharged.
- ♦ The fault message "Signal too low" is stored if the supply voltage falls below 10.00 V for more than 1 second. (The control unit will not function at less than 6.5 V.)

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
00543 Maximum revs exceeded Protected by copyright. Copying or distribution in any form or by any means, electronic, mechanical, photocopying, recording, or by any information storage and retrieval system, 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 over revving (e.g. wrong gear engaged) - Engine speed greater than 7100 rpm	- Possible engine damage	- Rectify mechanical damage
00544 Maximum boost pressure exceeded	- Hoses interchanged, not connected, blocked or leaking - Solenoid valve for boost pressure control defective - Pressure unit for turbo-charger defective - Short to earth - Altitude sensor defective	- Loss of power (over-run cut-off until boost pressure falls to a non critical level) - Reduced boost pressure	- Check boost pressure control => Page 61 - Check solenoid valve for boost pressure control =>Page 61 - Check altitude sensor =>Page 63

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
00561 Mixture adaptation Adaptation limit (add) exceeded	- Fuel system pressure too low	- Vehicle bucking	- Fill up vehicle, check fuel-system pressure => Page 50
Adaptation limit (mul) exceeded	- Incorrect signal from air mass meter	- Increased fuel consumption	- Check air mass meter => Page 59
	- Leaks in exhaust system upstream of catalytic converter - Unmetered air downstream of air mass meter	- Possibly rough idling - Vehicle bucking	- Rectify leaks
	- Coked injectors		- Check injection quantity =>Page 52

Notes:

- ♦ (add) = additive, i.e. fault only occurs during idling.
- ♦ (mul) = multiplicative, i.e. fault occurs throughout the entire engine speed range and load range.

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
00561 Mixture adaptation Adaptation limit (add) not reached	- Fuel system pressure too low	- Vehicle bucking	- Fill up vehicle, check fuel system pressure => Page 50
Adaptation limit (mul) not reached	- Incorrect signal from air mass meter	- Increased fuel consumption	- Check air mass meter => Page 59
	- Fuel in engine oil - Unmetered air downstream of air mass meter	- Possibly rough idling - Vehicle bucking	- Drive vehicle on a motorway for 15 minutes or change oil Rectify leaks
	- Injectors leaking	Black smoke	Check injection quantity => Page 52

Notes:

- ♦ (add) = additive, i.e. fault only occurs during idling.
- ♦ (mul) = multiplicative, i.e. fault occurs throughout the entire engine speed range and load range.

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
00575 Intake manifold pressure Control limit not reached	- Signal from air mass meter too low	- Increased power	- Check air mass meter => Page 59
	- Unmetered air between air mass meter and turbocharger		- Check intake system
	- Turbocharger pressure unit sticking - Solenoid valve for boost pressure control defective - Short circuit or open circuit	- Poor performance	- Check boost pressure control => Page 61
Control limit exceeded	- Signal from air mass meter too high	- Poor performance	- Check air mass meter => Page 59
	- Turbocharger pressure unit sticking - Solenoid valve for boost pressure control defective	- Increased power	- Check boost pressure control => Page 61

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
00670 -G127 sensor for throttle valve positioner			
Signal too low	- Short to earth - Fault in power supply to -G127 - -G127 defective	- Idling speed too high - No idling speed control - Load change jolt on accelerator release - AC compressor only activated at high engine speeds	- Check sensor for -G127 throttle valve positioner without CCS => Page 78
Signal too high	- Open circuit or short to positive - Fault in earth supply to -G127 - -G127 defective		- Check sensor for -G127 throttle valve positioner with CCS => Page 85
Implausible signal	- Throttle valve sticking - Fault in wiring to -G127		

**Notes on fault code 00670:**

- ♦ The sensor for the throttle valve positioner is located in the J338 throttle valve control unit.
- ♦ The sensor is a potentiometer, which reports the position of the throttle valve positioner to the control unit.

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
00671 -E45 switch for CCS Implausible signal	- E45 defective - Open circuit or short circuit	- Cruise control system is switched off	- Check the cruise control system (CCS) => Electrical system; Repair Group 01; Technical Bulletin No. 2 Technical Bulletin No. 2

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
01119 Gear recognition signal Open/short to positive	- Open circuit or short to positive - F125 defective	- Brief and slightly more pronounced engine speed fluctuations when engaging or disengaging a gear	- Check wiring to -F125 multifunction switch => Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder - Interrogate the fault memory for gearbox => Automatic Gearbox 01M; Repair Group 01; Self diagnosis, Electrical check; Perform self diagnosis Self diagnosis, Electrical check; Perform self diagnosis
Short to earth	- Short to earth - F125 defective		

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
01165 -J338 throttle valve control unit Control limit not reached	- Throttle valve sticking - Actuator mechanics sticking	- Increased idling speed - Load change jolt on accelerator release	- Check throttle valve control unit without CCS => Page 73
Control limit exceeded Control difference	- Open circuit to -V60 throttle valve positioner		

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
01182 Height adaptation Signal outside tolerance	- G69 throttle valve potentiometer defective - Wrong throttle valve unit fitted - Unmetered air - Air cleaner blocked	- Starting problems - Poor throttle response - Starting problems	- Check -G69 throttle valve potentiometer without CCS => Page 83 - Check part number - Rectify unmetered air - Replace air cleaner

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
01247 -N80 solenoid valve 1 for activated carbon canister			
Short to earth	- Short to earth - N80 defective	- Possibility of bucking in part load range	- Check solenoid valve 1 for activated carbon canister =>Page 71
Short to positive	- Short to positive - N80 defective	- Car may smell of petrol	
Output open	- Open circuit - N80 defective		

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
01249 Injector, cylinder 1 -N30			
01250 Injector, cylinder 2 -N31			
01251 Injector, cylinder 3 -N32			
01252 Injector, cylinder 4 -N33			
Short to earth	- Short to earth - Injector defective	- Irregular engine running - Engine stops	- Check injectors =>Page 53
Short to positive	- Short to positive - Injector defective		
Output open	- Open circuit - Injector defective		

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 printout	Possible cause of fault	Possible effects	Fault remedy
01259 -J17 fuel pump relay			
Open circuit/short circuit to earth	- Open circuit - J17 fuel pump relay - defective	- Engine will not start - Engine stops - Several faults may be recorded	- Check fuel pump relay => Page 56
	- Short to earth	- Fuel pump runs continuously when ignition is on	
Short to positive	- Short to positive	- Engine will not start - Engine stops - Several faults may be recorded	

Note:

If fault code "01259" has been stored, fault codes "01247 / 01249 / 01250 / 01251 / 01252 / 1262 / 16486" may also be stored, as these components are supplied with power from the fuel pump relay.

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
01262 -N75 solenoid valve for boost pressure control			



Short to earth	- Short to earth - N75 defective	- Loss of power (over-run cut-off until boost pressure falls to a non critical level) - Boost pressure too high - Fault 0544 maximum boost pressure exceeded/ stored	- Check solenoid valve for boost pressure control =>Page 61
Short to positive	- Short to positive - N75 defective	- Poor performance - Boost pressure too low	
Output open	- Open circuit - N75 defective		

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
01314 Engine control unit Defective		- CCS not working	- Replace engine control unit => Page 48

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
16486 -G70 air mass meter Signal too low	- Open circuit or short to earth - G70 defective	- Scarcely perceptible change in performance	- Check air mass meter => Page 59
	- Unmetered air - Air cleaner blocked		- Check intake system
16487 -G70 air mass meter Signal too high	- Open circuit or short to positive - G70 defective	- Scarcely perceptible change in performance	- Check air mass meter => Page 59

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
16496 -G42 sensor for intake air temperature. Signal too low	- Short to earth - G42 defective	- Emergency operation (substitute value constant +19.5 °C)	- Check sensor for intake air temperature =>Page 103
16497 -G42 sensor for intake air temperature Signal too high	- Open circuit or short to positive - G42 defective	- Emergency operation (substitute value constant +19.5 °C)	- Check sensor for intake air temperature =>Page 103

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
16500 -G62 sensor for coolant temperature			

Implausible signal	- Moisture or corrosion on connector - Loose contact - G62 defective	- Cold start problems at very low temperatures - Engine running problems when warm	- Check sensor for intake air temperature =>Page 105
16501 -G62 sensor for intake air temperature Signal too low	- Short to earth - G62 defective	- Increased fuel consumption - Emission values not OK	
16502 -G62 sensor for coolant temperature Signal too high	- Open circuit or short to positive - G62 defective		

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
16505 -G69 throttle valve potentiometer Implausible signal	- Moisture or corrosion in the connector - G69 defective	- Acceleration bucking - Rough idling	- Check -G69 throttle valve potentiometer without CCS => Page 76
16506 -G69 throttle valve potentiometer Signal too low	- Open circuit or short to earth - G69 defective	- Acceleration bucking - Load change jolt on accelerator release	- Check -G69 throttle valve potentiometer with CCS => Page 83
16507 -G69 throttle valve potentiometer Signal too high	- Open circuit or short to positive - G69 defective	- Acceleration bucking - Load change jolt on accelerator release	

Note on fault code 16505:

The air throughput (air mass) at the relevant speed is checked with the throttle angle.

Notes on fault codes 16505, 16506 and 16507:

- Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability for errors or omissions.
- ◆ As soon as the error is identified, the control unit uses a substitute value formed from the speed.
 - ◆ If an error occurs simultaneously on the G69 throttle valve potentiometer and the air mass meter, no emergency operation function is possible. Consequence: The engine stalls.

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
16514 Bank 1 - Probe 1 Electrical fault in circuit	- Corrosion due to moisture on connector - Short circuit between signal line for lambda probe and reference earth wire for lambda probe	- Lambda control not working (mixture formation is controlled)	- Check lambda control =>Page 67



	- Amplitude in signal line too low (lambda probe contaminated or probe slots clogged or dirty)	- Rough idling - Emission values not OK - Increased fuel consumption	- Check lambda probe signal line and actuation => Page 69
--	--	--	---

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
16515 Bank 1 - Probe 1 Voltage too low	- Short to earth or short to screening in lambda probe signal line - Short to earth or short to screening in lambda probe reference earth line - Lambda probe defective	- Lambda control not working (mixture formation is controlled) - Rough idling - Emission values not OK - Increased fuel consumption	- Check lambda control =>Page 69
16516 Bank 1 - Probe 1 Voltage too high	- Short to positive in signal line		

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
16518 Bank 1 - Probe 1 No activity	- Short to earth in reference earth line - Lambda probe defective (dirty) - Lambda probe heating not functioning	- Rough idling - Emission values not OK - Increased fuel consumption - Soot deposits on spark plugs	- Check lambda control =>Page 67 - Check fuel pump relay => Page 68
16519 Bank 1 - Probe 1 Electrical fault in heating circuit	- Open circuit or short circuit	- Lambda probe heating not functioning	- Check lambda probe heating => Page 68

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
16705 -G28 engine speed sensor Implausible signal	- Sensor disc loose or bent - -G28 engine speed sensor defective - Loose contact - Open circuit in screening	- Poor starting - Engine misfiring	- Remove oil sump and check sensor disc - Check engine speed sensor =>Page 104
16706 -G28 engine speed sensor No signal	- Open circuit or short circuit - -G28 engine speed sensor loose or defective	- Engine will not start - Engine cuts out	- Check engine speed sensor =>Page 104

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
16711 -G61 knock sensor 1 Signal too low	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.		

16716 -G66 knock sensor 2 Signal too low	- Knock sensor loose or corrosion on connector	- High fuel consumption - Poor performance	- Tightening torque for knock sensor: 20 Nm
	- Open circuit or short to earth - Knock sensor defective		- Check knock sensor =>Page 106

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
16885 Vehicle speed signal Implausible signal	- Open circuit between -G22 speedometer sensor and dash panel insert - Open circuit between dash panel insert and engine control unit - -G22 defective - Dash panel insert defective	- Engine control unit does not deactivate air conditioner compressor - Poor load change performance	- Check speed signal => Page 92
16989 Control unit defective	- Engine control unit defective	- Engine will not start	- Replace engine control unit => Page 48

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
17733 Knock control cyl. 1 17734 Knock control cyl. 2 17735 Knock control cyl. 3 17736 Knock control cyl. 4 Control limit reached	- Poor quality fuel (less than RON 91) - Knock sensor tightened with incorrect torque - Abnormal engine noise (ancillaries loose)	- High fuel consumption - Poor performance - Irregular engine running	- Fill up with petrol of at least RON 91 - Tighten knock sensor (20 Nm) - Check knock control => Page 106

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
17913 -F60 idling switch Does not close / open circuit	- Throttle cable setting - Floor mat pressing down on accelerator	- Idling speed too high	- Adjust throttle cable => 4-cylinder engine, mechanical components; Repair Group 20; fuel supply; repair throttle mechanism fuel supply; repair throttle mechanism



	- Throttle valve sticking - Open circuit or short to positive - -F60 idling switch defective	- Idling speed control not functioning - Load change jolt on accelerator release - AC compressor only activated at high engine speeds	- Check idling switch =>Page 75
17914 -F60 idling switch Does not open / short to earth	- Moisture in throttle valve connector - Short to earth - -F60 idling switch defective		

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
17953 Throttle valve control Faulty	- Open circuit - Throttle valve stiff or dirty - -G69 and -G127 defective	- Idling speed too high - Load change jolt on accelerator release	- Check -J338 throttle valve control unit - without CCS => Page 80
17966 Throttle valve drive Electrical fault in circuit	- Short to earth - short to positive - -V60 throttle valve positioner defective	- Idling speed too high	- Check throttle valve positioner without CCS => Page 86

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
17967 -J338 throttle valve control unit Fault in basic setting	- Idling switch open or open circuit - Throttle valve sticks and will not close - Pulse detected by engine speed sensor	- Adaptation of throttle valve control unit not performed	- Adapt the throttle valve control unit => Page 80
17972 -J338 throttle valve control unit Undervoltage in basic setting	- Voltage less than 10 V during basic setting		- Check voltage, read measured value blockDisplay Group 03, display zone 2=> Page 30

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
17978 Engine control unit blocked	- Attempted tampering	- Engine starts but cuts out again immediately	- Adapt engine electronics control unit to electronic immobilizer => Electrical System; Repair Group 01; immobilizer self-diagnosis

	- Short circuit in the communication line - Immobilizer control unit defective/missing		- Check the electronic immobilizer => Electrical System; Repair Group 01; immobilizer self-diagnosis
--	---	--	---

Note on fault code 17978:

If an attempt is made to start the car with a key which has not been adapted, a static fault will be recorded. If the car is then started with a correctly adapted key, the fault will be re-classified as a sporadic fault.

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
18010 Power supply term. 30 Voltage too low	- Battery was disconnected - Open circuit	- All learned values erased	- Erase fault memory and continue to observe vehicle - Check power supply for control unit =>Page 106
18020 Engine control unit incorrectly encoded	- Engine control unit incorrectly encoded	- Loss of performance - Increased emission values - Various faults in fault memory	- Encode control unit =>Page 19

V.A.G 1551 printout	Possible cause of fault	Possible effects	Fault remedy
18034 CAN bus fault. Message from gearbox control unit	- Fault in the data lines to the gearbox control unit	- Automatic gearbox goes into emergency operation - Engine running problems (gearshift jolt, load change jolt)	- Checking the Motronic system/ABS/gearbox data exchange (CAN bus) => Page 96
18259 CAN bus fault. Message from ABS control unit	- Fault in the data line to the ABS control unit (antilock system)	- No driving dynamics control	- Checking the Motronic system/ABS/gearbox data exchange (CAN bus) => Page 96

1.6 - Final control diagnosis

Notes:

- ◆ The final control diagnosis can only be performed with the engine stopped and the ignition switched on.
- ◆ The final control diagnosis will be terminated if the engine is started or if an engine speed pulse is detected.



- ♦ During the final control diagnosis, individual control elements continue to be actuated until the test programme is advanced to the next control element by pressing the ➡ key.
- ♦ The control elements can be checked either by listening or by touching.
- ♦ Before repeating the final control diagnosis, without starting the engine briefly, switch off the ignition for approx. 20 seconds.
- ♦ The electric fuel pump runs continuously throughout the final control diagnosis.
- ♦ The final control diagnosis is terminated after 10 minutes.

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

1. Injector, cylinder 1 -N30

2. Injector, cylinder 2 -N31

3. Injector, cylinder 3 -N32

4. Injector, cylinder 4 -N33

5. -N80 solenoid valve 1 for activated carbon canister

6. -N75 solenoid valve for boost pressure control

- Connect the V.A.G 1551 fault reader (V.A.G 1552) and select the engine electronics control unit with the "Address word" 01. During this, the ignition must be switched on.
(Connecting the fault reader and selecting the control unit for the engine electronics => Page 2.)

-> Display readout:

Rapid data transfer HELP
Select function XX

- Press keys 0 and 3 for the function "Final control diagnosis".

-> Display readout:

Rapid data transfer Q
03 - Final control diagnosis

- Confirm input with the Q key.

-> Display readout:

Final control diagnosis
Injector, cylinder 1 -N30

- Turn the throttle mechanism on the throttle valve control unit to open the idling switch.

The injector should click five times.

- To switch to the next injector, press the ➡ key. (It is also possible to advance the programme without checking the injector in question.)
- Use this procedure to check all the injectors in sequence.

If one of the injectors is not actuated (does not click):

- Check the injectors => Page 53
- Press the ➡key.

-> Display readout:

Final control diagnosis
-N80 solenoid valve 1 for activ. carb.
canistor

This solenoid valve will continue to be actuated (clicks) until the ➡ key is pressed to switch to the next control element.

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

- Check the -N80 solenoid valve for the activated carbon canister =>Page 71 .
- Press the =>key.

-> Display readout:

Final control diagnosis
 -N75 solenoid valve for boost pressure control

This solenoid valve will continue to be actuated (clicks) until the => key is pressed to switch to the next control element.

Note:

The clicking of the valve is difficult to hear and it is therefore best checked by touch.

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

- Check the solenoid valve for boost pressure control
 =>Page 61
- Press the =>key.

Note:

The final control diagnosis cannot be re-started until the ignition has been switched off briefly.

1.7 - Basic setting

With the engine stopped, the following operation can be performed with the basic setting:

- ◆ Adaptation of the throttle valve control unit to the engine control unit => Display Group 98

With the engine running, the following operations can be performed with the basic setting:

- ◆ Learning process for lambda control
 => all display groups
- ◆ Fault finding by selective actuation and deactuation of the lambda control => Display Group 99
- ◆ Check the ignition timing
 => Display Group 95

Test conditions for operations with engine running

- Coolant temperature at least 80 °C
- Electrical consumers switched off (radiator fan must not run during the test)
- Air conditioner switched off
- Gear selector lever in P or N position
- No fault stored in fault memory
- Connect the V.A.G. 1551 fault reader and select the engine electronics control unit.
 => Page 2 .
- Interrogating and erasing fault memory.
 => Page 3 No faults must be stored (if necessary, rectify fault, erase fault memory, switch off and re-start engine, perform test drive and interrogate the fault memory again as a check.
- Leave engine idling.

-> Display readout:

Rapid data transfer HELP
 Select function XX



- Press keys 0 and 4.

(04 is used to select the function "Basic Setting")

-> Display readout:

```
Rapid data transfer      Q
04-Basic setting
```

- Confirm entry by pressing the Q key.

-> Display readout:

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

- Enter the required display group number according to the list of display groups in "Reading measured value block" => Page 21 .

Note:

Display Group number 00 is used here as an example to demonstrate the procedure.

- Press key 0 three times.

(000 is used to select the function "Display Group 00").

-> Display readout:

```
Basic setting      Q
Enter display group number    00
```

- Confirm entry by pressing the Q key.

-> Display readout:

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

Display group 00 (decimal value)										
▪ Engine running at idling speed										
Display zones										
1	2	3	4	5	6	7	8	9	10	
										Learned value for mixture formation (if outside tolerance, perform test drive)
										118...138
										-8...+8 %
										Learned value for mixture formation (if outside tolerance, perform test drive)
										115...141
										-0.64...+0.64 ms
										Control value for mixture formation (if outside tolerance, perform test drive)
										78...178
										-10...+10 %
										Learned value for idle stabilisation
										120...136
										-4.0...+4.0 kg/h
										Control value for idle stabilisation
										122...134
										-3.0...+3.0 kg/h
										Throttle angle
										0...12
										0...5 °
										Battery voltage
										142...206
										10...14.5 V
										Engine speed (idling speed)
										80...92
										800...920 rpm1)
										Engine load (no consumers)
										10...30
										0.5...1.5 ms
										Coolant temperature (pre-condition for basic setting)
										170...204
										80...105 °C

- 1) Current values:

=> Exhaust Emissions Check under

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.

- Run engine at idling speed for a few minutes, coolant temperature at least 80 °C.

Display zone 1: specified value at least 170)

Notes:

- ◆ Each time the PRINT key is pressed, the current display is printed out.
- ◆ Press the C key before selecting further display groups.
- If the specified values are achieved in all display zones, press the ⇒ key.

-> Display readout:

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.

- Press keys 0 and 6.

(06 is used to select the function "End of output".)

-> Display readout:

Rapid data transfer	Q
06 - End of	output

- Confirm entry by pressing the Q key.

-> Display readout:

Rapid data transfer	HELP
Select function XX	

1.8 - Encoding the control unit

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

- Connect the V.A.G 1551 fault reader (V.A.G 1552) and select the engine electronics control unit with the "Address word" 01. During this, the ignition must be switched on.
 (Connecting the fault reader and selecting the control unit for the engine electronics => Page 2).

-> Display readout:

Rapid data transfer	HELP
Select function XX	

- Press keys 0 and 7 for the function "Encoding control unit" and confirm entry with the Q key.

-> Display readout:

Encode control unit	Q
Input code number xxxxx	(0- 32000)

- Enter the appropriate code number for this vehicle and confirm with the Q key.

Encoding variants =>Page 20

Compose the code number as follows (example):

Member State of the European Union	04
Front wheel drive without traction slip control	0
5-speed manual gearbox	0
Audi A3	0



Code number	04 0 0 0
-------------	----------

-> The control unit identification appears on the V.A.G 1551 fault reader, e.g.:

8D0907557.. 1.8l	R4/5VT MOTR HS
D..	
Code 04000	WSC 12345

- Switch the ignition off and then on again.

Note:

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

- Press the ➡key.

-> Display readout:

Rapid data transfer	HELP
Select function XX	

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

Encoding variants for the engine control unit

Country/emissions	Drive / auxiliary functions	Gearbox	Vehicle type
00 = ---	0 = Front wheel drive without traction slip control	0 = 5-speed manual gearbox	0 = Audi A3
01 = ---	1 = ---	1 = ---	1 = ---
02 = Non Member State of the European Union (MVEG I)	2 = Four wheel drive without traction slip control	2 = ---	2 = ---
03 = ---	3 = ---	3 = Automatic gearbox 01V	3 = ---
04 = Member State of the European Union (MVEG II)	4 = ---	4 = ---	4 = ---
05 = ---	5 = ---	5 = ---	5 = ---
06 = ---	6 = ---	6 = ---	6 = ---
07 = ---	7 = ---	7 = ---	7 = ---
08 = China and Commonwealth of Independent States (CIS)	8 = ---	8 = ---	8 = ---

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.

1.9 - Reading measured value block

Test conditions

- Coolant temperature at least 80 °C
- Electrical consumers switched off (radiator fan must not run during the check)
- Air conditioner switched off
- Gear selector lever in P or N position
- Connect the V.A.G 1551 fault reader (V.A.G 1552) and select the engine electronics control unit with the "Address word" 01. During this, the engine must be running at idling speed.
(Connecting the fault reader and selecting the control unit for the engine electronics => Page 2).

-> Display readout:

Rapid data transfer	HELP
Select function XX	

- Press keys 0 and 8 for the function "Reading measured value block" and confirm entry with the Q key.
- Enter the desired display group number and confirm entry with the Q key.

-> Display readout (for example):

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

Note:

To change to another display group, proceed as follows:

Display group	V.A.G 1551	V.A.G 1552
Up	Press key 3	Press ↑ key
Down	Press key 1	Press the ↓ key
Skip	Press the C key	Press the C key

List of display groups

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 no.	Display Readout	Meaning
00 Basic function	Read measured value block 00 1 2 3 4 5 6 7 8 9 10	1 = Coolant temperature 2 = Engine load 3 = Engine speed 4 = Battery voltage 5 = Throttle angle 6 = Control value for idling air mass 7 = Learned value for idling air mass 8 = Control value for mixture formation (lambda control value) 9 = Learned value for mixture formation (lambda learned value) 10 = Learned value for mixture formation (lambda learned value)

Display Group no.	Display Readout	Meaning
01 Basic function	Read measured value block 1 1 2 3 4	1 = Engine speed 2 = Engine load (injection period per crankshaft revolution) 3 = Throttle angle 4 = Ignition timing
02 Basic function	Read measured value block 2 1 2 3 4	1 = Engine speed 2 = Engine load (injection period per crankshaft revolution) 3 = Injection period (per engine cycle) 4 = Intake air mass
03 Basic function	Read measured value block 3 1 2 3 4	1 = Engine speed 2 = Battery voltage 3 = Coolant temperature 4 = Intake air temperature



Display Group no.	Display Read-out	Meaning
04 Idle stabilisation	Read measured value block 4 1 2 3 4	1 = Throttle angle 2 = Learned value for idle stabilisation for manual gearbox and automatic gearbox with no gear engaged 3 = Learned value for idle stabilisation for automatic gearbox with gear engaged 4 = Operating status Idling speed Part load Overrun Enrichment
05 Idling-stabilisation	Read measured value block 5 1 2 3 4	1 = Engine speed (actual) 2 = Engine speed (specified) 3 = Control value for idle stabilisation (idling speed control) 4 = Intake air mass

Display Group no.	Display Readout	Meaning
06 Idling-stabilisation	Read measured value block 6 1 2 3 4	1 = Engine speed 2 = Control value for idle stabilisation (idling speed control) 3 = Control value for mixture formation (lambda control value) 4 = Ignition timing
07 Lambda control	Read measured value block 7 1 2 3 4	1 = Control value for mixture formation (lambda control value) 2 = Lambda probe voltage 3 = Signal ratio for -N80 solenoid valve 1 for activated carbon canister 4 = Correction factor for mixture formation with active fuel tank breather system
08 Lambda control learned values	Read measured value block 8 1 2 3 4	1 = Injection period (per engine cycle) 2 = Control value for mixture formation at idling speed (additive) 3 = Learned value for mixture formation at part load (multiplicative) 4 = Fuel tank breather system: TB active Fuel tank breather system active TB not active Fuel tank breather system not active λ-Adaptation Fuel tank breather system not active, learning process for mixture formation in progress

Display Group no.	Display Read-out	Meaning
09 Lambda learned values	Read measured value block 9 1 2 3 4	1 = Engine speed 2 = Control value for mixture formation (lambda control) 3 = Lambda probe voltage 4 = Control value for mixture formation at idling speed (additive)

Display Group no.	Display Read-out	Meaning
10 Tank breather	Read measured value block 10 1 2 3 4	1 = Signal ratio for -N80 solenoid valve 1 for activated carbon canister 2 = Correction factor for mixture formation with active fuel tank breather system 3 = Fill level of -N80 activated carbon canister 4 = Air from fuel tank breather system as a proportion of total air mass
11 Fuel consumption	Read measured value block 11 1 2 3 4	1 = Engine speed 2 = Engine load (injection period per crankshaft revolution) 3 = Speed 4 = Fuel consumption

Display Group no.	Display Readout	Meaning
12 Fuel consumption	Read measured value block 12 1 2 3 4	1 = Engine speed 2 = Battery voltage 3 = Fuel consumption 4 = Ignition timing
13 Knock control	Read measured value block 13 1 2 3 4	1 = Cylinder 1 ignition timing retardation by knock control 2 = Cylinder 2 ignition timing retardation by knock control 3 = Cylinder 3 ignition timing retardation by knock control 4 = Cylinder 4 ignition timing retardation by knock control
14 Knock control	Read measured value block 14 1 2 3 4	1 = Engine speed 2 = Engine load (injection period per crankshaft revolution) 3 = Cylinder 1 ignition timing retardation by knock control 4 = Cylinder 2 ignition timing retardation by knock control

Display Group no.	Display Readout	Meaning
15 Knock control	Read measured value block 15 1 2 3 4	1 = Engine speed 2 = Engine load (injection period per crankshaft revolution) 3 = Cylinder 3 ignition timing retardation by knock control 4 = Cylinder 4 ignition timing retardation by knock control
16 Knock control	Read measured value block 16 1 2 3 4	1 = Knock sensor signal, cylinder 1 2 = Knock sensor signal, cylinder 2 3 = Knock sensor signal, cylinder 3 4 = Knock sensor signal, cylinder 4
17 Catalyst heating	Read measured value block 17 1 2 3 4	1 = Engine speed 2 = Engine load 3 = Energy balance for catalyst heating 4 = Ignition timing



Display Group no.	Display Readout	Meaning
18 Altitude correction	Read measured value block 18 1 2 3 4	1 = Engine speed 2 = Engine load without altitude correction 3 = Engine load with altitude correction 4 = Correction factor for mixture formation based on air density (altitude)
19 Torque reduction up to model year 1998	Read measured value block 19 1 2 3 4	1 = Engine speed 2 = Engine load (injection period per crankshaft revolution) 3 = Gearbox intervention 4 = Ignition timing
19 Torque reduction from model year 1998	Read measured value block 19 1 2 3 4	1 = Engine speed 2 = Engine load (injection period per crankshaft revolution) 3 = Signals Pressure switch for power steering Gearbox intervention Clutch pedal switch 4 = Ignition timing

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted without express authorisation by AUDI AG. AUDI AG does not accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Display Group no.	Display Readout	Meaning
20 Operating conditions	Read measured value block 20 1 2 3 4	1 = Engine speed 2 = Selector lever position Neutral Selector lever in position P or N Gear engaged Selector lever at 1, 2, 3, D, or manual gearbox 3 = Air conditioner High High heating or cooling power Low low heating or cooling power 4 = Air conditioner compressor Compr.OFF Air conditioner compressor off Compr.ON Air conditioner compressor on
21 Operating conditions Lambda control	Read measured value block 21 1 2 3 4	1 = Engine speed 2 = Engine load (injection period per crankshaft revolution) 3 = Coolant temperature 4 = Lambda control λ-control OFF Lambda control off λ-control ON Lambda control on

Display Group no.	Display Readout	Meaning
22	Read measured value block 22 1 2 3 4	(Ignore)
23 Throttle valve control unit	Read measured value block 23 1 2 3 4	1 = Learning demand display 1 X X X X X Potentiometer characteristics learned X 0 X X X X Adaptation to engine control unit completed X X 0 X X X Upper stop position learned by -G69 throttle valve potentiometer

		X X X 0 X X Lower stop position learned by -G69 throttle valve potentiometer X X X X 0 X Upper stop position learned by -G127 throttle valve positioner X X X X X 0 Upper stop position learned by -G127 throttle valve positioner 2 = Lower stop of throttle valve positioner 3 = Emergency running stop for throttle valve positioner 4 = Upper stop of throttle valve positioner
--	--	---

Display Group no.	Display Read-out	Meaning
24	Read measured value block 24 1 2 3 4	1 = Engine speed 2 = Engine load (injection period per crankshaft revolution) 3 = Ignition timing 4 = Total ignition timing retardation for cylinders 1 to 4
25	Read measured value block 25 1 2 3 4	1 = Specified engine load (driver's requirement via accelerator pedal) 2 = Specified engine load after correction based on knock control, altitude and coolant temperature 3 = Actual engine load 4 = Signal ratio for -N75 boost pressure control solenoid valve

Display Group no.	Display Read-out	Meaning
26	Read measured value block 26 1 2 3 4	1 = Control value for idle stabilisation (idling speed control) 2 = Learned value for idle stabilisation with manual gearbox and with automatic gearbox with no gear engaged 3 = Coolant temperature 4 = Engine speed
27	Read measured value block 27 1 2 3 4	1 = Engine load reduction by knock control 2 = Engine load (actual) after reduction 3 = Engine speed 4 = Signal ratio for solenoid valve for boost pressure control -N75
66	Read measured value block 66 1 2 3 4	1 = Switch settings for operating switch (CCS) 2 = Driving speed (actual) 3 = Switch settings Brake, clutch, CCS released 4 = Driving speed (specified)

Display Group no.	Display Readout	Meaning
98	Read measured value block 98 1 2 3 4	1 = Voltage from throttle valve potentiometer -G69 2 = Voltage from throttle valve positioner -G127 3 = Operating status Idling speed



		Part load Overrun Enrichment 4 = Adaptation status (ADP = adaptation) ADP. running Adaptation in progress ADP. OK Adaptation successfully completed ADP. ERROR An error has occurred in the adaptation process
--	--	--

Display Group no.	Display Readout	Meaning
99 Lambda control	Read measured value block 99 1 2 3 4	1 = Engine speed 2 = Coolant temperature 3 = Control value for mixture formation (lambda control) 4 = Lambda control λ-control OFF Lambda control off λ-control ON Lambda control on

1.10 - Reading measured value block: Display Groups 00 to 10

Display group 00 (decimal values)							
▪ Engine running at idling speed							
Display zones					Specified value	Corresponds to	
1	2	3	4	5	Learned value for mixture formation (if outside tolerance, perform test drive)	118...138	
6	7	8	9	10			
					Learned value for mixture formation (if outside tolerance, perform test drive)	115...141	
					Control value for mixture formation (if outside tolerance, perform test drive)	78...178	
					Learned value for idle stabilisation	120...136	
					Control value for idle stabilisation	122...134	
					Throttle angle	0...12	
					Battery voltage	142...206	
					Engine speed (idling speed)	80...92	
					Engine load (no consumers)	10...30	
					Coolant temperature (pre-condition for basic setting)	170...204	

1) Current values:

=> Exhaust Emissions Check binder

Test table, Display Group 00

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1	greater than 204	- G62 sensor for coolant temperature - Wiring to engine control unit	- Check -G62 => Page 105
	less than 170	- G62 sensor for coolant temperature - Wiring to engine control unit	- Check -G62 => Page 105

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
		- Coolant thermostat constantly open	- Check coolant thermostat

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
2	greater than 30	- Air conditioning system switched on - Electrical consumers on - Lambda control at rich or lean stop - Air conditioner compressor running although air conditioner is off	- Switch off the air conditioner - Switch off the consumers - Check the lambda control => Page 67 - Check air conditioner compressor control => Page 87
	less than 10	- Unmetered air downstream of air mass meter - Unmetered air downstream of throttle valve - Vacuum hose disconnected - Fuel pressure regulator	- Rectify fault

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
3	less than 80	- Drive position engaged (automatic gearbox) - Engine loaded by ancillaries - J338 throttle valve control unit sticking or defective	- Put selector lever in P or N position - Remove load (e.g. air conditioner, power steering) - Check J338 throttle valve control unit =>Page 79
	greater than 92	- F60 idling switch open or defective - Large quantity of unmetered air (cannot be compensated by idling speed stabiliser) - J338 throttle valve control unit sticking or defective	- Interrogate the fault memory and check/adjust idling switch - Rectify unmetered air - Check -J338 throttle valve control unit =>Page 79

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
4	less than 142	- Alternator defective, battery heavily discharged - Heavy high load on electrical system shortly after starting engine due to high charging current and load from ancillaries - Contact resistance in positive supply or earth connection for engine control unit - Current drain with ignition off	- Test voltage, charge battery - Slightly increase engine speed for several minutes and switch off ancillaries - Check power supply to engine control unit =>Page 106 - Rectify current drain
	greater than 206	- Voltage regulator on alternator defective - Excess voltage from assisted start or high speed charging	- Test voltage; if necessary replace regulator - Interrogate the fault memory =>Page 3

Protected by copyright. Copying for private or commercial purposes, in whole or in part, is prohibited without the written permission of Audi AG. Audi AG does not guarantee the correctness of the information in this document. Copyright by Audi AG.

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
5	less than 0	- Not possible	



Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
	greater than 12	- Basic setting of throttle valve control unit not performed - Throttle control cable not OK - Throttle valve potentiometer in throttle valve control unit defective - Throttle valve mechanism sticking	- Perform basic setting of throttle valve control unit => Page 3 - Adjust throttle cable => 4-cylinder engine, mechanical components; Repair Group 20; remove and install parts of the fuel supply; repair throttle mechanism - Rectify fault, replace if necessary
6	less than 122	- Unmetered air downstream of throttle valve	- Eliminate unmetered air
	greater than 134	- Increased engine load from ancillaries	- Remove load by switching off ancillaries

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
7	less than 120	- Unmetered air downstream of throttle valve	- Eliminate unmetered air
	greater than 136	- Increased engine load from ancillaries	- Reduce load by switching off ancillaries
8	less than 78	- Mixture too rich; lambda control makes it leaner - Large quantity of fuel from ACF system (not with basic setting) - Leak in vacuum hose for fuel pressure regulator - Lambda learned values at stop	- Press down on accelerator pedal at 20 second intervals until the learning process has been performed - Replace vacuum hose - Check lambda-learned values, Display Group 08 =>Page 32

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
8	greater than 178	- Mixture too lean; lambda control makes it richer - Unmetered air - Injectors defective - Lambda learned values at stop	- Check injection quantity => Page 52 - Eliminate unmetered air - Check lambda-learned values, Display Group 08 =>Page 32
	Readout fluctuates or remains constant at 128	- Fuel reserve too low - Lambda mixture control is on open loop control	- At least 10 l of fuel in the tank
9	less than 115 or greater than 141		- Display Group 08, display panels 2 and 3 =>Page 32
10	less than 118 or greater than 138		- Display Group 08, display panels 2 and 3 =>Page 32

Display Group 01 - Basic function at idling speed (engine warm, coolant temperature not below +85 °C):

Read measured value block 1 800...920 rpm 0.5...1.5 ms 0...5 <°	⇒ 3...12 ° BTDC	• Display readout
--	-----------------------	-------------------

			Ignition timing ▪ 3...12.0° BTDC OK ▪ greater than 12.0° BTDC: Engine loaded => Switch off consumers
			Throttle angle ▪ 0...5 <°: OK. ▪ greater than 5 <°: No throttle valve control unit adaptation => Page 73 Throttle cable incorrectly set => Adjust ▪ Throttle valve control unit defective => Replace Note: The value displayed when the accelerator pedal is fully depressed is around 80...90 <°. As soon as a fault from the throttle valve potentiometer is recognised, a constant substitute value of 35 <° is displayed.
			Engine load ▪ 0.5...1.5 ms: OK ▪ less than 0.5 ms: Unmetered air downstream of air mass meter => Check intake system ▪ Fuel pressure too high => check - Page 50 ▪ greater than 1.50 ms Engine loaded => Switch off consumers
			Engine load shown in increments of 40 ▪ 800...920 rpm: OK ▪ Outside tolerance: Check idling speed => Page 49

Display Group 02 - Basic function at idling speed (engine warm, coolant temperature not below +85°C):

Read measured value block 2 =>				Display readout
800...920 rpm	0.5...1.5 ms	1...3 ms	1.8...4.0 g/s	
				Intake air mass ▪ 1.8...4.0 g/s: OK ▪ less than 1.8 g/s Unmetered air downstream of air mass meter => Check ▪ greater than 4.0 g/s Engine loaded => Switch off consumers
				Corrected injection period per engine cycle ▪ 1.00...3.00 ms: OK ▪ less than 1.00 ms: High proportion from tank breather system => Page 71 ▪ greater than 3.00 ms: Engine loaded => Switch off consumers
				Engine load, theoretical injection period per crankshaft revolution ▪ 0.5...1.50 ms: OK ▪ less than 0.5 ms: Unmetered air downstream of air mass meter => Check intake system ▪ or fuel pressure too high => Check - Page 50 ▪ greater than 1.50 ms Engine loaded => Switch off consumers
				Idling speed is shown in increments of 40 ▪ 800...920 rpm: OK ▪ Outside tolerance: Check idling speed => Page 49

Notes on Display Group 02:

- ◆ Display zone 2 shows the injection period corresponding to the intake air mass and the engine load when idling. This value is a calculated, theoretical value which, because of the processor technology, only relates to a single crankshaft revolution. The engine load when idling is the load created by the internal friction which the engine has to overcome and the power required to drive the ancillaries. The intake air mass is shown in display zone 4.
- ◆ Display zone 3, on the other hand, shows the injection period for a complete engine cycle, i.e. two crankshaft revolutions.
- ◆ However, the value shown in display zone 3 is not approximately twice the value in display zone 2, but a corrected actual injection period. Corrected by influencing variables such as:



- Lambda control

- Fuel intake from the activated carbon canister

- Air density, air temperature

- Vehicle voltage (faster /slower opening of injectors)

- ♦ For example, if the engine takes in unmeasured air, only the calculated value in display zone 2 (injection period per crankshaft revolution) should change. The lambda mixture control will ensure that the actual injection period per complete engine cycle remains at the specified value.

Display Group 03; basic function (warm engine, coolant temperature not less than +85 °C)

Read measured value block 3 ⇒				◀ Display readout
800...920 rpm	10...14.5 V	80...105 °C	...	°C
			Intake air temperature	
			▪ In the event of an open circuit, a constant temperature of -19.5°C will be displayed as a substitute value.	
			▪ Check the -G42 sensor for intake air temperature =>Page 105	
			Coolant temperature	
			▪ 80...105 °C: OK	
			▪ less than 80 °C run engine until warm	
			▪ Check -G62 sensor for coolant temperature =>Page 105	
			Battery voltage	
			▪ 10.000...14.500 V: OK	
			▪ Outside tolerance: Check voltage supply from engine control unit => Page 106	
			Idling speed is shown in increments of 40	
			▪ 800...920 rpm: OK	
			▪ Outside tolerance: Check idling speed => Page 49	

Note on display zone 4:

It is not possible to give specified values as the display readout is heavily affected by the ambient temperature.

Display Group 04: Idling speed setting (warm engine, coolant temperature not less than +85 °C)

Read measured value block 4 ⇒				◀ Display readout
0...5 <°	-1.1...+1.1 g/s	-1.1...+1.1 g/s	Idling speed	
				Operating status (idling, part load, enrichment, overrun)
				▪ Idling: OK
				▪ Other display: Check idling speed => Page 75
				Idling speed air mass, learned with automatic gearbox with gear engaged D/1/2/3
				On cars with manual gearboxes, the display will always show the value "0".
				Idling speed air mass learned (no gear engaged with automatic gearbox)
				▪ - 1.1...+ 1.1 g/s: OK
				▪ Less than - 1.1 g/s: Unmetered air downstream of throttle valve => Check
				▪ higher than + 1.1 g/s: Engine loaded => Switch off consumers
				▪ Intake system blocked => Check
				Throttle angle
				▪ 0...5<°: OK.
				▪ greater than 5 <°: Throttle cable incorrectly adjusted => Adjust
				▪ no adaptation, check throttle valve control unit => Page 73

Notes on display zones 2 and 3:

- ♦ The display shows how far the learned values of the idle stabilisation have "drifted away" from the pre-programmed mean value. With a new engine, the display will show a positive value because of the greater friction; if the engine has been run in it will show a negative value. A value of - 1.7 g/s combined with an excessively low value in Display Group 05, display zone 3, indicates the presence of unmetered air.
- ♦ The value displayed is not measured by the air mass meter but calculated from information from the throttle valve potentiometer.

Display Group 05, idling speeding stabilisation when idling: (warm engine, coolant temp. not less than +85 °C)

Read measured value block 5 ⇒				◀ Display readout
800...920 rpm	rpm	-10...+10 %	1.8...4.0 g/s	
				Air mass ▪ 1.8...4.0 g/s: OK ▪ less than 1.8 g/s Unmetered air downstream of air mass meter => Check ▪ greater than 4.0 g/s Engine loaded => Switch off consumers
				Idling speed control ▪ -10...+10 %: OK
				Engine speed (specified)
				Engine speed (actual) is shown in increments of 10 ▪ 800...920 rpm: OK ▪ Outside tolerance: Check idling speed => Page 49

Notes on display zone 3:

- ♦ During idling, the air mass requirement varies with changing load conditions, even though the engine speed is constant.
- ♦ The change in air mass during idling is shown as a percentage. As soon as the change has been compensated by the idle stabilisation learning process, the mean value is restored. The amount of deviation from the mean value depends on the extent of the load change (e.g. as a result of switching electrical consumers on or off).
- ♦ The learning process proceeds in small stages each time the idling switch closes. In the event of a large deviation, several stages are required. To do this, the accelerator pedal should be briefly pressed. at intervals of approx. 20 seconds (throttle burst). Each time this is done, a further stage of the learning process is performed.
- ♦ The "drifted" deviation then appears in Display Group 04, display zone 2. The values from the idling speed control remain outside the tolerance if the learned values in Display Group 04, display zone 2 have reached the stop (stop values: -1.1 g/s and +1.1 g/s).

Notes on display zone 4:

- ♦ With fault (00670), throttle valve positioner: constant engine speed and air throughput of 2.8 g/s.
- ♦ With faults (00670/16505/16506/16507), throttle valve positioner and throttle valve potentiometer, the digital idle stabilisation (DIS) is switched off and a constant speed of approx. 1000 rpm and an air mass of 2.8 g/s is output.

Display Group 06, idling speeding stabilisation when idling: (warm engine, coolant temp. not less than +85°C)

Read measured value block 6 ⇒				◀ Display readout
800...920 rpm	-10...+10 %	-10...+10 %	3...12°BTDC	
				Ignition timing
				Lambda control
				Idling speed control



Idling speed is shown in increments of 10

- 800...920 rpm: OK
- Outside tolerance: Check idling speed => Page 49

Notes on display zone 3:

- ♦ The display must fluctuate around zero. If a constant 0 is displayed, the lambda control has switched from closed-loop control to open-loop control because there is a fault in the lambda control: Interrogate the fault memory => Page 3.
- ♦ Operating status of lambda control Display Group 21, display panel 4 =>Page 39.

Display Group 07, lambda control and ACF system: (warm engine, coolant temperature not less than +85 °C)

Read measured value block 7	⇒	Display readout
-10...+10 %	0...1 V	0...99 %
		0.3...1.2
Lambda correction factor with active fuel tank breather system ▪ less than 1.00 Tank breather supplying rich mixture, lambda control reduces the quantity injected ▪ Display 1.00: No fuel tank breather function or fuel tank breather supplying ideal mixture ($\lambda = 1$) ▪ Greater than 1.00 Tank breather supplying lean mixture, lambda control increases the quantity injected Signal ratio for -N80 solenoid valve 1 for activated carbon canister ▪ Signal ratio 0 % means -N80 is closed ▪ Signal ratio 99 % means -N80 is fully open Lambda probe voltage ▪ Voltage constantly fluctuates back and forth between - 0.1 V and 1.0 V: OK ▪ -0.1...+ 0.3 V: Large amount of residual oxygen, mixture too lean ▪ 0.7...1.0 V: Small amount of residual oxygen, mixture too rich ▪ constant 0.45...0.50 V: Lambda probe not functioning ▪ => Check lambda control - Page 65 Lambda control ▪ -10...+10 %: OK ▪ Outside tolerance: Check lambda control => Page 65		

1.11 - Reading measured value block: Display Groups 08 to 99

Display Group 08: Lambda learned values (warm engine, coolant temperature not less than +85 °C)

Read measured value block 08	⇒	Display readout
1...3 ms	-10...+10 %	-8...+8 %
		TB active or TB not active
"TB active" means that the solenoid valve 1 for the activated charcoal container is pulsing (6 to 16 minutes) "TB not active" means that solenoid valve 1 for activated charcoal filter is constantly closed (1 minute). Lambda learned value at part load (multiplicative) multiplicative means that the fault occurs throughout the entire speed range and load range. Lambda learned value at part load (additive) additive means that the fault only occurs during idling		

Protected by copyright. Copying, reproducing or distributing in any form is prohibited without the written permission of Audi AG. Copyright by Audi AG.

Injection period

- 1...3 ms: OK
- less than 1 ms: High proportion from tank breather system => Page 71
- greater than 3 ms: Engine loaded => Switch off consumers

Test table, Display Group 08

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
2 and 3	low lambda learned values	- Low lambda idling learned values with normal lambda -part-load-learned values: oil may be diluted with petrol (high petrol content in oil) - Injector leaking - Fuel pressure too high - -N80 solenoid valve 1 for activated charcoal canister is constantly open - -G70 air mass meter defective - Lambda probe heating defective or lambda probe dirty	- Disappears after drive on motorway or oil change Display Group 07, display zone 2 => Page 32 - Check the injector=> Page 53 - Check fuel pressure =>Page 50 - Check -N80 prüfen => Page 71 - Check -G70 => Page 59 - Check lambda probe heating =>Page 68

Note on display zones 2 and 3:

Low values mean that the engine is running too rich, and the lambda control is compensating by leaning out the mixture.

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 table, Display Group 08

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
2 and 3	high lambda learned values	- High lambda - idling- learned values with lower lambda -part-load-learned values: possibility of unmetered air around intake manifold - Injector blocked - Display zones 2 and 3 high: -G70 air mass meter defective - Fuel pressure too low - Unmetered air between -G70 air mass meter and throttle valve - Unmetered air at manifold gasket - Lambda probe heating defective or lambda probe dirty	- Eliminate faults Display Group 07, display zone 2 => Page 32 - Check injection quantity =>Page 52 - Check -G70 => Page 59 - Check fuel pressure =>Page 50 - Rectify fault - Check lambda probe heating =>Page 68

Notes on display zones 2 and 3:

- ♦ High learned values mean that the engine is running too lean, and therefore the lambda control is compensating by enriching the mixture.
- ♦ If there is no voltage in the control unit, all the learned values will be reset.

Display Group 09: Lambda learned values (warm engine, coolant temperature not less than +85 °C)

Read measured value block 9	⇒	• Display readout
-----------------------------	---	-------------------



rpm	-10...+10 %	0...1.0 V	-10...+10 %	
				Lambda learned value when idling -10...+10 %: OK - Outside tolerance: Check lambda control => Page 65
				Lamba probe voltage - Voltage constantly fluctuates between - 0.1...+0.3 V and 0.7...1.0 V: OK -0.1...+0.3 V: Large amount of residual oxygen, mixture too lean 0.7...1.0 V: Small amount of residual oxygen, mixture too rich - constant 0.45...0.50 V: Lambda probe not functioning => Check lambda control - Page 65
				Lambda control -10...+10 %: OK - Outside tolerance: Check lambda control => Page 65
Engine speed is shown in increments of 10				

Display Group 10, Fuel tank breather (warm engine, coolant temperature not less than +85°C)

Read measured value block 10	⇒	• Display readout
0...99 %	0.3...1.25 %	-3...+32 %
		Activated charcoal filter purging quantity (ACF) - At value "0.00", nothing is supplied from the ACF system - At value "0.30", 30% of the intake air mass supplied is supplied by the ACF system
		Fill level of activated charcoal filter canister - At -3 % there is no petrol vapour in the activated charcoal canister. - At +32 % the activated charcoal canister is full of petrol vapours.
		Lambda correction factor with active fuel tank breather system - less than 1.00 Tank breather supplying rich mixture, lambda control reduces the quantity injected 1.00: No fuel tank breather function or fuel tank breather supplying ideal mixture ($\lambda = 1$) - Greater than 1.00 Tank breather supplying lean mixture, lambda control increases the quantity injected
		Signal ratio for -N80 solenoid valve 1 for activated carbon canister (ACF) - Signal ratio 0 % means that the -N80 is closed - Signal ratio 99 % means -N80 is fully open

Display Group 11 - Fuel consumption:

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.

Read measured value block 11	⇒	• Display readout
800...920 rpm	0.5...1.5 ms	0 km/h
		0.5...1.5 ltr/h
		Fuel consumption: The specified value shown on the display only relates to idling without any additional load from ancillaries (automatic gearbox, air conditioner, alternator, power steering pump).
		Driving speed
		Engine load
Idling speed is shown in increments of 40		

Notes on display zone 2:

- ♦ The maximum engine load decreases by about 10 % for every 1000 m above sea level.
- ♦ The maximum engine load also falls by up to 10 % at very high ambient temperatures.

♦ The values when driving at full load should not be less than the following:

- approx. 7.5 ms at 4000 rpm

- approx. 6.5 ms at 6000 rpm

Display Group 12 - Fuel consumption:

Read measured value block 12			⇒	Display readout
800...920 rpm	10...14.5 V	0.5...1.5 ltr/h	3...12° BTDC	
				Ignition timing ▪ 3...12.0°BTDC OK ▪ greater than 12.0°BTDC: Engine loaded => Switch off consumers
				Fuel consumption: The specified value shown on the display relates only to idling without any additional load from ancillaries (automatic gearbox, air conditioner, alternator, power steering pump).
				Battery voltage ▪ 10.000...14.500 V: OK ▪ Outside tolerance: Check supply voltage from engine control unit => Page 106
Engine speed				

Display Group 13 - Knock control:

Read measured value block 13				⇒	Display readout
0...15° crankshaft	0...15° crankshaft	0...15° crankshaft	0...15° crankshaft		
					Cylinder 4 ignition timing retardation by knock control
					Cylinder 3 ignition timing retardation by knock control
					Cylinder 2 ignition timing retardation by knock control
					Cylinder 1 ignition timing retardation by knock control

Notes on Display Group 13:

- ♦ The knock control is active from an engine load of greater than 40 %.
- ♦ At engine loads of more than 40 %, the display will show the current ignition timing retardation values. At engine loads of less than 40 % the display will constantly show the last values used.
- ♦ If there is audible knocking and no perceptible ignition timing retardation, increase the engine speed to above 3500 rpm for 5 seconds in order to activate the knock sensor fault recognition (diagnosis) function.
- ♦ If there is a significant difference between the ignition timing retardation value for one of the cylinders and the values for the other cylinders, the following faults are possible:

- Loose ancillaries

- Corrosion on plug the connector

Readme: This document is for informational purposes only and 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 damage (e.g. oil combustion because of defective piston)

Notes on Display Group 13:

- ♦ If the ignition timing retardation values for all the cylinders are high, the following faults are possible:

- Corrosion on plug the connector



- Tightening torque (20 Nm) not OK
- Open circuit
- Knock sensor defective
- Loose ancillaries
- Poor quality fuel (less than RON 95)

Display Group 14 - Knock control:

Read measured value block 14				⇒	◀ Display readout
rpm	ms	0...15° crankshaft	0...15° crankshaft		
			Cylinder 2 ignition timing retardation by knock control		
			Cylinder 1 ignition timing retardation by knock control		
		Engine load (injection period per revolution)			
Idling speed is shown in increments of 40					

Note on Display Group 14:

With this display group it is possible to check the ignition timing retardation for cylinders 1 and 2 at specific engine speeds and under specific load conditions.

Display Group 15 - Knock control:

Read measured value block 15				⇒	Display readout
rpm	ms	0...15° crankshaft	0...15° crankshaft		
					Cylinder 4 ignition timing retardation by knock control
					Cylinder 3 ignition timing retardation cylinder by knock control
					Engine load (injection period per revolution)
Idling speed is shown in increments of 40					

Notes on Display Group 15:

- ♦ With this display group it is possible to check the ignition timing retardation for cylinders 3 and 4 at specific engine speeds and under specific load conditions.
- ♦ Causes of ignition timing retardation: Display Group 13 =>Page 35.

Display Group 16 - Knock control: (Idling):

Read measured value block 16				⇒	Display readout
400...1400 mV	400...1400 mV	400...1400 mV	400...1400 mV		
			Knock sensor signal, cylinder 4		
		Knock sensor signal, cylinder 3			
	Knock sensor signal, cylinder 2				
Knock sensor signal, cylinder 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 for the content of this document.	

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:

- ♦ If the difference between the highest and lowest knock control signals is more than 50 %, this may be due to corrosion on the plug connector.
- ♦ If no faults are found as a result of the electrical check on the knock sensor, the wiring and the plug connector, check the engine for loose ancillaries or mechanical damage. Display Group 13 =>Page 35.
- ♦ At higher engine speeds and engine loads, the voltage signal displayed for the knock sensors may reach values of up to 5.1 volts.

Display Group 17 - Catalyst heating:

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.

Read measured value block 17				⇒	◀ Display readout
...	...	...	...	°	
rpm	ms	%	BTDC		
				Ignition timing	
				Energy balance for catalyst heating	
				Engine load (injection period per revolution)	
Idling speed is shown in increments of 40					

Notes on Display Group 17:

- ♦ To bring the catalyst up to operating temperature as quickly as possible after a cold start, increase the idling speed and retard the ignition timing. In the part load range, only the ignition timing retardation remains activated.
- ♦ The rapid catalyst heating function is activated at starting temperatures of from -9 to +39 °C.
- ♦ The function is terminated under the following conditions:
 - Engine speed greater than 4000 rpm
 - Engine load greater than 7.0 ms
 - Fault in fault memory for air mass meter and sensor for coolant temperature
 - Speed greater than 55 km/h
 - Altitude correction factor less than -20 % (Display Group 18)
- ♦ When the function is terminated, the display readout for the energy balance remains frozen and is reset the next time the engine is started.

Display Group 18 - Altitude adaptation:

Read measured value block 18				⇒	◀ Display readout
....	...	...	-50...+10		
rpm	ms	ms	%		
				Altitude correction factor	
				▪ Outside the display limits, check the altitude sensor => Page 63	
				Engine load from throttle angle after altitude correction	
				▪ No specified value	
				Engine load from air mass meter	
Idling speed is shown in increments of 40					

Notes on Display Group 18:

- ♦ The engine control unit compares the load signal from the air mass meter with a load value calculated from the throttle angle and the engine speed. The difference between the two values is the altitude correction factor.



- ♦ At an altitude of approx. 400 m above sea level and under normal weather conditions, altitude adaptation is not necessary.

- The correction factor at sea level is approx. 0 %.

- At an altitude of 2000 m the correction factor is approx. -20 %.

- ♦ The altitude adaptation affects the following functions:

- Determination of starting fuel delivery

- Intake manifold-pulsation compensation

Display Group 19 up to model year 1998 - Torque reduction (automatic gearbox)

Read measured value block 19				⇒	• Display readout
760...880 rpm	1.0...2.5 ms	1 0 1 1		6...12° BTDC	
			Ignition timing		
			Operating status		
			▪ X 1 X = no gearbox intervention signal ▪ X 0 X = gearbox intervention signal ▪ X = (display has no meaning)		
		Engine load			
Idling speed is shown in increments of 40					

Readout for informational purposes only. For legal purposes, in part or in whole, is not

Readout is shown in increments of 40 for 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 on Display Group 19:

- ♦ This Display Group may be used to evaluate whether the engine control unit is receiving the gearbox intervention signal from the gearbox control unit.
- ♦ Because of the brief signal, the V.A.G 1551 does not always recognise the ignition timing retardation.

Display Group 19 from model year 1998, Gearshift signals

Read measured value block 19				⇒	• Display readout
760...880	1.0...2.5	1 0 1 1		6...12°	
rpm	ms			BTDC	
				Ignition timing	
				Operating status	
				1 X 1 X = No signal from pressure switch for power steering	
				0 X 1 X = Signal from pressure switch for power steering (steering on full lock)	
				X 1 1 X = no gearbox intervention signal	
				X 0 1 X = no gearbox intervention signal	
				X X 1 1 = No signal from clutch pedal switch (clutch not depressed)	
				X X 1 0 = Signal from clutch pedal switch (clutch not depressed)	
				Engine load	
Idling speed is shown in increments of 40					

Notes on Display Group 19:

- ♦ The function of the power steering pressure switch is to stabilise the idling speed when the steering wheel is on full lock (left or right).
- ♦ Check F88 power steering pressure switch =>Page 95 .
- ♦ Check gearbox intervention signal =>Page 93 .
- ♦ The clutch pedal switch is used to
 - suppress the load change jolt
 - prevent engine-speed overshoots on changing up
 - Cruise control system (if there is one)

- ♦ Check clutch pedal switch =>Page 94 .

Display Group 20 - Operating status:

Read measured value block 20 ⇒				◀ Display readout
...	Neutral	A/C - high	Compr.ON	
rpm	Driving position	ON	A/C - low	
			Compr.OFF	
				Air conditioner compressor ▪ Compr. ON or compr. OFF: OK ▪ For vehicles with no air conditioner, "Compr. .OFF" is always displayed.
				Air conditioner ▪ A/C high = high heating or cooling power ▪ A/C low = low heating or cooling power ▪ For vehicles with no air conditioner, "A/C - LOW" is always displayed
				Selector lever position ▪ Neutral or. driving position ENGAGED OK ▪ For cars with manual gearboxes, the display will always show "Driving position engaged".
Engine speed is shown in increments of 10				

Display Group 21 - Operating status for lambda control:

Read measured value block 21 ⇒				◀ Display readout
...	...	...	λ-control OFF	
rpm	ms	°C	λ-control ON	
				Lambda control ▪ λ-control OFF = lambda control off ▪ λ-control ON = lambda control on
				Coolant temperature
				Engine load
Idling speed is shown in increments of 40				

Notes on Display Group 21:

- ♦ The lambda control is activated by the engine control unit in response to the engine temperature, the engine temperature on starting and the intake air temperature.
- ♦ When the lambda control is switched off, the engine runs according to the map stored in the control unit.

Display Group 23 -(Adaptation of the throttle valve positioner):

Read measured value block 23 ⇒				◀ Display readout
1	0	0	0	
0	0	0	0	
72...95 %	60...91 %	18...54 %		
				Max- stop for V60 throttle valve positioner ▪ 18...54 %: OK ▪ Outside tolerance: Perform adaptation of the throttle valve control unit => Page 73
				Emergency - running stop for V60 throttle valve positioner ▪ 60...91 %: OK ▪ Outside tolerance: Perform adaptation of the throttle valve control unit ▪ => Page 73



Min- stop for V60 throttle valve positioner ▪ 72...95 %: OK ▪ Outside tolerance: Perform adaptation of the throttle valve control unit => Page 73	
Learning demand display ▪ 100000: OK ▪ Other display: Perform adaptation of the throttle valve control unit => Page 73	

Display Group 24 - Knock control:

Read measured value block 24				⇒	Display readout
rpm	ms	° BTDC	5 crankshaft		
					Total ignition timing retardation for cylinders 1 to 4
					Ignition timing
					Engine load
Idling speed is shown in increments of 40					

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

Notes on Display Group 24:

- ♦ As soon as symptoms of knocking are detected, the knock control must retard the ignition timing in order to prevent engine damage.
- ♦ However, the ignition timing retardation does increase the exhaust gas temperature. There is a risk of the catalytic converter overheating.
- ♦ Retarding the ignition timing in all the cylinders by, for example, 3 °CS has exactly the same effect as retarding it by 12 °CS in only one of the cylinders.
- ♦ To avoid overheating, at full load, from a total retardation of approx. 10 °CS, enrichment takes place to reduce the exhaust gas temperature.

Display Group 25; Boost pressure control at full load (test drive in 3rd gear at approx. 4000 rpm, coolant temperature not less than +85 °C)

Warning: The V.A.G 1551 fault reader must be operated by a second person.

Read measured value block 25				⇒	Display readout
3.0...8.0 ms	0.0...8.0 ms	0.5...8.0 ms	0...99 %		
					Signal ratio (actuation) of the N75 solenoid valve for boost pressure control ▪ No specified value ▪ Constant 5 %: Boost pressure has open loop control => Interrogate the fault memory
					Actual engine load (regulated by boost pressure to specified -engine load) ▪ As specified engine load after correction, display zone 2 (Tolerance ±0.30 ms) OK ▪ Outside tolerance: Fault in boost pressure control => Page 61
					Specified engine load after correction (reduced driver requirement due to knock control, altitude adaptation and intake air temperature) ▪ 0.00...8.00 ms: OK
					Specified engine load before correction (driver's requirement indicated via accelerator pedal) ▪ 3.00...8.00 ms: OK

Display Group 26 - Idling air requirement:

Read measured value block 26	⇒	Display readout
------------------------------	---	-----------------

-10...+10 %	-1.1...+1.1 g/s	80...105 °C	800...920 rpm	
				Engine speed
				Coolant temperature
				Idling air mass (without gear engaged with automatic gearbox)
				Idling speed control

Display Group 27, Load reduction by knock control at full load: (test drive in 3rd gear at approx. 4000 rpm, coolant temperature not less than +85°C)

Warning: The V.A.G 1551 fault reader must be operated by a second person.

Read measured value block 27 ⇒	• Display readout
0...5 ms	0.5...8 ms
.... rpm	0...99 %
Signal ratio (actuation) of the -N75 solenoid valve for boost pressure control	
- No specified value - Constant 5 %: Boost pressure open loop control => Interrogate the fault memory	
	Engine speed
	Engine load after reduction
	Load reduction by knock control

Display Group 66 Only for vehicles with cruise control systems (CCS): Engine idling

Read measured value block 66 ⇒	• Display readout
km/h	X X X X
km/h	X X X X
	Switch settings for operating switch
	0000= CCS switched on
	0110= CCS switched off (switch engaged)
	0010= CCS off (before the engagement point)
	0100= Fix key depressed
	1000= Key Mounting pulled
	Specified driving speed (the last speed to be stored is displayed) until the CCS on the control switch switches off, switch engages in "OFF" or the engine is stopped)
	Switch settings for brake, clutch and CCS released
	1000= CCS released
	1111= Brake depressed (brake light switch)
	1111= Brake depressed (brake light switch)
	1011= Clutch depressed
	Actual driving speed

Notes on Display Group 66:

If the specified values are not reached, check the cruise control system (CCS).

=> Electrical system; Repair Group 01; Technical Bulletin No. 2 Technical Bulletin No. 2



Display Group 98 - Adaptation of throttle valve control unit: Ignition switched on

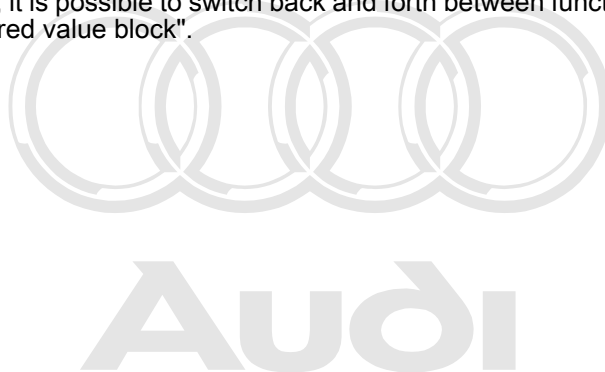
Basic setting 98 0...5 0...5 Idling speed ADP running V V			⇒	◀ Display readout
				Adaptation status ▪ ADP running = Adaptation in progress ▪ ADP OK = Adaptation successfully completed ▪ ADP ERROR = Error has occurred in adaptation process: Check throttle valve control unit =>Page 73
				Operating status ▪ Idling, part load, full load, overrun, enrichment
				Potentiometer voltage for idle positioner
				Throttle valve potentiometer voltage

Display Group 99 - Lambda control:

Read measured value block 99 -10...+10 rpm °C %			⇒	◀ Display readout
				λ-control OFF λ-control ON
				Lambda control OFF/ON ▪ Basic setting 04: λ-Control OFF ▪ Read measured value block 08: λ-Control ON
				Lambda control
				Coolant temperature
				Engine speed

Notes on Display Group 99:

- ♦ For defined fault finding, the lambda control is switched off when Display Group 99 is selected under "Basic setting 04" and switched when it is selected in "Reading measured value block 08".
- ♦ When function 04 "Basic setting" is left, the lambda control is automatically re-activated.
- ♦ By pressing the keys 4 and 8 on the V.A.G 1551, it is possible to switch back and forth between function 04 "Basic setting" and function 08 "Reading measured value block".



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.

24 - Mixture preparation, Injection

1 - Repairing the Motronic fuel injection system

1.1 - Repairing the Motronic fuel injection system

1.2 - Safety precautions

Warning:

The fuel system is under pressure! Before loosening hose connections or opening the test connection, place a cloth around the connection point. Then dissipate the pressure by carefully pulling off the hose or removing the plug.

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 turning at starter speed.
- ◆ Only detach or attach the wiring in the injection and ignition system, including measuring instrument leads, when the ignition is switched off.
- ◆ To operate the engine at starting speed without actually starting it (for example, in order to test compression), unplug the connector from the power output stage for the ignition coils and also the plug connectors from the injectors. 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.

1.3 - Rules for cleanliness

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

- ◆ Thoroughly clean all unions and the adjacent areas before disconnecting.
- ◆ Place removed parts on a clean surface and cover. Do not use fluffy cloths!
- ◆ Carefully cover or seal open components if repairs cannot be carried out immediately.
- ◆ Only install clean components:
Only remove replacement parts from packaging immediately prior to installation.
Do not use parts that have been stored loose (e.g. in tool boxes etc.).
- ◆ When the system is open:
Do not work with compressed air if this can be avoided.
Do not move vehicle unless absolutely necessary.

1.4 - Technical data

Engine code	AGU
-------------	-----

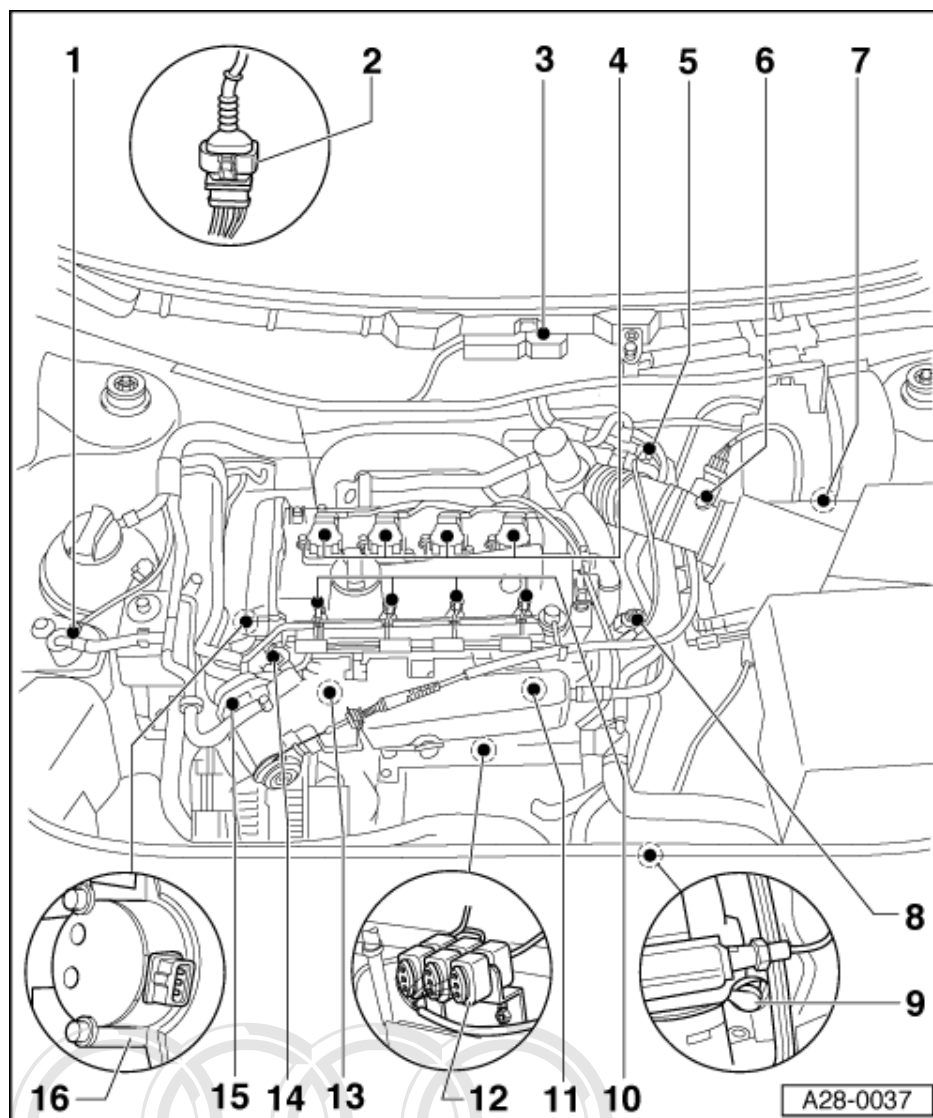


Idling speed Speed not adjustable- it is controlled by the idle stabilisation	Manual gearbox 860 rpm (air conditioner on and off) Automatic gearbox (driving position neutral, air conditioner off) 860 rpm Automatic gearbox (driving position neutral, air conditioner on) 880 rpm Automatic gearbox (driving position engaged, air conditioner off) 820 rpm Automatic gearbox (driving position engaged, air conditioner on) 820 rpm	
Engine speed limitation by disconnecting the injectors	6800 rpm	
Fuel pressure at idling speed	Vacuum hose connected	approx. 2.5 bar
	Vacuum hose detached	approx. 3 bar
Holding pressure after 10 minutes	at least 1.5 bar	
Injectors	Spray pattern	Two hole nozzle
	Injection quantity (30 s)	85...105 ml
	Resistance (room temperature) ¹⁾	13...18 ω

- 1) If the engine is warm, the resistance increase by approx. 4...6 ω .

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 carbon canister (N80)

2 4-pin connector

- ◆ For lambda probe and lambda probe heating
- ◆ Located on underside of car on right hand side

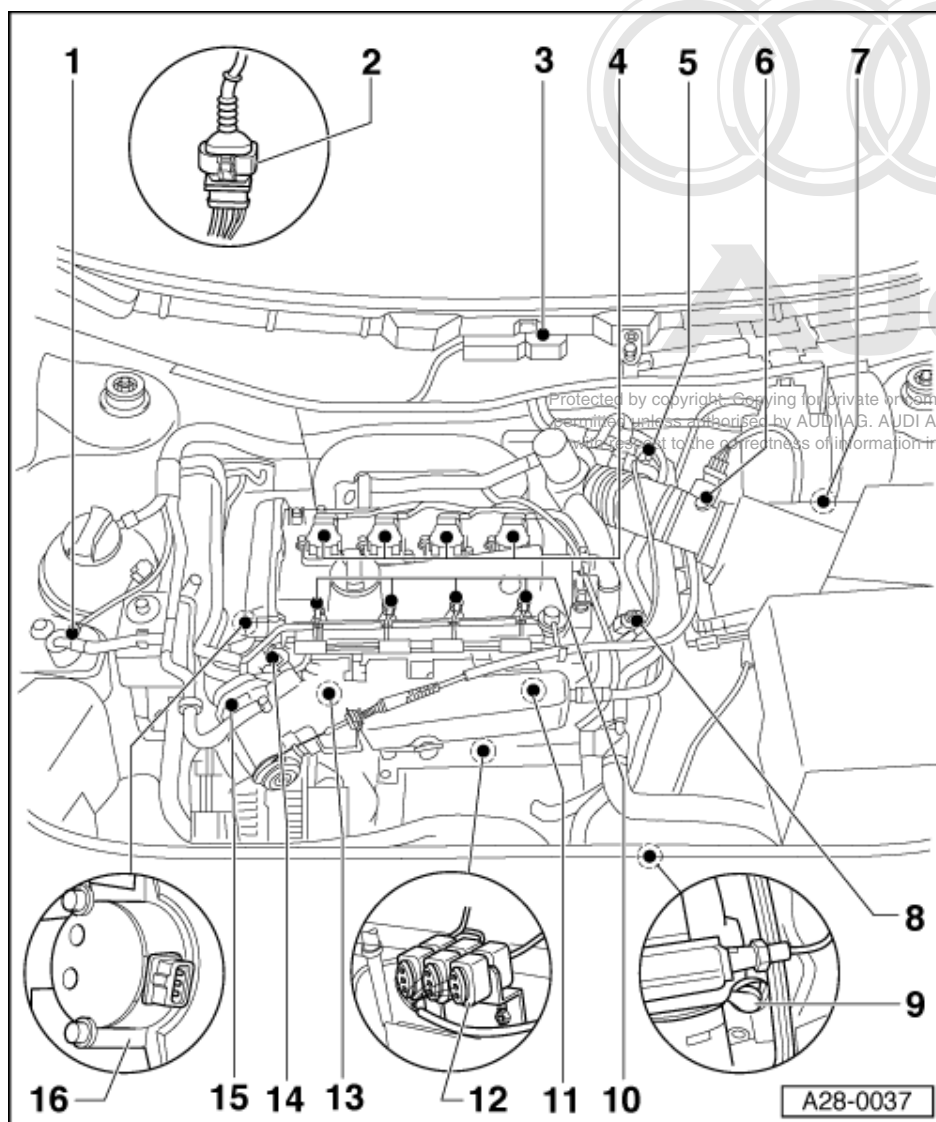
3 Engine control unit (J220)

4 Ignition coils

- ◆ Cylinder 1 (N)
- ◆ Cylinder 2 (N128)
- ◆ Cylinder 3 (N158)
- ◆ Cylinder 4 (N163)

5 Solenoid valve for boost pressure control (N75)

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



6 Air mass meter (G70)

7 Output stage for ignition coils (N122)

- ◆ at the air cleaner

Note:

In certain vehicles, the output stage may be installed in the plenum chamber on the wiper motor.

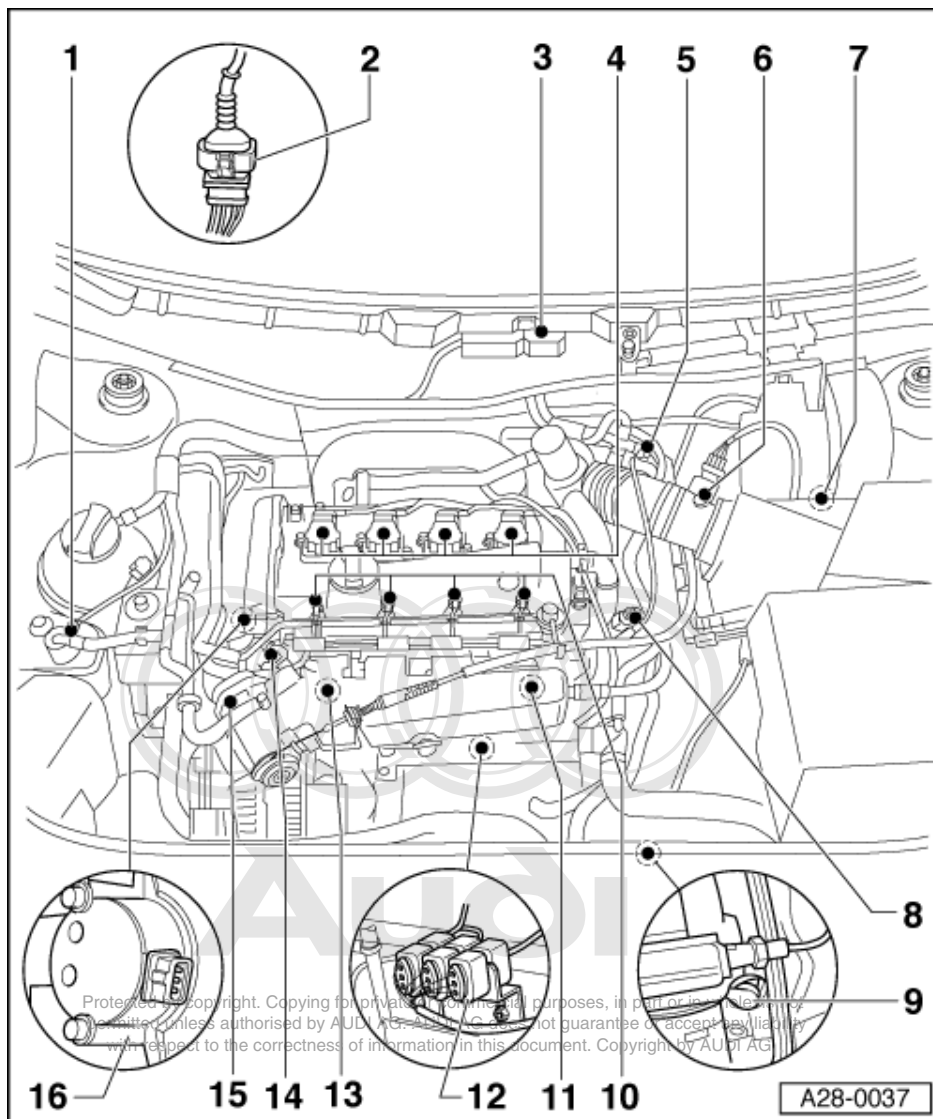
8 Sensor for coolant temperature (G62)

9 Engine speed sensor (G28)

10 Injectors

- ◆ Cylinder 1 (N30)
- ◆ Cylinder 2 (N31)
- ◆ Cylinder 3 (N32)
- ◆ Cylinder 4 (N33)

11 Knock sensor 2 (G66)



**12 3-pin connector
from left**

- ◆ For knock sensor 1
- ◆ For engine speed sensor
- ◆ For knock sensor 2

13 Knock sensor 1 (G61)

14 Intake air temperature sensor (G42)

15 Throttle valve control unit (J338)

16 Hall sensor (G40)

1.6 - Wiring and component check with test box V.A.G 1598/22

Notes:

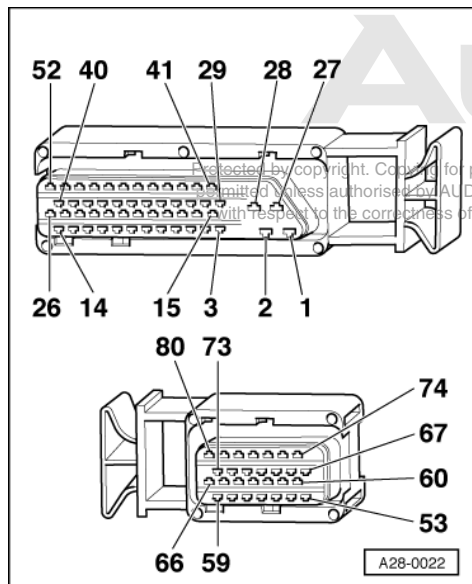
- ◆ Use the V.A.G 1526 hand multimeter or the V.A.G 1715 multimeter and the diode test lamp V.A.G 1527 for the checks.
- ◆ To connect the test devices to the 1598/22 test box, always use auxiliary cables from adapter set V.A.G 1594.
- ◆ The contact numbers of the plugs and the socket numbers in the test box are identical.
- ◆ After re-connecting the engine control unit, adapt the throttle valve control unit.



=> Page 73

Warning:

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



- With the ignition switched off, pull the plug connector off control unit.
- -> Connect the V.A.G 1598/22 test box to the connector on the wiring harness.
- Carry out the test as described in the relevant repair instructions.

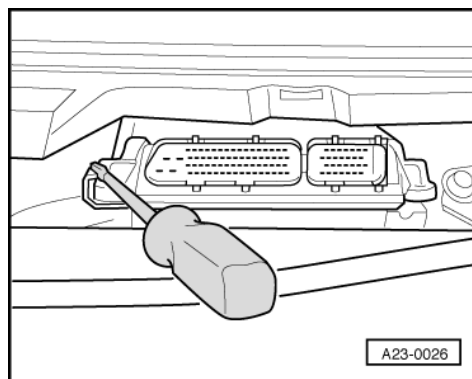
1.7 - Replacing the engine control unit

Note:

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

Removing the engine control unit

- Switch the ignition off.
- Unscrew the windscreen wiper arms and remove the plenum chamber cover.



Note:

To remove the cover, first disconnect the hoses and plugs for the spray nozzles.

- -> Press the retainer tab on the bracket to the side using a screwdriver, then pull out the engine control unit towards the front.
- Release the connector latches and pull of the control unit connectors.

Installing the engine control unit

Installation is performed in the reverse sequence.

Note:

In the first learning phase, during the basic setting operation for the engine, irregular idling and slight jolting during normal driving are possible.

After installing the engine control unit, carry out the following operations:

- Perform the encoding of the new engine control unit => Page 19
- Perform adaptation of the throttle valve control unit => Page 73
- Adaptation of the engine control unit to the immobilizer control unit.

=> Electrical system; Repair Group 01; Immobilizer self-diagnosis; adaptation after replacement of the engine control unit Immobilizer self-diagnosis adaptation after replacement of the engine control unit

1.8 - Checking idling speed

Test conditions

- No leaks in exhaust system.
- Coolant temperature at least 80 °C
- Throttle valve in idle position

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-Cylinder Engine, mechanical components; Repair group 20; fuel supply system; repair throttle mechanism. fuel supply system repair throttle mechanism.

- Electrical consumers switched off (radiator fan must not run during the check)
- Air conditioner switched off
- Pressure gauge not connected.
- Selector lever in position P or N.

Checking idling speed

Notes:

- ◆ The idling speed cannot be adjusted.
- ◆ The idling speed should be tested during the basic setting of the engine.
- Interrogate the fault memory => Page 3 . No faults must be stored, if necessary, rectify fault, erase fault memory, switch off and re-start engine, perform test drive and interrogate the fault memory again as a check.
- Leave engine idling.
- Switch off the air conditioner.
- Switch off the rear window heating.
- Place the selector lever in P or N position (vehicles with automatic gearboxes).



Warning:
The electric radiator fan should not be running.

- Select the function "Reading measured value block" (function 08) and Display Group 5
=>Page **31** .

-> Display readout:

Read measured value block 5			
1	2	3	4

- Read off idling speed (actual) from display zone 1.
- Read off idling speed (specified) from display zone 2.
- Press the =>key.
- Press keys 0 and 6 for the function "End of output" and confirm entry with the Q key.
- If the value does not match the specification, interrogate the fault memory again =>Seite **3** .

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:

- Check the idling switch => Page **75** .
- Check the throttle valve control unit =>Page **73** .
- Unmetered air in intake system
- Solenoid valve for activated carbon canister constantly open.

1.9 - Checking fuel pressure regulator and holding pressure

Test conditions

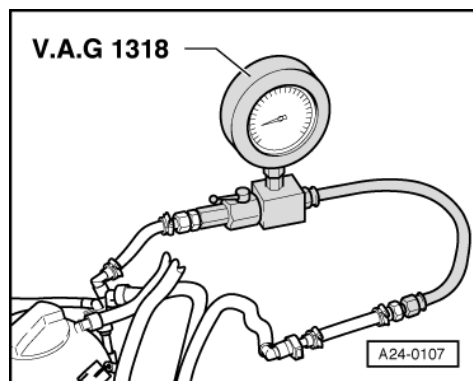
- Check that fuel pump relay is OK => Page **56** .
- Fuel pump OK.
- Fuel filter OK.
- Battery voltage OK.

Note:

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

Warning:
The fuel system is under pressure! Before opening the system place a cloth around the connection point. Then release pressure by carefully loosening the connection.

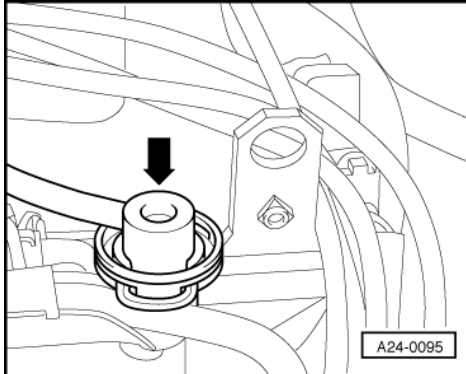
- Briefly open the fuel tank filler cap (to release pressure).
- Cover the pressurised screw connection with a cloth.



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.

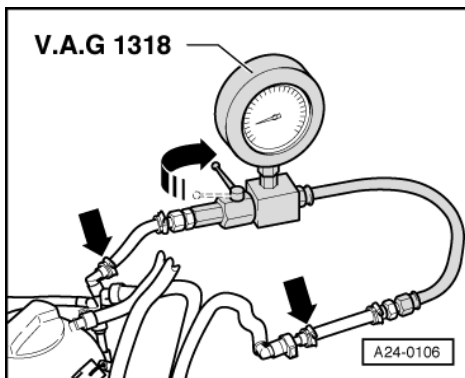
- Pull the fuel supply hose (white marking) off the fuel supply pipe.
- Connect the V.A.G 1318 pressure gauge to the fuel supply pipe using adapters 1318/8, 1318/9 and 1318/17.
- -> Open the cut-off valves in the pressure gauge. The lever points in the direction of flow.
- Start the engine and run at idling speed.
- Measure the fuel pressure.

Specified value: approx. 2.5 bar.



- -> Pull the vacuum hose off the fuel pressure regulator. The fuel pressure should increase to approx. 3.0 bar.
- Switch the ignition off.
- Check tightness and holding pressure by watching the gauge indicator fall.
- After 10 minutes the remaining pressure should be at least 1.5 bar.

If the holding pressure drops below 1.5 bar:

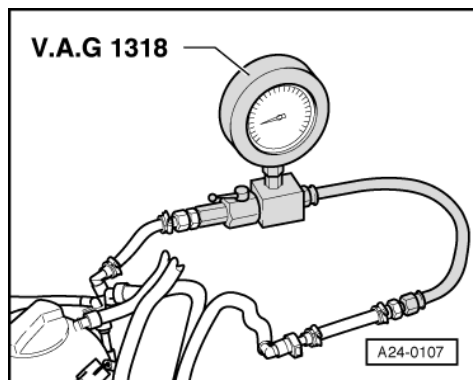


- Start the engine and run at idling speed.
- -> Allow the pressure to build up, then switch off the ignition. At the same time close the cut-off valve on the pressure gauge (valve handle at right angles to direction of flow).
- Observe the pressure drop on the gauge.

If the pressure now does not drop:

- Check the fuel pump non return valve.

Audi



However, if the pressure drops again:

- -> Open the cut-off valve on the V.A.G 1318 pressure gauge (valve handle points in direction of flow).
- Start the engine and run at idling speed.
- Allow the pressure to build up, then switch off the ignition. At the same time, pinch the return hose (with blue marking) firmly together.

If the pressure now does not drop:

- Replace the fuel pressure regulator.

If the pressure drops again:

- Check the pipe connections, O-rings on the fuel manifold and injectors for leaks.
- Check the pressure gauge for leaks.

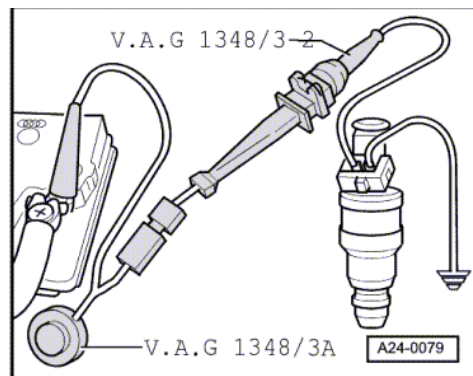
Note:

Before removing the pressure gauge, release the fuel pressure by opening the cut-off valve. Hold a container over the connection while doing so.

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

Test conditions

- Check that the fuel pressure is OK => Page 50 .
- Disconnect the vacuum hose from the fuel pressure regulator.
- Disconnect the connectors from all the injectors.
- Unclip the wiring harness from the cable guide and remove.
- Unbolt the fuel manifold from the intake manifold and pull it upwards and off the intake manifold together with the injectors.
- Place the injector which is to be tested in a measuring glass from the V.A.G 1602 injection quantity tester.



- -> Connect one of the injector contacts to the engine earth using a test cable and crocodile clip from the V.A.G 1594 test.
- Connect the second injector contact to positive using remote control V.A.G 1348/3 A, adapter cable V.A.G 1348/3- 2 and an auxiliary cable.
- Start the final control diagnosis => Page 15 . The fuel pump must be running.
- Check injectors for leaks (visual check). When the fuel pump is running, only 1 or 2 drops a minute should escape from each injector.
- If the fuel loss is greater than this, switch off the fuel pump (terminate final control diagnosis) and replace the faulty injector.
- If necessary, re-start the final control diagnosis.

Note:

The final control diagnosis cannot be re started until the ignition has been switched off briefly.

- Activate the V.A.G 1348/3 A remote control for 30 seconds.
- Perform measurements on all injectors.
- Once all four injectors have been actuated, place the measuring glasses on a level surface.

Specified value: 85...105 ml

- If the measured value for one or more of the injectors is outside the tolerance range, switch off the fuel pump (terminate final control diagnosis) and replace the defective injector.
- If the measured values for all the injectors are outside the tolerance range, check the fuel pressure => Page 50 .

Note:

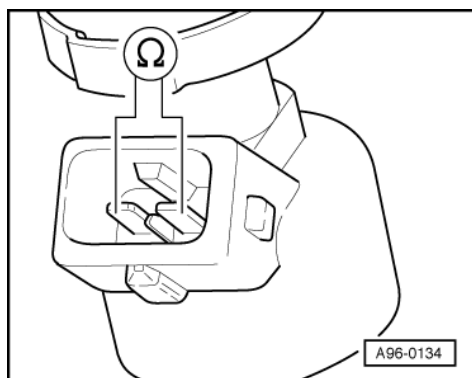
When checking the injection quantity, also check the spray pattern. The spray pattern should be the same for all the injectors.

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.

The installation of the fuel manifold together with injectors is performed in the reverse sequence. The following points should be noted when installing:

- Replace the O-rings at all opened connections. (When replacing the front O-ring, never pull the plastic cap off the injector head. - Pull the O-ring off over the plastic cap.)
- Moisten the O-rings with clean engine oil.
- Make sure that the injectors are installed in the correct positions.
- Check to make sure that the retainer clamps are properly seated.

1.11 - Checking the injectors



Electrical checks on injectors

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

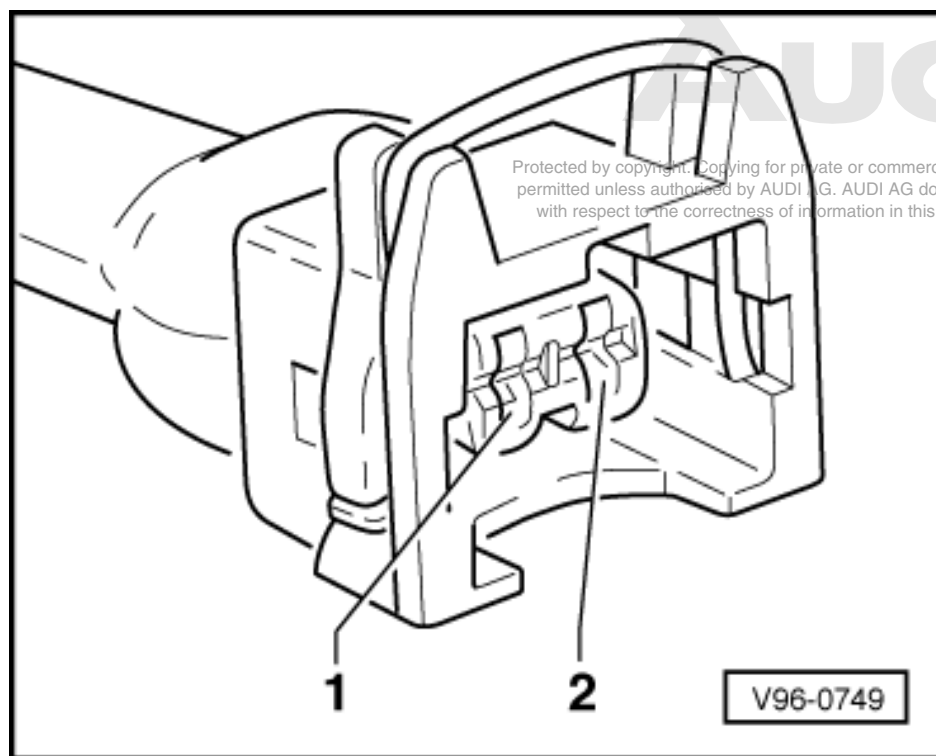
- -> Measure the resistance between the injector contacts using the V.A.G 1526 hand held multimeter.

Specified value: 13...18 Ω .

If the engine is warm, the resistance will be approx. 4...6 Ω .

- If the measured value is not as specified, replace the injector.

Checking the power supply to the injectors



Test conditions

- Fuse for injectors OK.
- Remove the plug connector from the injector which is to be tested.
- -> Connect the V.A.G 1527 diode test lamp between contact 1 and the engine earth.
- Operate the starter for a few seconds (the engine can be allowed to start).

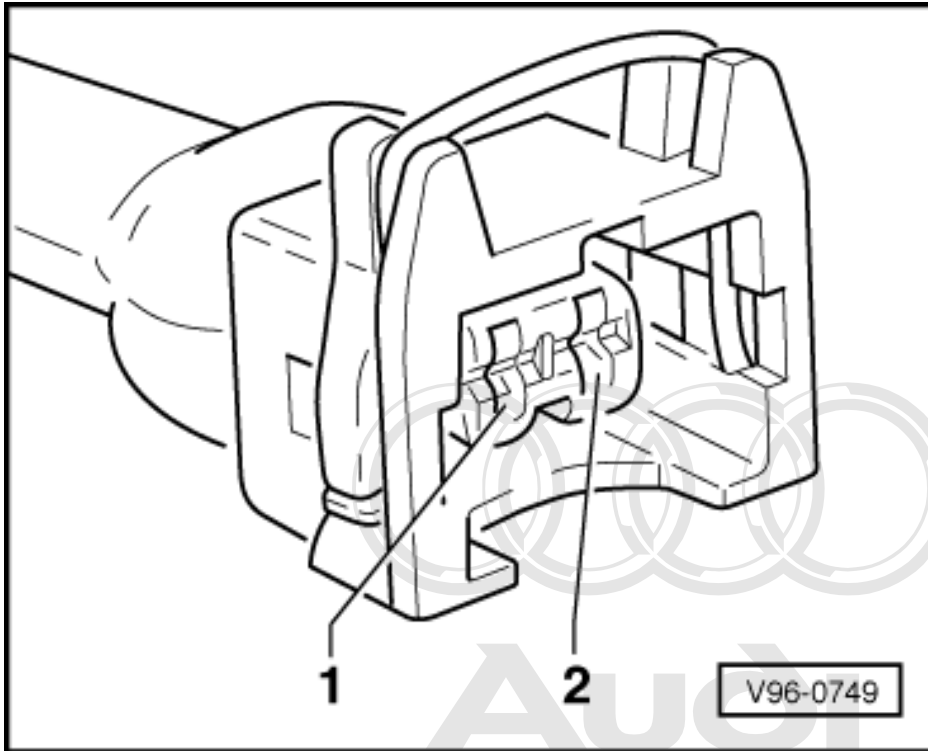
The diode test lamp should light up.

- If the diode test lamp lights up, test the actuation of the injectors.

If the diode test lamp does not light up:

- Check the wiring from contact 1 via the injector fuse to the fuel pump relay for continuity and, if necessary, rectify open circuit.

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



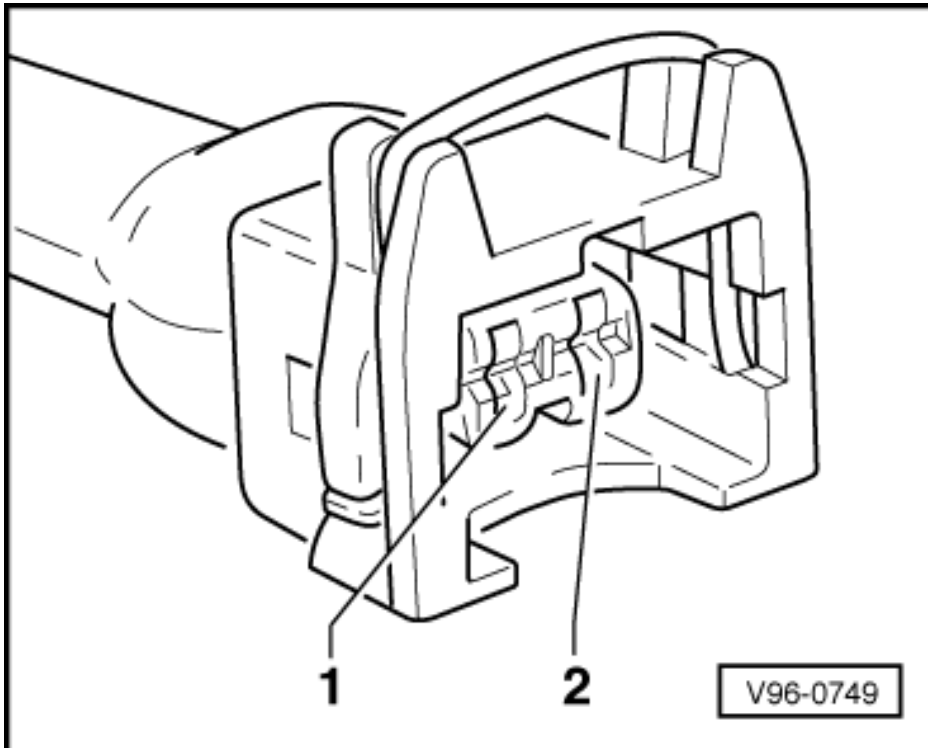
Checking injector actuation

- Remove the plug connector from the injector which is to be tested.
- -> Connect the V.A.G 1527 diode test lamp between contact 2 and the battery's positive terminal.
- Operate the starter briefly (the engine may start briefly).

The diode test lamp should flash.

Note:

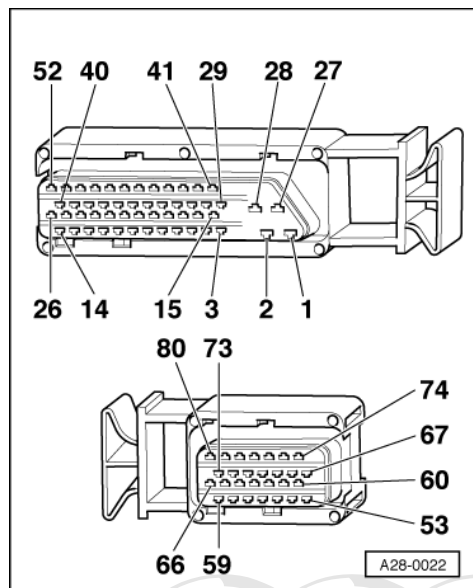
Diode test lamps with a low current consumption do not go out completely between the flashing pulses, but continue to glow slightly and become much brighter during the flashing pulses.





If the diode test lamp does not flash:

- Connect the V.A.G 1598/22 test box to the wiring harness for the engine control unit
=>Page 47 .
- -> Check the wiring between contact 2 on the connector for the injector in question and the engine control unit for continuity or a short to positive.

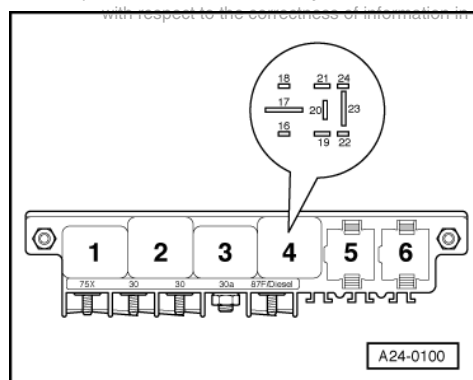


Contact 2 on plug the connector for injector	Test box V.A.G 1598/22 Contact
1	73
2	80
3	58
4	65

- If necessary, rectify open circuit or short circuit.
- If the wiring is OK, replace the engine control unit => Page 48 .

1.12 - Checking fuel pump relay and actuation

This document, part of the Audi technical literature, is not permitted to be reproduced, stored in a retrieval system 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.

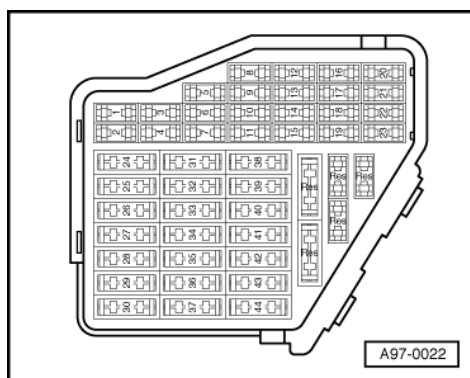


Note:

-> The fuel pump relay is located in the central electrics in the left hand footwell, relay position 4.

Checking the -J17 fuel pump relay

- Remove the storage bin in the front left hand footwell.

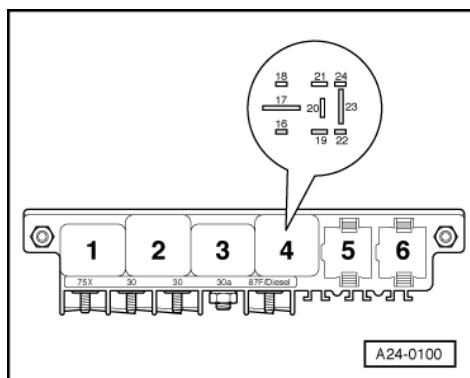


- -> Pull fuse 28 out of the fuse holder and connect the V.A.G 1527 diode test lamp between the earth and one of the two contacts for fuse 28.
- Operate the starter briefly.

The fuel pump relay should pick up (can be felt and heard) and the diode test lamp should light up.

If the diode test lamp does not light, although the fuel pump relay picks up:

- Repeat the test on the other contact on fuse 28.



If the diode test lamp still does not light up:

- -> Check the wiring between contact 23 at relay position 4 and fuse 28 for continuity and, if necessary, rectify open circuit.

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

- If no open circuit is detected, replace the fuel pump relay.

If the fuel pump relay does not pick up:

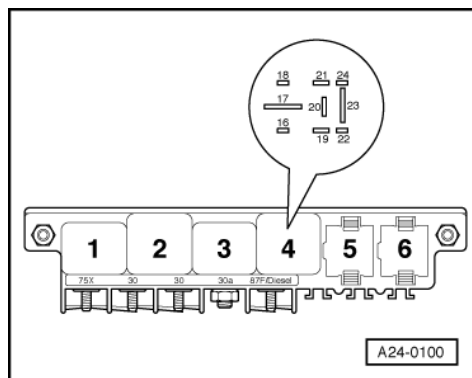
- Check the actuation of the fuel pump relay => Page 57 .

Checking the power supply and actuation of the fuel pump relay

- Remove the -J17 fuel pump relay from the central electrics, relay position 4.

Checking the power supply

- Switch on the ignition.

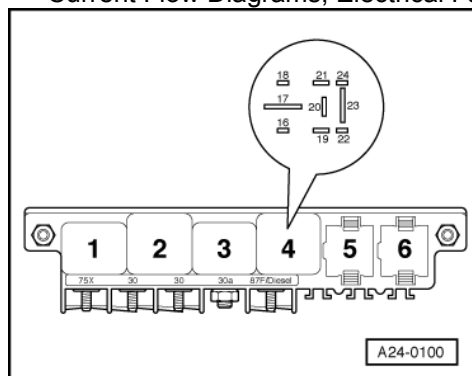


- -> In sequence, connect the V.A.G 1526 hand held multimeter to contact 19 (positive) and earth and contact 17 (positive) and the earth in the relay panel.

Specified value: approx. battery voltage in each case

- If the values are not as specified, rectify the open circuit.

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

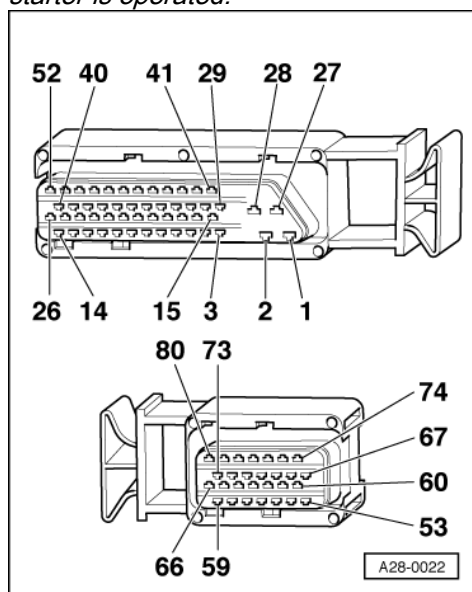


Checking actuation

- -> Connect the V.A.G 1527 diode test lamp to contact 16 (earth) and positive.
- The diode test lamp should light up and remain lit when the starter is operated.

Note:

Diode test lamps with a low current consumption do not go out completely but continue to glow faintly until the starter is operated.



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 diode test lamp does not light up, check the wiring as follows:

- -> Connect the V.A.G 1598/22 test box to the wiring harness for the engine control unit
=>Page 47 .
 - Connect the hand-held multimeter between contact 16 on the relay panel and socket 4 on the test box, then check the wiring for an open circuit.
 - If necessary, rectify open circuit.
- => Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder
- If there is no open circuit and the diode test lamp does not light, replace the engine control unit => Page 48 .
 - If the actuation and power supply for the fuel pump relay and the wiring are OK, replace the fuel pump relay.
 - Replace fuse 28.

1.13 - Checking the air mass meter

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

Checking operation

- Select the function "Reading measured value block" (function 08) and Display Group 2
=>Page 29 .

-> Display readout

Read measured value block 2			
1	2	3	4

Display zone 4 will show the intake air mass (grams per second).

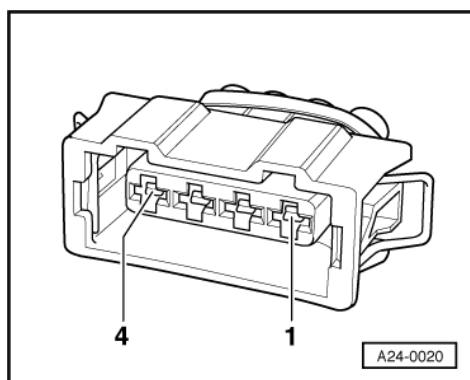
Specified value: 1.8...4.0 g/s

- If the specified values are not achieved or if there is a fault relating to the air mass meter in the fault memory, check the power supply to the air mass meter => Page 59 .

Checking the power supply to the air mass meter

- Check the fuse for the air mass meter.

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



- -> If the fuse is OK, connect the V.A.G 1527 diode test lamp between contact 3 on the connector and the engine earth.
- Operate the starter briefly (the engine may start briefly).

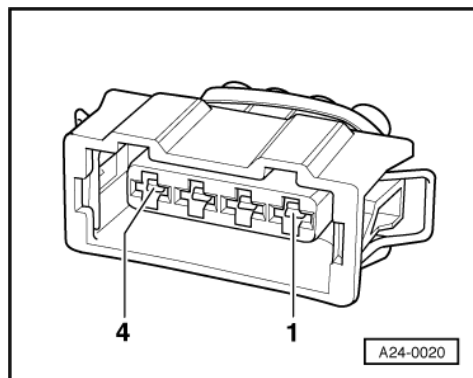
The diode test lamp should light up.

- -> If the diode test lamp does not light up, check the wiring from contact 3 on the connector via the fuse to the fuel pump relay for an open circuit or short to earth and rectify if necessary.



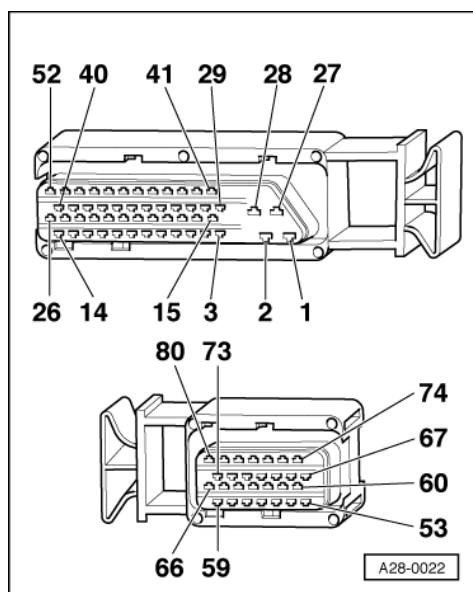
=> Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder

- If the fuse and the wiring are OK but the diode test lamp still does not light up, check the fuel pump relay => Page 56 .
- If the power supply is OK, check the signal line => Page 60 .



Checking signal line for the air mass meter

- Connect the V.A.G 1598/22 test box to the wiring harness for the engine control unit
=>Page 47 .
- -> Check the wiring from the connector on the air mass meter...



- -> to the engine control unit for an open circuit or short to positive or earth and rectify if necessary:

Connector for -G70 air mass meter	Test box V.A.G 1598/22 Contact
1	02 (earth)
2	12
4	13

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 power supply and the wiring are OK, replace the -G70 air mass meter.

2 - Checking the boost pressure system

2.1 - Checking the boost pressure system

2.2 - Checking the boost pressure control

- Select the function "Reading measured value block" (function 08) and Display Group 25
=>Page 40.

-> Display readout:

Read measured value block 25
7.40 ms 7.10 ms 7.05 ms
67 %

Warning:
The V.A.G 1551 must be operated by a second person.

- Perform a test drive at full throttle at approx. 4000 rpm.

Read measured value block 25
7.40 ms 7.10 ms 7.05 ms 67 %

-> Observe the display in display zone 4 (duty cycle of solenoid valve for boost pressure control).

Specified value: 5...95 %

If the specified value is not achieved, change the engine speed until the duty cycle is within the specified range.

Read measured value block 25
7.40 ms 7.10 ms 7.05 ms 67 %

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.

-> Observe the display in display zone 2 (corrected specified -engine load)

Specified value: 0.00...8.00 ms

Read measured value block 25
7.40 ms 7.10 ms 7.05 ms 67 %

-> Observe the display in display zone 3 (actual-engine load)

Specified value: Identical with corrected specified engine load in display zone 2 (tolerance ± 0.3 ms)

If the actual engine load is outside the tolerance, this may be due to one of the following faults:

- ♦ Electrical fault in solenoid valve for the boost pressure control.
- ♦ Charge pressure control hoses disconnected, leaking or blocked.
- ♦ -N75 solenoid valve for boost pressure control blocked.
- ♦ Leak between turbocharger and intake manifold.
- ♦ Actuation mechanism (linkage, shaft) for the by-pass valve stiff or jamming.
- ♦ Turbocharger defective (turbine jammed by foreign body).

2.3 - Checking solenoid valve for boost pressure control

Checking operation

- Pull the hoses off the -N75 solenoid valve for boost pressure control
=> Fitting locations -Overview - Page 45.
- Connect auxiliary hose.

- Start the final control diagnosis and actuate the -N75 solenoid valve for boost pressure control =>Page 15 .

-> Display readout:

Final control diagnosis
-N75 solenoid valve for boost pressure control

The valve should click...

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

If the valve does not click:

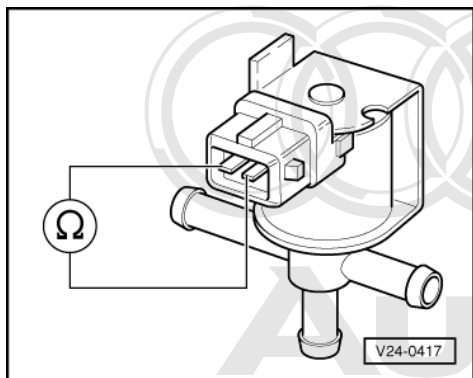
- Check the solenoid valve for boost pressure control electrically => Page 62 .

When there is no electrical signal, the long connection is closed.

If the solenoid valve clicks, but does not open and close properly:

- Replace the solenoid valve for boost pressure control (N75).

Electrical check on solenoid valve for boost pressure control (N75).



- Unplug the connector from the valve
=> Fitting locations - Overview - Page 45
- -> Connect the V.A.G 1526 hand held multimeter for resistance measurement to the valve.

Specified value: 25...35 Ω.

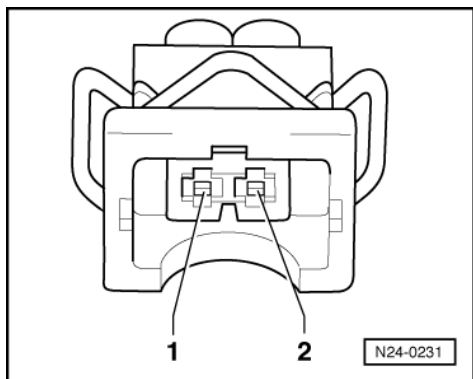
If the specified value is not achieved:

- Replace the solenoid valve for boost pressure control (N75).

If the specified value is achieved:

- Check the power supply from the solenoid valve for boost pressure control => Page 62 .

Check the power supply to the solenoid valve for boost pressure control (N75).



- -> Connect the V.A.G 1526 hand held multimeter for voltage measurement to contact 1 of the connector and the earth.
- Operate the starter briefly (the engine may start briefly).

Specified value: approx. battery voltage.

If the specified value is not achieved:

- Check the wiring from contact 1 on the connector via the fuse to the fuel pump relay for an open circuit or short circuit.

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

If the specified value is achieved:

- Check the actuation for the solenoid valve for boost pressure control => Page 63 .

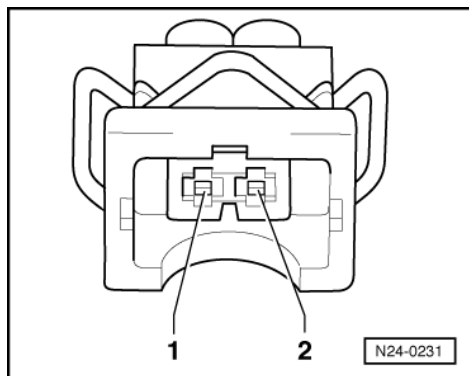
Checking the actuation of the solenoid valve for the boost pressure control (N75)

- Unplug the connector from the solenoid valve (N75) and connect the V.A.G 1527 diode test lamp between connector contacts 1 and 2.
- Start the final control diagnosis and actuate the N75 solenoid valve for boost pressure control =>Page 15 .

The diode test lamp should start flashing.

- If diode test lamp does not flash or if the lamp is lit continuously. Check the wiring.
- Connect the V.A.G 1598/22 test box to the wiring harness for the engine control unit
=>Page 47 .

provided 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.



-> The following wiring should be checked for a short to positive or negative and an open circuit:

2-pin connector on the wiring harness contact.	Test box V.A.G 1598/22 contact.
2	64

- If necessary, rectify open circuit or short circuit.

2.4 - Checking altitude sensor

The altitude sensor signal influences:

- ◆ The boost pressure control

The boost pressure control prevents the turbocharger from over revving when the altitude increases and consequently the air density decreases.

A decrease in air density (lower air pressure) causes the turbocharger to increase its charging rate (higher speed) to produce the required boost pressure.



This results in a higher charge air temperature and an increased risk of engine knock. To avoid this, the boost pressure is limited.

♦ Composition of mixture when starting the engine

The richness of the starting mixture is determined by mapped characteristics stored in the engine control unit and is leaned out according to a correction factor determined by the altitude sensor as the altitude increases (lower air density as the air pressure decreases).

- Switch on the ignition.
- Select the function "Reading measured value block" (function 08) and Display Group 18
=>Page 40 .

-> Display readout:

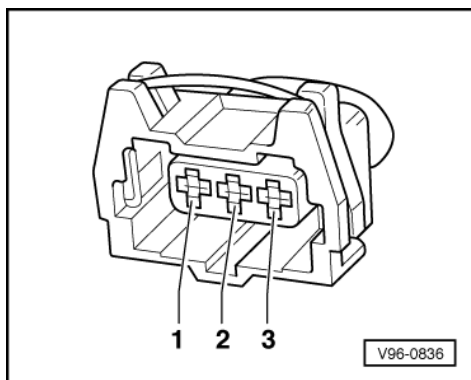
Read measured value block 18			
1	2	3	4

Note:

The altitude correction factor is determined by the air pressure (barometer reading) and by the altitude of the workshop.

Observe display zone 4.

Display in display zone 4	Air pressure in mbar
0 %	1013 mbar (sea level)
-6 %	950 mbar (altitude 500 m)
-10 %	900 mbar (altitude 1000 m)
-20 %	800 mbar (altitude 2000 m)
-30 %	700 mbar (altitude 3000 m)



If an implausible value appears in display zone 4:

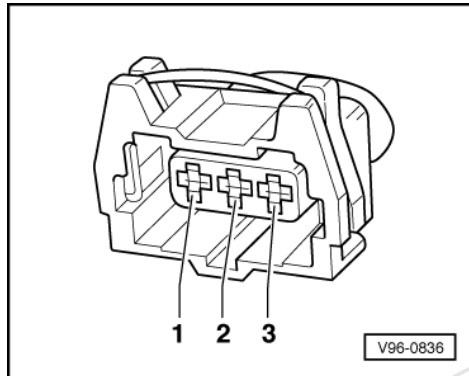
- -> Pull off connector on the sensor.
- Switch on the ignition.
- -> Connect the V.A.G 1526 hand held multimeter for voltage measurement between the following connectors contacts:

3-pin connector on the wiring harness, contact	Specified value
1 + 3	approx. 5 V

2 + 3	approx. 5 V
-------	-------------

If the specified values are not achieved:

- Switch the ignition off.
- Connect the V.A.G 1598/22 test box to the wiring harness for the engine control unit
=>Page 47 .



-> The following wiring should be checked for a short to positive or negative and an open circuit:

3-pin connector on the wiring harness contact.	Test box V.A.G 1598/22 contact.
1	61
2	62
3	67

- If necessary, rectify open circuit or short circuit.

If no wiring fault is detected:

- Replace the altitude sensor (F96).
- If an implausible value is still displayed after the replacement of the altitude sensor, replace the engine control unit => Page 48 .

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.

3 - Checking the lambda control

3.1 - Checking the lambda control

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 approx. 0.7...1.1 V (relative to the reference earth).

The voltage signal for "Mixture too lean" (high residual oxygen) is approx. -0.1...+0.3 V (relative to the reference earth).

During the transition from "rich" to "lean" and vice versa ($\lambda = 1.0$), there is a voltage jump from 0....1.1 V to -0.1...+0.3 V or vice versa.

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



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

- ♦ Slots or holes in probe head are blocked.
- ♦ Lambda probe was subjected to excessive thermal stress.
- ♦ Contact resistance in signal wiring or reference earth wire.
- ♦ Lambda probe too cold; lambda probe heating not working.
- ♦ Lambda control switched off (control unit has detected a fault in the injection system). =>Interrogate the fault memory and reading measured value block, Display Group 21.
- ♦ Lambda probe damaged by contact spray or similar product. (The contact spray is drawn through the fine cavities in the electrical wiring as a result of thermal fluctuations and capillary effect.)
- ♦ Lambda probe damaged by silicone vapours. (The engine draws in traces of any silicone based sealants that may have been used. These silicone components do not burn and damage the lambda probe.)

3.2 - Poor performance after cold start

Test conditions

- No faults relating to lambda control stored, if necessary rectify any faults and erase the fault memory.

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

Warning:

The V.A.G 1551 must be operated by a second person.

Checking the vehicle under cold start conditions:

- Take the vehicle for a test drive.
- Select the function "Reading measured value block" (function 08) and Display Group 21
=>Page 39.

-> Display readout:

```
Read measured value block 21
      860 rpm      1.15 ms      13.7 5C
l-Control OFF
```

- Check display in display zone 4.

Specified value: λ-Control OFF (lambda control not active)

If the engine running problems occur before the lambda control cuts in, the following faults are possible:

- ♦ Carbon deposits on the inlet valves.
- ♦ Unmetered air in intake system.
- ♦ Fuel supply system defective.

At a lambda probe temperature of approx 300°C, the lambda control kicks in. The time it takes for this temperature to be reached is influenced by the following factors:

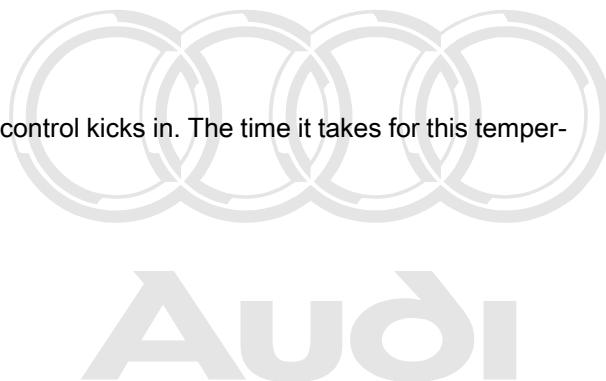
- ♦ Ambient temperature (summer or winter)
- ♦ Operating status after starting.
- ♦ Operation of lambda probe heating.

-> Display readout:

```
Read measured value block 21
      860 rpm      1.15 ms      34.2 5C
l-Control ON
```

- Check display in display zone 4.

Specified value: λ-Control ON (lambda control active)



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 running problems only occur after the lambda control sets in:

- Check operation => Page 67

3.3 - Checking operation

- Select the function "Reading measured value block" (function 08) and Display Group 03
=>Page 30 .

-> Display readout:

Read measured value block 3			
1	2	3	4

Do not proceed with the test until the coolant temperature shown in display zone 3 has reached at least 80 °C.

- Press the C key.
- Press keys 0 and 7 for "Display group number 07" and confirm entry by pressing the Q key.

-> Display readout:

Read measured value block 7			
1	2	3	4

Display zone 2 will show the voltage of the lambda probe signal.

- If the probe voltage fluctuates very slowly, check the lambda probe heating => Page 68 .
- If the display shows a constant lambda probe voltage reading of 0.45...0.50 V, this means there is an open circuit in the signal wiring, check the wiring => Page 69 .
- If the display shows a constant voltage reading of 0.0...+0.3 V (mixture too lean), this means that the lambda control has reached the control stop in the "enrich" direction, but the lambda probe is still registering "Mixture too lean".
- If the display shows a constant voltage reading of 0.7...1.0 V (mixture too rich), this means that the lambda control has reached the control stop in the "lean" direction, but the lambda probe is still registering "Mixture too rich".
- Press the C key.

If the lambda probe is functioning properly, check the lambda learned values.

- Press keys 0 and 8 for "Display group number 08" and confirm entry by pressing the Q key.

-> Display readout

Read measured value block 8			
2ms	-0.7 %	-0.5 %	TB

active

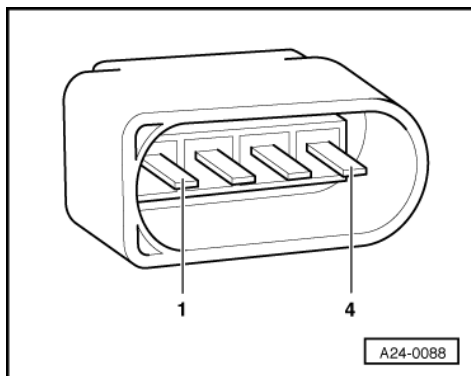
Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

The mixture adaptation system has a learning ability, i.e. the lambda control can recognise differences between engines (injector nozzle delivery, cylinder compression, fuel pressure, etc.) and compensates by adjusting the pre programmed basic injection periods mapped in the control unit. The injection periods are extended or reduced until a mixture of $\lambda = 1$ is achieved. The difference between the actual injection period and the basic injection time programmed in the map is given %.

- ◆ Positive learned value (+...%): Pre programmed basic injection period too short, actual injection period ...% longer, so that $\lambda = 1$ is achieved.
- ◆ Negative learning value (-...%): Pre programmed basic injection period too long, actual injection period ...% shorter, so that $\lambda = 1$ is achieved.

Specified values: => Page 32 .

3.4 - Checking lambda probe heating



- The lambda probe heating circuit is monitored by the self diagnosis system.
- Interrogate the fault memory => Page 3 .

Electrical check on lambda probe heating

- Unplug the 4 pin connector on the underside of the vehicle to the right of the lambda probe (G39).
- -> Measure the resistance between contacts 1 and 2 on the lambda probe connector using the V.A.G 1526 hand held multimeter.

Specified value at room temperature 1...5Ω.

Note:

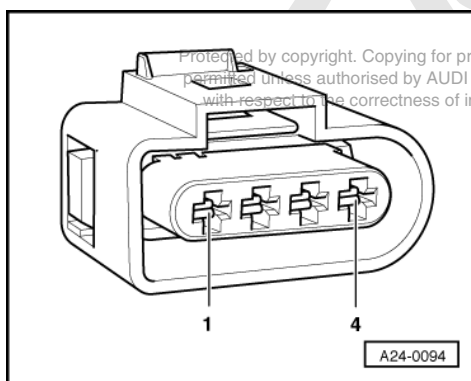
With even a small temperature increase, the resistance will increase sharply.

If an open circuit is detected:

- Replace the lambda probe.

If no open circuit is detected:

- Check the power supply for the lambda probe heating => Page 68 .



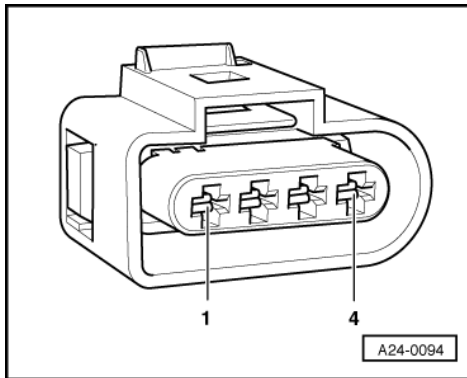
Checking the power supply for the lambda probe heating

- Check the fuse for the lambda probe heating.

If the fuse is OK:

- -> Connect the V.A.G 1527 diode test lamp between contact 1 on the wiring harness connector and the engine earth.
- Operate the starter briefly (the engine may start briefly).

The diode test lamp should light up.

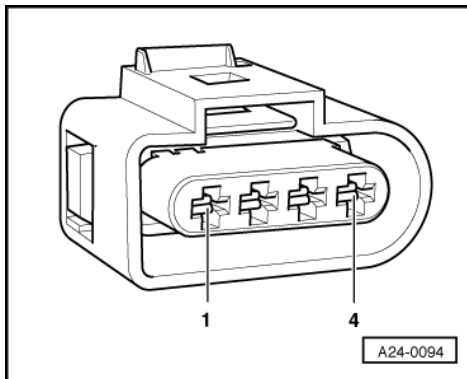


If the diode test lamp does not light up.

- -> Check the wiring from contact 1 in the wiring harness connector to fuse for an open circuit or short to earth and rectify if necessary.

If the power supply is OK:

- Connect the V.A.G 1598/22 test box to the wiring harness to the engine control unit =>Page 47 .

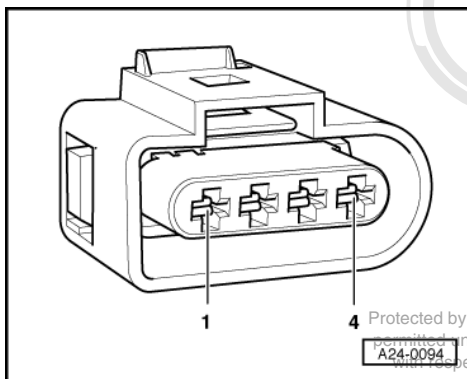


- -> Test the following wiring for continuity or a short circuit.

Connector on the wiring harness plug	Test box V.A.G 1598/22 Contact
2	27

- If the fuse and the wiring are OK but the diode test lamp still does not light up, check the fuel pump relay => Page 56 .

3.5 - Checking lambda probe signal line and 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.

Note:

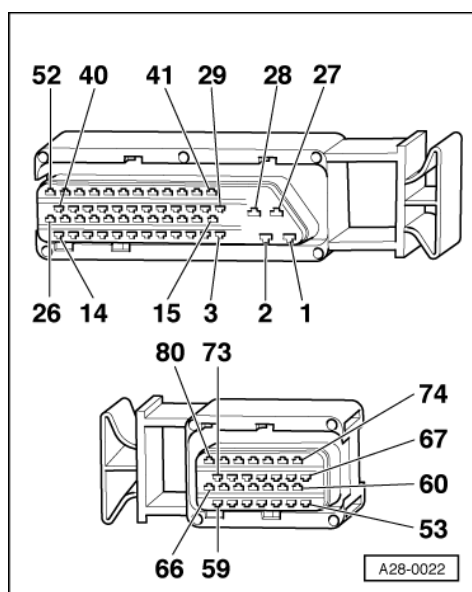
The lambda probe signal is monitored by the self diagnosis system.

- Interrogate the fault memory => Page 3 .
- If a fault in the lambda probe has been registered and the lambda probe heating is OK, unplug the lambda probe connector.
- -> Test voltage by connecting the V.A.G 1526 hand held multimeter (measuring range 2 V) between contacts 3 and 4 of plug on the wiring harness.
- Switch on the ignition.

Specified value: 450 ± 50 mV.

If the specified value is not achieved:

- Connect the V.A.G 1598/22 test box to the wiring harness for the engine control unit
=> Page 47 .



- -> Check the following wiring for an open circuit and short circuit to positive or earth and rectify if necessary.

Lambda probe, bank 1 -G39

Connector on the wiring harness plug	Test box V.A.G 1598/22 or control unit connector -J220
3	25
4	26

- If the wiring is OK, replace the engine control unit => Page 48 .

3.6 - Removing and installing the lambda probe

Removing

- Unplug the lambda probe connector.
- Unscrew the lambda probe using V.A.G 3337/9.

When installing, note the following points:

Notes:

- ◆ Tightening torque 50 Nm.
- ◆ The screw thread on the lambda probe is coated with a special paste (hot screw paste). This paste must not be allowed to penetrate the openings on the probe.

4 - Checking the fuel tank breather system

4.1 - Checking the fuel tank breather system

4.2 - Checking the solenoid valve 1 for the activated carbon canister

This document, including all drawings and technical data, is not permitted to be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or by any information storage and retrieval system, without the prior written permission 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.

Leak test

When there is no electrical signal, the solenoid valve remains closed.

- Disconnect the hoses from the solenoid valve for the activated carbon canister (N80).
- Attach the connector to the solenoid valve.
- Start the final control diagnosis and select the solenoid valve for the activated carbon canister (N80)
=>Page 15 .
- During the final control diagnosis, blow into solenoid valve to check whether it opens and closes properly.
If necessary, fit a new solenoid valve.

Electrical check on the -N80 solenoid valve

- Unplug the connector on the ACF valve.
- Measure the resistance between the contacts on the valve using the V.A.G 1526 hand held multimeter.

Specified value: 22...30 Ω .

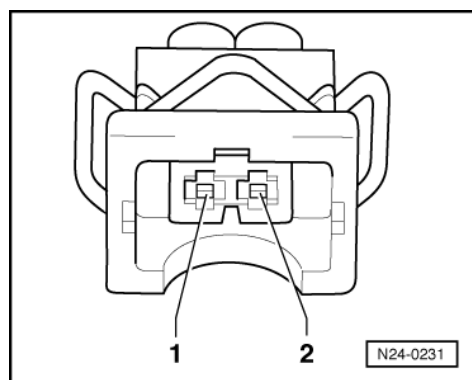
If the specified value is not achieved:

- Replace the -N80 solenoid valve for the activated carbon canister.

Checking the power supply to the ACF valve

Note:

The ACF valve receives its power supply via the fuel pump relay.



Test conditions

- Fuse for ACF valve OK



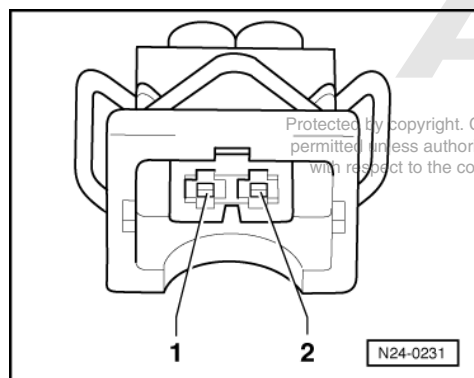
- Unplug the connector on the ACF valve.
- -> Connect the V.A.G 1527 diode test lamp between contact 1 on the connector and the engine earth.
- Actuate the starter.

The diode test lamp should light up.

If the diode test lamp does not light up:

- Check the wiring from contact 1 via the fuse to the fuel pump relay for continuity, repair if necessary.

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



- If the wiring is OK, check the fuel pump relay => Page 56 .

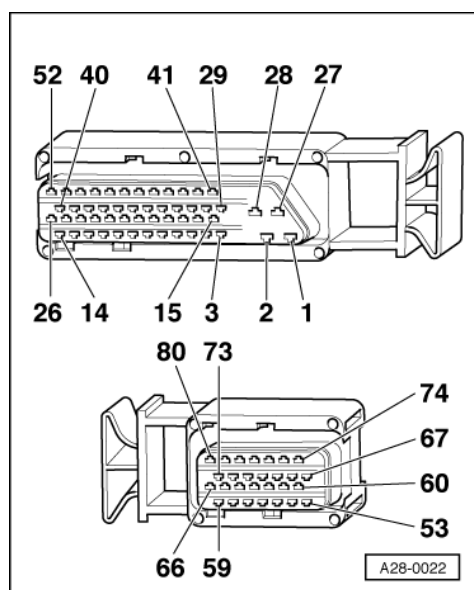
Check the actuation of the ACF valve

- -> Connect the V.A.G 1527 diode test lamp between contact 2 and contact 1 (positive) in the connector.
- Start the final control diagnosis and select the solenoid valve for the activated carbon canister (N80)
=>Page 15 .

The diode test lamp should start flashing.

If the diode test lamp does not flash or is continuously lit:

- Connect the V.A.G 1598/22 test box to the wiring harness for the engine control unit
=>Page 47 .



If the diode test lamp is continuously lit:

- -> Test for the line from contact 2 on the ACF valve connector and socket 15 on the test box for a short to earth.

If the diode test lamp does not flash:

- Test the line from contact 2 on the ACF valve connector to contact 15 on the test box for continuity and for a short to positive.
- If necessary, rectify a short circuit to earth or open circuit.
- If no short circuit or open circuit is found, replace the engine control unit
=> Page 48 .

5 - Checking the throttle valve control unit - vehicles without CCS

5.1 - Checking the throttle valve control unit - vehicles without CCS

The idle stabilisation is integrated in the throttle valve control unit.

The box facing the cable pulley contains the following components
(this box must not be opened):

- -G69 throttle valve potentiometer.
- -G127 sensor for throttle valve positioner.
- -F60 idling switch.
- -V60 throttle valve positioner (electric motor) .

None of the potentiometers and switches may be adjusted mechanically. The settings are performed as part of the basic setting (function 04) using the V.A.G 1551 or 1552 fault reader.

5.2 - Adaptation of the throttle valve control unit without CCS

The idle stabilisation requires the engine control unit to know the stop positions of the throttle valve positioner (V60) and the potentiometer characteristics of the throttle valve positioner sensor (G127) and throttle valve potentiometer (G69).

The learning process (adaptation) is necessary if:

- ◆ The power supply to the engine control unit has been interrupted (e.g. the battery disconnected) .
- ◆ The throttle valve control unit was replaced.
- ◆ The engine control unit was replaced.

The learning process (adaptation process) is performed:

- ◆ Automatically if the ignition is switched on once for at least 6 seconds without actuating the starter or the accelerator pedal.
- ◆ By initiating the basic setting (function 04) Display Group 98 with the engine stopped.

Test conditions

- No fault stored in fault memory
=> Page 3 , Interrogate the fault memory
- Connect the V.A.G 1551 fault reader (V.A.G 1552) and select the engine electronics control unit with the "Address word" 01. During this, the ignition must be switched on.
(Connecting the fault reader and selecting the control unit for the engine electronics => Page 2 .)

-> Display readout:



Rapid data transfer	HELP
Select function XX	

- Press keys 0 and 4 for the function "Introduction of basic setting" and confirm entry with the Q key.

-> Display readout:

Basic setting	HELP
Enter display group number XXX	

- Press keys 0, 9 and 8 for "Display group number 98" and confirm entry with the Q key.

-> Display readout

System in basic setting	98
x.xxx V x.xxx V	Idle ADP.
running	

When the Q key is pressed, the throttle valve positioner moves to min., - max. - and five intermediate positions. The control unit records the voltage reading for each position in its non volatile memory. This process takes no more than 10 seconds. The throttle valve then remains in the start position for a brief period before closing.

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

-> Display readout:

System in basic setting	98
x.xxx V x.xxx V	Idle ADP. OK

-> If one of the following messages appears on the display, the adaptation was terminated.

Basic setting 98	
X,XXX V X.XXX V	Idle ADP. not OK

Basic setting 98	
X,XXX V X.XXX V	Idle ADP. running

Terminate adaptation by pressing the ➡ key.

Basic setting 98	
X,XXX V X.XXX V	Idle ERROR

Function is unknown or cannot be performed at present!
--

- Interrogate the fault memory

No-fault detected

-> If no faults are recognised, check whether the idling switch opens and closes when the accelerator pedal is operated. Check idling switch => Page 75 .

Idling switch does not open
Short to earth

-> If one of these faults is displayed, check whether the idling switch opens and closes when the accelerator pedal is pressed, check the idling switch => Page 75 .

Idling switch does not close
Open circuit

Voltage supply
Signal too low

-> If this fault is displayed, check the power supply to the engine control unit (voltage at terminal 30 on engine control unit has dropped below 10 V).

-G127 sensor for throttle valve positioner
Signal too low or too high

-> If one of the following faults is displayed, check the -G127 sensor for the throttle valve positioner => Page 76.

-G69 throttle valve potentiometer
Signal too low or too high

-G127 sensor for throttle valve
positioner
Implausible signal

Note:

If the basic setting of the control unit is interrupted, the cause could be one of the following:

- ◆ The throttle valve does not reach the mechanical idle stop due to contamination.
- ◆ Throttle cable incorrectly adjusted.
- ◆ The battery voltage is too low.
- ◆ The throttle valve control unit or wiring is defective.

After an interruption, the fault "Basic setting not completed, fault in basic setting" is stored in the fault memory. The next time the ignition is switched on, the basic setting is automatically performed again.

- Terminate the engine basic setting by pressing the => key.
- Press keys 0 and 6 for the function "End data transfer" and confirm the entry with the Q key.

5.3 - Checking the idling switch without CCS

- Switch on the ignition.
- Select the function "Reading measured value block" (function 08) and Display Group 98
=>Page 42.

-> Display readout:

Read measured value block 98
X,XXX V X,XXX V
Idling

Display zone 3 should read "Idling".

- Slowly open throttle valve.

-> Display readout:

Read measured value block 98
X,XXX V X,XXX V Part
load

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 3 should read "Part load".

- Slowly close throttle valve again.

-> Display readout:

Read measured value block 98
X,XXX V X,XXX V
Idling

Display zone 3 should read "Idling".

If the specified value "Idling" is not achieved:

- Switch the ignition off.
- Connect the V.A.G 1598/22 test box to the wiring harness for the engine control unit
=>Page 47.



- Measure the resistance between contacts 67 and 69 using the V.A.G 1526 hand held multimeter.

Specified value: continuity (throttle valve closed)

- Open the throttle valve slightly.

Specified value: No continuity (idling speed switch should open).

If the specified value is not achieved:

- Check the wiring for short circuit to positive or earth and open circuit.

8-pin connector on the wiring harness contact	Test box V.A.G 1598/22 contact
3	69
7	67

- If necessary, rectify open circuit or short circuit.

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

If no wiring faults are detected:

- Inspect throttle valve for dirt or stiffness and, if necessary, clean.
 - Perform adaptation of the throttle valve control unit => Page 73 .
 - If it is not possible to start the adaptation or successfully conclude it:
 - Detach the throttle cable.
 - Repeat the adaptation of the throttle valve control unit once more => Page 73 .
 - If it is once again not possible to start or conclude successfully the adaptation of the throttle valve control unit, replace the throttle valve control unit. Perform the adaptation again.
- => Page 73 .

5.4 - Checking the throttle valve potentiometer without CCS

The throttle valve potentiometer (G69) informs the engine control unit of the position of the throttle valve.

Test conditions

- Check the throttle cable setting

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability for errors or omissions. © 1996 AUDI AG.

=> 4-cylinder engine, mechanical components; Repair Group 20

- Switch on the ignition.
 - Select the function "Reading measured value block" (function 08) and Display Group 01
- =>Page 28

-> Display readout:

Read measured value block 1
0 rpm 0.00 ms 4 -5 xxxBDTC

- Check display in display zone 3.

Read measured value block 1
0 rpm 0.00 ms 4 -5 xxxBDTC

-> Specified value: 0...5 <°

- Slowly depress accelerator pedal.

Read measured value block 1
0 rpm 0.00 ms 86 -5 xxxBDTC

-> Specified value: The readout in display zone 3 should increase steadily until it reaches 85...90 <° (with accelerator pedal fully depressed).

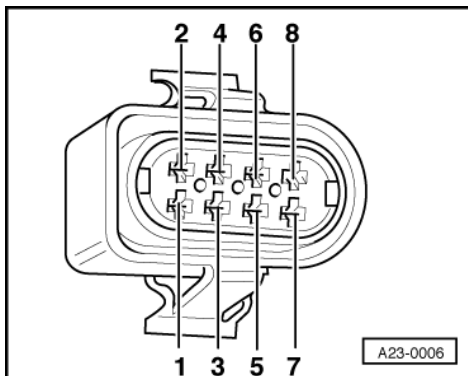
If either the initial or the final specification is not achieved:

- Check the power supply.

If the display does not change or only changes irregularly:

- Check the wiring
=> Page 77 .

Check the power supply to the throttle valve control unit



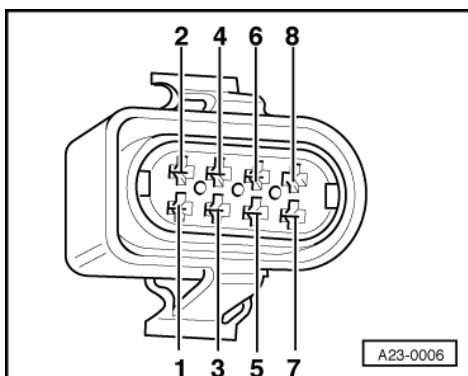
- Unplug the connector from the throttle valve control unit.
- -> Connect the V.A.G 1526 hand held multimeter for voltage measurement to contact 4 of the connector and the earth.
- Switch on the ignition.

Specified value: approx 5 V

Check wiring

- Switch the ignition off.
- Connect the V.A.G 1598/22 test box to the wiring harness for the engine control unit
=>Page 47 .

The following wiring should be checked for a short to positive or negative and an open circuit:



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-pin connector on the wiring harness contact	Test box V.A.G 1598/22 contact
4	62
5	75



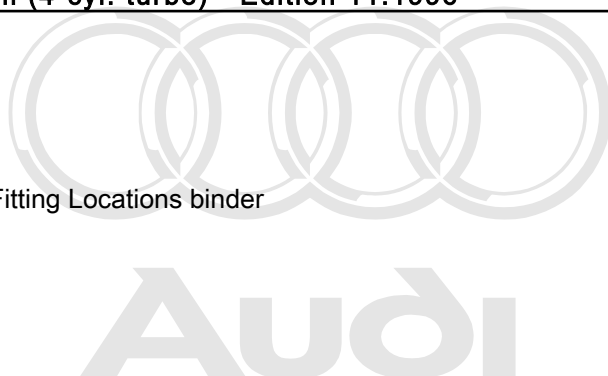
7	67
---	----

- If necessary, rectify open circuit or short circuit.

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

If no wiring fault is detected:

- Test sensor for throttle valve positioner
=> Page 78 .



5.5 - Checking the sensor for throttle valve positioner without CCS

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

The sensor for the throttle valve positioner (G127) informs the engine control unit of the position of the throttle valve positioner (V60).

- Start the engine.
- Select the function "Reading measured value block" (function 08) and Display Group 98
=>Page 42 .

-> Display readout:

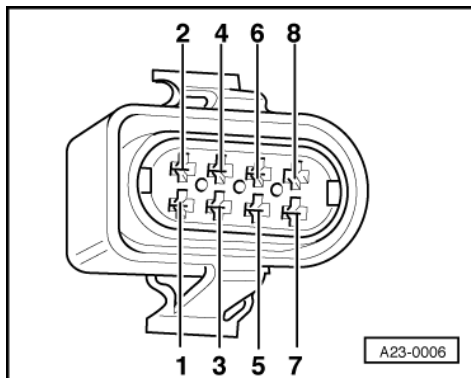
Read measured value block 98		
4.420 V	3.880 V	Idle
ADP. OK		

- Check display in display zone 2.

Specified value: 0.500...4.900 V.

If the specified value is not achieved:

- Switch the ignition off.



- -> Unplug the connector from the throttle valve control unit.
- Connect the V.A.G 1598/22 test box to the wiring harness for the engine control unit
=>Page 47 .

The following wiring should be checked for a short to positive or negative and an open circuit:

8-pin connector on the wiring harness contact	Test box V.A.G 1598/22 contact
4	62
7	67
8	74

- If necessary, rectify open circuit or short circuit.

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

If no wiring fault is detected:

- Check throttle valve positioner => Page 79 .

5.6 - Checking throttle valve positioner without CCS

The throttle valve positioner (V60) is an electric motor. When the engine is idling, it actuates the throttle valve via a gear mechanism in order to control the idling speed.

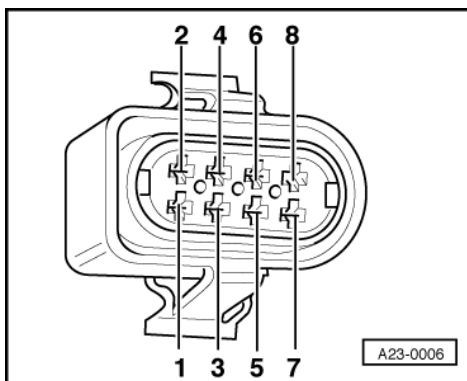
- Switch on the ignition.
- Select "Basic setting" (function 04) and Display Group 98 => Page 42 .

-> Display readout

Basic setting 98		
4.420 V	3.880 V	Idle
ADP. running		

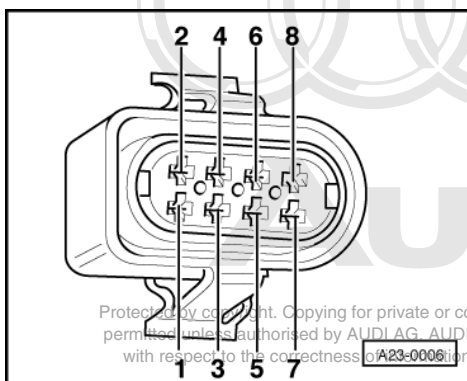
When the Q key is pressed, the throttle valve positioner moves to the min. - and max. - stop (visible and audible at the throttle valve control unit).

If the throttle valve positioner does not move:



- Switch the ignition off.
- -> Unplug the connector from the throttle valve control unit.
- Connect the V.A.G 1598/22 test box to the wiring harness for the engine control unit
=>Page 47 .

The following wiring should be checked for a short to positive or negative and an open circuit:



8-pin connector on the wiring harness contact	Test box V.A.G 1598/22 socket
1	66



2	59
---	----

- If necessary, rectify open circuit or short circuit.

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

If no wiring fault is detected:

- Replace the throttle valve control unit (J338).

6 - Checking the throttle valve control unit - vehicles with CCS

6.1 - Checking the throttle valve control unit - vehicles with CCS

The idle stabilisation is integrated in the throttle valve control unit.

The box facing the cable pulley contains the following components (this box must not be opened):

- -G69 throttle valve potentiometer.
- -G127 sensor for throttle valve positioner.
- -F60 idling switch.
- -V60 throttle valve positioner (electric motor)

None of the potentiometers and switches may be adjusted mechanically. The settings are performed as part of the basic setting (function 04) using the V.A.G 1551 or 1552 fault reader.

6.2 - Adaptation of the throttle valve control unit with CCS

The idle stabilisation requires the engine control unit to know the stop positions of the throttle valve positioner (V60) and the potentiometer characteristics of the throttle valve positioner sensor (G127) and throttle valve potentiometer (G69).

The learning process (adaptation) is necessary if:

- ♦ The power supply to the engine control unit has been interrupted (e.g. the battery disconnected) .
- ♦ The throttle valve control unit was replaced.
- ♦ The engine control unit was replaced.

The learning process (adaptation process) is performed:

- ♦ Automatically if the ignition is switched on once for at least 6 seconds without actuating the starter or the accelerator pedal.
- ♦ By initiating the basic setting (function 04) Display Group 98 with the engine stopped.

Test conditions

- No fault stored in fault memory
=> Page 3 . Interrogate the fault memory.
- Connect the V.A.G 1551 fault reader (V.A.G 1552) and select the engine electronics control unit with the "Address word" 01. During this, the ignition must be switched on.
(Connecting the fault reader and selecting the control unit for the engine electronics => Page 2 .)

-> Display readout

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

- Press keys 0 and 4 for the function "Introduction of basic setting" and confirm entry with the Q key.

-> Display readout:

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

- Press keys 0, 9 and 8 for "Display group number 98" and confirm entry with the Q key.

-> Display readout

```
System in basic setting    98
x.xxx V      x.xxx V      Idle ADP.
running
```

When the Q key is pressed, the throttle valve positioner moves to min., - max. - and five intermediate positions. The control unit records the voltage reading for each position in its non volatile memory. This process takes no more than 10 seconds. The throttle valve then remains in the start position for a brief period before closing.

-> Display readout:

```
System in basic setting    98
x.xxx V      x.xxx V      Idle ADP. OK
```

-> If one of the following messages appears on the display, the adaptation was terminated.

```
Basic setting 98
X,XXX V      X.XXX V      Idle ADP. not OK
```

```
Basic setting 98
X,XXX V      X.XXX V      Idle ADP. running
```

Terminate adaptation by pressing the => key.

```
Basic setting 98
X,XXX V      X.XXX V      Idle      ERROR
```

```
Function is unknown or cannot
be performed at present
```

- Interrogate the fault memory

```
No-fault detected
```

-> If no faults are recognised, check whether the idling speed switch opens and closes when the accelerator pedal is operated, check the idling switch with CCS.
 => Page 82.

```
Idling switch does not open
Short to earth
```

-> If one of these faults is displayed, check whether the idling speed switch opens and closes when the accelerator pedal is operated. Test idling switch with CCS.
 => Page 82.

```
Idling switch does not close
Open circuit
```

```
Voltage supply
Signal too low
```

-> If this fault is displayed, check the power supply to the engine control unit (voltage at terminal 30 on engine control unit has dropped below 10 V).

```
-G127 sensor for throttle valve positioner
Signal too low or too high
```



-> If the following faults are displayed, check the -G127 sensor for the throttle valve positioner => Page 83 .

-G69 throttle valve potentiometer
Signal too low or too high

-G127 sensor for throttle valve
positioner
Implausible signal

Note:

If the basic setting of the control unit is interrupted, the cause could be one of the following:

- ♦ The throttle valve does not reach the mechanical idle stop due to contamination.
- ♦ Throttle cable incorrectly adjusted.
- ♦ The battery voltage is too low.
- ♦ The throttle valve control unit or wiring is defective.

After an interruption, the fault "Basic setting not completed, fault in basic setting" is stored in the fault memory. The next time the ignition is switched on, the basic setting is automatically performed again.

- Terminate the engine basic setting by pressing the ⇒ key.
- Press keys 0 and 6 for the function "End data transfer" and confirm the entry with the Q key.

6.3 - Checking the idling switch with CCS

- Switch on the ignition.
- Select the function "Reading measured value block" (function 08) and Display Group 98
=>Page 42 .

-> Display readout:

Read measured value block 98
X,XXX V X,XXX V
Idling

Display zone 3 should read "Idling".

- Slowly open throttle valve.

-> Display readout:

Read measured value block 98
X,XXX V X,XXX V Part
load

Display zone 3 should read "Part load".

- Slowly close the throttle valve again.

-> Display readout:

Read measured value block 98
X,XXX V X,XXX V
Idling

Display zone 3 should read "Idling".

If the specified value "Idling" is not achieved:

- Switch the ignition off.
- Connect the V.A.G 1598/22 test box to the wiring harness for the engine control unit
=>Page 47 .



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.

- Measure the resistance between contacts 67 and 69 using the V.A.G 1526 hand held multimeter.

Specified value: continuity (throttle valve closed)

- Open the throttle valve slightly.

Specified value: No continuity (idling speed switch should open)

If the specified value is not achieved:

- Check the wiring for short circuit to positive or earth and open circuit.

8-pin connector on the wiring harness contact	Test box V.A.G 1598/22 contact
6	69
2	67

- If necessary, rectify open circuit or short circuit.

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

If no wiring faults are detected:

- Inspect throttle valve for dirt or stiffness and clean if necessary.
- Perform adaptation of the throttle valve control unit => Page 80 .
- If it is not possible to start the adaptation or successfully conclude it:
- Detach the throttle cable.
- Repeat the adaptation of the throttle valve control unit once more => Page 80 .
- If it is once again not possible to start or conclude successfully the adaptation of the throttle valve control unit, replace the throttle valve control unit. Perform the adaptation again.
=> Page 80

6.4 - Checking the throttle valve potentiometer with CCS

Unauthorized copying or reuse of any part of this document is prohibited. Copyright 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.

The throttle valve potentiometer (G69) informs the engine control unit of the position of the throttle valve.

Test conditions

- Check the throttle cable setting

=> 4-cylinder engine, mechanical components; Repair Group 20

- Switch on the ignition.
- Select the function "Reading measured value block" (function 08) and Display Group 01
=>Page 28 .

-> Display readout:

Read measured value block 1
0 rpm 0.00 ms 4 -5 xxxBDTC

- Check display in display zone 3.

Read measured value block 1
0 rpm 0.00 ms 4 -5 xxxBDTC

-> Specified value: 0...5 <°

- Slowly depress accelerator pedal.

Read measured value block 1
0 rpm 0.00 ms 86 -5 xxxBDTC



-> Specified value: The readout in display zone 3 should increase steadily until it reaches 85...90 <° (with accelerator pedal fully depressed).

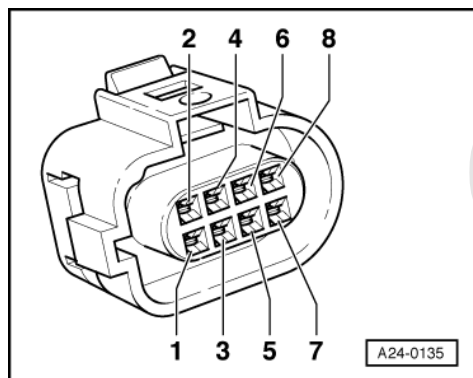
If either the initial or the final specification is not achieved:

- Check the power supply.

If the display does not change or only changes irregularly:

- Check the wiring.
=> Page 84

Check the power supply to the throttle valve control unit



- Unplug the connector from the throttle valve control unit.
- -> Connect the V.A.G 1526 hand held multimeter for voltage measurement to contact 5 of the and to the earth.
- Switch on the ignition.

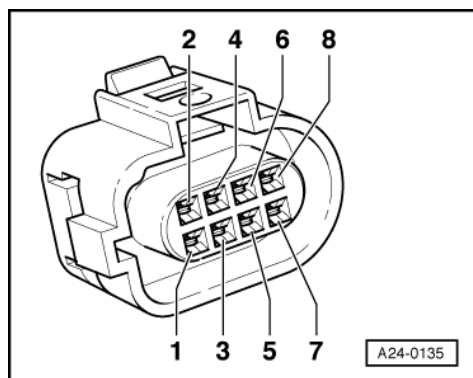
Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Specified value: approx. 5 V.

Check wiring.

- Switch the ignition off.
- Connect the V.A.G 1598/22 test box to the wiring harness for the engine control unit
=>Page 47 .

The following wiring should be checked for a short to positive or negative and an open circuit:



8-pin connector on the wiring harness contact	Test box V.A.G 1598/22 contact
4	75
5	62

2	67
---	----

- If necessary, rectify open circuit or short circuit.

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

If no wiring fault is detected:

- Test sensor for throttle valve positioner
=> Page 85 .

6.5 - Checking the sensor for the throttle valve positioner with CCS

The sensor for the throttle valve positioner (G127) informs the engine control unit of the position of the throttle valve positioner (V60).

- Start the engine.
- Select the function "Reading measured value block" (function 08) and Display Group 98
=>Page 42

-> Display readout:

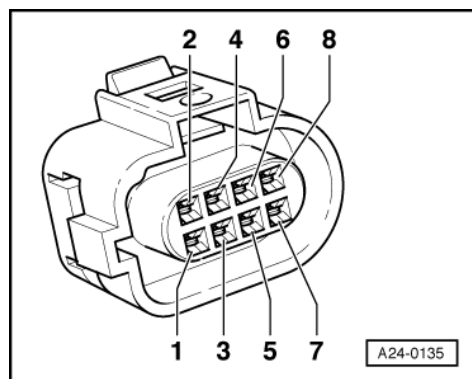
Read measured value block 98	
4.420 V	3.880 V
Idle ADP. OK	

- Check display in display zone 2.

Specified value: 0.500...4.900 V.

If the specified value is not achieved:

- Switch the ignition off.



- -> Unplug the connector from the throttle valve control unit.
- Connect the V.A.G 1598/22 test box to the wiring harness for the engine control unit
=>Page 47 .

The following wiring should be checked for a short to positive or negative and an open circuit:

8-pin connector on the wiring harness contact	Test box V.A.G 1598/22 contact
5	62
2	67
1	74

- If necessary, rectify open circuit or short circuit.



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

If no wiring fault is detected:

- Check throttle valve positioner => Page 86 .

6.6 - Checking the throttle valve positioner with CCS

The throttle valve positioner (V60) is an electric motor. When the engine is idling, it actuates the throttle valve via a gear mechanism in order to control the idling speed.

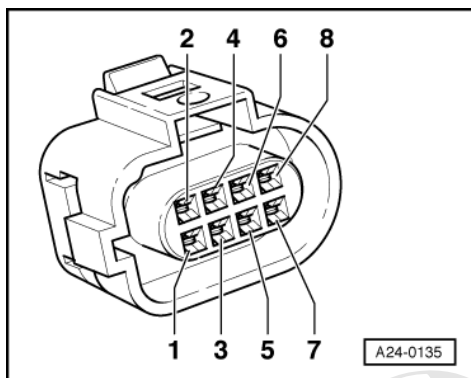
- Switch on the ignition.
- Select "Basic setting" (function 04) and Display Group 98 => Page 42 .

-> Display readout:

Basic setting 98		
4.420 V	3.880 V	Idle
ADP. running		

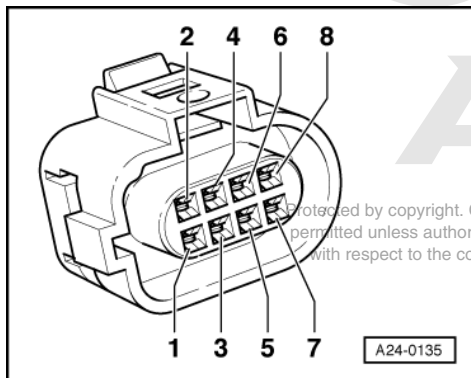
When the Q key is pressed, the throttle valve positioner moves to the min. - and max. -stop (visible and audible at the throttle valve control unit).

If the throttle valve positioner does not move:



- Switch the ignition off.
- -> Unplug the connector from the throttle valve control unit.
- Connect the V.A.G 1598/22 test box to the wiring harness for the engine control unit
=>Page 47 .

The following wiring should be checked for a short to positive or negative and an open circuit:



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-pin connector on the wiring harness contact	Test box V.A.G 1598/22 contact
7	59

8	66
---	----

- If necessary, rectify open circuit or short circuit.

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

If no wiring fault is detected:

- Replace the throttle valve control unit (J338).

7 - Cheocking auxiliary signals

7.1 - Cheocking auxiliary signals

7.2 - Checking air conditioner compressor shut-off

The air conditioner compressor signal informs the engine control unit that the compressor will be switched on in 140 ms.

The engine control unit can send a signal via the same wire to shut off the air conditioner compressor.

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

- ◆ On accelerating sharply from low speeds for approx 4 s (recognition from change in angle on throttle valve potentiometer and speed signal).
- ◆ At full load in 1st gear for a maximum of 12 seconds.
- ◆ If the throttle valve control unit is defective and the engine speed is less than 1500 rpm.
- ◆ After each engine start for approx 6 seconds.
- ◆ During the learning process for idle stabilisation for approx 15 seconds.

Test conditions

- Air conditioner functioning properly.
- No faults recorded in fault memory of engine control unit.
- Passenger compartment temperature warmer than +15 °C.
- Connect the V.A.G. 1551 fault reader => Page 2 .
- Start the engine.
- Select the function "Reading measured value block" (function 08) and Display Group 20 % Page.

-> Display readout:

Read measured value block 20		
860 rpm	Neutral	A/C-Low
Compr. OFF		

- Observe readout in display zone 4.

Specified value: Compr. OFF

- Switch on the air conditioner by pressing the "Auto" key. The compressor must run.

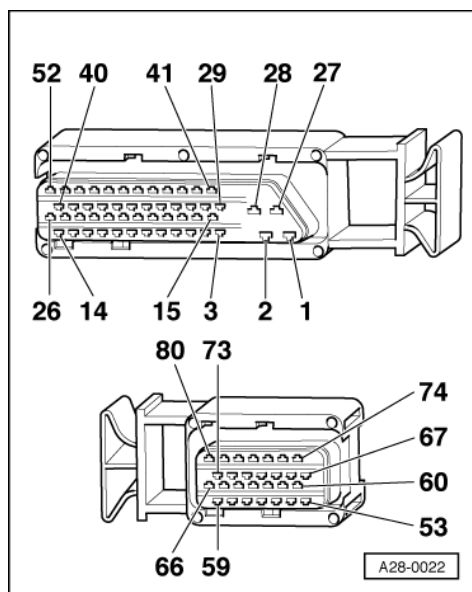
Specification for display zone 3: A/C - high

Specification for display zone 4: Compr. ON

- Abruptly floor the accelerator and release again (brief burst of throttle).



When the accelerator is floored quickly, the readout in display zone 4 should jump from "ON" to "OFF" for a few seconds (compressor shut off during acceleration).



If the display is not as described:

- Switch the ignition off.
- -> Connect the V.A.G 1598/22 test box to the wiring harness for the engine control unit
=> Page 47 .
- Test for an open circuit and short to earth or positive in the wiring from contact 8 on engine control unit to the air conditioner.

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

- If there are no faults in the wiring, check the operation of air conditioner.

=> Air conditioner; Repair Group 01; Self diagnosis for air conditioner Self diagnosis for air conditioner

7.3 - Checking the engine speed adaptation by switching on the air conditioner

Notes:

- ♦ When the air conditioner is switched on, a positive signal is sent to contact 10 on the engine control unit.
- ♦ The signal causes the engine control unit to maintain a constant idling speed despite the varying power requirements of the air conditioner.

Test conditions

- Air conditioner functioning properly.
- No faults recorded in air conditioner fault memory.
- Passenger compartment temperature warmer than +15 °C.
- Connect the V.A.G. 1551 fault reader => Page 2 .
- Start the engine (operating temperature).
- Switch off the rear window heating.
- Select the function "Reading measured value block" (function 08) and Display Group 20 % Page.

-> Display readout:

Read measured value block 20
860 rpm Neutral A/C Low
Compr. OFF

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 1: Idling speed

Display zone 3: Signal from air conditioner

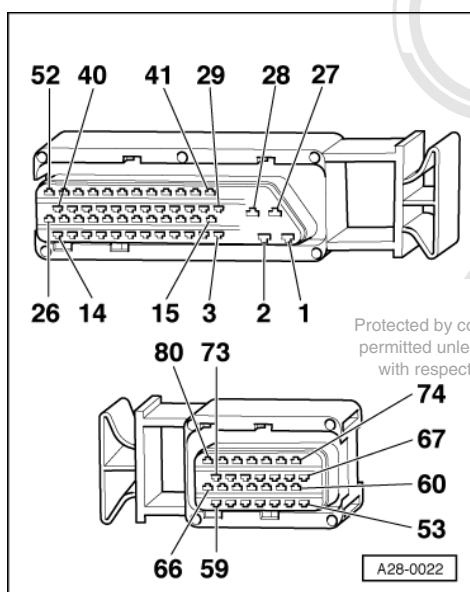
Display zone 4: Signal from air conditioner compressor

- Switch on the air conditioner by pressing the "Auto" key. The compressor must run.

Specification for display zone 4: "Compr. ON"

Apart from a brief drop in revs, the idling speed should remain constant.

If the idling speed does not remain constant, check whether the engine control unit is receiving the signal from the 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.

Specification for display zone 3: A/C - high
Specification for display zone 4: "Compr. ON"

If the specified value is not achieved:

- Switch the ignition off.
- -> Connect the V.A.G 1598/22 test box to the wiring harness for the engine control unit
=>Page 47 .
- Test for an open circuit and short to earth or positive in wiring from the contact 10 on engine control unit to the air conditioner.

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

- If there are no faults in the wiring, check the operation of air conditioner.

=> Air conditioner; Repair Group 01; Self diagnosis for air conditioner Self diagnosis for air conditioner

7.4 - Checking selector lever position on automatic gearbox

Note:

In selector lever positions P and N, the J226 relay for the starter inhibitor and reversing light switches contact 22 on the engine control unit to earth.

- Connect the V.A.G. 1551 fault reader => Page 2 .
- Switch on the ignition.



- Select the function "Reading measured value block" (function 08) and Display Group 20 % Page.

-> Display readout:

Read measured value block 20
860 rpm Neutral A/C-Low
Compr. OFF

Observe readout in display zone 2.

Specified value: "Neutral" (selector lever in P or N)

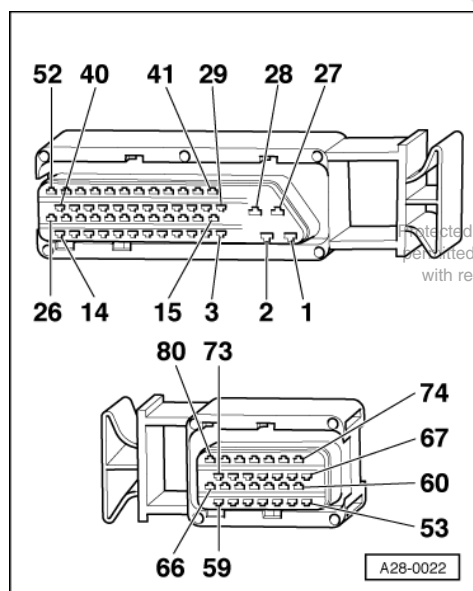
- Operate the footbrake and engage a gear.

-> Display readout:

Read measured value block 20
860 rpm Neutral A/C-Low
Compr. OFF

Observe readout in display zone 2.

Specified value: Driving position "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.

If the display is not as described:

- Switch the ignition off.
- -> Connect the V.A.G 1598/22 test box to the wiring harness for the engine control unit
=> Page 47 .
- Connect the diode test lamp between contact 3 (terminal 30) and contact 22.
- The diode test lamp should go out when a gear is engaged.
- Move selector lever to position P or N.

The diode test lamp should light up.

If the diode test lamp does not light up:

- Test for an open circuit and short to positive or earth in the wiring between gearbox control unit and contact 22 on engine control unit.

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

- If there are no faults in the wiring, test the multi function switch.

=> Automatic gearbox 01M; Repair Group 01; Gearbox electrical check Gearbox electrical check

7.5 - Checking engine speed signal

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

However, since the signal cannot be read in the form in which it is generated by the engine speed sensor (G28), it has to be processed beforehand by the engine control unit.

Determine the engine speed, as follows:

- Connect the V.A.G 1551 fault reader
=> Page 2 and perform "Automatic Test Sequence 00".

No faults relating to a "missing engine speed signal" should be stored in any of the control units.

If one of the control units indicates a fault:

- Determine open circuit or or short circuit between engine control unit and the control unit concerned.

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

7.6 - Checking throttle valve positioner

Notes:

- ♦ This signal is used by the control unit for the automatic gearbox in conjunction with the engine speed for various things including for calculating the engine torque output.
- ♦ The signal is output by contact 7 on the engine control unit.

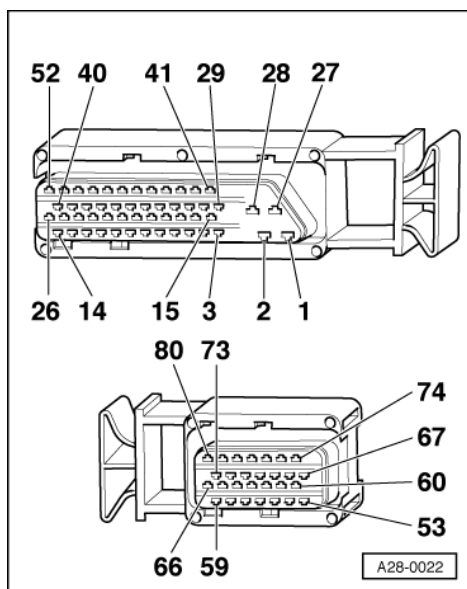
- Connect the V.A.G. 1551 fault reader => Page 2.
- Start the self diagnosis of the gearbox control unit.

=> Automatic Gearbox 01M; Repair Group 01; Perform self diagnosis. Perform self diagnosis.

- If the gearbox control unit displays fault 00638 "Engine/gearbox electrical connection 2", interrogate the engine control unit's fault memory => Page 3.

If the engine control unit has recorded a fault relating to the throttle valve potentiometer:

- Rectify this fault first. (In this case the fault recorded in the gearbox control unit is then only a secondary fault.)





If no fault relating to the throttle valve potentiometer is displayed:

- -> Connect the V.A.G 1598/22 test box to the wiring harness for the engine control unit
=> Page 47 .
- Check the wiring from contact 7 of the engine control unit (test box V.A.G 1598/22) to the gearbox control unit for an open circuit or short circuit.

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

7.7 - Checking the speed signal

Notes:

- ♦ The speed signal is produced by the -G68 road speed sensor and processed in the dash panel insert.
- ♦ The processed signal goes to contact 20 on the engine control unit and is used for idling speed stabilisation and for the damping of load change jolts when changing gear.

- Connect the V.A.G. 1551 fault reader => Page 2
- Switch on the ignition.
- Select the function "Reading measured value block" (function 08) and Display Group 11.

-> Display readout:

Read measured value block 11
860 rpm 1.15 ms 0 km/h
0.84 l/h

Warning:

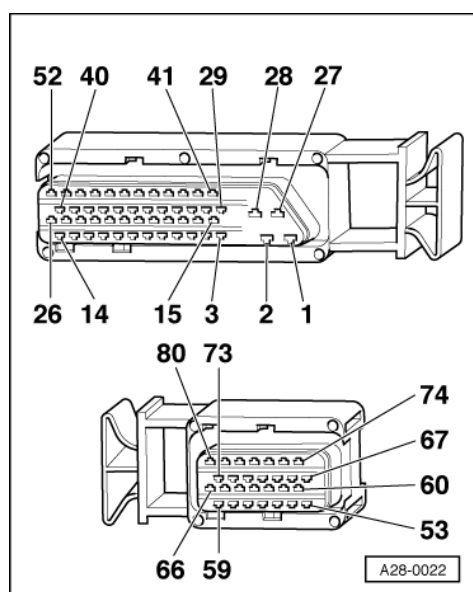
The V.A.G 1551 must be operated by a second person.

- Take the vehicle for a test drive.
- Observe readout in display zone 3.

-> Specified value: The current road speed should be displayed (compare with speedometer).

Read measured value block 11
2430 rpm 5.60 ms 45 km/h
3.38 l/h

If the road speed is not displayed:



- -> Connect the V.A.G 1598/22 test box to the wiring harness for the engine control unit
=>Page 47 .
- Check the wiring between contact 20 on the test box and the dash panel insert for continuity or short circuit.

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

If no fault is detected in the wire:

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

7.8 - Checking the gearbox intervention signal when changing gear

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

- ◆ This signal is produced by the automatic gearbox control unit when the gear is changed. The signal enables the ignition timing to be briefly retarded by varying amounts (torque reduction) depending on the road speed and engine speed in order to reduce shifting jolt.
- ◆ Because the signal is very brief the V.A.G. 1551 does not always recognise the command to retard the ignition timing.
- Connect the V.A.G. 1551 fault reader => Page 2 .
- Select the function "Reading measured value block" (function 08) and Display Group 19
=> Page 38 .
- Take the vehicle for a test drive.

Warning:
The V.A.G 1551 must be operated by a second person.

-> Display readout:

Read measured value block 19			
1	2	3	4

- Display zone 3 shows the gearshift signal supplied by the gearbox when changing gear.

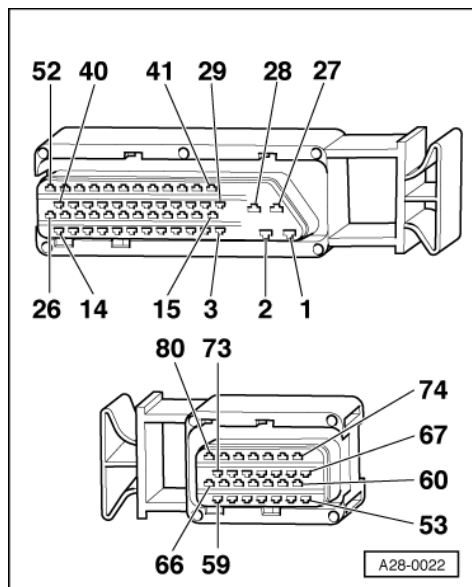
up to model year 1998:

Specified value: X 1 X = no gearbox intervention.
Specified value: X 0 X = gearbox intervention.

from model year 1998:

Specified value: X 1 X X = no gearbox intervention.
Specified value: X 0 X X = gearbox intervention.
Value: X = (no meaning).

- Display zone 4 shows the effective ignition timing (actual value).



- The wiring to the gearbox control unit is monitored by the gearbox self diagnosis (fault code 00545).
- If no torque reduction is displayed on the measured value block during a gearshift, or if fault code 00545 appears (in the gearbox control unit):
- -> Connect the V.A.G 1598/22 test box to the wiring harness for the engine control unit
=> Page 47 .
- Check the wiring from contact 23 on the engine control unit to the gearbox control unit for an open circuit or short circuit

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

7.9 - Checking clutch pedal switch

This signal prevents engine speed fluctuations and load change jolts when the clutch is disengaged and is also required for the cruise control system.

- Read measured value block (function 08) and selected display group 19 => Page 38 .

-> Display readout:

Read measured value block 19			
1	2	3	4

- Check display in display zone 3.

Specified value: X X X 1 = Clutch pedal not depressed

- Depress clutch pedal.

Specified value: X X X 0 = Clutch pedal depressed

Value: X = (no meaning)

This document is copyrighted by Audi AG. It may not be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or by any information storage and retrieval system, without prior written permission from Audi AG. Audi AG does not guarantee or accept any liability for the content of this document. Copyright by Audi AG.

If the display is not as described, check the power supply => Page 94 .

Checking the power supply

- Unplug the connector from clutch pedal switch.
- Switch on the ignition.
- Connect the V.A.G 1527 diode test lamp between contact 1 (positive) on the connector and the engine earth.

Specified value: The diode test lamp should light up.

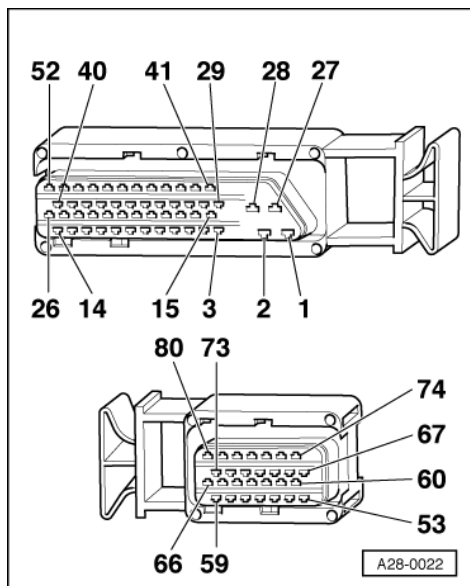
If the diode test lamp does not light up:

- If the diode test lamp does not light up, check the wiring from contact 1 on the connector via the fuse to the fuel pump relay for an open circuit or short circuit.

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

If the specified value is achieved, check the actuation.

=>Page 95 .



Check the actuation of the clutch pedal switch

- -> Connect the V.A.G 1598/22 test box to the wiring harness for the engine control unit
=> Page 47 .
- Check the wiring from contact 9 on the engine control unit to the connector on the clutch pedal switch contact 2 for an open circuit or short circuit.

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

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.

7.10 - Checking the power steering pressure switch

The function of the power steering pressure switch is to stabilise the idling speed when the steering wheel is on full lock (left or right).

- Start the engine.
- Read measured value block (function 08) and selected display group 19 => Page 38 .

-> Display readout:

Read measured value block 19			
1	2	3	4

- Check display in display zone 3.

Specified value: 1 X X X = No Signal from the pressure switch for power steering

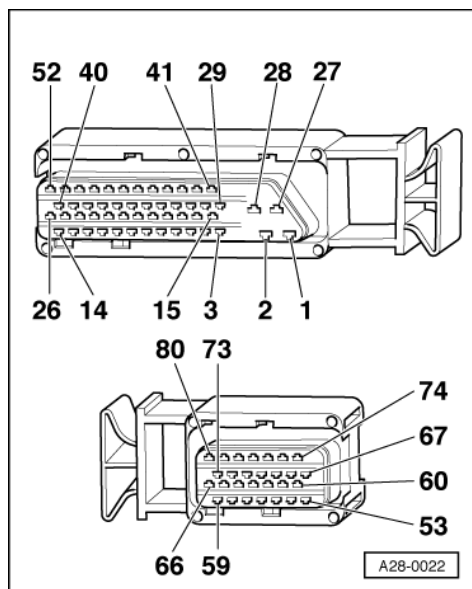
- Turn the steering fully to the left or right.



Specified value: 0 X X X = Signal from the pressure switch for power steering

Value: X = (no meaning)

If the display is not as described, check the wiring => Page 96 .



Check wiring

- -> Connect the V.A.G 1598/22 test box to the wiring harness for the engine control unit
=> Page 47 .
- Check the following wiring for an open circuit and short circuit to positive or earth.

Connector on the wiring harness plug	Test box V.A.G 1598/22 socket
1	49
2	14

- If necessary, rectify open circuit or short circuit.

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

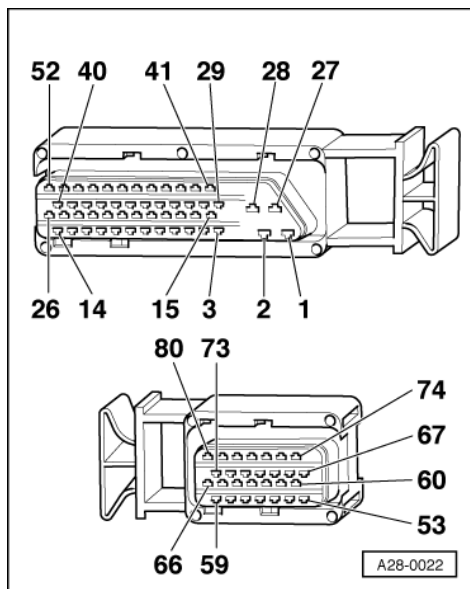
Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

7.11 - Checking the Motronic system/ABS/gearbox data exchange (CAN bus)

- Read fault memory from ABS control unit and gearbox control unit.

If a fault relating to the CAN bus appears on the display:

- Switch the ignition off.



- -> Connect the V.A.G 1598/22 test box to the wiring harness for the engine control unit
 => Page 47.
- Check the wiring from contacts 29 and 41 on the engine control unit to the gearbox control unit and ABS control unit for an open circuit or short circuit.

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

- If the wiring is OK, tentatively replace ABS control unit, gearbox control unit or engine control unit.



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.



28 - Ignition system

1 - Checking ignition system

1.1 - Checking ignition 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.

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 turning at starter speed.
- ♦ Only detach or attach the wiring in the injection and ignition system, including measuring instrument leads, when the ignition is switched off.
- ♦ To operate the engine at starting speed without actually starting it (for example, to check the compression), unplug the connector from the power output stage for the ignition coils and the connector from the injectors. After completing the work, interrogate the fault memory.

Warning:

Before disconnecting battery, obtain the radio code for radios fitted with anti theft coding.

Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.

1.3 - Technical data

Engine codes	AGU
Ignition timing is determined by the control unit Ignition timing cannot be adjusted	
Ignition system	Single coil ignition system with four ignition coils
Spark plugs	Tightening torque: 30 Nm.
Spark plug connectors	Resistance approx. 2 kw
Ignition sequence	1-3-4-2
Engine speed limitation by Motronic system Cut off speed	6800 ± 40 rpm

1.4 - Checking ignition coils

Identify an inoperative or misfiring cylinder as follows:

- Unplug the connectors from the injectors in sequence with the engine running, and observe how the engine runs.
or
- Compare the spark plugs of all cylinders with each other and check for soot on the electrodes.

If the defective cylinder has been identified:

- Connect a hand held multimeter for resistance measurement to the spark plug connector.

Specified value: approx. 2 kΩ

If the specified value is not achieved:

- Replace the spark plug connector.

If the specified value is achieved:

- Replace the spark plug of the defective cylinder with one from another cylinder.

If the fault moves with the spark plug:

- Replace the spark plug.

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 fault remains in the same cylinder:

- Replace the ignition coil from the defective cylinder with one from another cylinder.

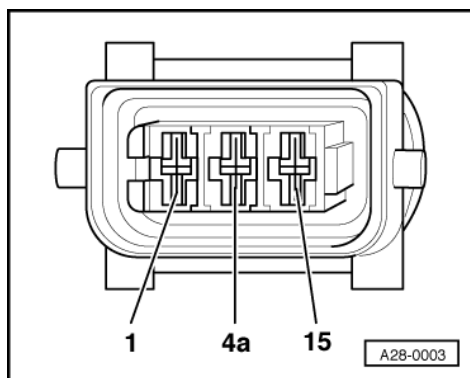
If the fault moves with the ignition coil:

- Replace the ignition coil.

If the fault remains in the same cylinder:

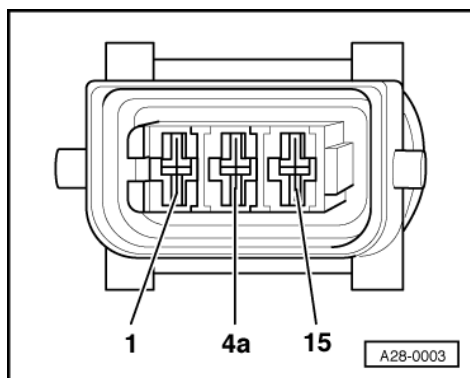
Check the earth connection for the ignition coil

- Unplug the connector from the ignition coil.



- -> Check the earth connection from contact 4a on the 3 pin connector to the engine earth for an open circuit or short to positive.
- If necessary, rectify open circuit or short circuit.

If the earth connection is OK:





Check the power supply to the ignition coil

- -> Connect the multimeter for voltage measurement to contact 15 on the connector and the earth.
- Switch on the ignition.

Specified value: approx battery voltage

If the specified value is not achieved:

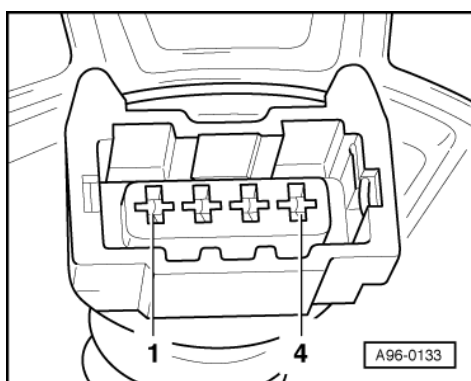
- Check the wiring.

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

If the specified value is achieved:

Checking actuation

- Remove the 4-pin connector from the power output stage => Overview of fitting locations - Page 45 .
- Switch on the ignition.

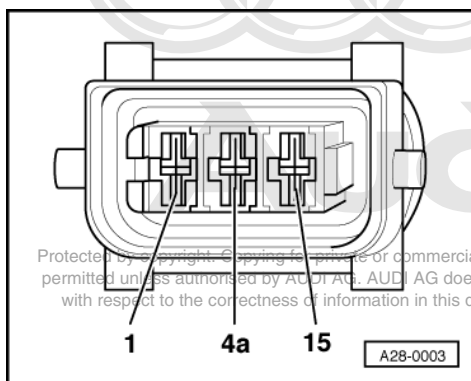


- -> Connect the V.A.G 1527 diode test lamp to the following contacts on the connector:

4-pin connector on the wiring harness contact	Specified value
1 + earth	Diode test lamp should light up
2 + earth	
3 + earth	
4 + earth	

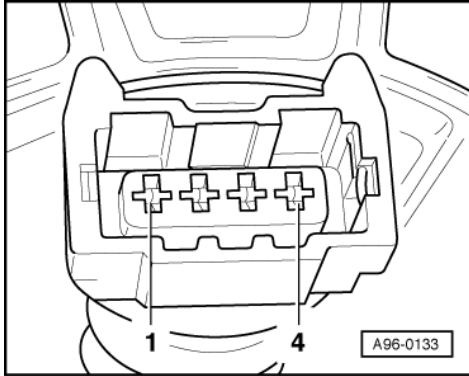
If the specified values are not achieved:

- Switch the ignition off.



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 3 pin connector on the relevant ignition coil.
- Check the wiring between the power output stage and contact 1 on the relevant ignition coil connector for an open circuit.



Contact on 4 pin connector for output stage	Contact 1 on 3 pin connec- tor for ignition coil
Connector	Cylinder
1	1
2	3
3	4
4	2

- If necessary, rectify open circuit or short circuit.

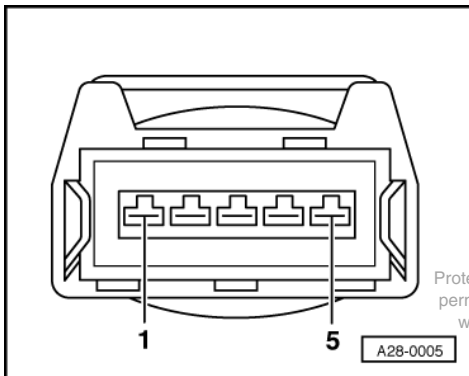
1.5 - Checking output stages for ignition coils

Checking actuation of power output stages

- Pull the connectors off all four injectors.

Note:

It is important to ensure that no fuel is injected during the test, as this would damage the catalytic converter. Therefore, the connectors on the injectors must be unplugged.

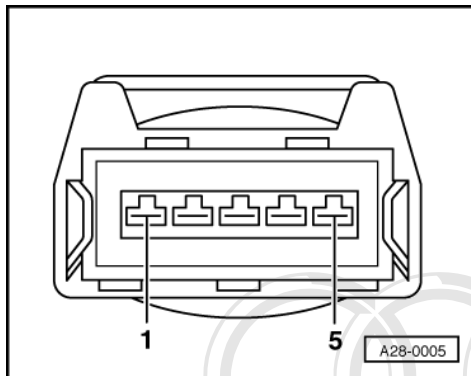


Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

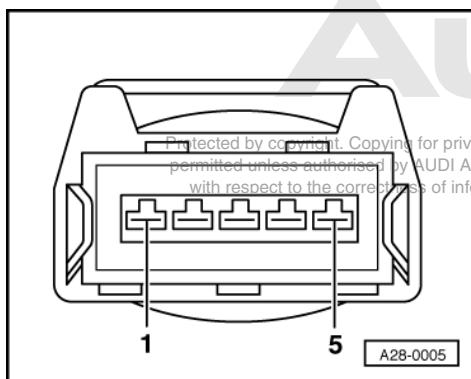
- Remove the 5-pin connector from the power output stage => Overview of fitting locations - Page 45 .
- -> Connect the V.A.G 1527 diode test lamp to the following contacts on the power output stage connector:
- Actuate the starter for a few seconds.

5-pin connector on the wiring harness contact	Specified value
1 + earth	Diode test lamp should flash (brief impulse)
2 + earth	
4 + earth	
5 + earth	

If the specified values are not achieved:



- Switch the ignition off.
- Connect the V.A.G 1598/22 test box to the wiring harness for the engine control unit
=>Page 47 .
- -> Check the wiring from the 5 pin connector on the power output stage ...
- to the engine control unit for an open circuit and short to positive or earth. Check the earth.



Contact on 5 pin connector on the power output stage	Contact on test box V.A.G 1598/22
1	77
2	70
3	2
4	78
5	71

- If necessary, rectify open circuit or short circuit.

If no fault is detected in the wiring:

- Connect the 5 pin connector to the power output stage.
- Pull the 4 pin connector off the power output stage.
- Connect the V.A.G 1527 diode test lamp to battery positive (+) and to one of the contacts on the 4 pin connector on the power output stage.

- Operate the starter for a few seconds.

The diode test lamp should start flashing.

- Carry out the test with all 4 contacts on the power output stage.

The diode test lamp should flash each time.

If the diode test lamp does not flash when testing one or more of the contacts:

- Replace the power output stage.

1.6 - Checking the intake air temperature sensor

- Connect the V.A.G. 1551 fault reader => Page 2 .
- Switch on the ignition (engine cold).
- Select the function "Reading measured value block" (function 08) and Display Group 03.

-> Display readout:

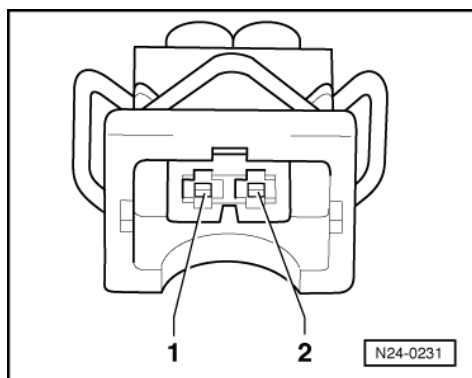
Read measured value block 3			
1	2	3	4

- Check display in display zone 4.

Specified value: approx the same as the ambient temperature

If there is an open circuit in the wiring to the sensor, a substitute value of 19.5 °C will be displayed.

If display zone 4 shows an implausible value:



- Switch the ignition off.
- -> Pull off the connector on the sensor => Fitting locations Overview, Page 45 .
- Connect the V.A.G 1598/22 test box to the wiring harness for the engine control unit =>Page 47 .
- -> Check the wiring from the connector for the intake air temperature sensor...
- ... and engine control unit for an open circuit and short circuit.

4-pin connector on the wiring harness contact	Test box V.A.G 1598/22 contact
1	54
3	67

- If necessary, rectify open circuit or short circuit.

If no fault is detected in the wiring:

- Fit a new intake air temperature sensor (G42).

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

1.7 - Checking the engine speed sensor

Notes:

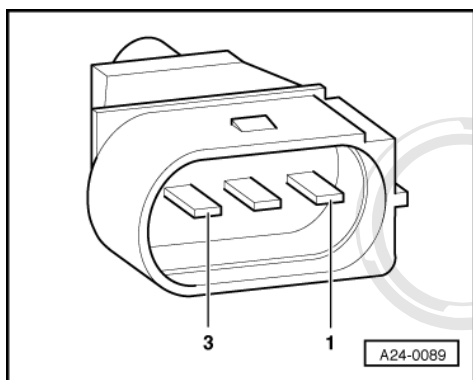
- ♦ The engine speed sensor is a combined speed sensor and reference mark sensor.
- ♦ The engine cannot be started without a signal from the -G28 engine speed sensor.
- ♦ If the signal from the -G28 engine speed sensor fails while the engine is running, the engine will cut out immediately.

Checking the engine speed sensor

Fitting location for the sensor and connector

=> Page 45 .

- Before carrying out the test, make sure that the sensor is correctly installed and firmly seated.
- Unplug the connector for the engine speed sensor (identification: grey connector).



- -> Connect the V.A.G 1526 hand held multimeter for resistance measurement to contacts 2 and 3 on the connector.

Specified value: approx. 450...1000 ω .

If the specified value is not achieved:

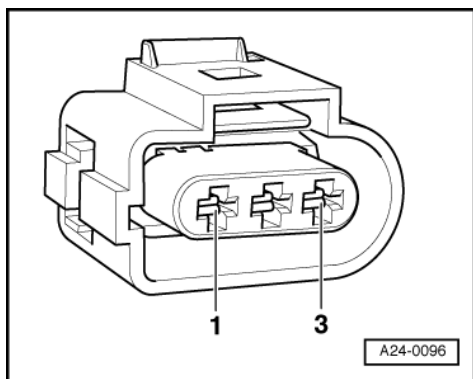
Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted. This document is authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

- Replace the engine speed sensor.

If the specified value is achieved:

- Connect the V.A.G. 1526 hand-held multimeter for resistance measurement between contacts 2 and 1 (earth) and to contacts 3 and 1 (earth).

Specified value: infinity in each case ω (no continuity).

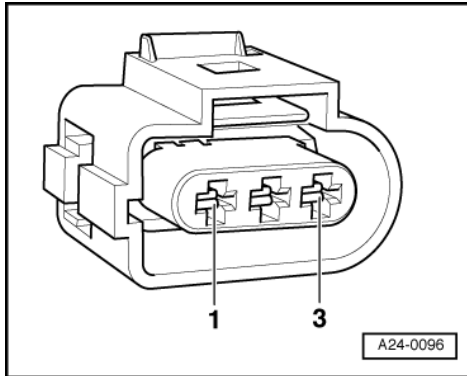


If the specified value is not achieved:

- Replace the engine speed sensor.

If the specified value is achieved:

- -> Check the wiring between the sensor connector and the engine control unit as follows:
- Connect the V.A.G 1598/22 test box to the wiring harness for the engine control unit
=>Page 47 .



- -> Check the wiring from the 3 pin connector (sensor connector) ...
- ... to the engine control unit for an open circuit and short to positive or earth. Check the earth.

3-pin connector on the wiring harness contact	Test box V.A.G 1598/22 contact
1	67
2	63
3	56

- If necessary, rectify open circuit or short circuit.

1.8 - Checking the sensor for coolant temperature

- Connect the V.A.G. 1551 fault reader => Page 2 .
- Select the function "Reading measured value block" (function 08) and Display Group 03.

-> Display readout:

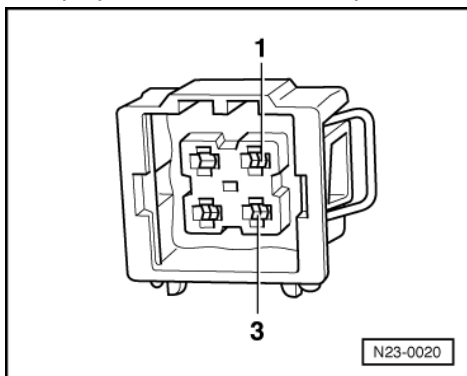
Read measured value block 3
1 2 3 4

- Observe readout in display zone 3.

Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted. All rights reserved 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.

Specified value: The temperature reading should increase at a uniform rate.

If display zone 3 shows an implausible value:





- Switch the ignition off.
- -> Pull off the connector on the sensor => Overview of fitting locations, Page 45 .
- Connect the V.A.G 1598/22 test box to the wiring harness for the engine control unit
=>Page 47 .
- -> Check the wiring from the 4 pin connector ...
- ...t o the engine control unit for an open circuit and short to positive or earth. Check the earth.

4-pin connector on the wiring harness contact	Test box V.A.G 1598/22 contact
1	67
3	53

- If necessary, rectify open circuit or short circuit.

If no fault is detected in the wiring:

- Replace the sensor for coolant temperature (G62).

1.9 - Checking the power supply for the control unit

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 conditions

- Battery voltage OK.
- Connect the V.A.G. 1551 fault reader => Page 2 .
- Select the function "Reading measured value block" (function 08) and Display Group 03.

-> Display readout:

Read measured value block 3			
1	2	3	4

- Check display in display zone 2.

Specified value: approx battery voltage

If the specified value is not achieved:

- Connect the V.A.G 1598/22 test box to the wiring harness for the engine control unit
=>Page 47 .
- Connect the V.A.G 1526 hand held multimeter for voltage measurement to the following contacts on the test box:

	Contact	Specified value
Ignition off	3 + 2	approx battery voltage
Ignition on	1 + 2	approx battery voltage

If the specified values are not achieved:

- Check the wiring.

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

1.10 - Checking the knock sensors

- Start the engine and run at idling speed.
- Connect the V.A.G. 1551 fault reader => Page 2 .

- Select the function "Reading measured value block" (function 08) and Display Group 16.

-> Display readout:

Read measured value block 16		
0.800 V	0.840 V	0.800 V
0.760 V		

- Observe all display zones.

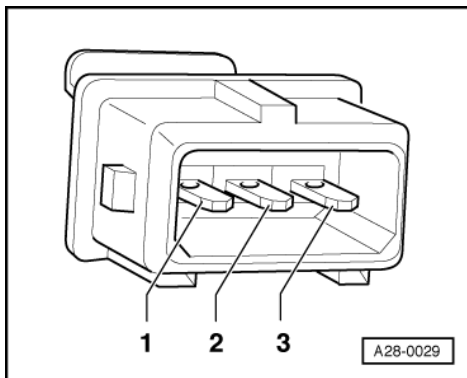
Specified value: 0.400...1.400 V.

- Compare the display zones with each other.

Specified value: Difference less than 0.500 V.

If the specified values are not achieved:

- Loosen knock sensors and tighten again to 20 Nm.

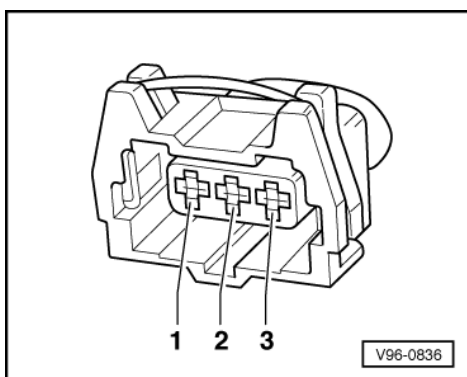


- Repeat the test.

If the specified values are not achieved:

- Unplug the connector for the relevant knock sensor in the engine compartment.
- -> Test for a short circuit between all three contacts in the knock sensor connector. There must be no connection between any of the wires.
- If there is a connection between the contacts, replace the knock sensor.

Checking the wiring from the knock sensors to the engine control unit



- Connect the V.A.G 1598/22 test box to the wiring harness for the engine control unit
=>Page 47 .
- -> Check the wiring from the relevant sensor connector ...
- ... to the engine control unit for an open circuit and short to positive or earth. Check the earth.

Knock sensor 1 -G61 (cylinders 1 and 2)

3-pin connector on the wiring harness contact	Test box V.A.G 1598/22 or engine control unit
1 (signal)	68
2 (earth)	67
3 (screening)	67

Knock sensor 2 -G66 (cylinders 3 and 4)

3-pin connector on the wiring harness contact	Test box V.A.G 1598/22 or engine control unit
1 (signal)	60
2 (earth)	67
3 (screening)	67

- If necessary, rectify open circuit or short circuit.

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

1.11 - Checking the Hall sensor

The Hall sensor indicates the ignition position for cylinder 1.

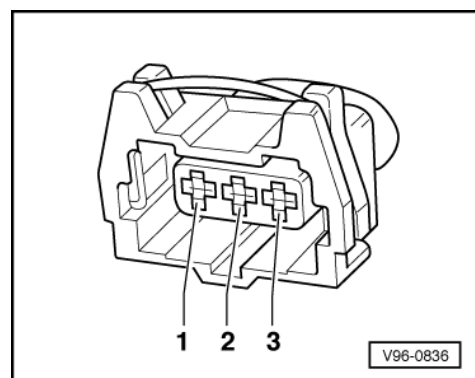
If the Hall sensor fails to function, the knock control is switched off and the ignition timing is retarded slightly because the signals can no longer be assigned to the cylinders.

Even without a signal from the Hall sensor, the engine will continue to run and can also be re started.

- ♦ When a fault is detected, the engine control unit produces one spark for each cylinder on every crankshaft revolution.
- ♦ The fact that the control unit is out of phase by one engine revolution does not have any noticeable effect on the injection system. If this happens, the fuel is injected "upstream" (before the closed inlet valve) instead of while the inlet valve is open. This has only a negligible influence on the quality of the air/fuel mixture.

Note on signal testing with an oscilloscope:

The centre point of the window of the Hall sensor must lie on the third trailing edge of the engine speed signal after the reference mark gap.



- Push back the rubber sleeve on the Hall sensor connector.
- -> Connect the V.A.G 1527 diode test lamp to contacts 1 and 2 on the Hall sensor connector from behind (the connector remains attached to the Hall sensor).

Note:

The connector contacts are numbered on the back of the connector.

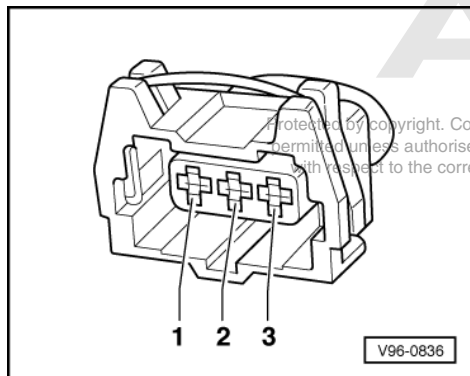
- Operate the starter for a few seconds.

The diode test lamp must flash briefly on each second engine revolution.

If the diode test lamp does not flash:

Check the power supply for the Hall sensor

- Unplug the connector from the Hall sensor.
- Switch on the ignition.



- -> Connect the V.A.G 1526 hand held multimeter for voltage measurement contact 1 on the connector and the engine earth.

Specified value: 4,5 ... 5,5 V.

Checking the signal wire for Hall sensor

- -> Connect the V.A.G 1526 hand held multimeter between contact 2 on the connector and the engine earth.

Specified value: approx battery voltage.

Checking the earth wire for the Hall sensor

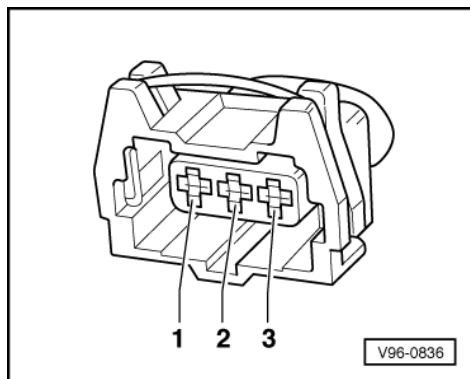
- Connect the V.A.G 1526 hand held multimeter for resistance measurement between contact 3 on the connector and the engine earth.

Specified value: Continuity

If the specified values are all achieved and the diode test lamp does not flash (measured between contacts 1 and 2 with starter connector attached), replace the Hall sensor.

If the specified values are not achieved:

Check the wiring between the Hall sensor and engine control unit





- Connect the V.A.G 1598/22 test box to the wiring harness for the engine control unit
=>Page **47** .
- -> Check the wiring from the Hall sensor ...
- ... to the engine control unit for an open circuit and short to positive or earth.

3-pin connector on the wiring harness contact	Test box V.A.G 1598/22 contact
1 (positive)	62
2 (signal)	76
3 (earth)	67

- If necessary, rectify open circuit or short circuit.
- If a trial erasure of the fault memory is followed by the renewed indication of a fault relating to the camshaft sensor (Hall sensor) although all previous tests were OK, the following faults are possible:
 - Rotor ring for Hall sensor misaligned.
- Unbolt the Hall sensor, then check to ensure that the rotor ring is correctly aligned on the camshaft.(if it is incorrectly installed, the catch will be pressed flat when the securing screw is tightened).
- If the position of rotor ring is OK, check the position of the camshaft in relation to the crankshaft.

=> 4- Cylinder Engine, Mechanics; Repair Group 15; Cylinder head, valve gear; Remove and install camshafts and camshaft adjustment Cylinder head, valve gear Remove and install camshafts and camshaft adjustment

Note on signal testing with an oscilloscope:

The centre point of the window of the Hall sensor must lie on the third trailing edge of the engine speed signal after the reference mark 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.