

Audi 100 1991 ➤

Motronic injection and ignition system (4-cyl.)									
Engine ID	ADR								

Edition 10.1995



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

Audi 100 1991 ➤

Motronic injection and ignition system (4-cyl.)

Repair Group

01 - Self-diagnosis

24 - Mixture preparation, Injection

28 - Ignition system



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

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01 - Self-diagnosis

1 - Motronic self-diagnosis

1.1 - Motronic self-diagnosis

1.2 - Technical data of self-diagnosis

Features

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

1.3 - Safety precautions

Pay attention to the following if testers and measuring instruments have to be used in the course of a test drive:

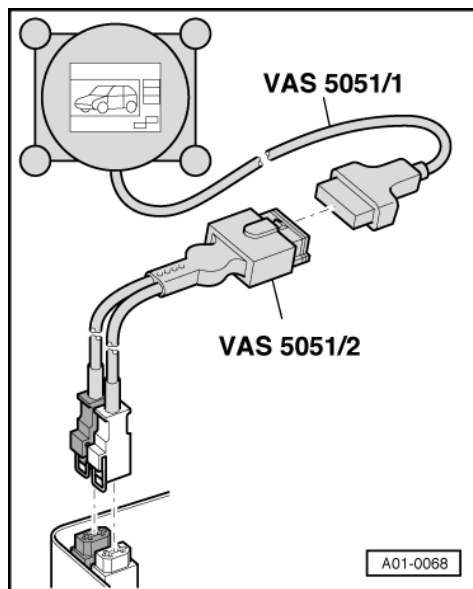
Attention:

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

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

Test requirements:

- Vehicle supply voltage OK
- Earth connections to engine and gearbox OK
- Fuses for engine electronics OK



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

- Earth connections at engine control unit checked (contacts D11; D12; E11 and E12)
- Fuel pump relay OK; checking => Page 83
- Detach cover from auxiliary relay carrier I in plenum chamber on left.
- -> Use diagnostic wire VAS 5051/1 and diagnostic adapter VAS 5051/2 to connect up vehicle diagnostic, testing and information system VAS 5051. Alternatively, use can be made of diagnostic wire V.A.G 1551/1 to connect up fault reader V.A.G 1551.

Attention:
Heed safety precautions => Page 1 .

Note:

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

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

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

-> Indicated on display:

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

- 1) Displayed alternately

Note:

If display remains blank, check power supply for black diagnostic connector => Page 52 .

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

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

- Switch on ignition.

or

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

-> Indicated on display:

Rapid data transfer HELP
Enter address word XX

Note:

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

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

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

8D0907557F.. 1.8l R4/5V MOTR HS
D.. □
Code 04002 WSC 12345

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

Control unit identification (example)

- 8D0907557F.. Part No.; Assignment
 => Parts List

- 1.8l Engine capacity

- R4/5V In-line engine, 4-cyl./5-valve

- MOTR Motronic

- HS Gearbox
 HS = Manual gearbox
 AT = Automatic gearbox

- D.. Data level (software version) of control unit

- Code 04002 Control unit code

- WSC 12345 Workshop code of V.A.G 1551 with which encoding was last performed

- Press =>key.

-> Indicated on display (function selection):

Rapid data transfer HELP
Select function XX

Notes:

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

Rapid data transfer HELP
No control unit response

-> If adjacent display appears:

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

Rapid data transfer HELP
K-wire not switched to earth

Check wiring of white diagnostic connector => Page 52 .



Rapid data transfer HELP
K-wire not switched to positive

Rapid data transfer
Fault in communication link

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

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

Available functions

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Vehicle diagnostic, testing and information system VAS 5051/ fault reader V.A.G 1551		Ignition on, engine stopped	Engine idling	Vehicle in operation	Page
Address words					
01	Engine electronics	yes	yes	yes	1
00	Automatic test sequence	yes	yes	yes	3
Functions					
01	Interrogating control unit version	yes	yes	yes	3
02	Interrogating fault memory	no	yes	yes	4
03	Final control diagnosis	yes	no	no	24
04	Basic setting	yes	yes	no	26
05	Erasing fault memory	yes	yes	yes	4
06	End of output	yes	yes	yes	5
07	Encoding control unit	yes	no	no	28
08	Reading measured value block	yes	yes	yes	29

2 - Interrogating and erasing fault memory

2.1 - Interrogating and erasing fault memory

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

Note:

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

-> Indicated on display:

Rapid data transfer HELP
Select function XX

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

-> Indicated on display:

No faults detected!

- Press =>key.

or

-> Indicated on display:

X faults detected!

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

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

-> Indicated on display:

Rapid data transfer HELP
Select function XX

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

Notes:

-> If adjacent display appears:

Attention:
Fault memory not interrogated

Sequence of operations not precisely observed.

- Interrogate fault memory.

Fault memory is also not erased under the following conditions:

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

-> Indicated on display:

Rapid data transfer
Fault memory erased

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

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Note:

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

- Perform test drive (minimum duration 10 minutes).
- Enter "00" for address word "Automatic test sequence" and confirm with Q key.

End of output

-> Indicated on display:

Rapid data transfer HELP
Select function XX

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

-> Indicated on display:

Rapid data transfer HELP
Enter address word XX

- Switch off ignition and unplug diagnostic connector.



2.2 - Fault table

Notes:

- ♦ Faults occurring in monitored sensors or components are stored in fault memory together with an indication of the type of fault.
- ♦ The fault table is arranged according to the 5-digit fault codes on the left.
- ♦ If a stored fault does not re-occur within the next 50 warm-up phases, the fault code is erased automatically.
- ♦ Sporadic faults are marked "SP" on the V.A.G 1551 display. "Sporadic" faults are faults which only occur occasionally.
- ♦ Do not immediately replace components indicated as being defective by V.A.G 1551, but rather: Start by checking wiring and connectors to these components in line with current flow diagram. Also use current flow diagram to check earth connections. This is particularly important if faults are output as being "sporadic" (SP).

2.3 - Fault codes 00515 - 16507

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00515 Hall sender -G40 Open circuit/short to positive	- Open circuit or short to positive in signal wire between Hall sender -G40 and engine control unit	- Lack of engine power at full throttle - Emission values not OK - High fuel consumption	- Use current flow diagram to eliminate open circuit in wiring or short circuit
	- Wheel of Hall sender incorrectly positioned - -G40 defective		- Perform visual inspection Check -G40 =>Page 155
	- Signal input in engine control unit defective (control unit defective) Continued ▼		- Replace engine control unit =>Page 65

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00515 Hall sender -G40 Short to earth	(Fault 00515 continued)		- Use current flow diagram to eliminate short circuit
	- Short to earth in wiring between Hall sender -G40 and engine control unit		- Check -G40 =>Page 155
	- -G40 defective		- Replace engine control unit =>Page 65
00532 Supply voltage Signal too high	- Signal input in engine control unit defective (control unit defective)	- Destruction of engine control unit	- Check voltage Read measured value block, display group 003 => Page 37
	- Alternator voltage regulator defective - Overvoltage caused by boost starting Continued ▼		

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00532 Supply voltage Signal too low	(Fault 00532 continued)		
	- Supply voltage less than - 10 V for more than 1 s	- Engine will not start - Idling speed not in specified range	- Check power supply of engine control unit => Page 149
	- Fuse S115 defective		- Check fuse
	- Poor earth connection to engine control unit	- Throttle valve control part adaption not possible	- Read measured value block, display group 003 => Page 37
	- Battery flat - Current draw with ignition off (discharge)		- Check voltage Check charge

Notes on fault code 00532:

- ◆ Display can be ignored if fault is indicated as being sporadic. This fault may be stored if engine is left idling for a lengthy period with numerous electr. loads switched on and very low battery charge.
- ◆ The fault "Signal too low" is set as soon as the supply voltage drops below 10.00 V for more than 2 seconds when 1 minute has elapsed since starting (control unit does not function at less than 6.5 V).
- ◆ Check for "Signal too low" is not made on starting as voltage may dip below 10.00 V in this case.

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00543 Maximum revs exceeded	- Engine over-revved (e.g. gearshift error) - Engine speed greater than 7100 rpm	- Engine damage	- Eliminate mechanical damage
00561 Mixture adaptation Adaption limit (add) exceeded	- Fuel system pressure too low Continued ▼	- Jolting	- Fill fuel tank and check fuel system pressure => Page 70

Notes:

- ◆ add. = additive i.e. fault only takes effect at idle
- ◆ mul = multiplicative, i.e. fault takes effect over entire engine-speed and load range

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00561 Mixture adaptation Adaption limit (mul) exceeded	(Fault 00561 continued)		
	- Incorrect signal from air-mass meter	- Increased fuel consumption	- Check air-mass meter => Page 89
	- Leaks in exhaust system as far as catalytic converter - Unmetered air downstream of air-mass meter	- Rough idling - Jolting	- Eliminate leakage
	- Injectors coked		- Check injection quantity => Page 81

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**Notes:**

- ♦ add. = additive i.e. fault only takes effect at idle
- ♦ mul = multiplicative, i.e. fault takes effect over entire engine-speed and load range

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00561 Mixture adaptation Adaption limit (add) not reached	(Fault 00561 continued) - Fuel system pressure too high	- Jolting	- Fill fuel tank and check fuel system pressure => Page 70
Adaption limit (mul) not reached	- Incorrect signal from air-mass meter	- Increased fuel consumption	- Check air-mass meter => Page 89
	- Fuel in engine oil (short-distance driving)	- Rough idling	- Drive on motorway for 15 minutes or change oil
	- Injectors leaking	- Formation of black smoke, soot deposits on spark plugs	- Check injection quantity =>Page 81

Notes:

- ♦ add. = additive i.e. fault only takes effect at idle
- ♦ mul = multiplicative, i.e. fault takes effect over entire engine-speed and load range

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Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00670 Throttle valve positioner sender - G127 Signal too low	- Short to earth - Power supply for - G127 defective - -G127 defective	- Idling speed too high - No idling-speed control - Load change jolt on deceleration	- Perform throttle valve control part adaption => Page 114
	- Signal output in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 65
Signal too high	- Open circuit in wiring or short to positive - Earth supply for - G127 defective - -G127 defective	- Air-conditioner compressor only cuts in at higher engine speed	- Check throttle valve control part => Page 113
	- Signal input in engine control unit defective (control unit defective) Continued ▼		- Replace engine control unit =>Page 65

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
00670 Throttle valve positioner sender - G127	(Fault 00670 continued)		

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
Implausible signal	- Throttle valve sticking	- Idling-speed positioner is deactivated - engine runs at idle with air volume fixed mechanically by emergency running gap (slightly higher idling speed)	- Check throttle valve control part => Page 113
	- Fault in wiring for - G127	- Load change jolt on deceleration	- Use current flow diagram to eliminate open circuit in wiring or short circuit
	- Basic setting of throttle valve control part not performed	- Air-conditioner compressor only cuts in at higher engine speed	- Perform throttle valve control part adaption => Page 114

Notes:

- ♦ Throttle valve positioner sender -G127 is located in throttle valve control part -J338.
- ♦ The sender is a potentiometer, which signals the setting of the throttle valve positioner to the control unit.

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
01119 Gear recognition signal Open circuit/short to positive	- Open circuit in wiring or short to positive - -F125 defective	- Slightly greater, brief fluctuations in engine speed on engaging/disengaging gear	- Use current flow diagram to check wiring to multifunction switch -F125
	- Signal output in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 65
Short to earth	- Short to earth - -F125 defective		- Interrogate gearbox fault memory => Automatic Gearbox 01N; Repair Group 01; Performing self-diagnosis Performing self-diagnosis

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
01120 Camshaft timing control 1 Mechanical fault	- Power supply for camshaft adjustment valve defective Open circuit/short to earth or positive - -N205 defective	- Loss of power	- Check -N205 => Page 24 , Final control diagnosis
	- Mechanical camshaft adjuster defective		- Check camshaft timing control => 4-cyl. Engine (5-valve), Mechanics; Repair Group 15; Checking camshaft timing control Checking camshaft timing control
	- Fuse defective		- Check fuse



Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
01165 Throttle valve control unit (part) - J338			
Control limit not reached	- Throttle valve sticking - Positioner mechanism sticking	- Increased idling speed - Load change jolt on deceleration	- Read measured value block, display group 023 => Page 47
Control limit exceeded	- Fault (open circuit/short to positive or earth) in wiring for throttle valve positioner - V60	- Load change jolt on deceleration	- Check throttle valve control part -J338 => Page 113
Control difference	- Throttle valve positioner sender -G127 defective - -V60 defective		
	- Signal output in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 65

Note:

If fault "01165" is stored in fault memory, fault "17953" will also be stored next time the engine is started.

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
01182 Altitude adaption Signal outside tolerance			
	- Throttle valve sticking - Positioner mechanism sticking	- Starting problems - Poor throttle response - Driving-off problems	- Read measured value block, display group 018 => Page 46
	- Incorrect throttle valve control part fitted		- Check part number
	- Unmetered air in intake system		- Check intake system for leaks (unmetered air) => Page 92
	- Air cleaner clogged		- Replace filter element

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
01247 ACF solenoid 1 -N80			
Short to earth	- Short to earth between activated charcoal filter solenoid valve -N80 and engine control unit - -N80 defective	- Jolting in part throttle range	- Check -N80 => Page 110
Short to positive	- Short to positive between -N80 and engine control unit - -N80 defective	- Smell of fuel in vehicle	- Read measured value block, display group 010 => Page 42

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
Output open	- Open circuit in wiring between -N80 and fuse - Open circuit in wiring between -N80 and engine control unit - -N80 defective		- Use current flow diagram to eliminate open circuit in wiring or short circuit - Check -N80 => Page 110
	- Fuse S117 defective		- Check fuse

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
01249 Injector, cylinder 1 -N30 Short to earth Protected by copyright. Copying for private commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. All rights reserved. AUDI AG does not accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG. Short to positive	- Short to earth in wiring between injector and fuse - Injector defective - Short to positive in wiring between injector and engine control unit - Injector defective	- Rough engine running/ engine cuts out	- Check injectors => Page 73
Output open	- Open circuit in wiring between injector and engine control unit - Fuse detached - Open circuit in wiring between injector and fuel pump relay - Injector defective - Fuse S116 defective		- Use current flow diagram to eliminate short circuit or open circuit in wiring
			- Check fuse

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
01250 Injector, cylinder 2 -N31 Short to earth Short to positive Output open	=> Cyl. 1 fault code 01249	=> Cyl. 1 fault code 01249	=> Cyl. 1 fault code 01249
01251 Injector, cylinder 3 -N32 Short to earth Short to positive Output open	=> Cyl. 1 fault code 01249	=> Cyl. 1 fault code 01249	=> Cyl. 1 fault code 01249

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
01252 Injector, cylinder 4 -N33 Short to earth Short to positive	=> Cyl. 1 fault code 01249	=> Cyl. 1 fault code 01249	=> Cyl. 1 fault code 01249



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

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
01259 Fuel pump relay -J17 Open circuit/short to earth	- Open circuit in wiring or short to earth between fuel pump relay -J17 and engine control unit - Power supply for -J17 defective - Fuel pump relay -J17 defective	- Open circuit: Engine does not run - Short to earth: Engine continues to run normally; however high current consumption with "ignition on" as relay is constantly energised and fuel pump runs continuously even if engine is not running	- Use current flow diagram to eliminate open circuit in wiring or short circuit - Check fuel pump relay -J17 => Page 83
Short to positive	- Short to positive in wiring between fuel pump relay -J17 and engine control unit	- Short to positive: Engine does not run	

Note:

If fault "01259" has been stored, faults "01247 / 01249 / 01250 / 01251 / 01252 / 17935" may also be stored, as these components are supplied with voltage by way of the fuel pump relay.

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
16486 Air-mass meter -G70 Signal too low	- Unmetered air between air-mass meter -G70 and engine	- Emergency operation (substitute value based on throttle valve angle and engine speed); therefore no noticeable effect on performance	- Check intake system for leaks (unmetered air) => Page 92
	- Air cleaner clogged		- Replace filter element
	- Power supply for -G70 defective - Open circuit/short to earth in signal wire between -G70 and engine control unit - -G70 defective		- Read measured value block, display group 002 => Page 89
	- Signal input in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 65

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
16487 Air-mass meter -G70			

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
Signal too high	- Short to positive in signal wire between air-mass meter -G70 and engine control unit - Earth supply for -G70 defective - -G70 defective	- Emergency operation (substitute value based on throttle valve angle and engine speed); therefore no noticeable effect on performance	- Read measured value block, display group 002 => Page 89
	- Signal input in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 65

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
16496 Intake air temp. sender -G42 Signal too low	- Short to earth in wiring between intake-air temperature sender -G42 and engine control unit - -G42 defective	- Emergency operation - (substitute value constant 19.5 ° C)	- Read measured value block, display group 003 => Page 37 - Check -G42 => Page 143
	- Signal input in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 65

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
16497 Intake air temp. sender -G42 Signal too high	- Open circuit or short to positive in wiring between intake-air temperature sender -G42 and engine control unit - Earth supply to -G42 defective - -G42 defective	- Emergency operation - (substitute value constant 19.5 ° C)	- Read measured value block, display group 003 => Page 37 - Check -G42 => Page 143
	- Signal input in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 65

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Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
16500 Coolant temp. sender -G62 Implausible signal	- Coolant temperature sender -G62 supplying implausible signal due to loose contact or corrosion caused by moisture in connector	- Cold starting problems at very low temperatures - Engine running problems during warm-up - Increased fuel consumption - Deterioration in emission values	- Read measured value block, display group 003 => Page 146



Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
	- Signal input in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 65

Note on fault code 16500:

The temperature profile in the range 20 °C to 60 °C is compared to a model stored in the control unit. The model profile increases less rapidly than the actual value. If the rate of increase of the actual values becomes too slow on account of a fault, they will eventually coincide with the model values. The engine control unit recognises this fault as being implausible.

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
16501 Coolant temp. sender -G62 Signal too low	- Short to earth in wiring between coolant temperature sender -G62 and engine control unit - -G62 defective	- Cold starting problems at very low temperatures - Engine running problems during warm-up - Increased fuel consumption - Deterioration in emission values	- Read measured value block, display group 003 => Page 37 - Check -G62 =>Page 146
	- Signal input in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 65

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
16502 Coolant temp. sender -G62 Signal too high	- Open circuit/short to positive in wiring between -G62 and engine control unit - -G62 defective	- Cold starting problems at very low temperatures - Engine running problems during warm-up - Increased fuel consumption - Deterioration in emission values	- Read measured value block, display group 003 => Page 37 - Check -G62 =>Page 146
	- Earth supply to -G62 defective		
	- Signal input in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 65

Note on fault codes 16500, 16501 and 16502:

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As soon as one of the above faults is detected, the control unit makes use of a substitute value from the model stored in the control unit.

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
16505 Throttle valve potentiometer - G69			

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
Implausible signal	- Moisture/corrosion in connector at throttle valve potentiometer - G69 - -G69 defective	- Jolting on acceleration - Load change jolt on deceleration - Idling-speed control behaviour unstable	- Check throttle valve control part -J338=> Page 35

Note on fault code 16505:

The air throughput (air mass) at the respective engine speed is compared to the throttle valve angle.

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
16506 Throttle valve potentiometer - G69 Signal too low	- Short to earth in signal wire between -G69 and engine control unit - Power supply for -G69 defective - -G69 defective	- Jolting on acceleration - Load change jolt on deceleration	- Check throttle valve control part -J338=> Page 35 - Use current flow diagram to eliminate short circuit or open circuit in wiring

Notes on fault codes 16505, 16506 and 16507:

- ◆ As soon as one of the above faults is detected, the control unit makes use of a substitute value based on engine speed.
- ◆ No emergency running function can be implemented in the event of a simultaneous fault at the throttle valve potentiometer and the air-mass meter. Consequence: The engine cuts out.

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
16507 Throttle valve potentiometer - G69 Signal too high	- Open circuit/short to positive in signal wire between -G69 and engine control unit - Earth supply for -G69 defective - -G69 defective	- Jolting on acceleration - Load change jolt on deceleration	- Check throttle valve control part -J338=> Page 35

Notes on fault codes 16505, 16506 and 16507:

- ◆ As soon as one of the above faults is detected, the control unit makes use of a substitute value based on engine speed.
- ◆ No emergency running function can be implemented in the event of a simultaneous fault at the throttle valve potentiometer and the air-mass meter. Consequence: The engine cuts out.

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2.4 - Fault codes 16514 - 18020

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
16514			



Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
Bank 1, probe 1 Fault in electrical circuit	- Corrosion caused by moisture in connector for Lambda probe heater - Z19/Lambda probe -G39 - Short circuit between Lambda probe signal wire and Lambda probe reference earth wire	- Lambda control switches to open-loop control - Rough idling	- Use current flow diagram to eliminate short circuit or open circuit in wiring - Check Lambda control =>Page 100
	- Signal wire amplitude not sufficient (Lambda probe -G39 poisoned/ probe slits clogged, dirty)	- Emission values not OK - Increased fuel consumption	- Read measured value block, display group 007 =>Page 47

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
16515 Bank 1, probe 1 Voltage too low	- Short to earth/screen in Lambda probe signal wire - Short to earth/screen in Lambda probe reference earth wire - Lambda probe defective	- Lambda control switches to open-loop control - Rough idling - Emission values not OK - Increased fuel consumption	- Use current flow diagram to eliminate short circuit or open circuit in wiring - Check Lambda control =>Page 40 - Read measured value block, display group 021 =>Page 47

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
16516 Bank 1, probe 1 Voltage too high	- Short to positive in signal wire - Lambda probe defective	- Lambda control switches to open-loop control - Rough idling - Increased fuel consumption	- Use current flow diagram to eliminate short circuit or open circuit in wiring - Check Lambda control =>Page 102 - Read measured value block, display group 007 =>Page 40
16518 Bank 1, probe 1 No activity	- Lambda probe defective (dirty) - Open circuit in wiring between probe heating and engine control unit - Fuse S117 defective - No probe heating function	- Emission values not OK - Soot deposits on spark plugs	- Read measured value block, display group 021 =>Page 47 - Check fuse - Check probe heating =>Page 104

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
16705 Engine speed sender -G28 Implausible signal	- Engine speed sender -G28 loose - Sender wheel loose - Gap between engine speed sender -G28 and sender wheel greater than 1.3 mm	- Engine misfiring	- Check engine speed sender -G28 => Page 140 -

Notes:

- ◆ The fault "implausible signal" is set if the number of signals per crankshaft revolution based on the reference mark gap is not correct (60 signals).
- ◆ A loose sender wheel may result in an uneven signal profile.
- ◆ An excessive gap between sender and wheel or a damaged sender wheel may result in absence of signals or signals which are too low and therefore not detected.
- ◆ Disturbance signals may cause additional signals to be detected.
- ◆ Swarf may cause additional signals to be generated.

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
16706 Engine speed sender -G28 No signal	- Open circuit or short to earth/positive in signal wire - Open circuit or short to positive in earth wire - -G28 loose/defective - Open circuit in wiring to screen of -G28 - Signal input in engine control unit defective (control unit defective)	- Engine will not start - Engine cuts out	- Use current flow diagram to eliminate open circuit in wiring or short circuit - Check -G28 =>Page 140 - Replace engine control unit =>Page 65

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
16711 Knock sensor 1 -G61 Signal too low	- Knock sensor loose or corrosion at connector - Open circuit in earth wire between knock sensor and engine control unit - Knock sensor defective - Open circuit or short to earth/screen in signal wire between knock sensor and engine control unit	- High fuel consumption - Loss of power	- Knock sensor tightening torque: 20 Nm - Check knock sensor => Page 152 - Read measured value block, display group 016 => Page 45



Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
	- Signal input in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 65

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
16716 Knock sensor 2 -G66 Signal too low	=> Knock sensor 1 -G61 Fault code 16711	=> Knock sensor 1 -G61 Fault code 16711	=> Knock sensor 1 -G61 Fault code 16711
16885 Vehicle speed signal Implausible signal	- Speedometer sender defective - Open circuit in wiring or short circuit between speedometer sender and speedometer - Speedometer defective	- No air-conditioner compressor shutoff in 1st gear at full throttle - Brief difference in idling speed and specified speed - Malfunction in systems making use of vehicle speed signal	- Use current flow diagram to check vehicle speed signal - Read measured value block, Display group 011, Display zone 3 => Page 43 - Check vehicle speed signal => Page 125
	Continued ▼		

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
16885 Vehicle speed signal Implausible signal	(Fault 16885 continued) - Short circuit in signal wire between speedometer and another control unit making use of vehicle speed signal - Open circuit in wiring or short circuit between dash panel insert and engine control unit - Signal input in engine control unit defective (control unit defective)	- Malfunction in systems making use of vehicle speed signal - Poor load change behaviour	- Check vehicle speed signal => Page 125 - Use current flow diagram to eliminate open circuit in wiring or short circuit - Replace engine control unit =>Page 65

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
16989 Control unit defective	- Open circuit in earth connections to engine control unit - Engine control unit defective	- Engine will not start	- Use current flow diagram to check earth connections - Replace engine control unit => Page 65

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
17733			

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
Knock control, cylinder 1 Control limit reached	- Poor fuel grade (less than 91 RON)	- High fuel consumption - Loss of power - Rough engine running - Maximum vehicle speed not reached	- Use fuel of at least 91 RON
	- Abnormal engine running noise (ancillaries loose) - Open circuit in wiring of screen of knock sensor - Loose contact in connector		- Read measured value block, display group 014/015 => Page 152
	- Knock sensor tightened to incorrect torque		- Knock sensor tightening torque: 20 Nm

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
17734 Knock control, cylinder 2 Control limit reached	=> Knock control, cyl. 1 Fault code 17733	=> Knock control, cyl. 1 Fault code 17733	=> Knock control, cyl. 1 Fault code 17733
17735 Knock control, cylinder 3 Control limit reached	=> Knock control, cyl. 1 Fault code 17733	=> Knock control, cyl. 1 Fault code 17733	=> Knock control, cyl. 1 Fault code 17733
17736 Knock control, cylinder 4 Control limit reached	=> Knock control, cyl. 1 Fault code 17733	=> Knock control, cyl. 1 Fault code 17733	=> Knock control, cyl. 1 Fault code 17733

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
17913 Idling-speed switch -F60 Does not close/open circuit	- Throttle cable setting - Floor covering pressing on accelerator pedal	- Idling speed too high	- Adjust throttle cable => Fuel Supply System - Petrol Engines; Repair Group 20; Servicing accelerator mechanism Servicing accelerator mechanism
	- Throttle valve sticking - Open circuit in wiring or short to positive - -F60 defective	- No idling-speed control function - Idling speed too high - Load change jolt on deceleration - Air-conditioner compressor only cuts in at higher engine speed	- Check idling-speed switch => Page 115
	- Signal input in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 65

Note:

Idling switch -F60 is located in throttle valve control part -J338.



Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
17914 Idling-speed switch -F60 Does not open/short to earth	- Moisture in throttle valve connector - Short to earth between idling switch -F60 and engine control unit - -F60 defective	- Idling-speed control switches to open-loop control - Idling speed not in specified range - Load change jolt on deceleration - Air-conditioner compressor only cuts in at higher engine speed	- Check idling-speed switch => Page 115 - Use current flow diagram to eliminate open circuit in wiring or short circuit - Replace engine control unit =>Page 65
	- Signal input in engine control unit defective (control unit defective)		

Note:

Idling switch -F60 is located in throttle valve control part -J338.

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
17915 Idling-speed sys. taught value Lower level reached	- Unmetered air upstream of throttle valve control part	- Idling speed too high	- Check intake system for leaks (unmetered air) => Page 92
17916 Idling-speed sys. taught value Upper level reached	- Intake system clogged (air cleaner or intake duct)	- Loss of power	- Check intake system

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
17920 Intake manif. changeover valve - N156 Short to positive	- Short to positive between -N156 and engine control unit - -N156 defective - Fuse S117 defective - Signal input in engine control unit defective (control unit defective)	- -N156 does not open - (loss of power in excess of 4700 rpm)	- Use current flow diagram to eliminate short circuit Check -N156 => Page 93 - Check fuse - Replace engine control unit =>Page 65

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
17923 Intake manif. changeover valve - N156			

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
Short to earth	- Short to earth between - -N156 and engine control unit	- -N156 does not open - (loss of power in excess - of 4700 rpm)	- Use current flow diagram to eliminate short circuit Check -N156 => Page 93
	- -N156 defective - Signal input in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 65

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
17924 Intake manif. changeover valve - N156 Open circuit	- Open circuit in wiring between -N156 and engine control unit	- -N156 does not open - (loss of power in excess - of 4700 rpm)	- Use current flow diagram to eliminate open circuit in wiring Check -N156 => Page 93
	- Power supply for - N156 defective - -N156 defective - Signal input in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 65

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
17934 Bank 1, variable valve timing -N205 Short to positive	- Short to positive between -N205 and engine control unit	- Loss of power	- Use current flow diagram to eliminate short circuit
	- -N205 defective		- Check -N205 => Page 24 , Final control diagnosis Check camshaft timing control => 4-cyl. Engine (5-valve), Mechanics; Repair Group 15; Checking camshaft timing control Checking camshaft timing control
	- Fuse S117 defective		- Check fuse
	- Signal input in engine control unit defective (control unit defective)		- Replace engine control unit =>Page 65

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
17935 Bank 1, variable valve timing -N205 Short to earth	- Short to earth between -N205 and engine control unit	- Loss of power	- Use current flow diagram to eliminate short circuit



Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
	- -N205 defective		- Check -N205=>Page 24 , Final control diagnosis Check camshaft timing control => 4-cyl. Engine (5-valve), Mechanics; Repair Group 15; Checking camshaft timing control
	- Fuse S117 defective		- Check fuse

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
17936 Bank 1, variable valve timing -N205 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. - Open circuit in wiring between -N205 and engine control unit	- Loss of power	- Use current flow diagram to eliminate open circuit in wiring Check -N205 => Page 24 , Final control diagnosis Check camshaft timing control => 4-cyl. Engine (5-valve), Mechanics; Repair Group 15; Checking camshaft timing control
	- Fuse S117 defective		- Check fuse

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
17953 Throttle valve control Faulty	- Power or earth supply for throttle valve potentiometer -G69 and throttle valve positioner sender -G127 defective - Open circuit in signal wire for -G69 and -G127 - -G69 and -G127 defective - Throttle valve stiff/dirty	- Increased idling speed - Load change jolt on deceleration	- Read measured value block, display group 023 => Page 47 - Check throttle valve control part -J338=> Page 113

Note:

If other faults relating to the throttle valve control part have also been stored in the fault memory, e.g. fault "00670", fault "17953" may be a resultant fault. In this case, start fault-finding with the other faults.

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
17967 Throttle valve control unit (part) - J338			

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
Fault in basic setting	- Voltage at engine control unit less than 10 V during "Adaption of throttle valve control part -J338 to engine control unit"		- Read measured value block, display group 003 => Page 37 Check power supply of engine control unit =>Page 28-17 Check battery charge

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
17978 Engine control unit blocked	- Fault in immobilizer system	- Engine will not start (cuts out after one second)	- Interrogate immobilizer fault memory => Electrical System; Repair Group 01; Self-diagnosis; Interrogating fault memory Self-diagnosis; Interrogating fault memory
	- No adaption of immobilizer control unit to engine control unit		- Perform control unit adaption => Electrical System; Repair Group 01; Self-diagnosis; Adaption on replacement of engine control unit Self-diagnosis; Adaption on replacement of engine control unit
	- Open circuit in wiring between immobilizer and engine control units		- Use current flow diagram to eliminate open circuit in wiring

Note on fault code 17978:

A static fault is stored in the event of attempted starting with a non-matched key. The fault is converted to a sporadic fault on subsequent starting with a matched key.

Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
18010 Voltage supply term. 30 Voltage too low	- Disconnection of battery	- All adaption values erased	- Erase fault memory and continue to monitor vehicle
	- Open circuit in wiring		- Check control unit power supply => Page 149
18020 Engine control unit incorrectly encoded			



Output on printer of V.A.G 1551	Possible cause of trouble	Possible effects	Fault remedy
	- Engine control unit incorrectly encoded	- Engine running problems - Deterioration in emission values - Various faults stored in fault memory	- Encode control unit => Page 28

3 - Final control diagnosis

3.1 - Final control diagnosis

Notes:

- ♦ Final control diagnosis can only be performed with engine stopped and ignition switched on.
- ♦ Final control diagnosis is terminated if engine is started or an engine speed pulse is detected.
- ♦ During final control diagnosis the individual control elements are actuated until ⇒ key is pressed to select next control element.
- ♦ The control elements are checked acoustically or by means of touch.
- ♦ The electric fuel pump is in operation during the entire final control diagnosis process.
- ♦ Final control diagnosis is terminated after 10 minutes.
- ♦ To repeat final control diagnosis, switch ignition off for approx. 20 seconds and then back on again.

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

Actuation sequence
1 Injector, cylinder 1 -N30
2 Injector, cylinder 2 -N31
3 Injector, cylinder 3 -N32
4 Injector, cylinder 4 -N33
5 Activated charcoal filter solenoid valve -N80
6 Intake manifold changeover valve -N156
7 Camshaft timing control 1 (camshaft adjustment valve 1 -N205)

Test requirements:

- Fuses for engine electronics OK
- => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder
- Fuel pump relay OK; checking => Page 83

Test sequence

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

-> Indicated on display:

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

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

-> Indicated on display:

Final control diagnosis
 Injector, cylinder 1 -N30

- Turn accelerator mechanism at throttle valve control part to open idling-speed switch.

Injector must click five times.

- Press ⇒key.
- Repeat procedure until the last of the 4 injectors is actuated.

If an injector does not click:

- Check injectors⇒Page 73 .
- Following actuation of last injector, press ⇒key.

→ Indicated on display:

Final control diagnosis
 Activated charcoal filter solenoid valve
 -N80

Valve must click.

If valve does not click:

- Check activated charcoal filter solenoid valve -N80 ⇒ Page 110 .
- Press ⇒key.

→ Indicated on display:

Final control diagnosis
 Intake manifold changeover valve -N156

Valve must click.

If valve does not click:

- Check intake manifold changeover valve -N156 ⇒ Page 93 .
- Press ⇒key.

→ Indicated on display:

Final control diagnosis
 Camshaft timing control 1

Valve must click.

If valve does not click:

- Check camshaft adjustment valve.

⇒ 4-cyl. Engine (5-Valve). Mechanics; Repair Group 15; Checking Camshaft Timing Control; Checking camshaft adjustment valve

- Press ⇒key.

→ Indicated on display (function selection):

Rapid data transfer HELP
 Select function XX

Note:

Switch off ignition for approx. 20 s before re-selecting function 03 "Final control diagnosis".



4 - Basic setting

4.1 - Basic setting

With the engine stopped, the basic setting function can be used to implement the following operation:

- ♦ Adaption of throttle valve control part to engine control unit => Display group 098

With the engine running, the basic setting function can be used to implement the following operations:

- ♦ Lambda control adaption
=> Appropriate display group
- ♦ Fault-finding by way of specific activation and deactivation of Lambda control => Page 50, Display group 099

Requirements:

- Coolant temperature at least 85 °C
- Electr. loads switched off (radiator fan must not run during test)
- Air conditioner switched off
- Vehicles with automatic gearbox: Selector lever set to P or N
- No fault stored in fault memory; Interrogating fault memory => Page 4

Sequence of operations

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

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

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

-> Indicated on display:

Basic setting	Q
Enter display group number XXX	

- Enter desired display group number.

Notes:

- ♦ Provided that printer is switched on, current display can be printed out on record slip.
- ♦ Proceed as follows to switch to a different display group:

Display group	V.A.G 1551	VAS 5051
Up	Press key 3	Press s key
Down	Press key 1	Press t key

Display group 008 at idle (warm engine, coolant temperature at least 85 °C)

For implementation of Lambda control adaption, activated charcoal filter solenoid valve is closed and air-conditioner compressor shut off on selecting display group.

System in basic setting 8 =>	♦ Indicated on display
X.XX ms X.X % X.X % XXXXX	

			Fuel tank breather system ▪ λ Adaption (fuel tank breather system not active): Activated charcoal filter solenoid valve closed
			Mixture formation learned value at part throttle (multiplicative) ▪ - 8...+ 8 %: OK ▪ Outside tolerance: Check Lambda control => Page 100
			Mixture formation learned value at idle (additive) ▪ - 10...+ 10 %: OK ▪ Outside tolerance: Check Lambda control => Page 100
			Injection period (per power stroke) ▪ 2.00...5.00 ms: OK ▪ < 2.00 ms: High fuel tank breather system component => Page 109 ▪ > 5.00 ms: Engine under load => Switch off loads

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Display group 098 with ignition on

This display group is used for implementation and checking of throttle valve control part adaption to engine control unit.

System in basic setting 98 ➤			◀ Indicated on display
X.XXX V X.XXX V XXXXX XXXXX			
			Adaption status ▪ ADP in progress: Adaption process running => Wait ▪ ADP OK: Adaption successfully completed ▪ ADP. ERROR: Fault during adaption => Check throttle valve control part - Page 114
			Operating status ▪ Idling speed: OK ▪ Other display: Idling-speed switch open => Checking - Page 115
			Throttle valve positioner sender -G127 voltage ▪ No specification
			Throttle valve potentiometer -G69 voltage ▪ No specification

Display group 099 at idle (warm engine, coolant temperature at least 85 °C)

For fault-finding purposes, it is possible to switch between "Basic setting" and "Reading measured value block" by pressing keys 4 and 8. This effects specific deactivation and activation of Lambda control.

System in basic setting 99 ➤				◀ Indicated on display
860 rpm	93.5 °C	0.0 %	λ contr. OFF	
			Lambda control deactivated	
			Mixture formation control value (Lambda control)	
			Coolant temperature	
			Engine speed	

Reading measured value block 99 ➤				◀ Indicated on display
860 rpm	93.5 °C	- 0.7 %	λ contr. ON	



			Lambda control activated
			Mixture formation control value (Lambda control)
			Coolant temperature
			Engine speed

5 - Encoding control unit

5.1 - Encoding control unit

Control unit must be encoded as follows if code displayed does not correspond to vehicle or if control unit has been replaced.

Note:

Incorrect encoding can lead to poorer emission values and greater strain on the automatic gearbox due to gearshift jolts.

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

-> Indicated on display:

Rapid data transfer
Select function XX

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- Enter "07" for "Encoding control unit" function and confirm with Q key.

-> Indicated on display:

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

- Enter control unit code in line with encoding table => Page 29 .

Explanatory notes on encoding

XX		Country/Emission standard
	X	Drive/Additional functions
		X Gearbox
		X Vehicle model

Encoding example	
04002	European Union member state, front-wheel drive without traction control system, 5-speed manual gearbox, Audi A6

-> Indicated on display (example):

Encoding control unit Q
Enter code number 04002 (0-32000)

- Confirm entry with Q key.

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

8D0907557F.. 1.8L R4/5V MOTR HS
D.. □
Code 04002 WSC 12345

- Press ➔key.

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

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

-> Indicated on display:

Rapid data transfer	HELP
Enter address word XX	

- Switch off ignition and unplug diagnostic connector.

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5.2 - Encoding table

Country/Emission standard	02	Non European Union member states (MVEG I)
	04	European Union member states (MVEG II)
	08	China and Confederation of Independent States (CIS)
Drive/Additional functions	0	Front-wheel drive without traction control system
	1	Front-wheel drive with traction control system ¹⁾
	2	Four-wheel drive without traction control system
Gearbox	0	5-speed manual gearbox
	3	Automatic gearbox 01N
Vehicle model	2	Audi A6

1) Vehicles with traction control system (TCS) can be recognised from TCS warning lamp in dash panel insert/on the basis of ABS/TCS self-diagnosis.

6 - Reading measured value block

6.1 - Reading measured value block

Test requirements:

- Coolant temperature at least 85 °C
- Electr. loads switched off (radiator fan must not run during test)
- Air conditioner switched off
- Vehicles with automatic gearbox: Selector lever set to P or N
- No fault stored in fault memory; Interrogating fault memory
=> Page **4**

Sequence of operations

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

-> Indicated on display:

Rapid data transfer	HELP
Select function XX	

- Switch on printer of fault reader by pressing Print key. Lamp in key must light.



- Enter "08" for "Reading measured value block" function and confirm with Q key.

-> Indicated on display:

Reading measured value block	Q
Enter display group number XXX	

- Enter desired display group number =>List of display groups, Page 30 .
- Confirm entry with Q key.

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

Reading measured value block	1
1 2 3 4	

Notes:

- ♦ Provided that printer is switched on, current display can be printed out on record slip.
- ♦ Proceed as follows to switch to a different display group:

Display group	V.A.G 1551	VAS 5051
Up	Press key 3	Press s key
Down	Press key 1	Press t key

- Press ⇒ key if readings match specifications in all display zones.

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6.2 - List of display groups

Display group number	Indicated on display	Designation
000 Basic function	Reading measured value block 1 2 3 4 5 6 7 8 9 10	1 = Coolant temperature 2 = Engine load 3 = Engine speed 4 = Battery voltage 5 = Throttle valve angle 6 = Idle air mass control value 7 = Idle air mass learned value 8 = Mixture formation control value (Lambda control value) 9 = Mixture formation learned value (Lambda learned value) 10 = Mixture formation learned value (Lambda learned value)

Display group number	Indicated on display	Designation
001 Basic function	Reading measured value block 1 1 2 3 4	1 = Engine speed 2 = Engine load (injection period per crankshaft revolution) 3 = Throttle valve angle 4 = Ignition timing
002 Basic function	Reading measured value block 2 1 2 3 4	1 = Engine speed 2 = Engine load (injection period per crankshaft revolution) 3 = Injection period (per power stroke) 4 = Intake air mass
003	Reading measured value block 3	1 = Engine speed

Display group number	Indicated on display	Designation
Basic function	1 2 3 4	2 = Battery voltage 3 = Coolant temperature 4 = Intake-air temperature

Display group number	Indicated on display	Designation
004 Idling-speed stabilisation	Reading measured value block 4 1 2 3 4	1 = Throttle valve angle 2 = Idling-speed stabilisation learned value for manual gearbox and automatic gearbox with no gear engaged 3 = Idling-speed stabilisation learned value for automatic gearbox with gear engaged 4 = Operating status Idling speed Part throttle Full throttle Overrun Enrichment
005 Idling-speed stabilisation	Reading measured value block 5 1 2 3 4	1 = Engine speed (actual) 2 = Engine speed (specified) 3 = Idling-speed stabilisation control value (idling-speed control) 4 = Intake air mass

Display group number	Indicated on display	Designation
006 Idling-speed stabilisation	Reading measured value block 6 1 2 3 4	1 = Engine speed 2 = Idling-speed stabilisation control value (idling-speed control) 3 = Mixture formation control value (Lambda control) 4 = Ignition timing
007 Lambda control and ACF system	Reading measured value block 7 1 2 3 4	1 = Mixture formation control value (Lambda control) 2 = Lambda probe voltage 3 = Activated charcoal filter solenoid valve -N80 duty cycle 4 = Lambda correction factor with fuel tank breather system active
008 Lambda learned values	Reading measured value block 8 1 2 3 4	1 = Injection period (per power stroke) 2 = Mixture formation learned value at idle (additive) 3 = Mixture formation learned value at part throttle (multiplicative) 4 = Fuel tank breather system: FTBS active (fuel tank breather system active) λ adaption (fuel tank breather system not active)

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Display group number	Indicated on display	Designation
009 Lambda learned values	Reading measured value block 9 1 2 3 4	1 = Engine speed 2 = Mixture formation control value (Lambda control) 3 = Lambda probe voltage 4 = Mixture formation learned value at idle (additive)
010 Fuel tank breather system	Reading measured value block 10 1 2 3 4	1 = Activated charcoal filter solenoid valve -N80 duty cycle 2 = Mixture formation correction factor with fuel tank breather system active 3 = Activated charcoal filter solenoid valve -N80 charge 4 = ACF purging quantity
011 Fuel consumption	Reading measured value block 11 1 2 3 4	1 = Engine speed 2 = Engine load (injection period per crankshaft revolution) 3 = Vehicle speed 4 = Fuel consumption

Display group number	Indicated on display	Designation
012 Fuel consumption	Reading measured value block 12 1 2 3 4	1 = Engine speed 2 = Battery voltage 3 = Fuel consumption 4 = Ignition timing
013 Knock control	Reading measured value block 13 1 2 3 4	1 = Ignition retard/cylinder 1 by knock control 2 = Ignition retard/cylinder 2 by knock control 3 = Ignition retard/cylinder 3 by knock control 4 = Ignition retard/cylinder 4 by knock control
014 Knock control	Reading measured value block 14 1 2 3 4	1 = Engine speed 2 = Engine load (injection period per crankshaft revolution) 3 = Ignition retard/cylinder 1 by knock control 4 = Ignition retard/cylinder 2 by knock control

Display group number	Indicated on display	Designation
015 Knock control	Reading measured value block 15 1 2 3 4	1 = Engine speed 2 = Engine load (injection period per crankshaft revolution) 3 = Ignition retard/cylinder 3 by knock control 4 = Ignition retard/cylinder 4 by knock control
016 Knock control	Reading 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
017	Reading measured value block 17	1 = Engine speed

Display group number	Indicated on display	Designation
Catalytic converter warm-up	1 2 3 4	2 = Engine load (injection period per crankshaft revolution) 3 = Energy balance for catalytic converter warm-up 4 = Ignition timing

Display group number	Indicated on display	Designation
018 Altitude adaption	Reading measured value block 18 1 2 3 4	1 = Engine speed 2 = Engine load without altitude correction 3 = Engine load with altitude correction 4 = Altitude correction factor
019 Torque reduction	Reading measured value block 19 1 2 3 4	1 = Engine speed 2 = Engine load (injection period per crankshaft revolution) 3 = Gearshift (signal) 4 = Ignition timing
020 Operating statuses	Reading measured value block 20 1 2 3 4	1 = Engine speed 2 = Selector lever position 3 = Air conditioner/heated rear window 4 = Air-conditioner compressor

Display group number	Indicated on display	Designation
021 Operating statuses/ Lambda control	Reading 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 OFF/ON
022	Reading measured value block 22	Ignore
023 Adaption/ throttle valve positioner	Reading measured value block 23 1 2 3 4	1 = "Learning required" display 2 = Lower stop of throttle valve positioner 3 = Emergency running stop of throttle valve positioner 4 = Upper stop of throttle valve positioner

Display group number	Indicated on display	Designation
024 Knock control	Reading measured value block 24 1 2 3 4	1 = Engine speed 2 = Engine load (injection period per crankshaft revolution) 3 = Ignition timing 4 = Sum total of ignition retard for cylinders 1 to 4
025 Control/ intake manifold-changeover and camshaft timing control	Reading measured value block 25 1 2 3 4	1 = Operating status: Idling speed Part throttle Full throttle Overrun Enrichment 2 = Hall sender -G40 (° crankshaft) 3 = Control:



Display group number	Indicated on display	Designation
		Intake-manifold changeover Camshaft timing control 4 = Active camshaft adjustment angle ° crankshaft

Display group number	Indicated on display	Designation
026 Control/ intake manifold- changeover and camshaft timing control	Reading measured value block 26 1 2 3 4	1 = Engine speed 2 = Engine load (injection period per crankshaft revolution) 3 = Control: Intake-manifold changeover Camshaft timing control 4 = Active camshaft adjustment angle ° crankshaft
027...094		Not used
095...097		Ignore

Display group number	Indicated on display	Designation
098 Adaption/ throttle valve control part	Reading measured value block 98 1 2 3 4	1 = Throttle valve potentiometer voltage 2 = Idling-speed positioner potentiometer voltage 3 = Operating status: Idling speed / part throttle 4 = Adaption status
099 Lambda control	Reading measured value block 99 1 2 3 4	1 = Engine speed 2 = Coolant temperature 3 = Lambda control 4 = Lambda control ON/OFF

6.3 - Display specifications

Display groups 000 to 007

Display group 000 at idle (warm engine, coolant temperature at least 85 °C)

Reading measured value block 0 xxx xxx xx xxx x xxx xxx xxx xxx xxx ⇒					Indicated on display
					Mixture formation learned value: 118...138 OK (=> Display group 008, Page 41)
					Mixture formation learned value: 243...255 or 0...13 OK (=> Display group 008, Page 41)
					Mixture formation control value: 78...178 OK (=> Display group 007, Page 40)
					Idling-speed stabilisation learned value: 112...144 OK (=> Display group 004, Page 38)
					Idling-speed stabilisation control value: 118...138 OK (=> Display group 005, Page 39)
					Throttle valve angle: 0...12 OK (=> Display group 001, Page 35)
					Battery voltage: 146...212 OK (=> Display group 003, Page 37)
					Engine speed: 82...90 OK (=> Display group 001, Page 35)
					Engine load: 20...50 OK (=> Display group 001, Page 35)

Coolant temperature: 170...204 OK (=> Display group 003, Page 37)

Display group 001, basic function:

Reading measured value block 1		⇒		◀ Indicated on display
XXX rpm	X.XX ms	X <°	XX.X ° before TDC	
				Ignition timing ▪ 12.0° before TDC: OK
			Throttle valve angle ▪ 0...5 <°: OK	
			Engine load (injection period per crankshaft revolution) ▪ 1.00...2.50 ms: OK	
	Engine speed ▪ 820...900 rpm: OK			

Test table: Display group 001

Display zone	Display on V.A.G 1551	Cause of trouble	Fault remedy
1	Less than 820 rpm	- Gear engaged (automatic gearbox) - Load on engine from ancillaries - Throttle valve control part - J338 sticking or defective	- Move selector lever to P or N - Eliminate load (air conditioner, power steering etc.) - Check throttle valve control part - J338 => Page 113
	Greater than 900 rpm	- Idling switch -F60 not closed/defective - Large volume of unmetered air (for which idling-speed stabilisation cannot provide compensation) - Throttle valve control part - J338 sticking or defective - Air conditioner not switched off	- Interrogate fault memory=>Page 4 - Check intake system for leaks (unmetered air) => Page 92 - Check throttle valve control part - J338 => Page 113 - Switch off air conditioner

Test table: Display group 001

Display zone	Display on V.A.G 1551	Cause of trouble	Fault remedy
2	Less than 1.0 ms	- Lower values can only occur in overrun mode	
	Greater than 2.5 ms	- Rough idling (not running on all cylinders) - Air-mass meter -G70 defective - Throttle valve control part - J338 defective - Electr. loads on - Steering wheel on full lock	- Injector or spark plugs defective - Interrogate fault memory=>Page 4 - Check throttle valve control part - J338 => Page 113 - Switch off loads - Move steering wheel to centre position



Display zone	Display on V.A.G 1551	Cause of trouble	Fault remedy
		- Gear engaged (automatic gearbox)	- Move selector lever to P or N

Test table: Display group 001

Display zone	Display on V.A.G 1551	Cause of trouble	Fault remedy
3	Less than 0 <°	- Not possible	
	Greater than 5 <°	- Adaption of throttle valve control part -J338 not performed - Throttle valve potentiometer in throttle valve control part -J338 defective or incorrectly set - Throttle cable setting - Throttle valve sticking	- Perform adaption of throttle valve control part -J338 => Page 4 - Check throttle valve control part -J338 => Page 113 - Adjust throttle cable => Fuel Supply System - Petrol Engines; Repair Group 20; Servicing accelerator mechanism Servicing accelerator mechanism - Eliminate cause

Test table: Display group 001

Display zone	Display on V.A.G 1551	Cause of trouble	Fault remedy
4	Less than 12° before TDC	- Electr. loads on - Steering wheel on full lock - Gear engaged (automatic gearbox)	- Switch off loads - Move steering wheel to centre position - Move selector lever to P or N
	Greater than 12° before TDC	- Not possible	

Display group 002, basic function:

Reading measured value block 2			⇒	Indicated on display
XXX rpm	X.XX ms	X.XX ms	X.X g/s	
				Intake air mass ▪ 2.0...4.0 g/s: OK
				Injection period (per power stroke) ▪ 2.00...5.00 ms: OK
				Engine load => Display group 001, display zone 2
				Engine speed => Display group 001, display zone 1

Notes:

- Display zone 2 shows the injection period corresponding to the intake air mass and engine load at idle. This is a theoretical arithmetic value which for processing reasons is only referenced to one crankshaft revolution. Engine load at idle refers to the natural engine friction to be overcome and the drive of the ancillaries. The intake air mass is displayed in zone 4.
- Display zone 3 on the other hand shows the injection period for a full power stroke, i.e. two crankshaft revolutions.
- Nevertheless, the value indicated in display zone 3 is not twice that in zone 2, but rather a corrected actual injection period based on factors of influence such as:

- Lambda control
- Fuel supply from activated charcoal filter
- Air density, air temperature
- Vehicle electrical system voltage (faster / slower opening of injectors)
- ♦ If, for example, the engine draws in unmetered air, this should only bring about a change in the arithmetic value in display zone 2 (injection period per crankshaft revolution). The actual injection period per power stroke is maintained at the specified level by the Lambda control.

Test table: Display group 002

Display zone	Display on V.A.G 1551	Cause of trouble	Fault remedy
3	Less than 2.0 ms	- Large quantity of fuel from activated charcoal filter system (ACF) - Wrong injectors with greater flow rate fitted	- Check activated charcoal filter solenoid valve => Page 110 - Check injection quantity => Page 81
	Greater than 5.0 ms	- Increased engine load due to electr. loads, air conditioner, engaged gear or power steering on lock	- Eliminate load
4	Less than 2.0 g/s	- Large volume of unmetered air between intake manifold and air-mass meter	- Check intake system for leaks (unmetered air) => Page 92
	Greater than 4.0 g/s	- Increased engine load due to electr. loads, air conditioner, engaged gear or power steering on lock	- Eliminate load

Display group 003, basic function:

Reading measured value block 3 ⇒ Indicated on display XXX rpm XX.XXX V XX.X °C XX.X °C			
			Intake-air temperature (at intake-air temperature sender -G42) ▪ 30...90 °C: OK
			Coolant temperature (at coolant temperature sender -G62) ▪ 80...105 °C: OK
			Battery voltage ▪ 10.000...14.500 V: OK
Engine speed => Display group 001, display zone 1			

Test table: Display group 003

Display zone	Display on V.A.G 1551	Cause of trouble	Fault remedy
2	Less than 10 V	- Alternator defective, very low battery charge - Heavy load on electrical system shortly after starting due to high charging current and ancillaries - Contact resistance in power supply/earth connection for engine control unit - Current draw with ignition off	- Check voltage, charge battery - Increase engine speed slightly for several minutes and switch off ancillaries - Check power supply to engine control unit => Page 149 - Eliminate current draw



Display zone	Display on V.A.G 1551	Cause of trouble	Fault remedy
	Greater than 14.5 V	- Voltage regulator at alternator defective - Overvoltage due to boost starting or rapid charger	- Check voltage, replace regulator if necessary - Interrogate fault memory =>Page 4

Test table: Display group 003

Display zone	Display on V.A.G 1551	Cause of trouble	Fault remedy
3	Less than 80 °C	- Engine too cold - Coolant temperature sender/wiring to engine control unit - Coolant temperature sender supplying implausible signal due to loose contact or corrosion (moisture in connector)	- Perform test drive if necessary - Check coolant temperature sender -G62 =>Page 146
	Greater than 105 °C	- Radiator dirty - No radiator fan function - Thermostat defective - Coolant temperature sender/wiring to engine control unit	- Clean radiator - Check operation - Check thermostat - Check coolant temperature sender -G62 =>Page 146
4	Constant 19.5 °C	- Fault detected at intake-air temperature sender -G42	- Interrogate fault memory =>Page 4
		- Intake-air temperature sender - -G42 defective	- Check -G42 =>Page 143

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Display group 004, idling-speed setting:

Reading measured value block 4			⇒	◀ Indicated on display
X <°	X.XX g/s	X.XX g/s	XXXXXX	
				Operating status ▪ Idling speed: OK
				Idling-speed stabilisation learned value for automatic gearbox with gear engaged ▪ - 1.70 ... 1.70 g/s: OK
				Idling-speed stabilisation learned value for manual gearbox/ automatic gearbox with no gear engaged ▪ - 1.70 ... +1.70 g/s: OK
				Throttle valve angle ▪ 0...5 <°: OK

Notes on display zones 2 and 3:

- ♦ The display shows the extent to which the idling-speed stabilisation "deviates from" the specified mean design value. The value is positive for a new engine on account of the greater friction and negative for an engine which has been run in. Values of -0.70 g/s in conjunction with an inadequate value in display group 005, display zone 3 are an indication of unmetered air.
- ♦ The value displayed is not measured by the air-mass meter, but rather calculated from the throttle valve potentiometer information.
- ♦ 0 is always displayed in zone 3 for vehicles with manual gearbox.

Note on display zone 4:

The following operating statuses are displayed:

- ♦ Idling speed, part throttle, full throttle, overrun, enrichment (full-throttle enrichment)

Test table: Display group 004

Display zone	Display on V.A.G 1551	Cause of trouble	Fault remedy
1	... <°	Throttle valve angle => Display group 001, display zone 3	
2	Less than -0.7 g/s	- Unmetered air downstream of throttle valve	- Check intake system for leaks (unmetered air) => Page 92
	Greater than +0.7 g/s	- Heavy load due to ancillaries - Constriction/foreign matter in intake system	- Switch off air conditioner and electr. loads - Eliminate constriction/remove foreign matter

Display group 005, idling-speed stabilisation (idle):

Reading measured value block 5			⇒	♦ Indicated on display
XXX rpm	XXX rpm	X.X %	X.X g/s	
			Intake air mass ▪ 2.0...4.0 g/s: OK	
			Idling-speed stabilisation control value (idling-speed control) ▪ - 10...+ 10 %: OK	
			Specified engine speed requested by engine control unit ▪ 820...900 rpm: OK	
Engine speed (actual)				

Notes on display zone 3:

- ♦ Altering the load ratios at idle produces a change in the idle air mass required at constant engine speed.
- ♦ The change in idle air mass is displayed as a percentage. As soon as compensation has been provided for this change by the idling-speed stabilisation adaption process, the mean value is re-established. The magnitude of the deviation from the mean value depends on the magnitude of the load change (e.g. switch-on/switch-off of electr. loads).
- ♦ The adaption process is implemented in small steps each time the idling-speed switch closes. Several steps are required in the event of major deviations. For this purpose, the accelerator pedal must be tapped briefly at intervals of approx. 20 seconds (burst of throttle). Each time this is done, a further step in the adaption process is implemented.
- ♦ The deviation value then appears in display group 04, display zone 2. The idling-speed control values remain outside the tolerance if the learned values in display group 04, display zone 2 have reached stop position.
- ♦ Stop values: -1.7 or +1.7 g/s

Notes on display zone 4:

- ♦ Throttle valve positioner fault (00670): Constant engine speed 840 rpm and air throughput 2.8 g/s
- ♦ Throttle valve positioner and throttle valve potentiometer faults (00670/16505/16506/16507): Digital idling-speed stabilisation (DIS) is deactivated and a constant engine speed of approx. 1000 rpm and an air mass of 2.8 g/s are output.

Display group 006, idling-speed stabilisation:

--



Reading measured value block 6				⇒	◀ Indicated on display
XXX rpm	X.X %	X.X %	° before TDC		
				Ignition timing => Display group 001, display zone 4	
				Mixture formation control value (Lambda control)	
				▪ - 10...+ 10 %: OK	
				Idling-speed stabilisation control value (idling-speed control)	
				▪ - 10...+ 10 %: OK	
				Engine speed => Display group 001, display zone 1	

Notes on display zone 3:

- Display must fluctuate around zero. If display is always 0, Lambda control has switched from closed-loop to open-loop mode on account of a fault in the Lambda control. Interrogate fault memory => Page 4 .
- Lambda control operating status: Check display group 021, display zone 4 => Page 47

Test table: Display group 006

Display zone	Display on V.A.G 1551	Cause of trouble	Fault remedy
3	Outside tolerance range	- Negative display, engine too rich, consequence: Lambda control effects leaning - Positive display ("+" is not shown), engine too lean, consequence: Lambda control effects enrichment - Unmetered air - Injector defective - Lambda learned values on stop	- Wait 30 seconds for display to stabilise - Check intake system for leaks (unmetered air) => Page 92 - Check injection quantity => Page 81 - Check Lambda learned values, refer to display group 007

Display group 007, Lambda control and ACF system:

Reading measured value block 7				⇒	◀ Indicated on display
X.X %	X.XXX V	X %	X.X		
				Mixture formation correction factor with fuel tank breather system active	
				Activated charcoal filter solenoid valve -N80 duty cycle	
				▪ 0 %: Solenoid valve closed	
				▪ 99 %: Solenoid valve open	
				Lambda probe voltage	
				Mixture formation control value (Lambda control) => Display group 006, display zone 3	

Notes on display zone 2:

- Voltage signal "Rich mixture (low residual oxygen level)" is approx. 0.7...1.0 V (based on reference earth).
- Voltage signal "Lean mixture (high residual oxygen level)" is approx. -0.1...+0.3 V (based on reference earth).
- Transition from "rich" to "lean" and vice versa ($\lambda = 1.0$) results in a voltage step change from 0.7...1.0 V to -0.1...+0.3 V and vice versa.

- ♦ On account of the steep voltage step change, the Lambda control cannot maintain the ideal mixture composition (corresponding to $\lambda = 1.0$) at a constant level. The control constantly fluctuates between the two statuses "slightly too lean" and "slightly too rich".

Notes on display zone 4:

- ♦ If a value of 0.3 is displayed, the engine is being supplied with a very rich mixture from the ACF system. The Lambda control thus has to reduce the injection quantity to 30 %.
- ♦ If a value of 1.0 is displayed, the ACF system is either providing an ideal mixture (no leaning or enrichment required) or the ACF valve is closed (Adaption: Display group 08, display zone 4).
- ♦ If the value displayed is 1.01 ... 1.2, the mixture from the ACF system is too lean and the Lambda control therefore has to effect enrichment.

6.4 - Display groups 008 to 099

Display group 008, Lambda learned values:

Reading measured value block 8 ➔				Indicated on display
X.XX ms	X.X %	X.X %	XXXXXX	
				Fuel tank breather system ▪ FTBS active: Pulsing of activated charcoal filter solenoid valve ▪ λ adaption (fuel tank breather system not active): Activated charcoal filter solenoid valve closed
				Mixture formation learned value at part throttle (multiplicative) ▪ -8...+8 %: OK
				Mixture formation learned value at idle (additive) ▪ -10...+10 %: OK
				Injection period (per power stroke) ▪ 2.00...5.00 ms: OK

Notes on display zones 2 and 3:

Low values indicate excessively rich engine operation and hence leaning by Lambda control.

- ♦ High values indicate excessively lean engine operation and hence enrichment by Lambda control.
- ♦ All learned values are reset if the control unit is deenergised.
- ♦ add = additive - The fault (e.g. unmetered air) becomes less and less pronounced with increasing engine speed. The additive learned value changes the injection period by a fixed amount, which is not governed by the basic injection period.
- ♦ mul = multiplicative - The fault (e.g. defective injector) becomes more pronounced with increasing engine speed. The multiplicative learned value represents a percentage change in injection period, which is governed by the basic injection period.

Test table: Display group 008

Display zone	Display on V.A.G 1551	Cause of trouble	Fault remedy
2/3	Low Lambda learned values	- Low Lambda idling speed learned values with normal Lambda part throttle learned values: Possible oil dilution (high fuel level in oil) - Injector leaking - Fuel pressure too high	- Disappears after driving on motorway or changing oil Display group 007, display zone 2 => Page 40 - Check injector=>Page 73 - Check fuel pressure => Page 70



Display zone	Display on V.A.G 1551	Cause of trouble	Fault remedy
		- Activated charcoal filter solenoid valve -N80 constantly open - Air-mass meter -G70 defective - Lambda probe heating defective or Lambda probe dirty	- Check -N80 => Page 109 - Check -G70 => Page 89 - Check Lambda probe heating => Page 104

Test table: Display group 008

Display zone	Display on V.A.G 1551	Cause of trouble	Fault remedy
2/3	High Lambda learned values	- High Lambda idling speed learned values with less high Lambda part throttle learned values: Possibility of unmetered air in intake manifold - Injector clogged - Display zones 2 and 3 high: Air-mass meter -G70 defective - Fuel pressure too low - Unmetered air between -G70 and throttle valve - Unmetered air at manifold gasket - Lambda probe heating defective or Lambda probe dirty	- Eliminate causes Display group 007, display zone 2 => Page 40 - Check injection quantity =>Page 81 - Check -G70 =>Page 89 - Check fuel pressure => Page 70 - Eliminate cause - Check Lambda probe heating =>Page 104

Display group 009, Lambda learned values:

Reading measured value block 9				Indicated on display
XXX rpm	X.X %	X.XXX V	X.X %	
				Mixture formation learned value at idle (additive)
				▪ - 10...+ 10 %: OK
				Lambda probe voltage
				Mixture formation control value (Lambda control) => Display group 006, display zone 3
				Engine speed => Display group 001, display zone 1

Display group 010, fuel tank breather system:

Reading measured value block 10				Indicated on display
X %	X.XX	XX	X.XX	
				Proportion of fuel tank breather system air in total air mass
				▪ 0.00: No fuel tank breather function
				▪ 0.30: 30 % of intake air from fuel tank breather system
				Activated charcoal filter charge
				▪ - 3 %: No fuel vapours in activated charcoal filter
				▪ + 32 %: Activated charcoal filter completely filled with fuel vapours

	Mixture formation correction factor with fuel tank breather system active
	Activated charcoal filter solenoid valve -N80 duty cycle

Note on display zone 4:

The display shows the proportion of the ACF system volume referenced to the total intake volume.

Display group 011, fuel consumption:

Attention: Fault reader is always to be attached to rear seat and operated from there by a second person. Heed safety precautions => Page 1.

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Reading measured value block 11 => Indicated on display			
XXX rpm	X.XX ms	X km/h	X.X l/h
			Fuel consumption (at idle with no load from ancillaries)
			▪ 0.50...1.5 l/h
			Vehicle speed
			Engine load => Display group 001, display zone 2
			Engine speed => Display group 001, display zone 1

Notes on display zone 2:

- ◆ Every 1000 m increase in height above sea level reduces maximum engine load by approx. 10 %.
- ◆ At very high ambient temperatures, the maximum engine load also decreases by up to 10 %.
- ◆ The following minimum values are attained when driving at full throttle:
 - at 4000 rpm approx. 7.5 ms
 - at 6000 rpm approx. 6.5 ms

Display group 013, knock control:

Attention: Fault reader is always to be attached to rear seat and operated from there by a second person. Heed safety precautions => Page 1.

Reading measured value block 13 => Indicated on display			
X.X ° crsh.	X.X ° crsh.	X.X ° crsh.	X.X ° crsh.
			Ignition retard/cylinder 4 by knock control
			Ignition retard/cylinder 3 by knock control
			Ignition retard/cylinder 2 by knock control
			Ignition retard/cylinder 1 by knock control

Notes:

- ◆ Knock control is activated as of an engine load greater than 40 %.
- ◆ On exceeding 40 % engine load, the current ignition retard values are displayed, whereas on dropping below the above figure the values last used are constantly indicated.
- ◆ If knocking is heard and there is no obvious ignition retard, increase engine speed for 5 seconds to in excess of 3500 rpm to start knock sensor fault detection (diagnosis).
- ◆ Possible faults if the ignition retard value for one cylinder clearly differs from the others:



- Loose ancillaries
- Corrosion at connector
- Engine damage (e.g. oil combustion with defective piston)
- ♦ Possible faults in the event of high ignition retard values for all cylinders:
- Corrosion at connector
- Tightening torque (20 Nm) not OK
- Open circuit in wiring
- Knock sensor defective
- Loose ancillaries
- Poor fuel grade (less than 95 RON)

Display group 014, knock control:

Reading measured value block 14				⇒	◀ Indicated on display
XXX rpm	X.XX ms	X.X ° crsh.	X.X ° crsh.		
					Ignition retard/cylinder 2 by knock control
					Ignition retard/cylinder 1 by knock control
					Engine load => Display group 001, display zone 2
					Engine speed => Display group 001, display zone 1

Note:

This display group can be used to check the ignition retard for cylinders 1 and 2 under certain engine speed and load conditions.

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Display group 015, knock control:

Reading measured value block 15				⇒	◀ Indicated on display
XXX rpm	X.XX ms	X.X ° crsh.	X.X ° crsh.		
					Ignition retard/cylinder 4 by knock control
					Ignition retard/cylinder 3 by knock control
					Engine load => Display group 001, display zone 2
					Engine speed => Display group 001, display zone 1

Notes:

- ♦ This display group can be used to check the ignition retard for cylinders 3 and 4 under certain engine speed and load conditions.
- ♦ Causes of ignition retard: Display group 013 =>Page 43

Display group 016, knock control (idling speed):

Reading measured value block 16				⇒	◀ Indicated on display
X.XXX V	X.XXX V	X.XXX V	X.XXX V		
					Knock sensor signal/cylinder 4
					Knock sensor signal/cylinder 3
					Knock sensor signal/cylinder 2
					Knock sensor signal/cylinder 1

Notes:

- ♦ The connector may be corroded if the difference between the lowest and highest knock sensor signal is more than 50 %.
- ♦ Check engine for loose ancillaries or engine damage if no faults are found during electrical checking of knock sensor, wiring and connector: Display group 013 =>Page 43
- ♦ At higher engine speeds and loads the knock sensor signal voltage displayed may attain values of up to 5.1 V.

Display group 017, catalytic converter warm-up:

Reading measured value block 17				⇒	◀ Indicated on display
XXX rpm	X.XX ms	X.XX	XX °		
			before TDC		
					Ignition timing => Display group 001, display zone 4
					Energy balance for catalytic converter warm-up
					Engine load => Display group 001, display zone 2
					Engine speed => Display group 001, display zone 1

Notes:

- ♦ To attain catalytic converter operating temperature as soon as possible after a cold start, the engine speed is increased at idle and the ignition retarded. In the part throttle range only the ignition retard remains active.
- ♦ This rapid catalytic converter warm-up function takes effect at starting temperatures between -9 and +39 °C.
- ♦ The function is terminated under the following criteria:
 - Engine speed greater than 4000 rpm
 - Engine load greater than 7.0 ms
 - Fault stored in fault memory for air-mass meter and coolant temperature sender
 - Energy balance greater than 1.0
 - Vehicle speed in excess of 55 km/h
 - Altitude correction factor less than -20 % (display group 018)
- ♦ As soon as the function is terminated, the energy balance display comes to a halt and is reset on next start.



Display group 018, altitude adaption:

Reading measured value block 18				⇒	◀ Indicated on display
XXX rpm	X.XX ms	X.XX ms	X.X %		
			Altitude correction factor		
			Engine load based on throttle valve angle		
			Engine load from air-mass meter		
Engine speed => Display group 001, display zone 1					

Notes:

- ♦ The engine control unit compares the load signal of the air-mass meter to a load value calculated from throttle valve angle and engine speed. The difference between the two values yields the altitude correction factor.
- ♦ Altitude correction is not necessary at an altitude of approx. 400 m above sea level under standard weather conditions.

- At sea level the correction factor is approx. 0 %.

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

- ♦ The altitude adaption influences the following factors:

- Determination of starting quantity

- Intake-manifold pulsation compensation

Display group 019, torque reduction (automatic gearbox):

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Reading measured value block 19				⇒	Indicated on display
XXX rpm	X.XX ms	X X X	XX °		
			before TDC		
			Ignition timing => Display group 001, display zone 4		
			Operating status ▪ X 1 X = No gearshift signal ▪ X 0 X = Gearshift signal X = No significance		
			Engine load => Display group 001, display zone 2		
			Engine speed => Display group 001, display zone 1		

Notes on display zone 3:

- ♦ This display group makes it possible to assess whether gearshift signal from gearbox control unit is received by engine control unit.
- ♦ On account of the brief signal, the ignition retard is not always detected by V.A.G. 1551/1552 and thus also not displayed.

Display group 020, operating statuses:

Reading measured value block 20			⇒	◀ Indicated on display
XXX rpm	XXXXXX	XXXXXX	XXXXXX	
				Air-conditioner compressor ON/ OFF ▪ Display for vehicles with no air conditioner is always "Compr. OFF"
				Air conditioner ▪ A/C High = high heating/ cooling output ▪ A/C Low = low heating/ cooling output ▪ On vehicles with no air conditioner, switching on heated rear window causes "A/C High" to be displayed (depending on design status)
				Selector lever in neutral or gear ENGAGED ▪ Display can be ignored for vehicles with manual gearbox
Engine speed => Display group 001, display zone 1				

Display group 021, Lambda control operating status:

Reading measured value block 21			⇒	◀ Indicated on display
XXX rpm	X.XX ms	XX.X °C	XXXXXX	
				Lambda control OFF/ON
				Coolant temperature => Display group 003, display zone 3
				Engine load => Display group 001, display zone 2
Engine speed => Display group 001, display zone 1				

Notes:

- ♦ At starting temperatures below +20 °C, Lambda control is only activated by engine control unit (at idle) as of a coolant temperature of +20 °C.
- ♦ At starting temperatures above +20 °C, Lambda control cuts in on detection of signal voltage.
- ♦ When Lambda control is off, map control is employed for engine.

Display group 023, throttle valve positioner adaption:

Reading measured value block 23				⇒	◀ Indicated on display
XXXXXX	XX.X %	XX.X %	XX.X %		
					Upper throttle valve positioner stop
					Throttle valve positioner emergency running stop
					Lower throttle valve positioner stop
"Learning required" display, significance => Page 48					
▪ 100000: OK					

**Note on display zone 1:**

If display specification is not attained, perform adaption of throttle valve control part -J338 => Page 114.

Note on display zones 2, 3 and 4:

The display shows the stop values learnt during last basic setting.

Note on display zones 1, 2, 3 and 4:

If display specification is still not attained after performing basic setting, check for open circuit/short circuit in wiring and contamination/corrosion of connectors before replacing throttle valve control part.

Significance of 6-position display in zone 1

X	X	X	X	X	X	Indicated on display
						Min. stop adaption for throttle valve positioner sender -G127
						▪ 0 = Adaption implemented, adaption OK
						▪ 1 = Adaption not implemented, adaption not OK
						Max. stop adaption for throttle valve positioner sender -G127
						▪ 0 = Adaption implemented, adaption OK
						▪ 1 = Adaption not implemented, adaption not OK
						Min. stop adaption for throttle valve potentiometer -G69
						▪ 0 = Adaption implemented, adaption OK
						▪ 1 = Adaption not implemented, adaption not OK
						Max. stop adaption for throttle valve potentiometer -G69
						▪ 0 = Adaption implemented, adaption OK
						▪ 1 = Adaption not implemented, adaption not OK
						No significance
						Matching of throttle valve potentiometer -G69 and throttle valve positioner sender -G127
						▪ 0 = Matching required
						▪ 1 = Matching implemented, matching OK

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Display group 024, knock control:

Reading measured value block 24				⇒	Indicated on display
XXX rpm	X.XX ms	XX°af./bef. TDC	XX ° crsh.		
					Sum total of ignition retard for cylinders 1...4
					Ignition timing
					Engine load => Display group 001, display zone 2
					Engine speed => Display group 001, display zone 1

Notes:

- ♦ As soon as knocking is detected, ignition must be retarded by knock control to prevent engine damage.
- ♦ An ignition retard of e.g. 3 ° crankshaft for all cylinders has the same effect as an ignition retard of 12 ° crankshaft for one cylinder only.
- ♦ The ignition retard does however increase the exhaust temperature and there is a danger of the catalytic converter overheating.
- ♦ To prevent such overheating, the mixture is enriched at full throttle as of a total retard of approx. 10 ° crankshaft to reduce the exhaust temperature.

Display group 025, control: Intake-manifold changeover and camshaft timing control

Reading measured value block 25				⇒	◀ Indicated on display
XXXXXX	XX ° crsh.	X XX	XX ° crsh.		
					Active camshaft adjustment angle
					▪ Camshaft timing control OFF = -3.0 ... 3.0 ° crankshaft
					▪ Camshaft timing control ON = 15.0 ... 21.0 ° crankshaft
					Operating status:
					▪ X 0 X = Intake-manifold changeover: OFF (short intake manifold)
					▪ X X 0 = Camshaft timing control: OFF (retard)
					▪ Value "0" = Condition not satisfied, actuation not active
					▪ Value "1" = Condition satisfied, actuation active
					▪ Value "X" = No significance
					Phase sensor (Hall sender) setting deviation
					Operating status: Idling speed, part throttle, full throttle, overrun, enrichment

Note on display zone 4:

To active camshaft timing control, accelerate vehicle from approx. 1000 rpm in 2nd gear with accelerator pedal floored. If camshaft timing control actuation is active (=> Display zone 3), display zone 4 shows whether camshaft adjustment has actually taken place (feedback). If camshaft timing control is not active, check whether full throttle is detected (camshaft timing control is only activated at full throttle).

Display group 026, control: Intake-manifold changeover and camshaft timing control

Reading measured value block 26				⇒	◀ Indicated on display
XXX rpm	X.XX ms	X XX	XX ° crsh.		
					=>Display group 025, display zone 4
					=>Display group 025, display zone 3
					Engine load => Display group 001, display zone 2
					Engine speed => Display group 001, display zone 1

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Display group 098, adaption of throttle valve control part:

Reading measured value block 98				⇒	◀ Indicated on display
X.XXX V	X.XXX V	XXXXX	XXXXXX		
					Adaption status
					Operating status
					▪ Idling speed: OK
					▪ Other display: Idling-speed switch open => Checking - Page 115
					Throttle valve positioner sender -G127 voltage
					▪ No specification
					Throttle valve potentiometer -G69 voltage
					▪ No specification



Display group 099, Lambda control:

Reading measured value block 99			⇒	◀ Indicated on display
XXX rpm	XX.X °C	XX.X %	XXXXXX	
				Lambda control ▪ Basic setting 04: λ contr. OFF ▪ Reading measured value block 08: λ contr. ON
				Mixture formation control value (Lambda control) => Display group 006, display zone 3
				Coolant temperature => Display group 003, display zone 3
				Engine speed => Display group 001, display zone 1

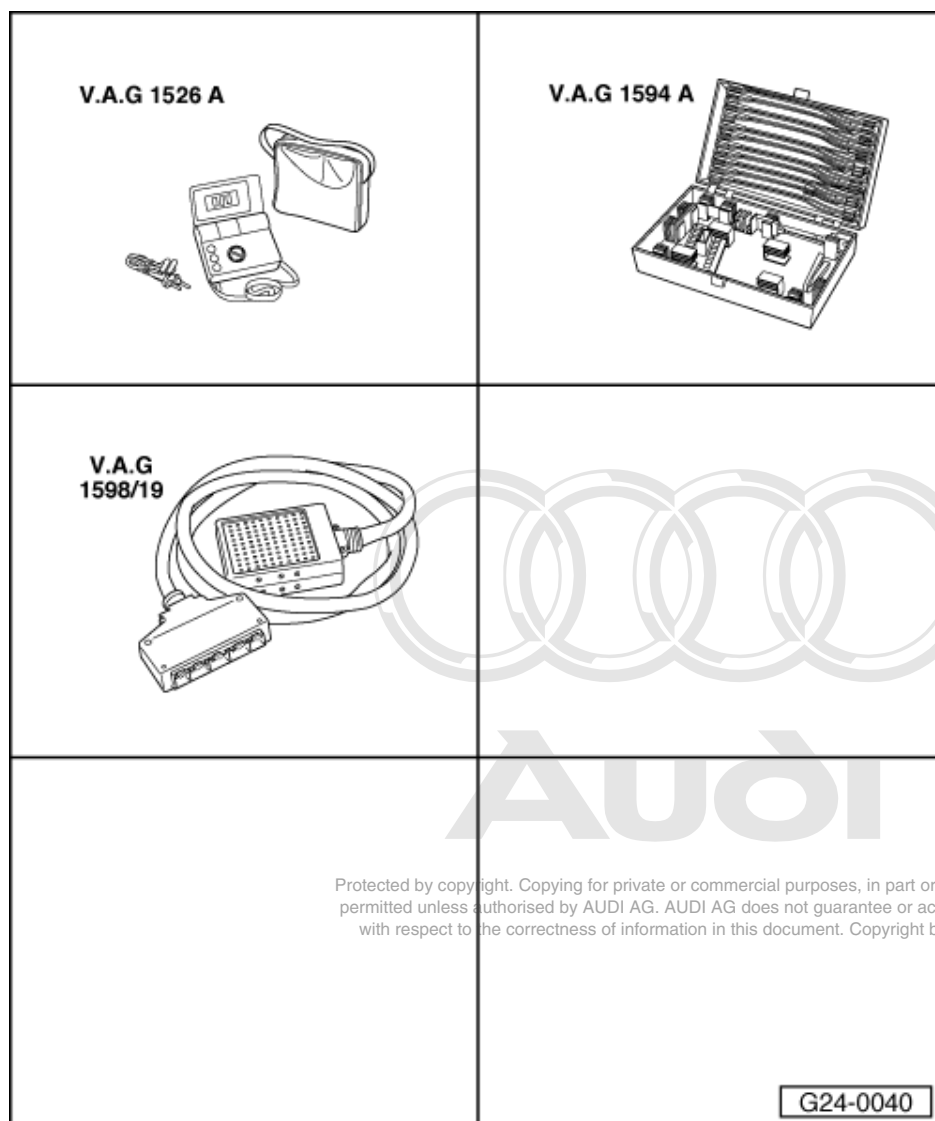
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Notes on display zone 4:

- ♦ For defined fault-finding, Lambda control is deactivated on selecting display group 099 in function 04 "Basic setting"/ activated in function 08 "Reading measured value block".
- ♦ Exit from function 04 "Basic setting" automatically re-activates Lambda control.
- ♦ Pressing keys 4 and 8 on V.A.G 1551 makes it possible to switch back and forth between function 04 "Basic setting" and function 08 "Reading measured value block".

7 - Checking wiring of diagnostic connectors

7.1 - Checking wiring of diagnostic connectors



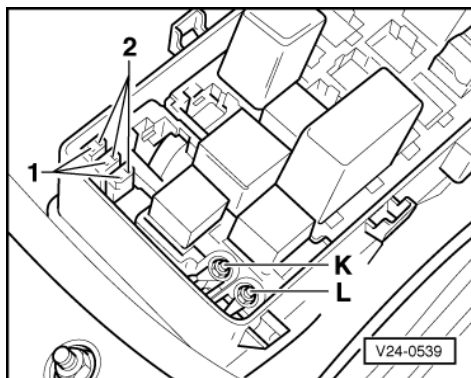
Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/19

Attention:
Switch off ignition before checking wiring.



7.2 - Checking power supply for "black" diagnostic connector



-> Installation position of diagnostic connectors: In auxiliary relay carrier I

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

Contact assignment for "black" diagnostic connector:

- 1 - Earth
- 2 - Terminal 30 (fused via fuse S19)

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- Connect up multimeter for voltage measurement as follows:

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

- Specification: approx. battery voltage in each case

If readings do not match specifications:

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

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

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

Note:

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

-> Indicated on display:

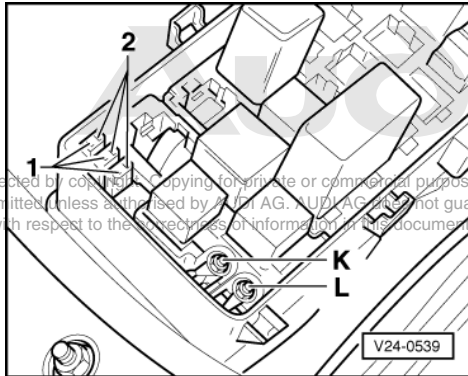
Rapid data transfer
Fault in communication link

or

Rapid data transfer HELP
K-wire not switched to earth

or

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



-> Installation position of diagnostic connectors and wiring junctions K and L: In auxiliary relay carrier I

Checking K-wire

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

Wiring junction	White diagnostic connector Contact	Immobilizer control unit		Engine control unit Contact
		IN	OUT	
K	2	10	9	A7

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

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

4A0953234 IMMO AUZ9Z0R4010830 D66
Code 00000 WSC 00000

- Continue with test A => Page 53 .

If immobilizer control unit identification is not displayed:

- Continue with test B => Page 54 .

Test A

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

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

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

If engine control unit identification is displayed:

- Replace immobilizer control unit.

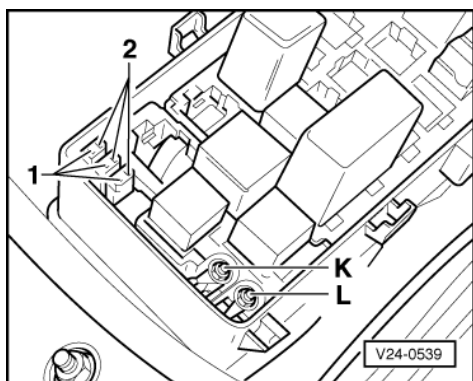
If engine control unit identification is not displayed:

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

Test B

- Switch off ignition.

Note:



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

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

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

4A0953234	IMMO	AUZ9Z0R4010830	D66
Code 00000		WSC 00000	

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

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

If immobilizer control unit identification is not displayed:

- Unplug connector at immobilizer control unit -J362.

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

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

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

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

24 - Mixture preparation, Injection

1 - Servicing Motronic injection system

1.1 - Servicing Motronic injection system

1.2 - Safety precautions

Attention:

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

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

Pay attention to the following if testers and measuring instruments have to be used in the course of a test drive:

Attention:

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

1.3 - Rules for cleanliness

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

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



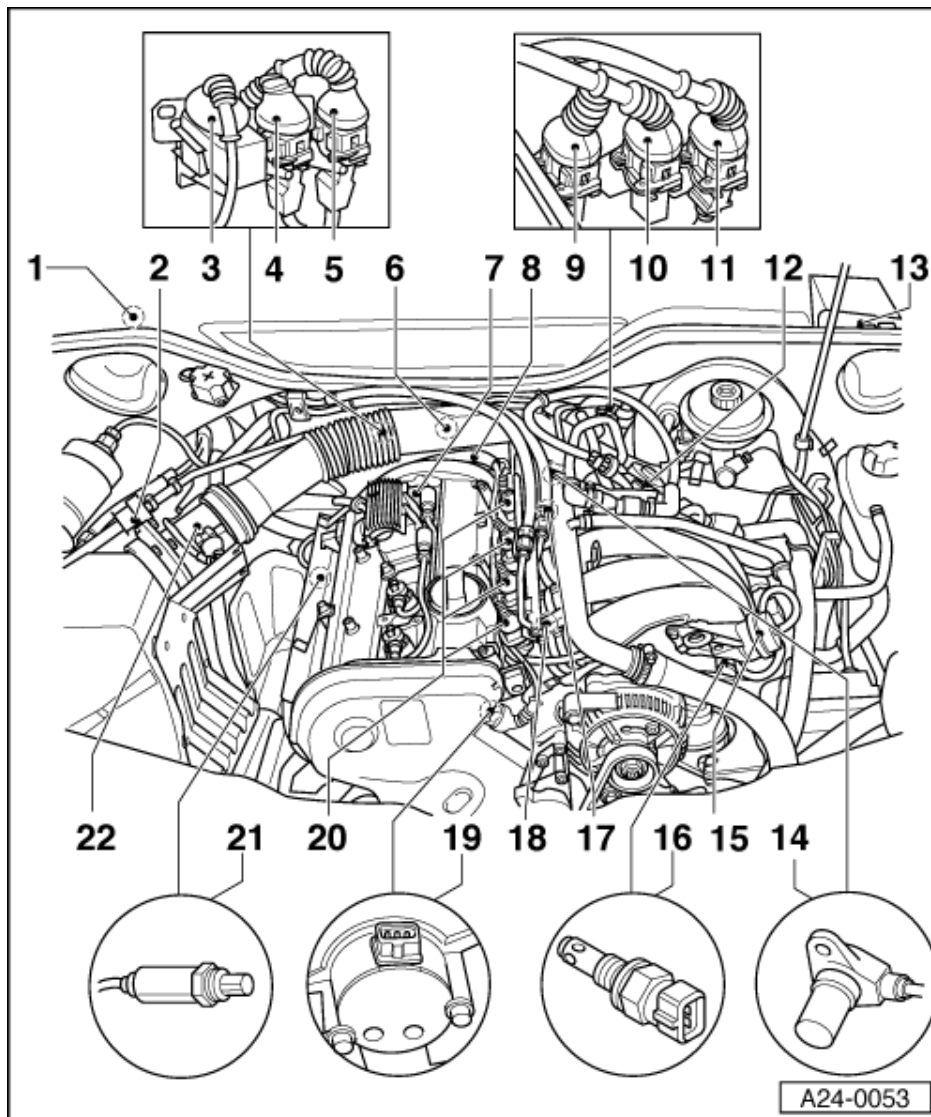
1.4 - Technical data

Engine codes		ADR (1.8 I / 92 kW engine)
Engine control unit	Part no.	=>Parts List
	Speed governing by deactivation of injectors	6800 rpm
Idling-speed setting	Speed cannot be adjusted; regulated by idling speed stabilisation	820 ... 900 rpm 1)
Fuel pressure regulator	Fuel pressure at idle	
	Vacuum hose connected	approx. 3.5 bar
	Vacuum hose disconnected	approx. 4.0 bar
	Holding pressure after 10 min.	min. 2.5 bar
Injectors	Spray pattern	Two-hole nozzle/same for all injectors
	Injection quantity (30 s)	85 ... 105 ml
	Resistance (ambient temperature)	11 ... 13 ω

1) Current values:

=> Exhaust emission test binder

1.5 - Exploded view of fitting locations



1 Motronic control unit -J220

- ◆ In electronics box in passenger's footwell
- ◆ Replacing => Page **65**

2 Activated charcoal filter solenoid valve -N80

3 4-pin connector

- ◆ For Lambda probe -G39 and Lambda probe heater -Z19

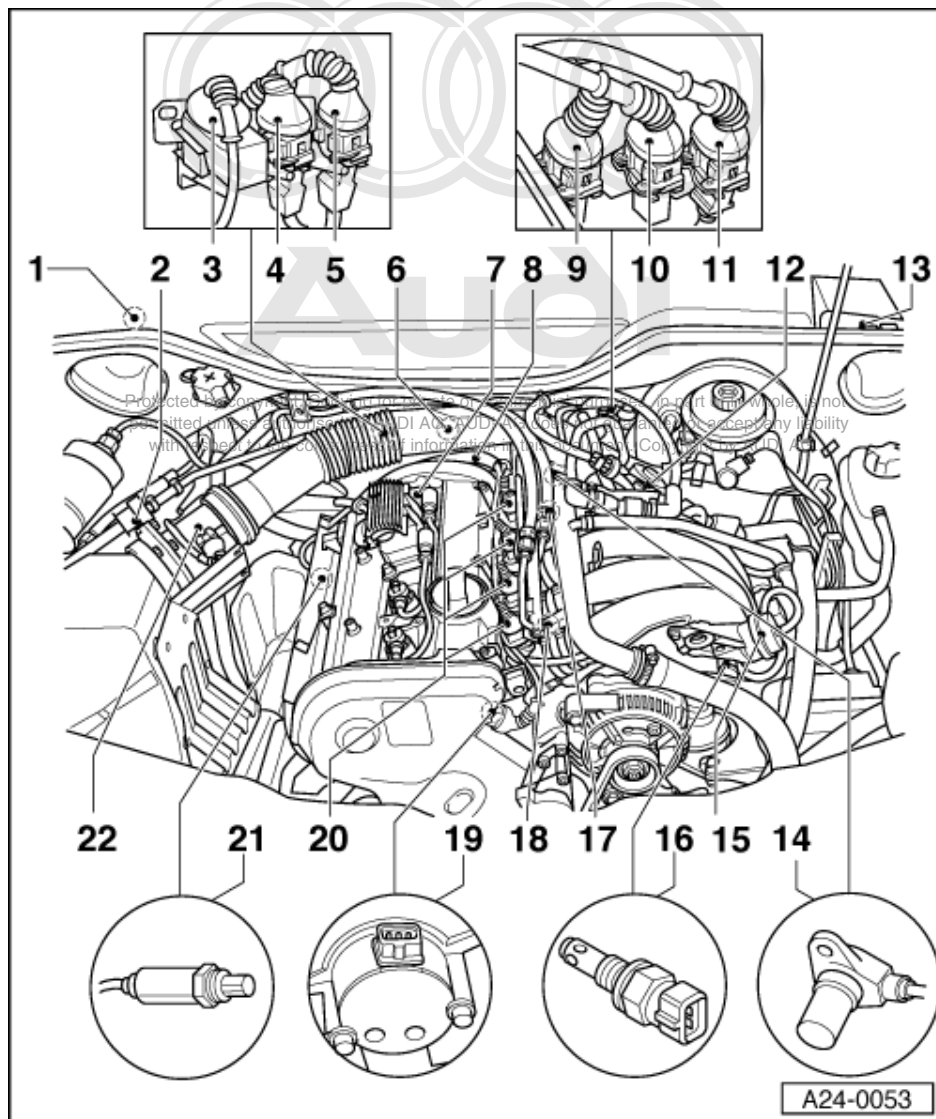
4 3-pin connector

- ◆ Green
- ◆ For knock sensor 1 -G61

5 3-pin connector

- ◆ Blue
- ◆ For knock sensor 2 -G66

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6 Coolant temperature sender -G62

- ◆ Dissipate cooling system pressure if necessary prior to removal

7 Ignition coils -N70, -N127

- ◆ With output stages

8 Camshaft adjustment valve 1 -N205
9 Connector

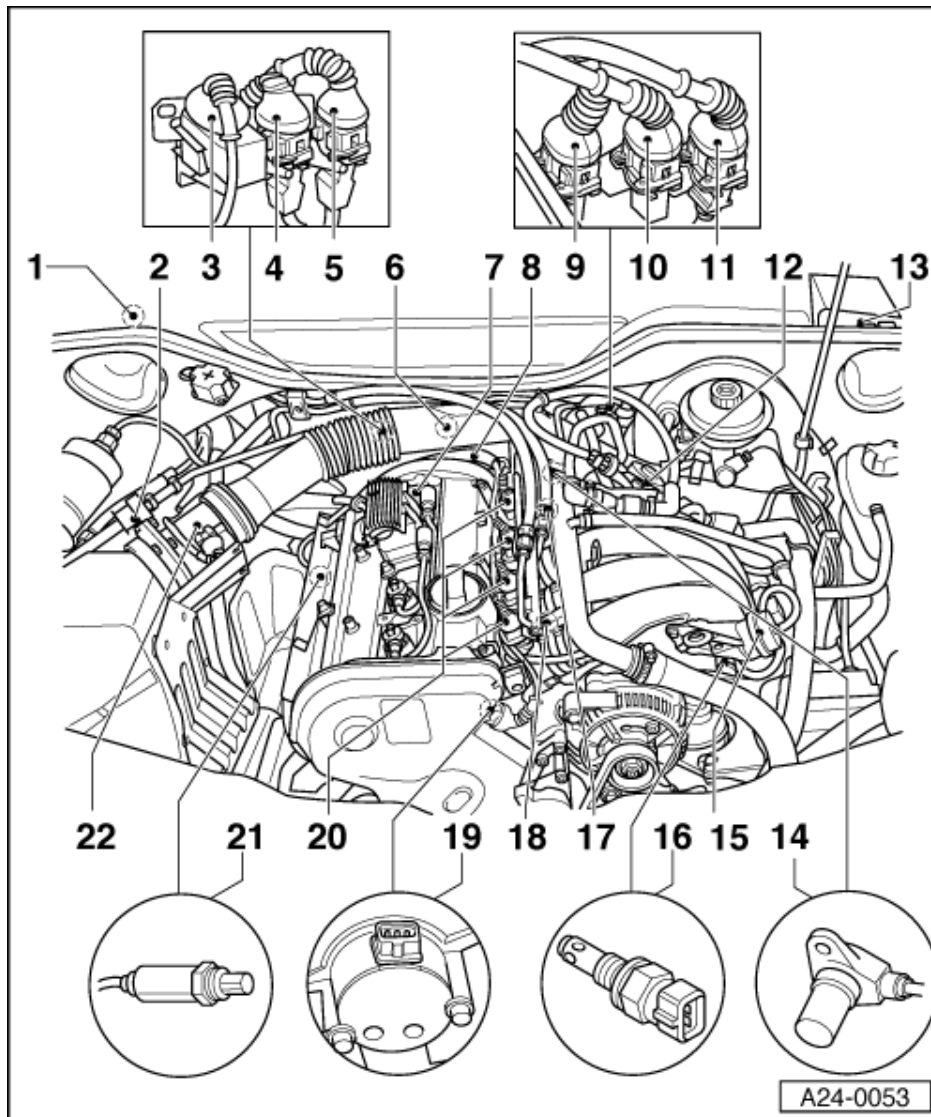
- ◆ Black
- ◆ For oil-pressure switch -F1

10 Connector

- ◆ Brown
- ◆ For coolant temperature sender -G62

11 3-pin connector

- ◆ Grey
- ◆ For engine speed sender -G28



12 Throttle valve control part -J338

- ♦ On replacement, perform adaption
 => Page **114**

13 Diagnostic connector

14 Engine speed sender -G28

15 Intake-manifold changeover system

16 Intake-air temperature sender -G42

17 Knock sensor 1 -G61

18 Knock sensor 2 -G66

19 Hall sender -G40

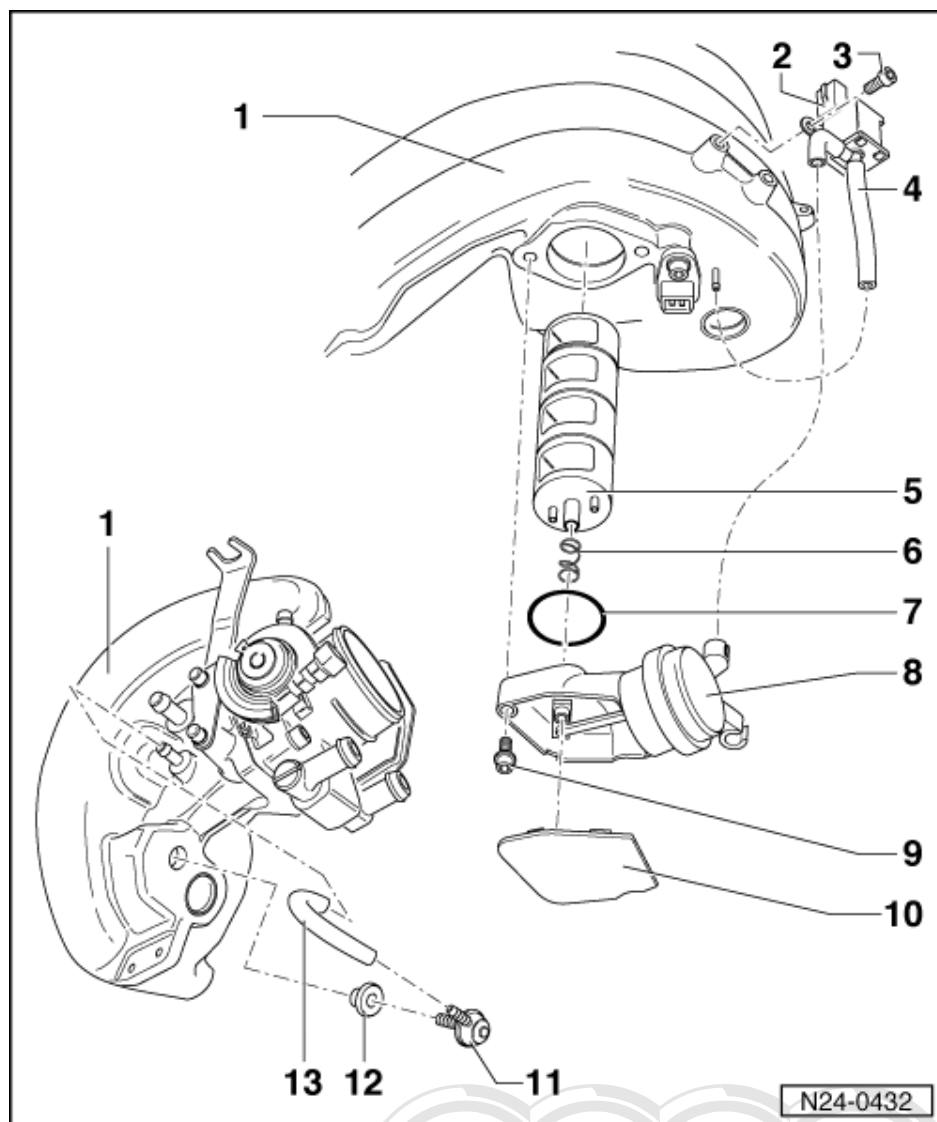
20 Injectors -N30 ... -N33

21 Lambda probe -G39 with Lambda probe heater -Z19

22 Air-mass meter -G70

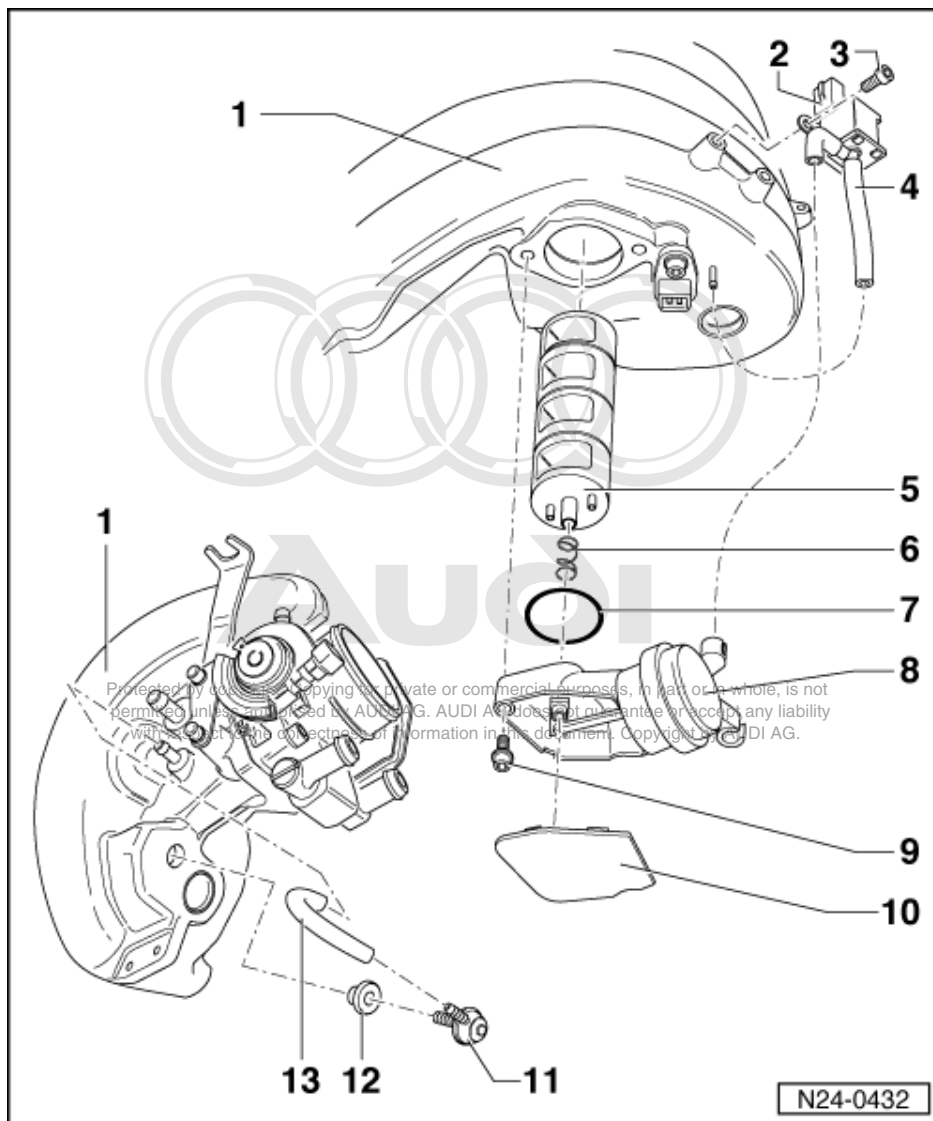
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1.6 - Removing and installing intake-manifold changeover system components



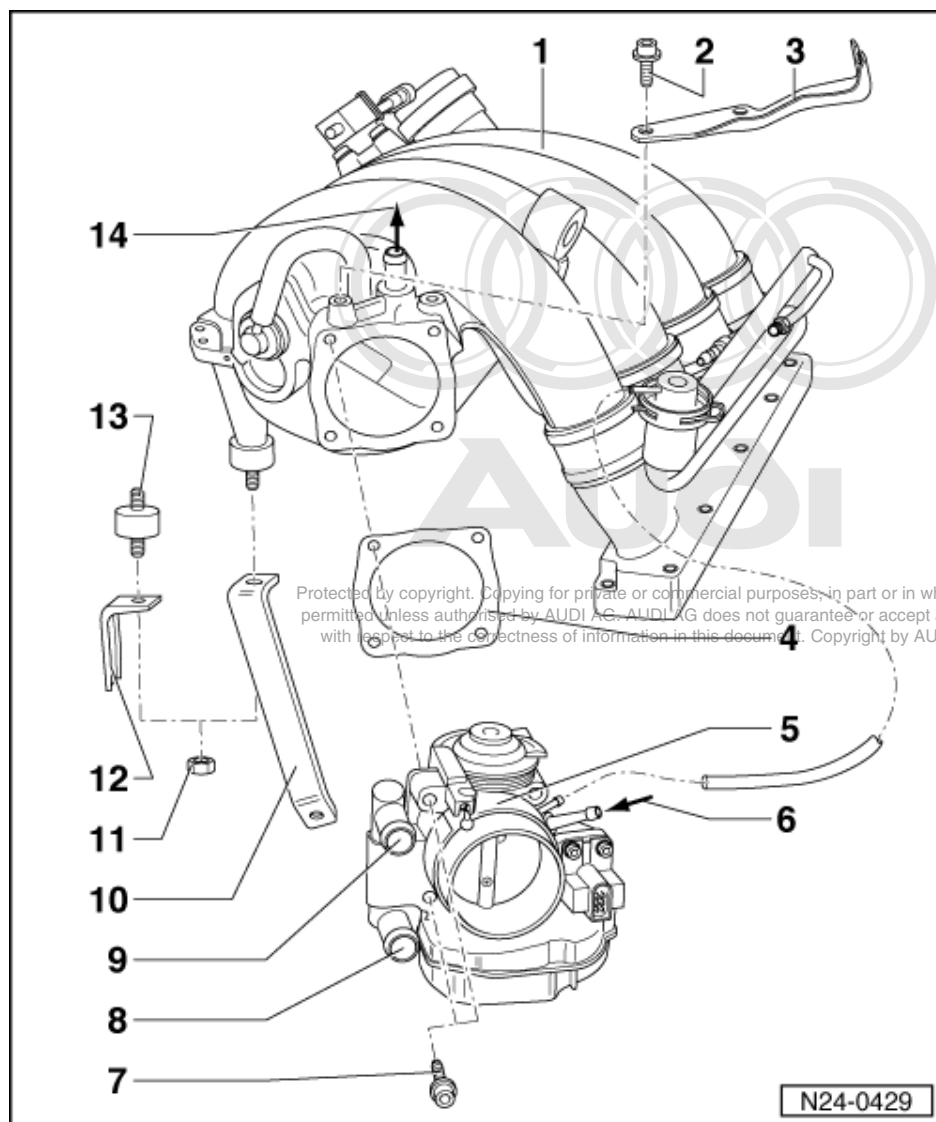
- 1 Intake manifold
- 2 Intake-manifold changeover valve -N156
- 3 6 Nm
- 4 Vacuum hose
- 5 Changeover barrel
- 6 Spring
- 7 Sealing ring
 - ♦ Replace if damaged
- 8
- 9
- 10
- 11
- 12
- 13

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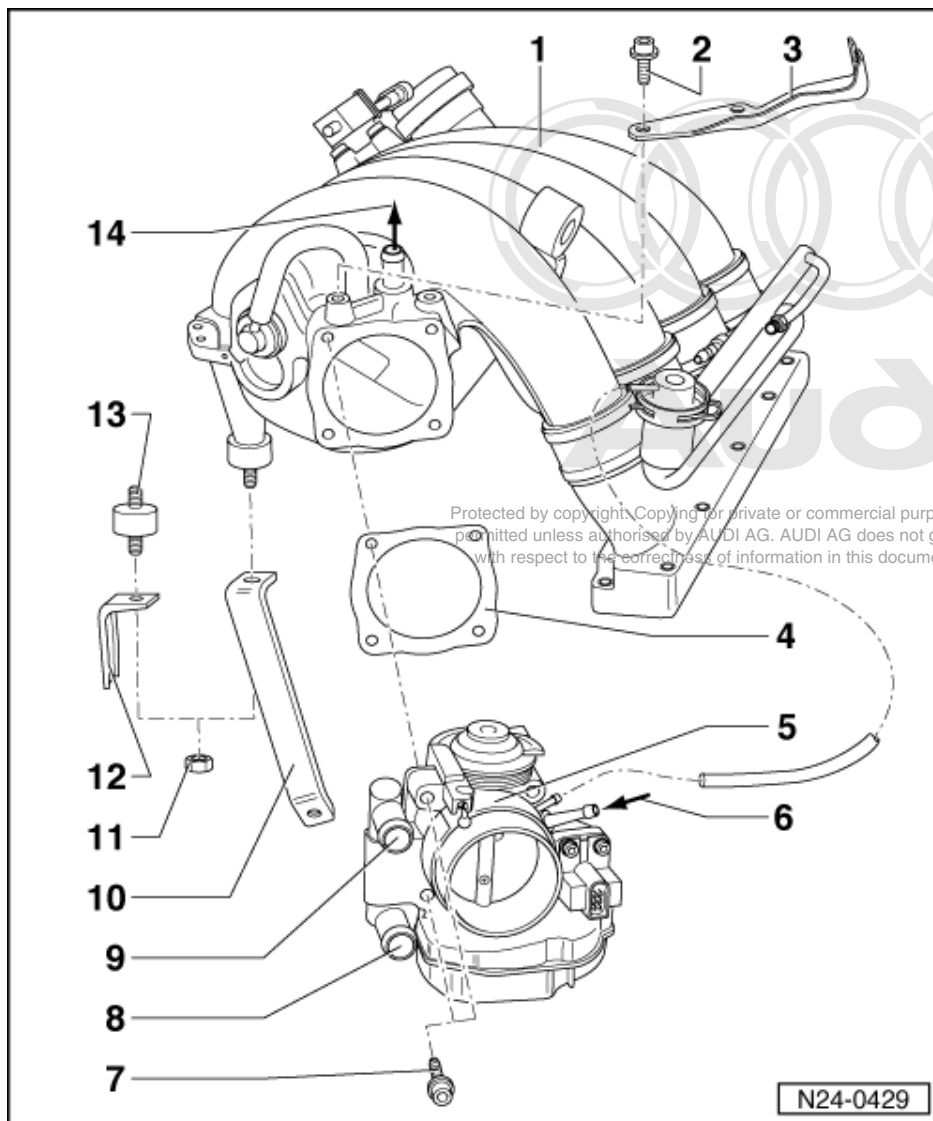


- 8 Vacuum actuator
- 9 10 Nm
- 10 Cover
- 11 Non-return valve
 - ♦ Installation position: White side facing intake manifold
- 12 Rubber grommet
- 13 Vacuum hose

1.7 - Removing and installing throttle valve control part



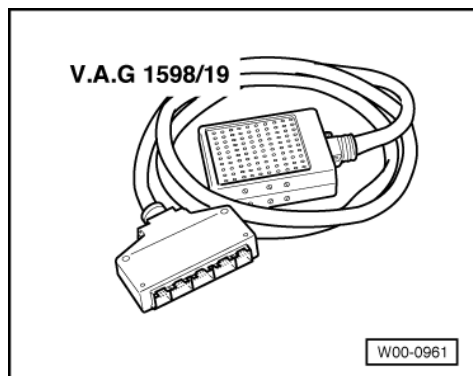
- 1 Intake manifold
- 2 10 Nm
- 3 Support bracket
 - ♦ For throttle cable
- 4 Gasket
 - ♦ Replace
- 5 Throttle valve control part -J338
- 6 From activated charcoal filter solenoid valve -N80



- 7 10 Nm
- 8 From coolant expansion tank
- 9 To top of radiator
- 10 Support
 - ♦ Between intake manifold and cylinder block
- 11 10 Nm
- 12 Support
 - ♦ Between intake manifold and alternator bracket, vane pump and guide roller
- 13 Bonded rubber bush
- 14 To suction jet pump

1.8 - Wiring and component check using test box V.A.G 1598/19

Special tools and workshop equipment required



- ♦ Test box V.A.G 1598/19

Attention:

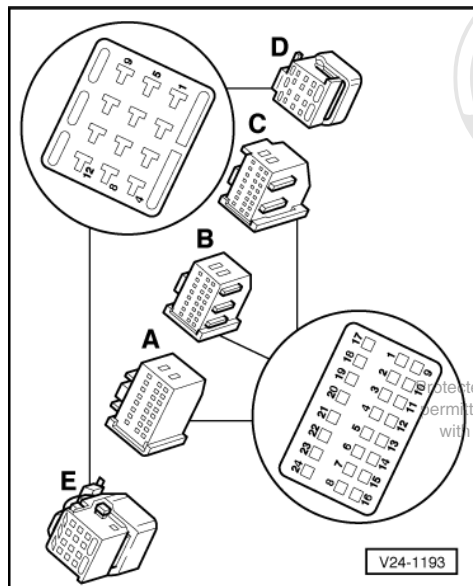
So as not to destroy electronic components, select required measuring range before connecting test leads and observe test conditions.

Sequence of operations

- Switch off ignition.
- Remove engine control unit => Page 65 .
- Disconnect control-unit plugs after releasing clips.

Note:

Always switch off ignition before disconnecting or connecting control unit connectors.



- -> Connect test box V.A.G 1598/19 to unplugged connectors of engine control unit.

Notes:

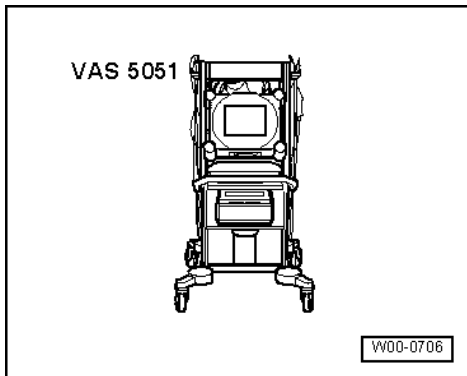
- ♦ For connection of measuring instruments (e.g. voltage tester V.A.G 1527 B, portable multimeter V.A.G 1526 A), always make use of adapter set V.A.G 1594 A.

- ♦ Contact numbers of connectors coincide with socket numbers of test box.
- Perform testing as described in appropriate repair operations.

1.9 - Replacing engine control unit

Fitting location => Exploded view of fitting locations - Page 57

Special tools and workshop equipment required



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

or

- ♦ V.A.G 1551 with V.A.G 1551/1

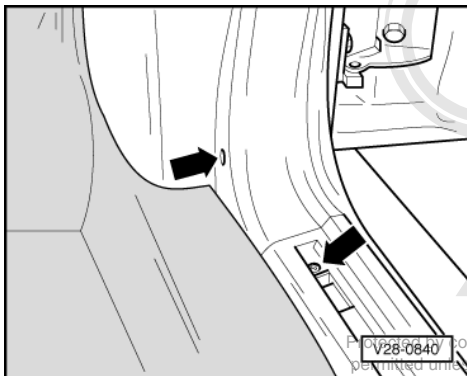
Removing

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

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

8D0907557F..	1.8l	R4/5V	MOTR HS
D..	□		
Code 04002	WSC 12345		

- Always start by displaying control unit identification and printing it out => Page 3 .
- Compare code to encoding alternatives => Page 28 .
- Switch off ignition.

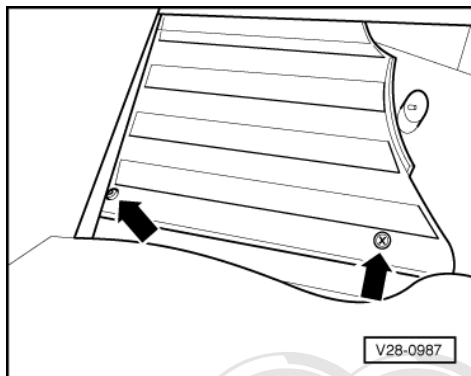


- -> Remove bottom right A-pillar trim and right sill panel trim in area of front door.

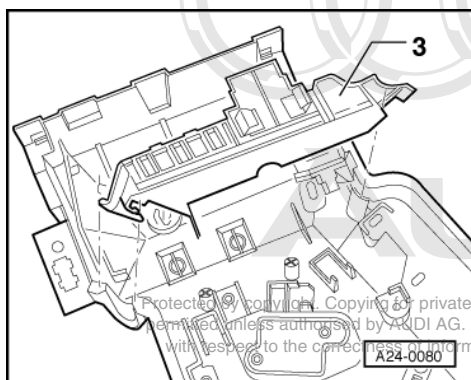
=> General Body Repairs; Repair Group 70; Trim; Removing and installing A-pillar trim Trim Removing and installing A-pillar trim

=> General Body Repairs; Repair Group 70; Trim; Removing and installing inner sill panel trim Trim Removing and installing inner sill panel trim

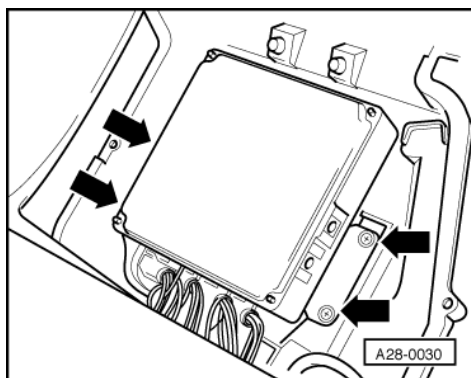
- Fold back floor covering in front right footwell (if necessary, use knife to cut open perforated seam on left).



- -> Screw out bolts for cover of electronics box -arrows-.
- Carefully disengage upper and lower cover section.



- -> Pull out transverse brace -3- with attachments.



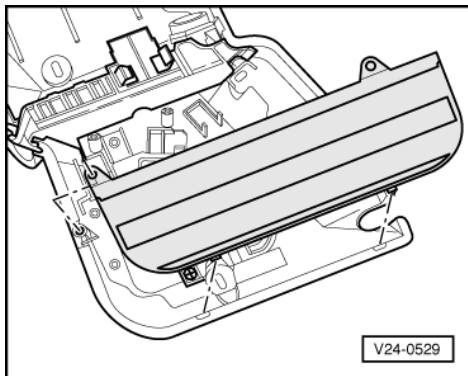
- -> Unscrew engine control unit from electronics box in footwell on right -arrows-.
- Take out engine control unit.
- Disconnect control-unit plugs after releasing clips.

Note:

Always switch off ignition before disconnecting or connecting control unit connectors.

Installing

Install in reverse order, paying attention to the following:

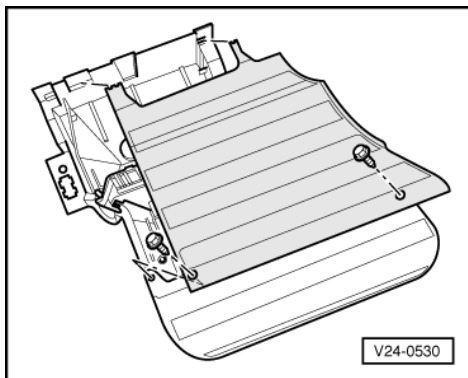


Note:

Always switch off ignition before disconnecting or connecting control unit connectors.

- -> Guide lower cover section into both openings of electronics box in footwell on right.

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- -> Engage upper cover section in both openings of electronics box in footwell on right.

Note:

Somewhat rough idling and slight jolting when driving may be encountered in the initial learning phase during engine basic setting.

- Interrogate and erase fault memory => Page 4 .
- Encode control unit => Page 28 .
- Perform throttle valve control part adaption => Page 114 .
- Adapt engine electronics control unit to immobilizer control unit.

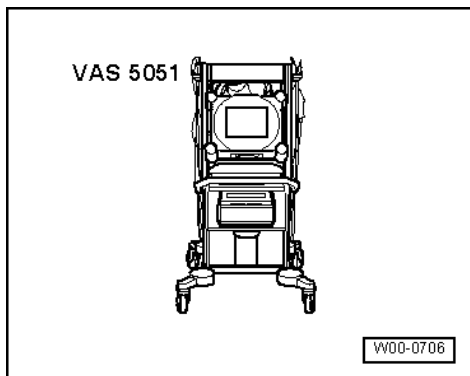
=> Electrical System; Repair Group 01; Self-diagnosis; Adaption on replacement of engine control unit Self-diagnosis Adaption on replacement of engine control unit

1.10 - Checking idling speed

The idling speed is specified by the engine control unit and cannot be adjusted.



Special tools and workshop equipment required



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

or

- ♦ V.A.G 1551 with V.A.G 1551/1

Test requirements:

- Coolant temperature at least 85 °C
- Electr. loads switched off (radiator fan must not run during test)
- Air conditioner switched off
- Vehicles with automatic gearbox: Selector lever set to P or N
- No leaks in exhaust system
- Throttle cable correctly adjusted

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

Test sequence

- Interrogate fault memory => Page 4 . There must not be any faults stored. If necessary, eliminate fault, erase fault memory, switch off and re-start engine, perform test drive and re-interrogate fault memory as a check.
- Leave engine idling.

Reading measured value block 3			
1	2	3	4

- > Read measured value block, Display group 003 => Page 37 .
- Check display in zone 3.
 - Specification: At least 85°C

Do not continue with test until coolant temperature has been attained.

- Check display in zone 1.
 - Specification: 820 ... 900 rpm

If reading matches specification:

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

If reading does not match specification:

- Press C key.

Reading measured value block 20			
1	2	3	4

-> Read measured value block, display group 020.

Vehicles with automatic gearbox:

- Check display in zone 2.
 - Specification: Neutral (automatic gearbox)
- If necessary, move selector lever to P or N.

Vehicles with air conditioner:

- Check display in zone 4.
 - Specification: Compr. OFF
- If necessary, switch off air conditioner.

All models:

- Check display in zone 1.
 - Specification: 820 ... 900 rpm

If reading does not match specification:

- Press C key.

Reading	measured	value	block 4
1	2	3	4

- > Read measured value block, display group 004.
- Check display in zone 4.
 - Specification: Idling speed

In the event of any other display:

- Check idling-speed switch => Page 115 .
- Check display in zone 1.
 - Specification: 0...5 <°

If reading does not match specification:

- Check adaption of throttle valve control part => Page 114 .

If reading matches specification:

Reading	measured	value	block 5
1	2	3	4

- > Read measured value block, display group 005.
- Check display in zone 1.
 - Specification: 820 ... 900 rpm

Possible faults if idling speed is too low:

- ◆ Engine under load
 - ◆ Throttle valve control part not adapted to engine control unit
 - ◆ Throttle valve control part defective
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Possible faults if idling speed is too high:

- ◆ Unmetered air in intake system
- ◆ Throttle valve control part not adapted to engine control unit
- ◆ Throttle valve control part defective
- ◆ Activated charcoal filter solenoid valve constantly open

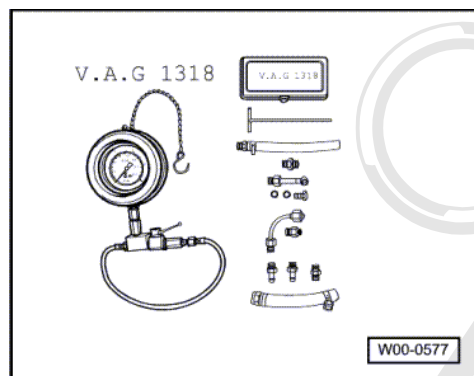


1.11 - Checking system pressure, fuel pressure regulator and holding pressure

Note:

The fuel pressure regulator controls the fuel pressure as a function of the intake manifold pressure at the throttle valve unit.

Special tools and workshop equipment required



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

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Test requirements:

- Battery voltage at least 12.7 V
- Fuel pump relay OK; checking => Page 83
- Fuel pump OK; checking

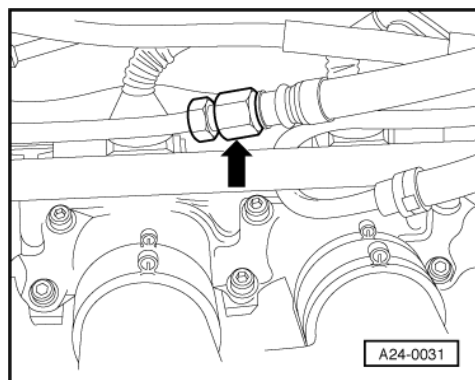
=> Fuel Supply System - Petrol Engines; Repair Group 20; Fuel Supply Fuel Supply

- Fuel filter OK

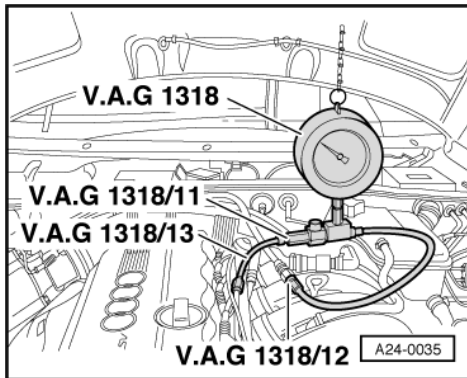
Attention:

Checking system pressure and fuel pressure regulator

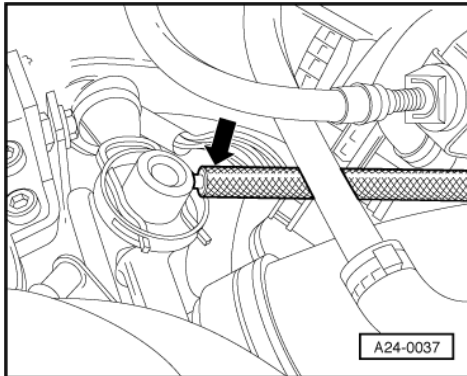
- Briefly open tank cap (pressure dissipation).
- Remove engine covers.
- Use rag to cover union (fuel pressure).



- -> Unfasten union -arrow- and catch fuel emerging with a rag.



- -> Connect up pressure gauge V.A.G 1318 with adapters 1318/11, 1318/12 and 1318/13 to supply pipe.
- Open pressure gauge cut-off valve. Lever points in direction of flow.
- Start engine and let it idle.
- Measure fuel pressure.
 - Specification: approx. 3.5 bar



- -> Pull vacuum hose -arrow- off fuel pressure regulator.
- Fuel pressure must increase to approx. 4.0 bar
- Re-connect vacuum hose.
- Switch off ignition.

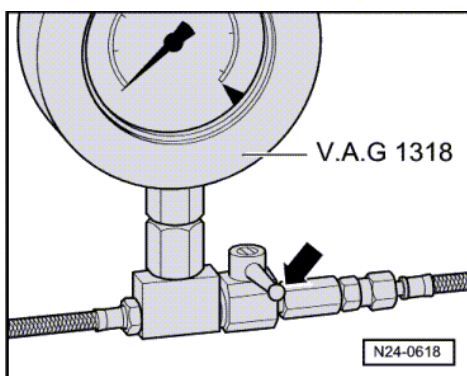
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Checking holding pressure

- Check freedom from leaks and holding pressure by observing pressure drop on gauge.
 - After 10 minutes pressure must still be at least 2.5 bar

If holding pressure drops below 2.5 bar:

- Start engine and let it idle.



- -> Switch off ignition once pressure has built up. At the same time, close cut-off valve of pressure gauge V.A.G 1318 (lever at right angles to direction of flow -arrow-).



- Observe pressure drop on gauge.

If pressure does not now decrease:

- Check fuel pump non-return valve.

If pressure does decrease again:

- Open pressure gauge cut-off valve. Lever points in direction of flow.
- Start engine and let it idle.
- Switch off ignition once pressure has built up. At the same time, pinch off return hose (with blue mark).

If pressure does not now decrease:

- Replace fuel pressure regulator.
- Check pipe connections, O-rings at fuel rail and injectors for leaks.
- Check pressure gauge for leaks.

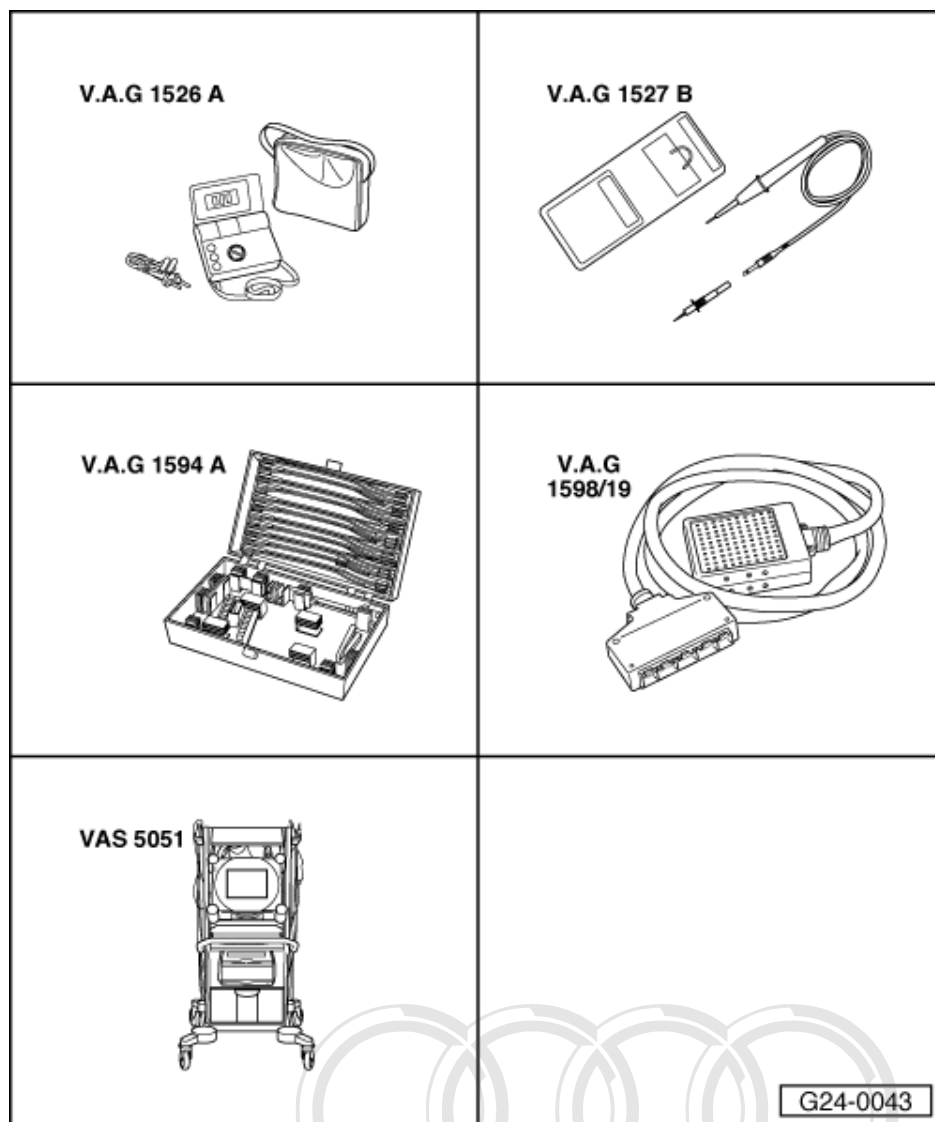
Note:

To remove pressure gauge, close cut-off valve, unfasten union at adapter V.A.G 1318/12 and drain off excess fuel into collector by opening cut-off valve.



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1.12 - Checking injectors



Special tools and workshop equipment required

- ◆ V.A.G 1526 A
- ◆ V.A.G 1527 B
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598/19
- ◆ VAS 5051 with VAS 5051/1 and VAS 5051/2

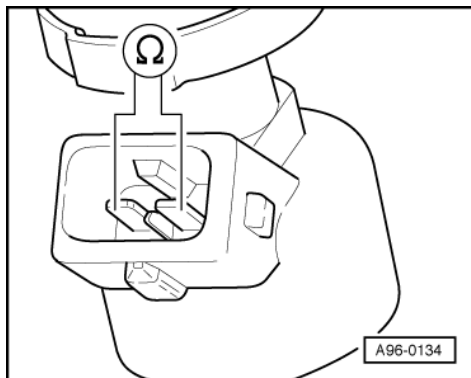
or

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- ◆ V.A.G 1551 with V.A.G 1551/1

Checking internal resistance

- Remove engine covers.
- Unplug connector at injector to be checked.



- -> Connect multimeter to injector for resistance measurement.
- Specification: 11 ... 13 ω (at ambient temperature)

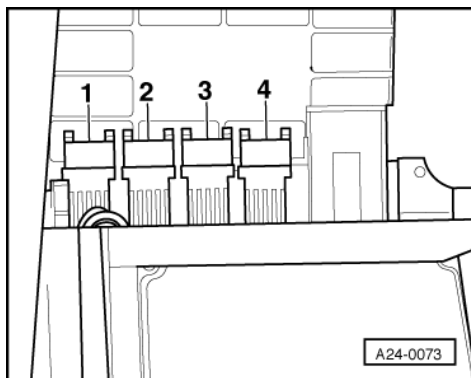
If reading does not match specification:

- Replace injector.

If reading matches specification:

Checking power supply

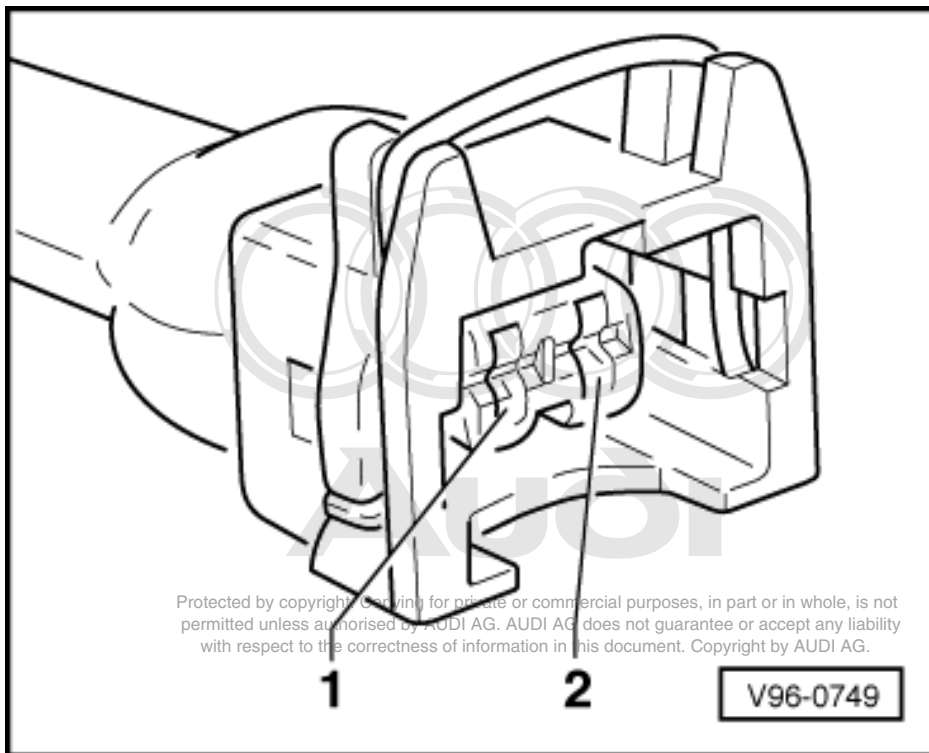
Test requirements:



- Fuel pump relay OK; checking => Page 83
- -> Fuse S116 (in red box in electronics box in passenger's footwell) OK
- Unplug connector at injector to be checked.



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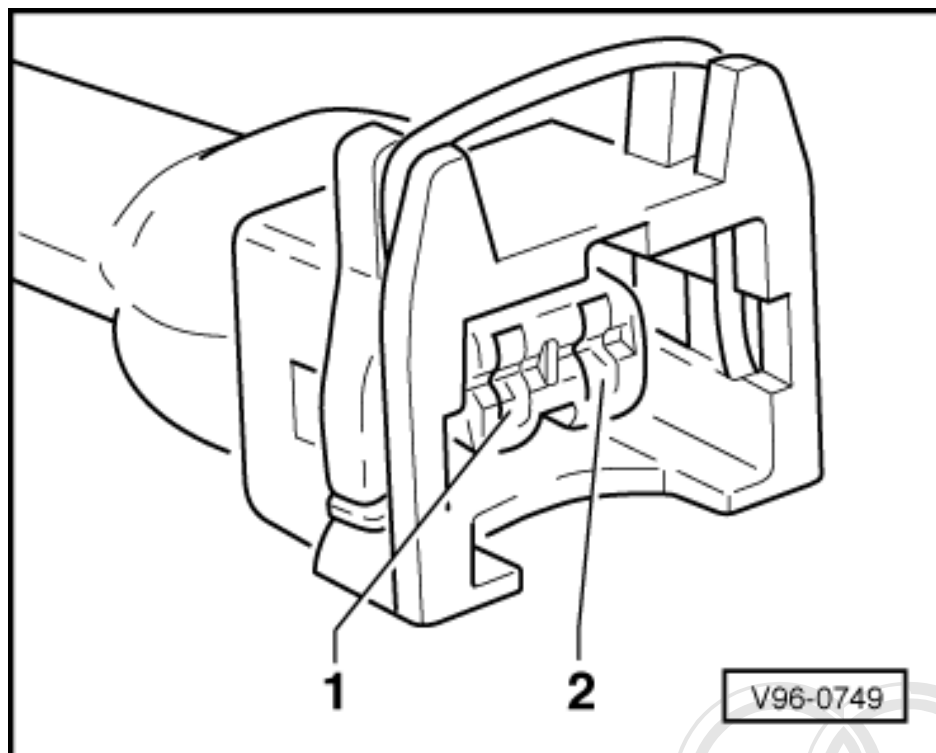


- -> Connect up voltage tester V.A.G 1527 B as follows.

Connector Contact	Measure to
1	Engine earth

- Switch on ignition.
 - LED must light

If LED does not light:



- -> Check wiring from contact 1 via fuse for injectors to fuel pump relay.
- => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder
- Eliminate open circuit in wiring if necessary.

If LED lights:

Checking actuation

Test requirement:

- Injector internal resistance OK
- Start final control diagnosis and actuate injectors => Page 24 .

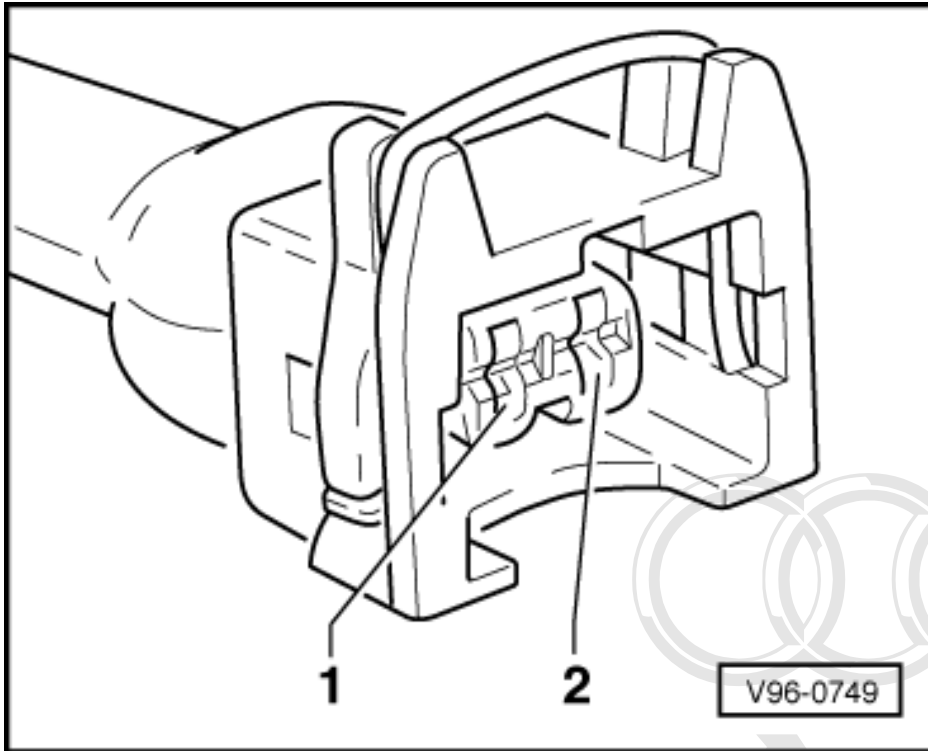
-> Indicated on display:

Final control diagnosis
Injector, cylinder 1 -N30

- Turn accelerator mechanism at throttle valve control part to open idling-speed switch.
 - Injector must click five times

If injector clicks:

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- Actuate next injector.

If injector does not click:

- Unplug connector at injector to be checked.
- -> Connect up voltage tester V.A.G 1527 B between contacts 1 and 2.
- Repeat final control diagnosis and actuate injector again.

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Note:

Switch off ignition for approx. 20 s before re-selecting function 03 "Final control diagnosis".

- LED must flash five times

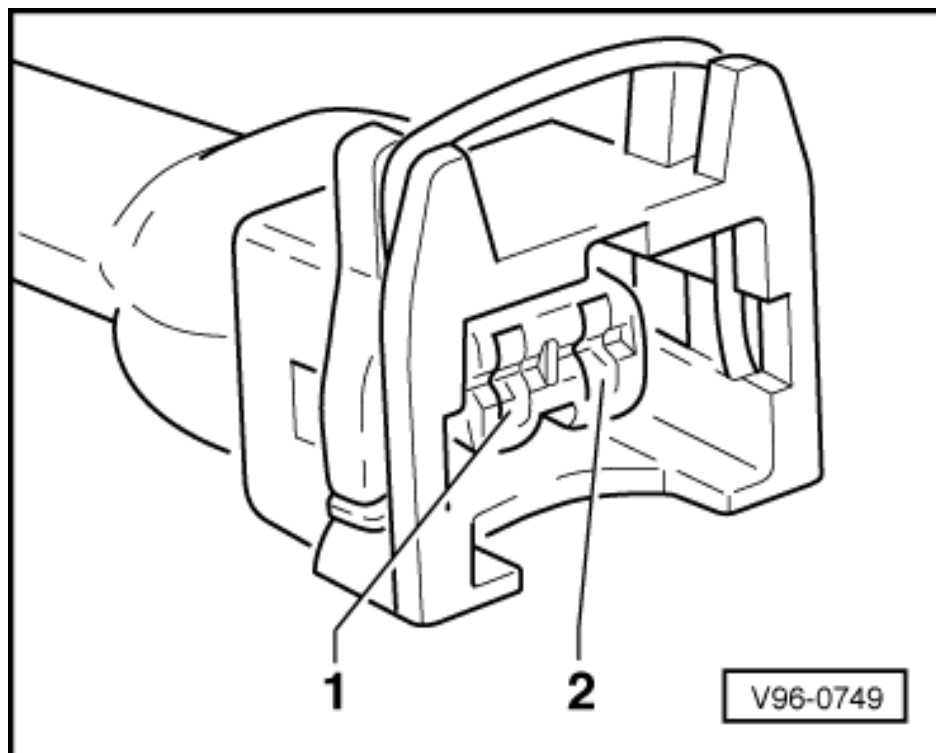
Note:

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

If LED does not flash:

Checking wiring

- Switch off ignition.
- Connect up test box V.A.G. 1598/19 at wiring harness to engine control unit => Page 64 .



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

Cylinder	Injector connector Contact	Test box V.A.G 1598/19 Socket
1	2	E1
2	2	E6
3	2	E5
4	2	E2

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

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

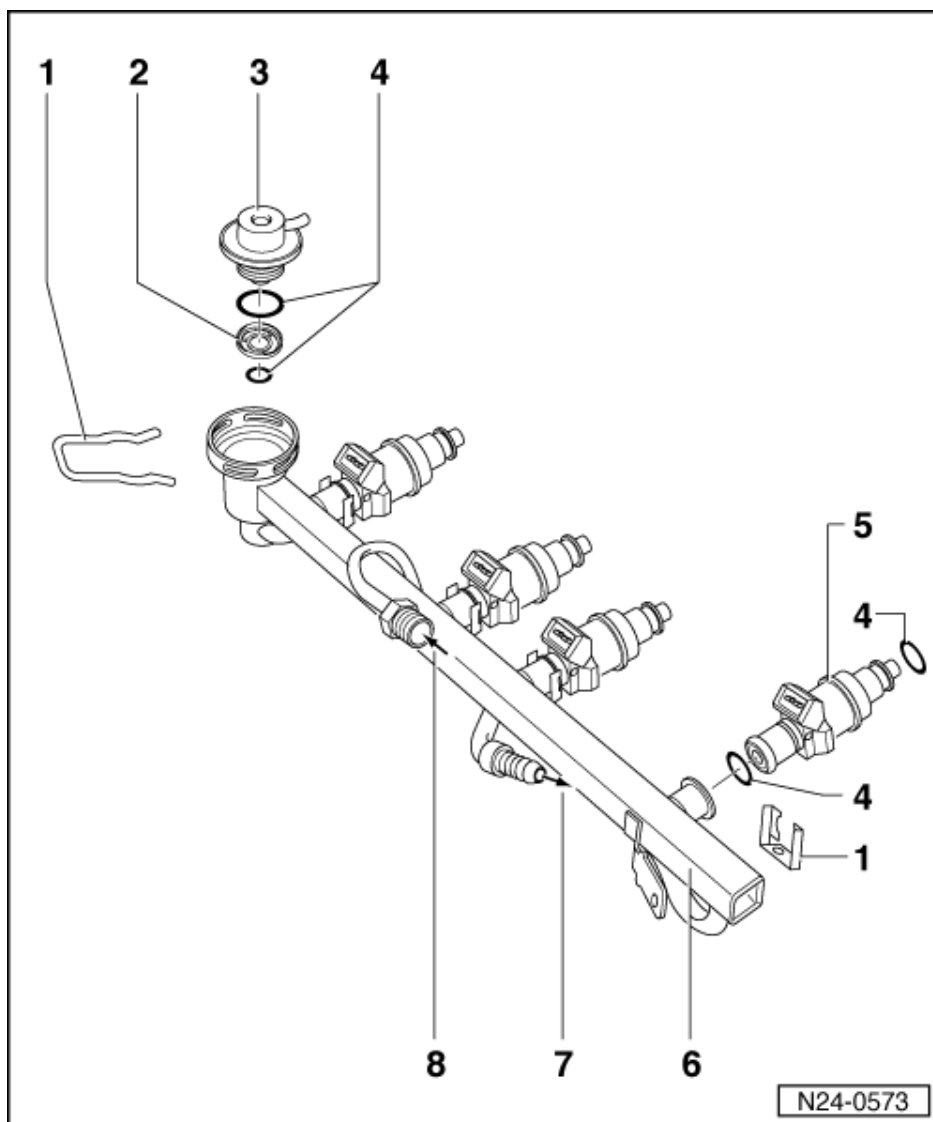
If no fault is found:

- Replace engine control unit => Page **65** .



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1.13 - Dismantling and assembling fuel rail with injectors



- 1 Clip
 - ♦ Check proper attachment at injector and fuel rail
- 2 Strainer
- 3 Fuel pressure regulator
- 4 O-ring
 - ♦ Replace if damaged
- 5 Injectors -N30 ... -N33
- 6 Fuel rail
- 7 Fuel return pipe
- 8 Fuel supply pipe
 - ♦ From fuel filter
 - ♦ Tighten to 25 Nm

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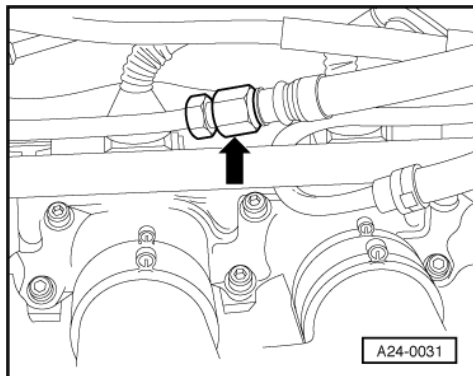
1.14 - Removing and installing injectors

Removing

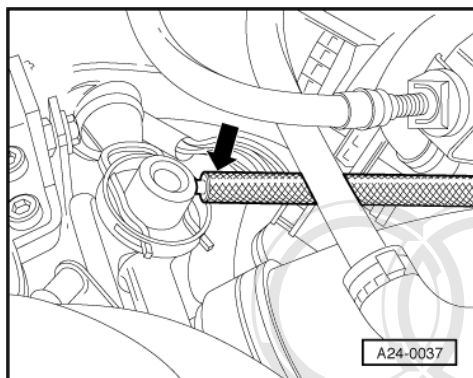
- Briefly open tank cap (pressure dissipation).
- Remove engine covers.

Attention:

- Use rag to cover union (fuel pressure).



- -> Unfasten union -arrow- and catch fuel emerging with a rag.



- -> Pull vacuum hose -arrow- off fuel pressure regulator.
- Unplug connectors from injectors and Hall sender.
- Unscrew fuel rail from intake manifold and detach from intake manifold with injectors upwards.
- Pull off clip at injector/fuel rail connection and pull injector out of fuel rail.

Note:

Replacement of fuel rail involves detaching fuel hoses.

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Installing

Install in reverse order, paying attention to the following:

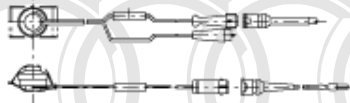
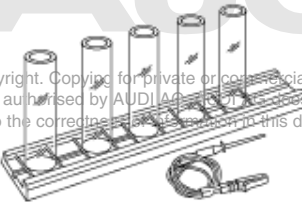
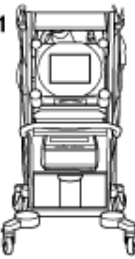
- Replace O-rings at all joints opened (to replace front O-ring, never pull plastic cap off valve head - lift O-ring over plastic cap).
- Moisten O-rings with clean engine oil.
- Make sure injectors are installed in correct position.
- Make sure clips are properly connected.

- Position fuel rail with secured injectors at intake manifold and press in evenly.

Tightening torque

Component	Nm
Fuel rail to intake manifold	10

1.15 - Checking injection quantity, freedom from leaks and spray pattern of injectors

V.A.G 1348/3-2 	V.A.G 1348/3A 
V.A.G 1594 A 	V.A.G 1602 
VAS 5051 	G24-0001

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Special tools and workshop equipment required

- ◆ V.A.G 1348/3-2
- ◆ V.A.G 1348/3A
- ◆ V.A.G 1594 A
- ◆ V.A.G 1602
- ◆ VAS 5051 with VAS 5051/1 and VAS 5051/2

or



- ♦ V.A.G 1551 with V.A.G 1551/1

Test requirement:

- Fuel pressure OK; checking => Page 70

Sequence of operations

- Remove fuel rail with injectors installed from intake manifold
=> Page 80 . Leave fuel hoses connected.
- Lift fuel rail with injectors off intake manifold and provide support.
- Start final control diagnosis => Page 24 .
 - Fuel pump must run

Note:

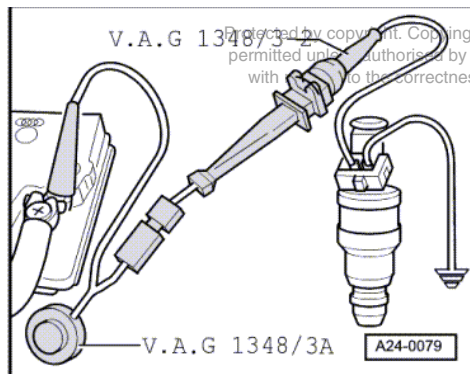
This step is merely designed to enable the fuel pump to run with engine stopped.

Leak test

- Check injectors for leaks (visual inspection). With fuel pump running, only 1...2 drops per minute per injector may emerge.
- In the event of greater fuel loss, switch off fuel pump (end final control diagnosis) and replace defective injector => Page 80 .

Checking injection quantity

- Hold injector to be tested over graduated beaker of injection quantity tester V.A.G 1602.



- -> Connect one contact of injector to engine earth using test lead and crocodile clamp from V.A.G 1594 A.
- Connect second contact of injector to positive with remote control V.A.G 1348/3A, adapter lead V.A.G 1348/3-2 and test lead.
- Start final control diagnosis => Page 24 .

Note:

Switch off ignition for approx. 20 s before re-selecting function 03 "Final control diagnosis".

-> Indicated on display:

Final control diagnosis
Injector, cylinder 1 -N30

- Fuel pump must run
Operate remote control V.A.G 1348/3A for 30 seconds.
Perform measurement with all injectors.
- Once all four injectors have been actuated, place graduated beakers on a flat surface.
 - Specification for each injector: 85...105 ml

If reading does not match specification for all injectors:

- Check fuel pressure => Page 70 .

If reading does not match specification for one injector:

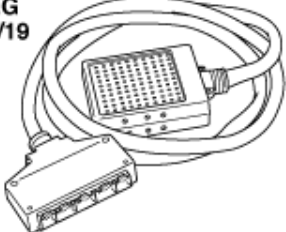
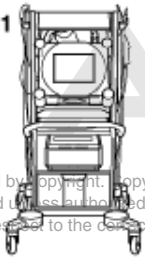
- Replace injector.

Note:

Spray pattern is also to be checked when checking injection quantity. It must be the same for all injectors.

- Install injectors with fuel rail => Page 80 .

1.16 - Checking fuel pump relay -J17 and actuation

V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598/19 	VAS 5051  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.
	G24-0041

Special tools and workshop equipment required

- ◆ V.A.G 1526 A
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598/19
- ◆ VAS 5051 with VAS 5051/1 and



VAS 5051/2

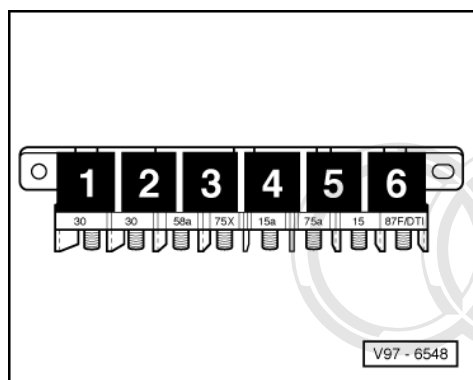
or

- ♦ V.A.G 1551 with V.A.G 1551/1

The fuel pump and several injection system components are supplied with power by way of the fuel-pump relay -J17.

A prerequisite for energisation of the fuel pump relay -J17 is that the engine is running. In other words, earth is not applied to the relay (via the engine control unit) until engine speed pulses are detected in the engine control unit.

Note:



-> Fitting location of fuel-pump relay: Central electrics beneath dash panel on left, position 6

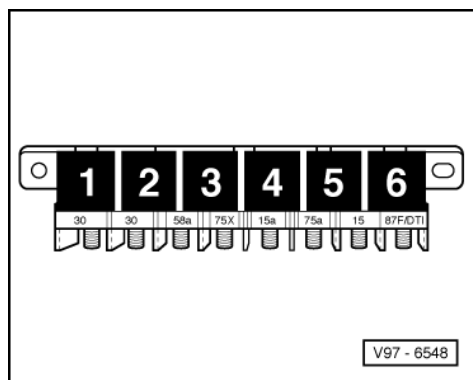
Test requirement:

- Battery voltage at least 12.7 V

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Checking operation of fuel-pump relay

- Start final control diagnosis and actuate one injector => Page 24 .



- -> Fuel-pump relay (central electrics beneath dash panel on left, position 6) must be energised and fuel pump must run

A - If relay is not energised:

- Check power supply of fuel-pump relay => Page 85 .
- Check actuation of fuel pump relay => Page 86 .

B - If relay is energised, but fuel pump does not run:

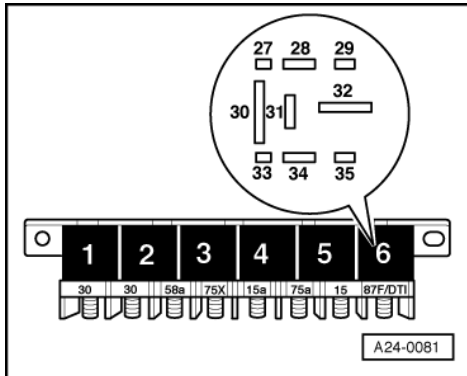
- Check power supply for fuel pump and components (from fuel-pump relay) =>Page **87** .

Checking power supply of fuel-pump relay

- Remove driver's storage compartment.

=> General Body Repairs; Repair Group 70; Dash Panel; Removing and installing storage compartment and glove box Dash Panel Removing and installing storage compartment and glove box

- Pull off fuel-pump relay.
- Switch on ignition.



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

Central electrics, position 6 Contact	Measure to
32	Engine earth
28	Engine earth

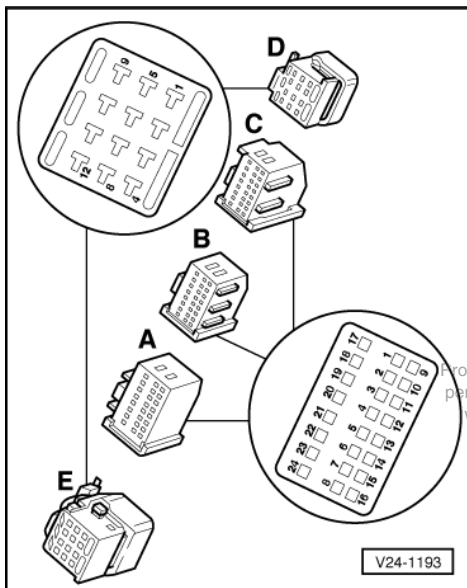
- Specification: approx. battery voltage

If reading does not match specification:

- Replace central electrics.

If reading matches specification:

- Re-insert fuel-pump relay.

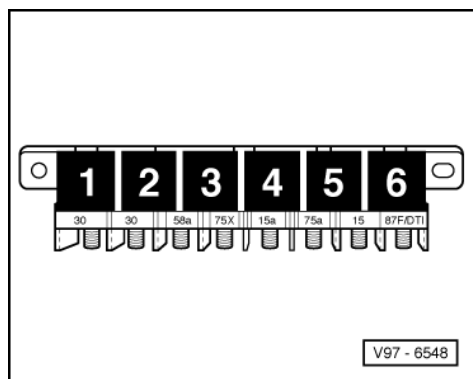


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Checking actuation of fuel pump relay

- Switch off ignition.
- -> With ignition switched off, connect test box V.A.G 1598/19 to connector D of engine control unit only (not to control unit) => Page 64 .
- Use test lead from V.A.G 1594 A to connect socket D11 and socket D6 of test box.
- Switch on ignition.



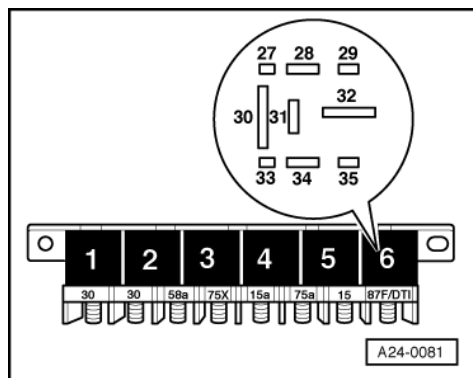
- -> Fuel-pump relay (central electrics beneath dash panel on left, position 6) must be energised

If relay is now energised, but not during final control diagnosis:

- Replace engine control unit => Page 65 .

If relay is not energised:

- Switch off ignition.
- Pull off fuel-pump relay.



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

Central electrics, position 6 Contact	Test box V.A.G 1598/19 Socket
29	D6

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

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

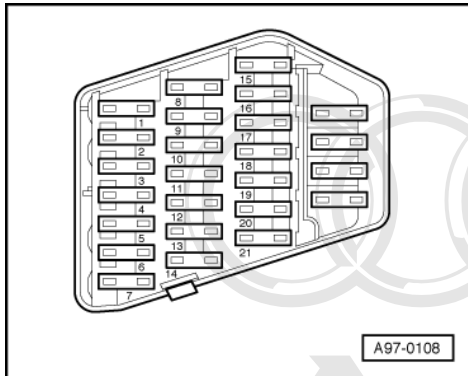
If no fault is found in wiring:

- Replace fuel pump relay -J17.

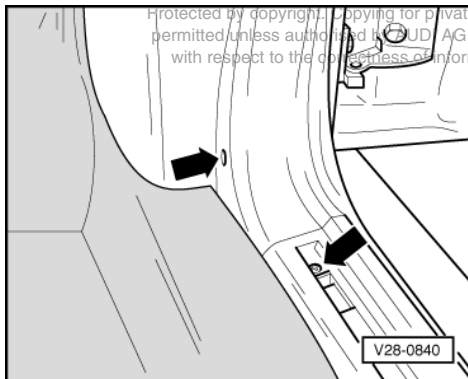


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Checking power supply for fuel pump and components



- Detach cover from fuse box on left.
- -> Pull out fuse S17.

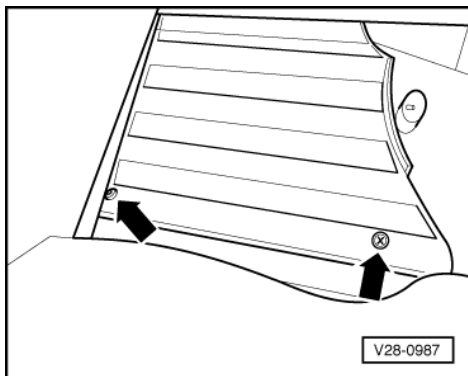


- -> Remove bottom right A-pillar trim and right sill panel trim in area of front door.

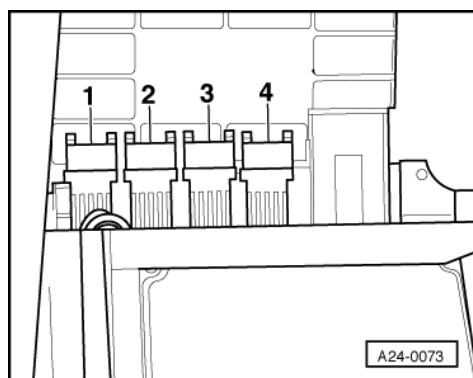
=> General Body Repairs; Repair Group 70; Trim; Removing and installing A-pillar trim Trim Removing and installing A-pillar trim

=> General Body Repairs; Repair Group 70; Trim; Removing and installing inner sill panel trim Trim Removing and installing inner sill panel trim

- Fold back floor covering in front right footwell (if necessary, use knife to cut open perforated seam on left).



- -> Screw out bolts for cover of electronics box -arrows-.
- Carefully disengage upper and lower cover section.



- -> Pull out fuses S117 (in brown box) and S116 (in red box) in electronics box in passenger's footwell.
- Start final control diagnosis and actuate injector, cylinder 1 -N30
=> Page **24** .
- Connect up multimeter for voltage measurement to earth and to one of the contacts of the following fuses in the fuse box.

Fuse	Specification at one of the contacts
S17 (No. 17 in fuse box)	approx. battery voltage
S117 (in brown box)	approx. battery voltage
S116 (in red box)	approx. battery voltage

If readings do not match specifications:

- Repeat test at other contact of fuse socket.

If readings still do not match specifications:

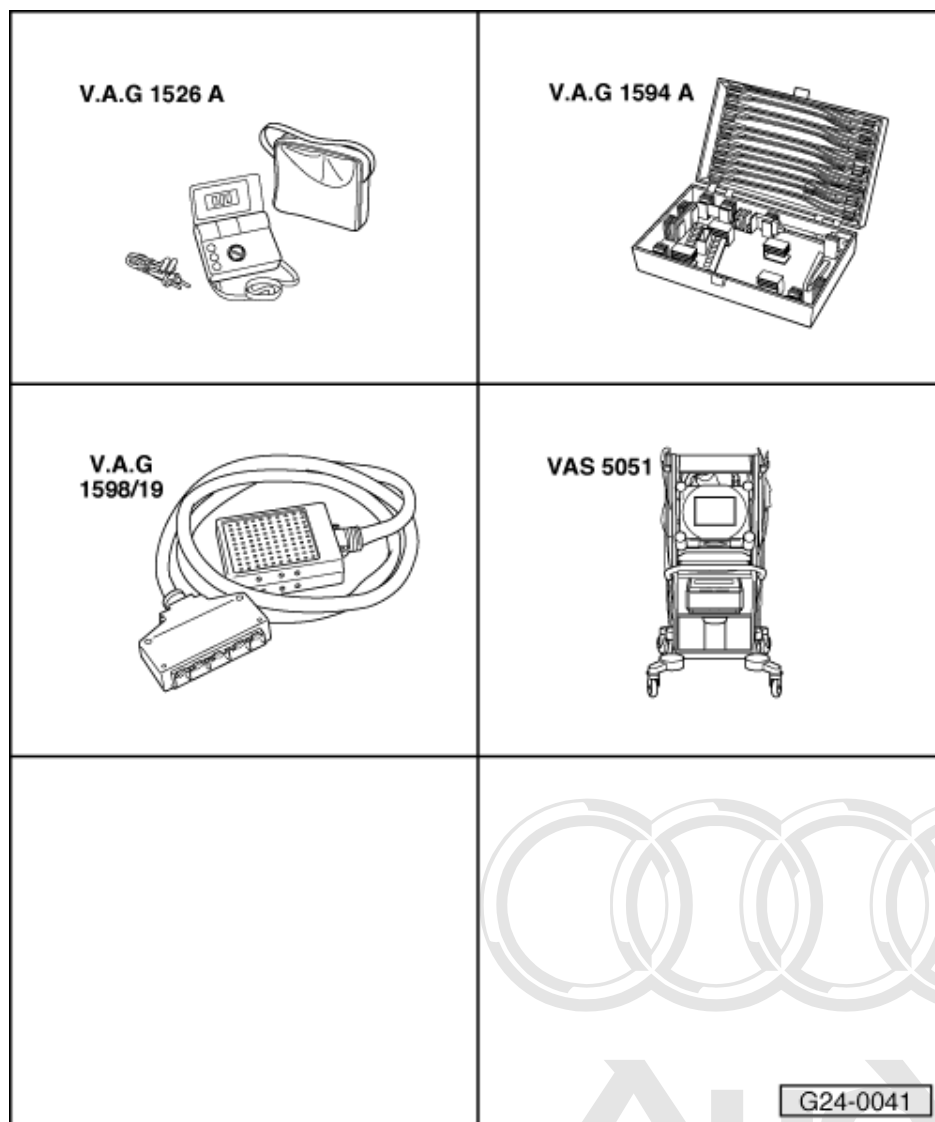
- Check wiring.

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

If no fault is found in wiring:

- Replace fuel pump relay -J17.

1.17 - Checking air-mass meter -G70



Special tools and workshop equipment required

- ◆ V.A.G 1526 A
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598/19
- ◆ VAS 5051 with VAS 5051/1 and VAS 5051/2

or

- ◆ V.A.G 1551 with V.A.G 1551/1

Fitting location => Exploded view of fitting locations - Page **57**

Test sequence

Reading	measured	value	block 2
1	2	3	4

- > Read measured value block, Display group 002, engine idling
=> Page **36**.
- Check display in zone 4.

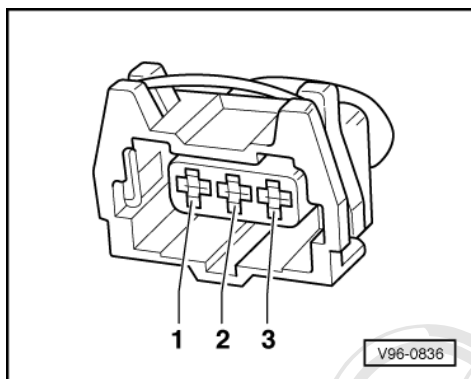


- Specification: 2.0 ... 4.0 g/s

If reading does not match specification:

Checking power supply

- Switch off ignition.
- Unplug connector from air-mass meter.



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

Connector Contact	Measure to
3	Engine earth

- Briefly operate starter.
- Specification: approx. battery voltage

Note:

Air-mass meter is supplied with power by fuel pump relay.

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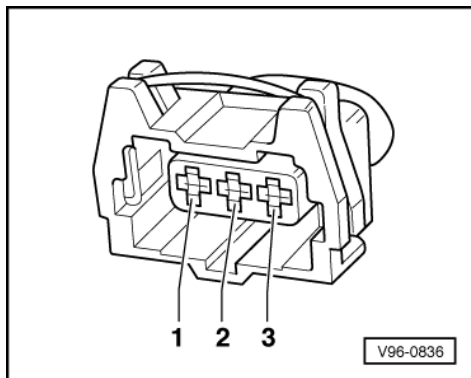
If reading does not match specification:

- Check for open circuit/short to earth in wiring from contact 3 of connector via fuse to fuel pump relay.

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

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

If power supply is OK:



Checking signal wire for air-mass meter

- -> Connect up multimeter for voltage measurement between contacts 2 and 3 of connector.

- Briefly operate starter.
- Specification: approx. battery voltage

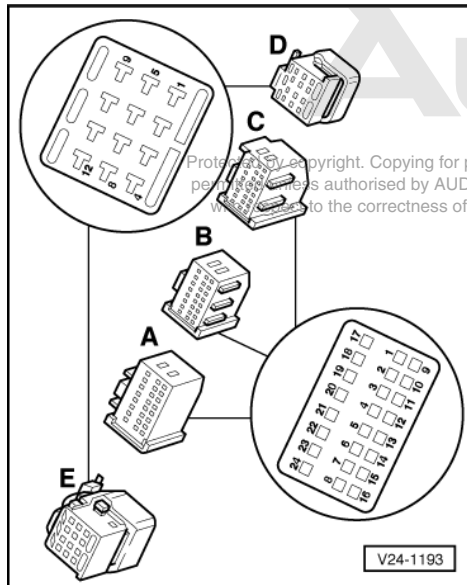
Note:

Engine control unit earth is applied to contact 2 of connector.

If reading does not match specification:

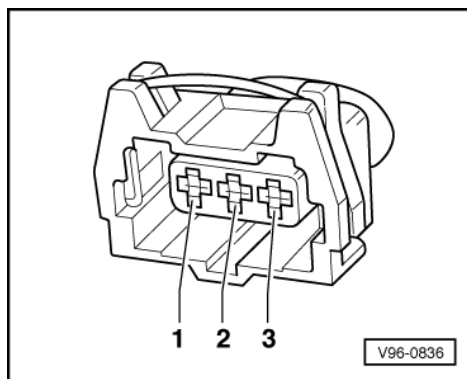
Checking wiring

Note:



Signal wire is also checked as part of wiring test.

- -> With ignition switched off, connect test box V.A.G 1598/19 to connector A of engine control unit only (not to control unit) => Page 64 .



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

Connector Contact	Test box V.A.G 1598/19 Socket
1	A1
2	A9

- Also check wires for mutual short circuit.



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

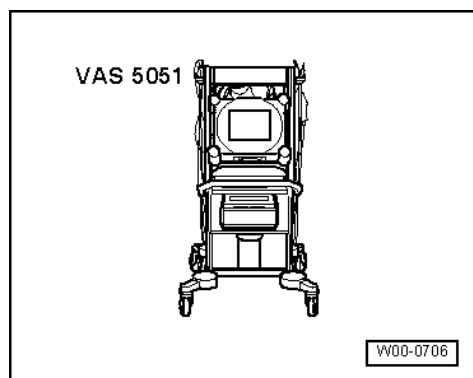
=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

If no fault is found in wiring:

- Replace air-mass meter -G70.

1.18 - Checking intake system for leaks (unmetered air)

Special tools and workshop equipment required



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

or

- ♦ V.A.G 1551 with V.A.G 1551/1
- ♦ Engine leak detector spray G 001 800 A1

Notes:

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

Test sequence

Reading measured value block 1			
1	2	3	4

-> Read measured value block, Display group 001 => Page **35**.

- Note engine speed in display zone 1.
- Systematically apply engine leak detector spray to intake system components.

If engine speed does not change:

- Press =>key.

-> Indicated on display (function selection):

Rapid data transfer	HELP
Select function XX	

If engine speed decreases:

- Press =>key.
- Enter "06" for "End output" function and confirm with Q key.
- Switch off ignition.

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

2 - Checking intake manifold changeover

2.1 - Checking intake manifold changeover

Check is only to be performed in the event of loss of power.

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2.2 - Checking operation

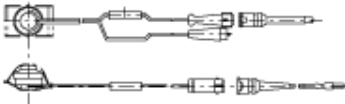
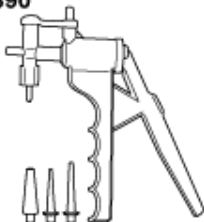
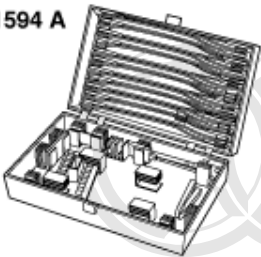
- Unclip cover -item **61** .
- Start engine.
- Abruptly increase engine speed (burst of throttle). Vacuum unit for intake-manifold changeover must be energised. (Fitting location: at intake manifold, front left).

Perform the following checks if changeover does not take place.

- Check intake-manifold changeover valve -N156 (if necessary, check valve and actuation => Page **76**).
- Check vacuum system for leaks =>Page **94** .
- Check vacuum pipes for proper connection, freedom from leaks and blockage.
- Check freedom of movement of changeover mechanism (actuate changeover linkage by hand).



2.3 - Checking for leaks in vacuum system for intake-manifold changeover

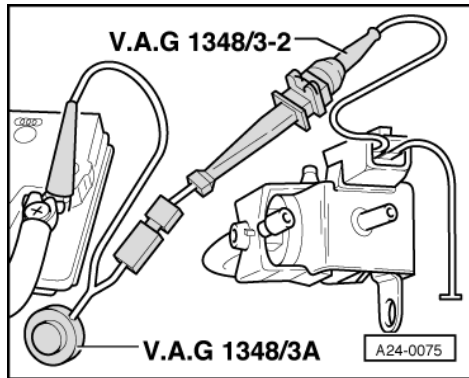
V.A.G 1348/3-2 	V.A.G 1348/3A 
V.A.G 1390 	V.A.G 1594 A 
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Special tools and workshop equipment required

- ♦ V.A.G 1348/3-2
- ♦ V.A.G 1348/3A
- ♦ V.A.G 1390
- ♦ V.A.G 1594 A

Test sequence

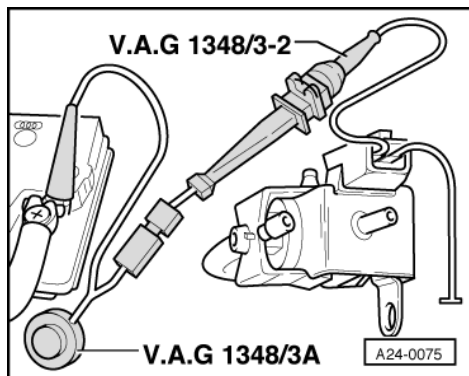
- Allow engine to idle for 2 to 3 minutes to build up vacuum.
- Switch off ignition.
- Unplug connector from intake-manifold changeover valve -N156.



- -> Use test leads and crocodile clamp from V.A.G 1594 A to connect one contact of valve to engine earth.
- Connect second contact of -N156 with remote control V.A.G 1348/3A, adapter lead V.A.G 1348/3-2 and test lead to positive.
- Actuate remote control V.A.G 1348/3A for approx. 2 to 3 minutes, during which period vacuum unit must remain energised.

If vacuum unit does not remain energised, check unit as follows:

- Pull vacuum pipes off vacuum unit for intake-manifold changeover.
- Connect vacuum hand pump V.A.G 1390 to vacuum unit.
- Actuate hand pump and observe changeover.
- Check vacuum unit for leaks (vacuum unit must not return to initial position until hand pump is vented).
- Replace vacuum unit if necessary.
- If vacuum unit is not energised, check -N156 for blockage as follows.

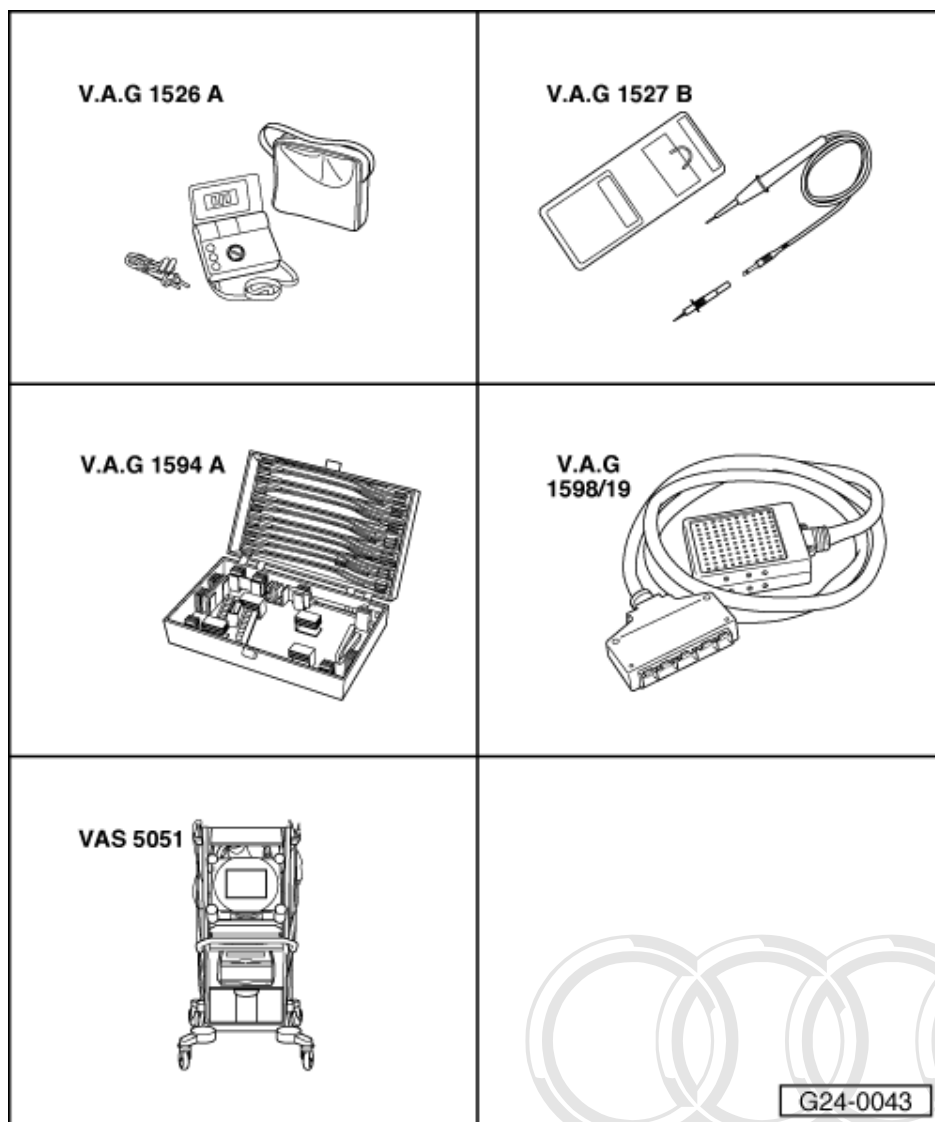


- -> Use test leads and crocodile clamp from V.A.G 1594 A to connect one contact of -N156 to engine earth.
- Connect second contact of -N156 with remote control V.A.G 1348/3A, adapter lead V.A.G 1348/3-2 and test lead to positive.
- Operate remote control V.A.G 1348/3A.
- Check valve for blockage (pull off vacuum pipes and blow through).
- If necessary, replace intake-manifold changeover valve.

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2.4 - Checking intake-manifold changeover valve -N156



Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1527 B
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/19
- ♦ VAS 5051 with VAS 5051/1 and VAS 5051/2

or

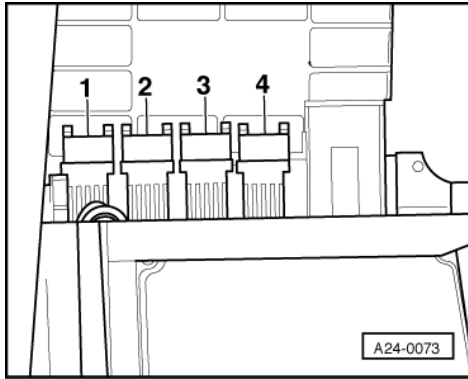
- ♦ V.A.G 1551 with V.A.G 1551/1

Fitting location => Exploded view of fitting locations - Page **57**

Test requirements:

- Final control diagnosis implemented

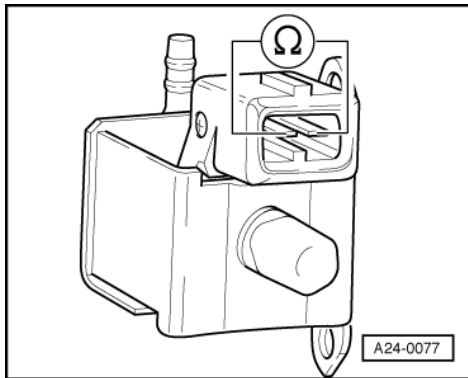
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- -> Fuse S117 OK (in brown box in electronics box in passenger's footwell)
- Fuel pump relay OK; checking => Page **83**

Checking internal resistance

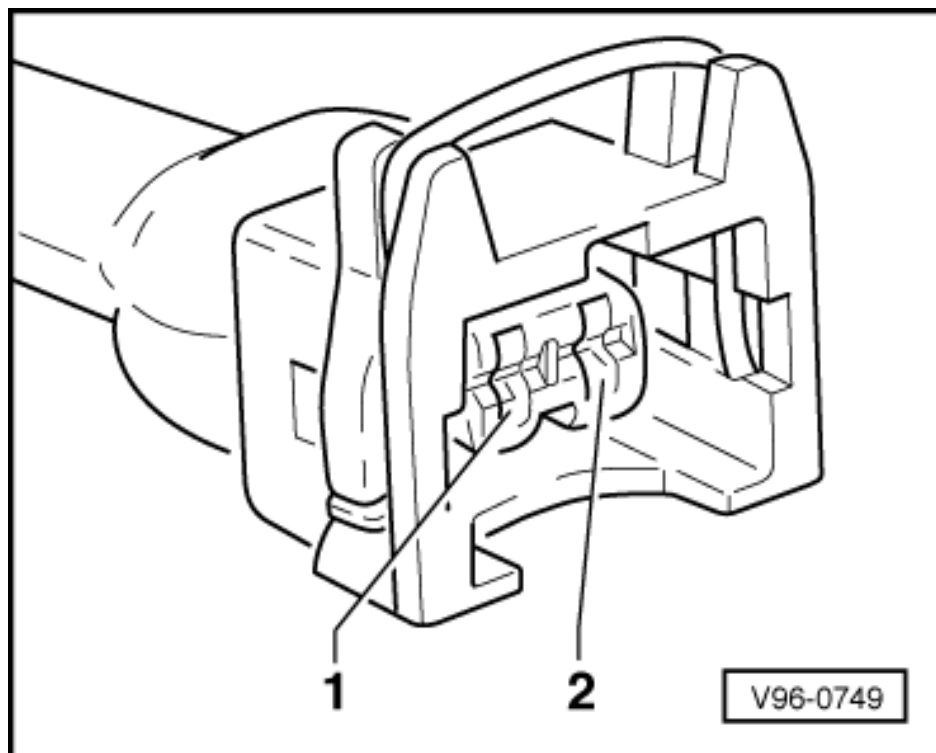
- Unplug connector from intake-manifold changeover valve -N156.



- -> Connect multimeter to valve for resistance measurement.
 - Specification: 25 ... 35 ω
- If reading does not match specification, replace intake-manifold changeover valve -N156.

Checking power supply

- Unplug connector from intake-manifold changeover valve -N156.



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

Connector Contact	Measure to
1	Engine earth

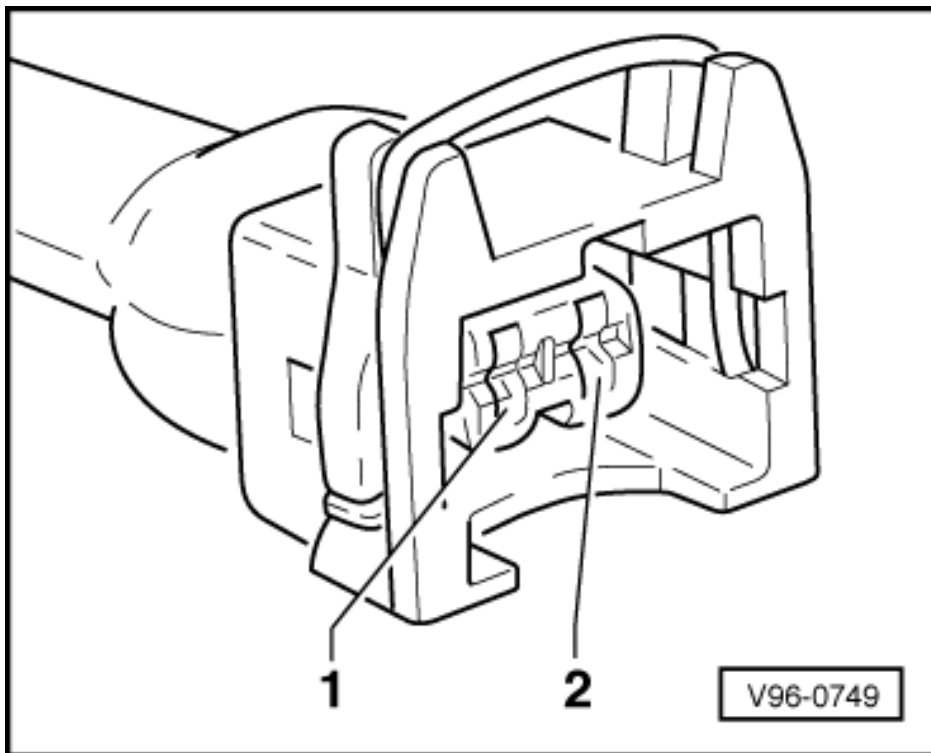
- Briefly operate starter.
- LED must light

If LED does not light:

- Check for open circuit in wiring from contact 1 via fuse to fuel pump relay.

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

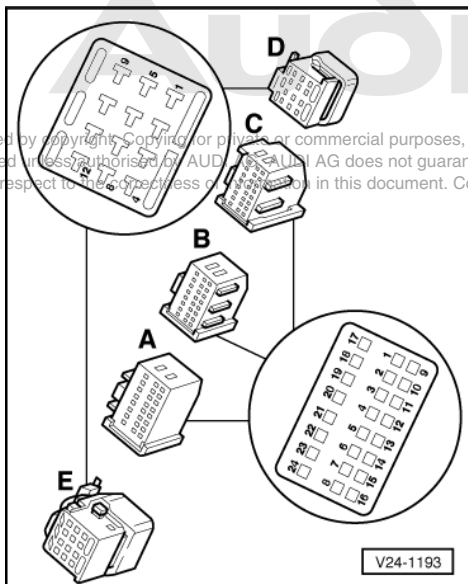
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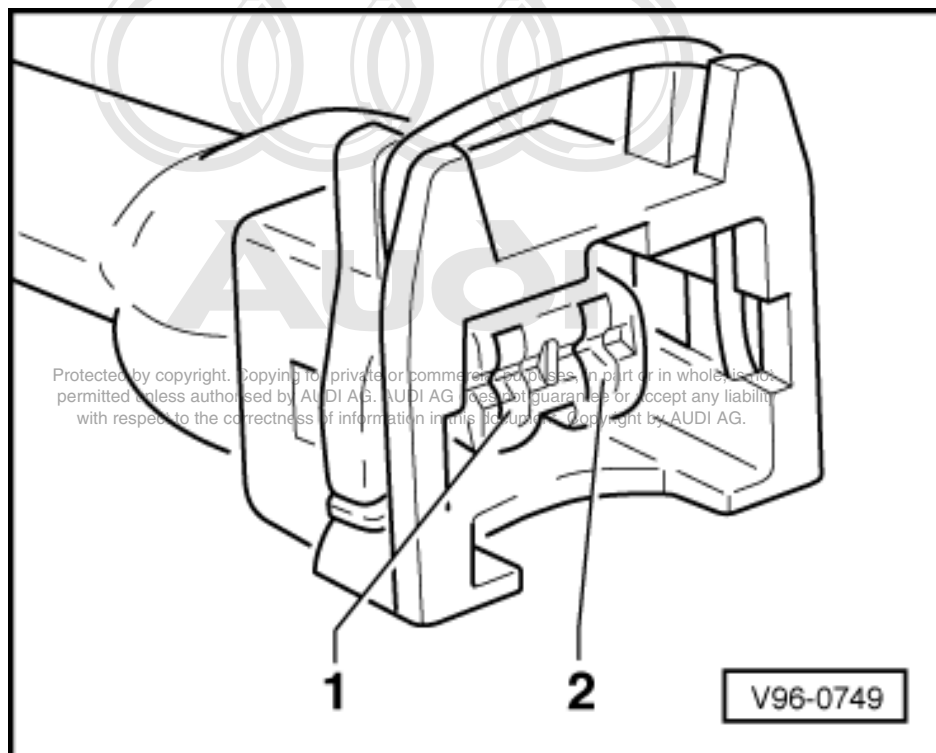
Checking actuation

- -> Connect up voltage tester V.A.G 1527 B between contacts 1 and 2.
- Start final control diagnosis => Page 24 and actuate intake-manifold changeover valve.
- LED must flash

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



- -> With ignition switched off, connect test box V.A.G 1598/19 to connector B of engine control unit only (not to control unit) => Page 64 .



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

Connector Contact	Test box V.A.G 1598/19 Socket
2	B7

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

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

If wiring is OK:

- Replace engine control unit => Page 65 .

3 - Checking Lambda control

3.1 - Checking Lambda control

Notes:

Lambda probe compares oxygen content of air to residual oxygen in exhaust gas and provides control unit with a voltage signal.

Voltage signal "Rich mixture (low residual oxygen level)" is 0.7... 1.1 V (based on reference earth).

Voltage signal "Lean mixture (high residual oxygen level)" is -0.1...+0.3 V (based on reference earth).

Transition from "rich" to "lean" and vice versa ($\lambda = 1.0$) results in a voltage step change from 0.7... 1.1 V to -0.1... +0.3 V and vice versa.

On account of the steep voltage step change, the Lambda control cannot maintain the ideal mixture composition (corresponding to $\lambda = 1.0$) at a constant level. The control constantly fluctuates between the two statuses "slightly too lean" and "slightly too rich".

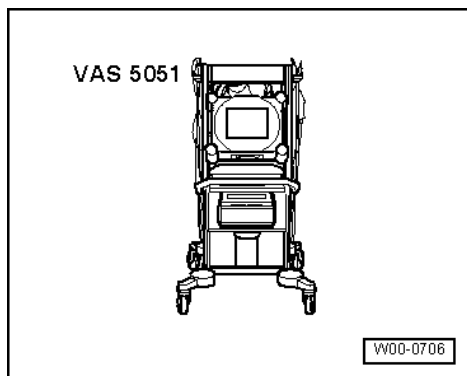
If there is no change in voltage or if the voltage change is sluggish, this may be due to the following:

- ◆ Slits or holes in probe head clogged
- ◆ Thermal overloading of probe
- ◆ Contact resistance in signal/earth wire.
- ◆ Probe too cold, no probe heating function
- ◆ Probe damaged by contact spray or the like (on account of thermal fluctuations and capillary action, contact spray is drawn through the fine cavities in the wires into the probe)
- ◆ Probe damaged by silicone vapours (the use of sealants containing silicone causes traces of silicone constituents to be drawn in by the engine; these are not burnt and damage the Lambda probe)

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3.2 - Engine running problems following cold start

Special tools and workshop equipment required



- ◆ VAS 5051 with VAS 5051/1 and VAS 5051/2

or

- ◆ V.A.G 1551 with V.A.G 1551/1

Test requirement:

- No fault stored relating to Lambda control; if necessary, eliminate fault and erase fault memory

If engine running problems are encountered following cold starting, check whether fault arises before or after commencement of Lambda control action.

Test sequence

Attention:
Attach fault reader to rear seat and operate it from there. Pay attention to safety precautions => Page 55 .

Reading measured value block 21
1 2 3 4

- > Read measured value block, display group 021, engine cold and idling=>Page 47 .
- Check display in zone 4.
- Specification: λ contr. OFF (Lambda control not active)

Possible faults if engine running problems are already encountered prior to commencement of Lambda control action:



- ♦ Coked inlet valves
- ♦ Unmetered air in intake system
- ♦ Fuel supply system defective
- Perform test drive.

Lambda control action commences at a Lambda probe temperature of approx. 300 °C. The time prior to attainment of this temperature is governed by the following factors:

- ♦ Ambient temperature (summer/winter)
- ♦ Operating conditions after starting
- ♦ Lambda probe heating function

Reading	measured	value	block	21
1	2	3	4	

- > Check display in zone 4.
- Specification: λ contr. ON (Lambda control active)

If engine running problems only occur after commencement of Lambda control action:

- Check operation => Page 102 .

3.3 - Checking operation

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Checking Lambda probe voltage

Reading	measured	value	block	21
1	2	3	4	

- > Read measured value block, Display group 021, engine idling
=>Page 47 .
- Check display in zone 4.
- Specification: λ contr. ON (Lambda control active)

Do not continue with test until Lambda control is active.

- Press C key.

Reading	measured	value	block	9
1	2	3	4	

- > Read measured value block, display group 009.
- Check display in zone 3.
- Specification: Voltage signal must fluctuate between the ranges -0.1 ... +0.3 and +0.7 ... +1.0 V

Note:

Voltage must fluctuate approx. 15...30 times per minute.

Possible faults if voltage fluctuation is too slow:

- ♦ Lambda probe heating defective
- ♦ Lambda probe defective

Possible faults if a constant voltage of 0.45...0.50 V is displayed:

- ♦ Open circuit in wiring to Lambda probe
- ♦ Lambda probe heating defective
- ♦ Lambda probe defective

If a constant voltage of - 0.1...+ 0.3 V (mixture too lean) is displayed, mixture control has reached control stop in "enrichment" direction, but Lambda probe is still recognising "mixture too lean". Possible faults:

- ◆ Unmetered air in intake system
- ◆ Fuel pressure too low

If a constant voltage of 0.7...1.0 V (mixture too rich) is displayed, mixture control has reached control stop in "lean" direction, but Lambda probe is still recognising "mixture too rich". Possible faults:

- ◆ Intake system clogged
- ◆ Fuel pressure too high
- ◆ Activated charcoal filter solenoid valve constantly open

Checking mixture formation learned values

The mixture adaption is "capable of learning" i.e. the Lambda control detects differences between engines (injector throughput, compression, fuel pressure etc.) and compensation is provided by adapting the basic injection periods programmed in the map. The injection periods are extended or shortened until a $\lambda = 1$ mixture is obtained. The difference between the actual injection period and the basic injection period programmed in the map is given in %.

1	2	3	4
Reading measured value block 8			

- > Read measured value block, Display group 008, engine idling
- =>Page 41 .
- Check display in zone 2.
 - Specification: - 10...+ 10 %
- Check display in zone 3.
 - Specification: - 8...+ 8 %

Positive learned value (+...%): Programmed basic injection period too short, actual injection period ...% longer to obtain $\lambda = 1$

Possible faults if learned value is too high:

- ◆ Unmetered air in intake system
- ◆ Unmetered air at exhaust manifold
- ◆ Air-mass meter defective
- ◆ Fuel pressure too low
- ◆ Injector clogged

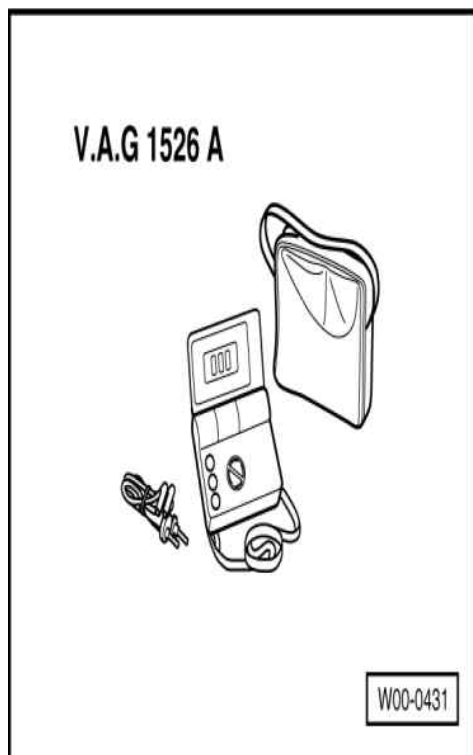
Negative learned value (-...%): Programmed basic injection period too long, actual injection period ...% shorter to obtain $\lambda = 1$

Possible faults if learned value is too low:

- ◆ Oil dilution (high fuel level in oil)
- ◆ Air-mass meter defective
- ◆ Fuel pressure too high
- ◆ Injector leaking
- ◆ Activated charcoal filter solenoid valve constantly open

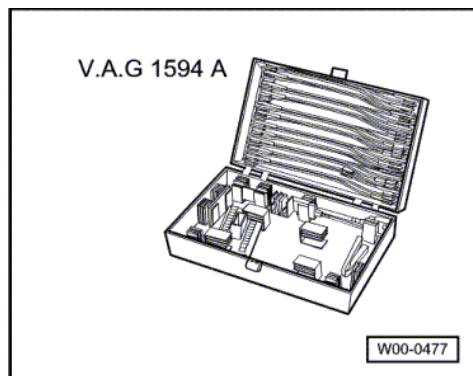


3.4 - Checking Lambda probe heating



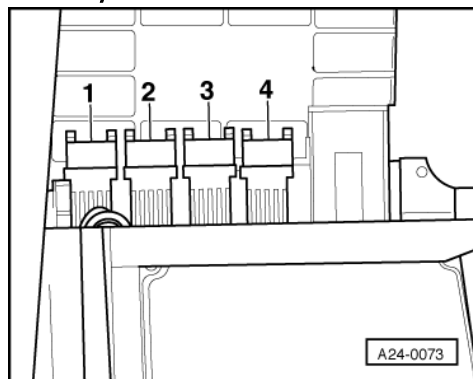
Special tools and workshop equipment required

- ♦ Portable multimeter V.A.G 1526 A



- ♦ Adapter set V.A.G 1594 A

Test requirements:

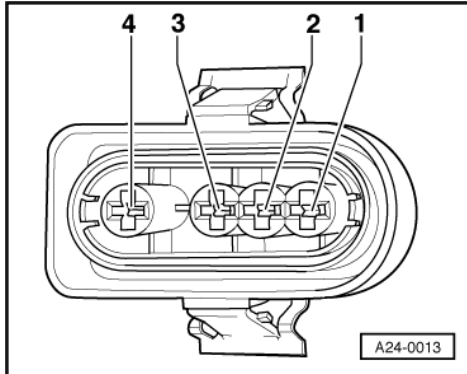


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- -> Fuse S117 OK (in brown box in electronics box in passenger's footwell)
- Fuel pump relay OK; checking => Page 83

Test sequence

- Unplug connector to Lambda probe => Exploded view of fitting locations - Page 57.

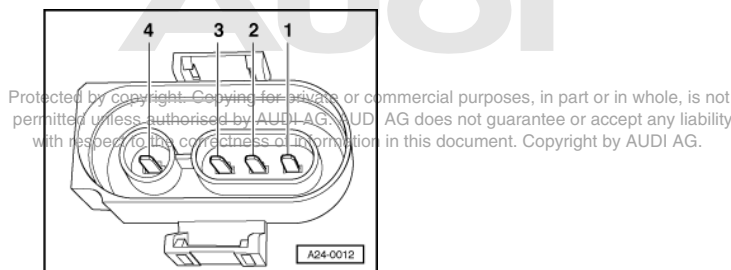


- -> Connect up multimeter for voltage measurement to contacts 1 (positive) and 2 (earth).
- Briefly operate starter (engine may also start briefly).
 - Specification: approx. battery voltage

If reading does not match specification:

- Perform the following checks marked with a dot.
- Use current flow diagram to check for open circuit in wiring between contact 1 and fuse S117 in brown box in electronics box in passenger's footwell (if necessary, check contact assignment).
- Check for open circuit in wiring between contact 2 and engine earth.

If reading matches specification:



- -> Connect up multimeter for resistance measurement between contacts 1 and 2.
 - Specification at ambient temperature: 2 ... 5 Ω

Note:

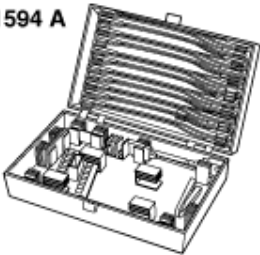
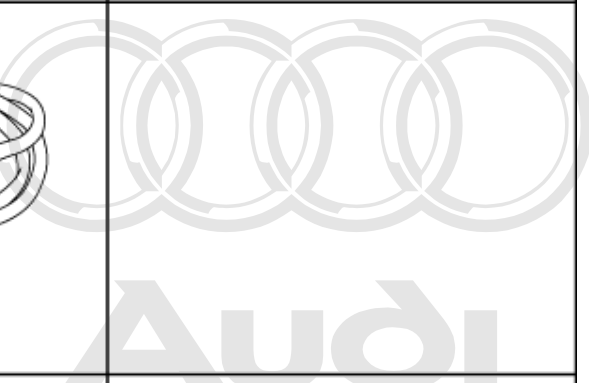
At ambient temperature, resistance of heating element is 2...5 Ω . Even a slight increase in temperature produces a sharp increase in resistance.

If reading does not match specification:

- Replace Lambda probe.

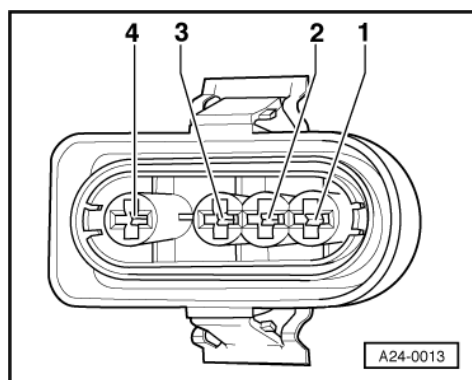


3.5 - Checking Lambda-probe signal wire and actuation

V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598/19 	
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G24-0040	

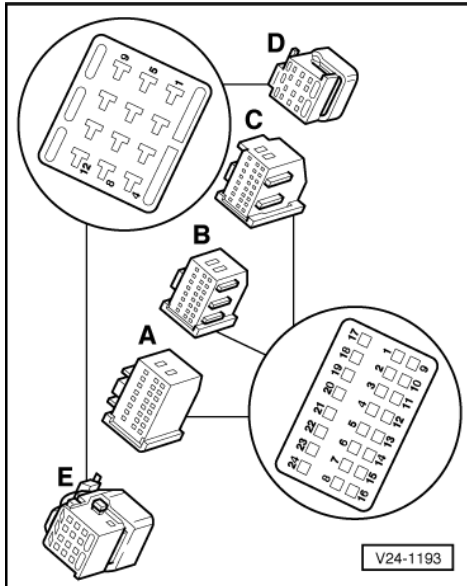
Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/19



Test sequence

- Unplug connector to Lambda probe => Exploded view of fitting locations - Page 57 .
- -> Connect up multimeter for voltage measurement between contacts 3 and 4.
- Switch on ignition.
 - Specification: 450 ± 50 mV
- Switch off ignition.



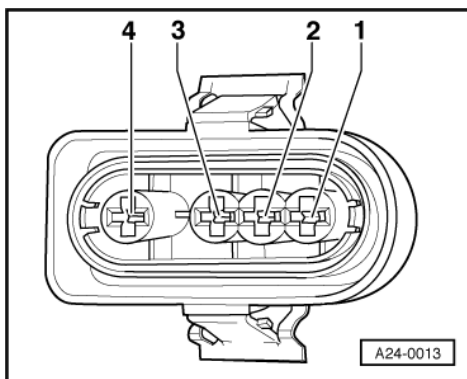
- Connect up multimeter for voltage measurement as follows.

Connector Contact	Measure to
3	Engine earth

- Switch on ignition.
 - Specification: 280 ± 50 mV

If readings do not match specifications:

- -> With ignition switched off, connect test box V.A.G 1598/19 to connector A of engine control unit only (not to control unit) => Page 64 .



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

Connector Contact	Test box V.A.G 1598/19 Socket
3	A10



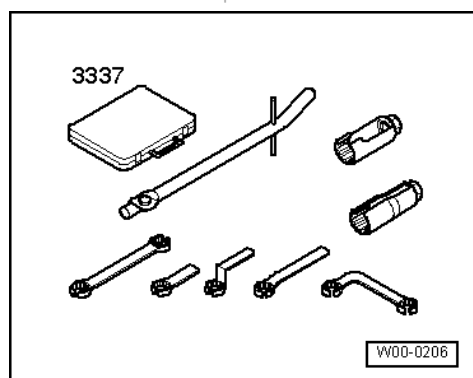
Connector Contact	Test box V.A.G 1598/19 Socket
4	A11

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

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

3.6 - Removing and installing Lambda probe

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

Sequence of operations

- Unplug connector to Lambda probe => Exploded view of fitting locations - Page 57 .
- Use V.A.G 3337/9 to screw out Lambda probe.

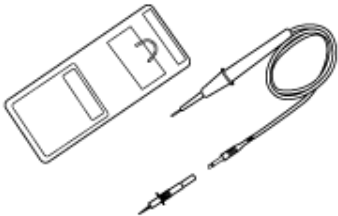
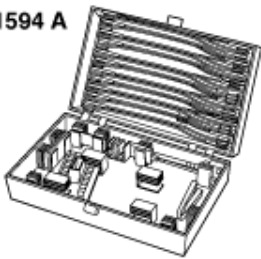
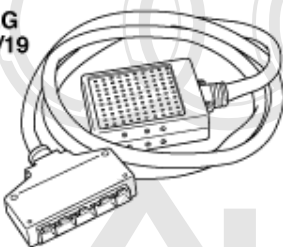
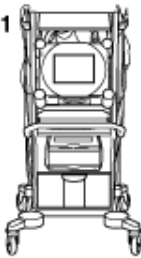
Pay attention to the following on installation:

Notes:

- ♦ The thread of the Lambda probe is coated with an assembly paste, which must not be allowed to ingress into the openings in the probe.
- ♦ Tightening torque 55 Nm
- ♦ On installation, always re-attach cable ties at the same location to stop probe wire coming into contact with exhaust pipe.

4 - Checking fuel tank breather system

4.1 - Checking fuel tank breather system

V.A.G 1526 A 	V.A.G 1527 B 
V.A.G 1594 A 	V.A.G 1598/19 
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Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1527 B
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/19
- ♦ VAS 5051 with VAS 5051/1 and VAS 5051/2

or

- ♦ V.A.G 1551 with V.A.G 1551/1

4.2 - Checking activated charcoal filter solenoid valve

Fitting location => Exploded view of fitting locations - Page 57

Leak test

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

- Pull hoses off ACF valve; leave connector attached.
- Connect test hose to one connection of ACF valve.
- Start final control diagnosis =>Page 24 and actuate activated charcoal filter solenoid valve -N80.

-> Indicated on display:

Final control diagnosis
Activated charcoal filter solenoid valve
-N80

Valve must click...

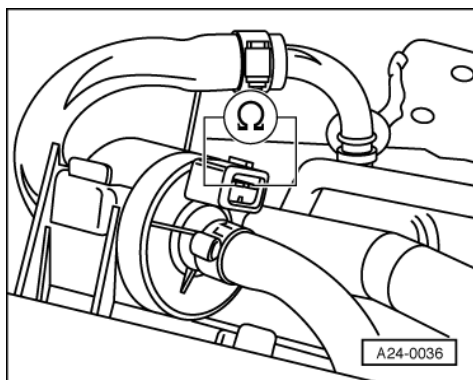
...and must open and close (can be checked by blowing into test hose).

If valve does not open and close properly:

- Replace ACF valve.

If valve does not click:

Checking internal resistance



- Unplug connector at ACF valve.
- -> Connect multimeter to valve for resistance measurement.
- Specification: 22 ... 30 ω

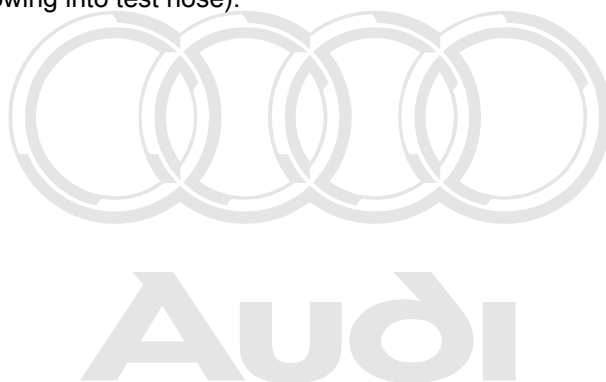
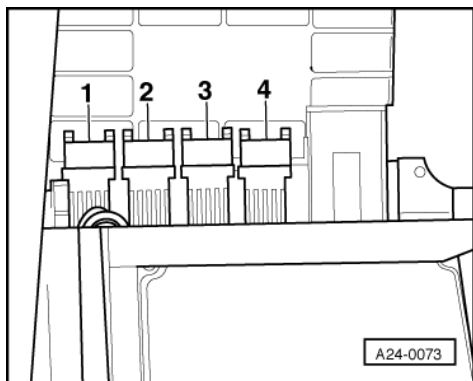
If reading does not match specification:

- Replace ACF valve.

If reading matches specification:

Checking power supply

Test requirements:



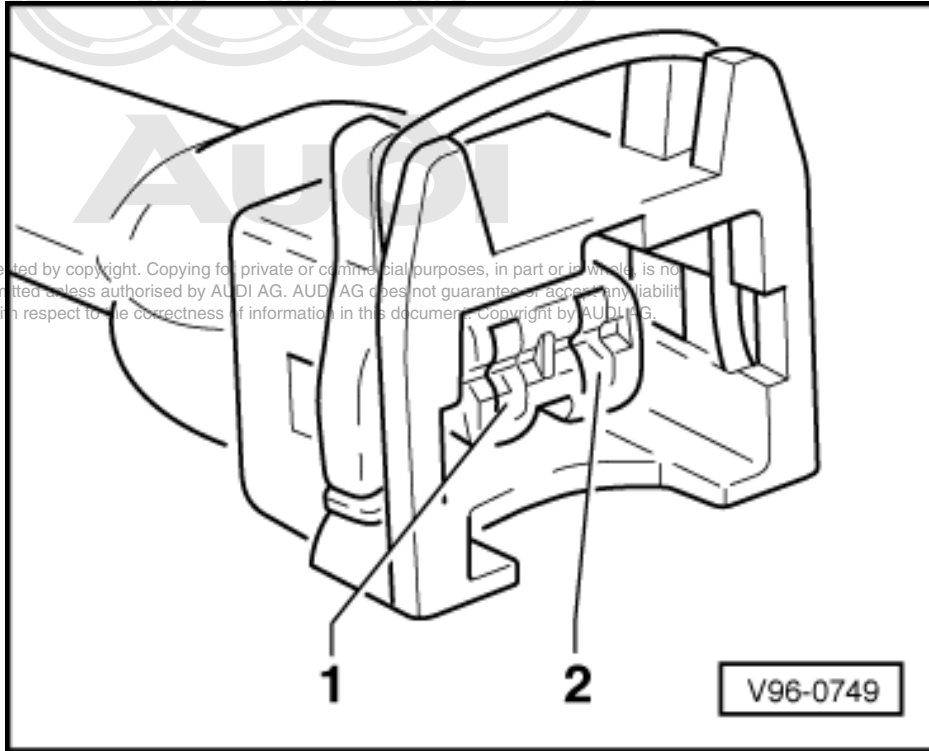
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- -> Fuse S117 OK (in brown box in electronics box in passenger's footwell)
- Fuel pump relay OK; checking => Page 83

Note:

ACF valve is supplied with power by way of fuel pump relay.

- Unplug connector at ACF valve.



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

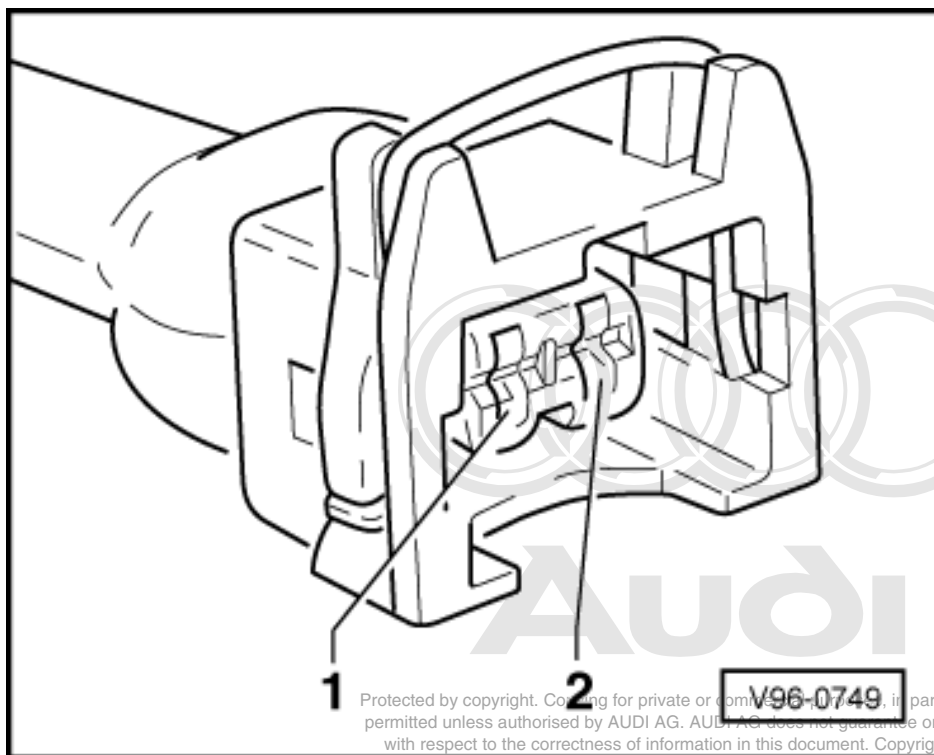
Connector Contact	Measure to
1	Engine earth

- Briefly operate starter (engine may start).
 - Specification: approx. battery voltage

If reading does not match specification:

- Check for open circuit in wiring from contact 1 via fuse to fuel pump relay.

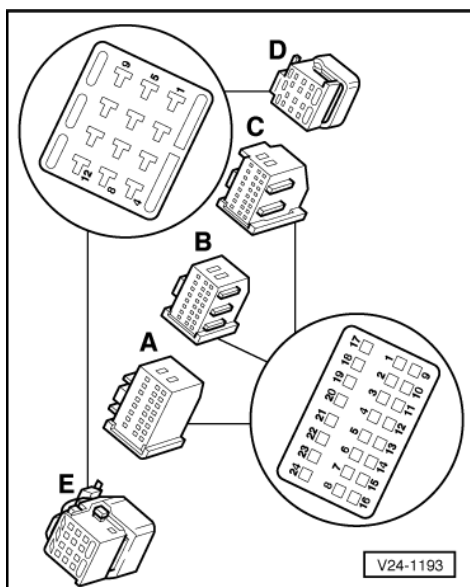
=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder



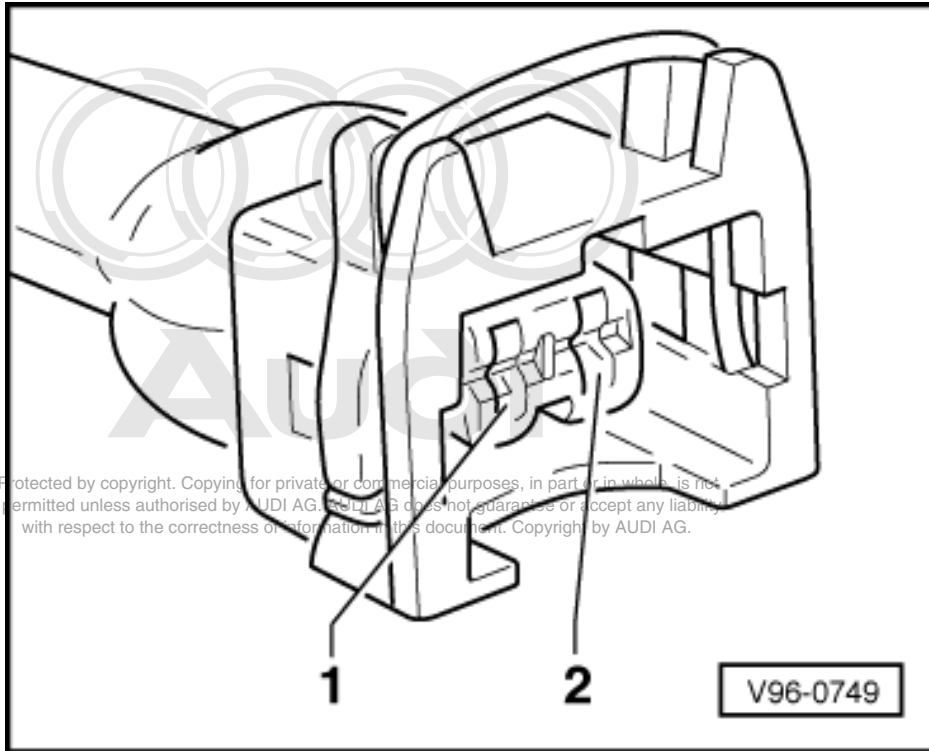
Checking actuation

- -> Connect up voltage tester V.A.G 1527 B with test leads from V.A.G 1594 A between contacts 1 and 2.
- Start final control diagnosis =>Page 24 and actuate activated charcoal filter solenoid valve -N80.
- LED must flash

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



- -> With ignition switched off, connect test box V.A.G 1598/19 to connector D of engine control unit only (not to control unit) => Page 64 .



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

Connector Contact	Test box V.A.G 1598/19 Socket
2	D4

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

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

If wiring is OK:

- Replace engine control unit => Page 65 .

5 - Checking throttle valve control part

5.1 - Checking throttle valve control part

The following components are accommodated in the throttle valve control part housing:

- ◆ Throttle valve potentiometer -G69
- ◆ Throttle valve positioner sender -G127
- ◆ Idling switch -F60
- ◆ Throttle valve positioner -V60 (electric motor)

Notes:

- ◆ Housing of throttle valve control part is not to be opened.
- ◆ The potentiometers and switches cannot be mechanically adjusted. Settings are made as part of the basic setting function (04) using the vehicle diagnostic, testing and information system VAS 5051 or the fault reader V.A.G 1551.

5.2 - Adaption of throttle valve control part to engine control unit

For idling-speed stabilisation, the engine control unit must be aware of the stop positions of the throttle valve positioner -V60 and the potentiometer characteristic curves of the throttle valve positioner sender -G127 and throttle valve potentiometer -G69.

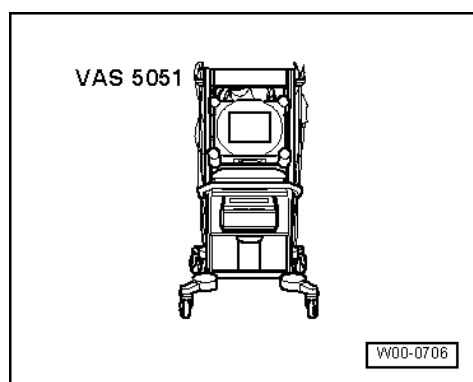
Adaption must be implemented if:

- ♦ Power supply to engine control unit has been interrupted (e.g. battery disconnected)
- ♦ Throttle valve control part has been replaced
- ♦ Engine control unit has been replaced
- ♦ Fault code 17967 has been stored in fault memory

Adaption is implemented:

- ♦ By starting basic setting, display group 098 with engine not running

Special tools and workshop equipment required



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

or

- ♦ V.A.G 1551 with V.A.G 1551/1

Sequence of operations

System in basic setting 98

1 2 3 4

-> Start basic setting, display group 098, engine not running
=> Page 27.

After pressing Q key, throttle valve positioner is moved into min., max. and several intermediate positions and control unit stores appropriate throttle valve angles in non-volatile memory. This process takes a maximum of 10 seconds.

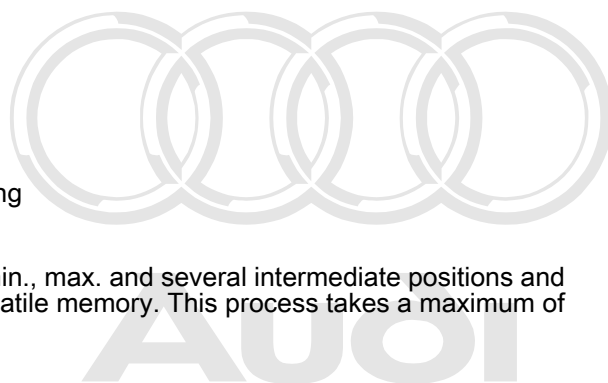
- Check display in zone 4.
- Specification: ADP OK

Adaption has been successfully implemented.

Note:

Termination of adaption process by control unit may be due to the following:

- ♦ Throttle valve does not reach mechanical idle stop on account of contamination, e.g. carbonised oil deposits or incorrect throttle cable setting
- ♦ Battery voltage too low
- ♦ Fault in throttle valve control part or wiring



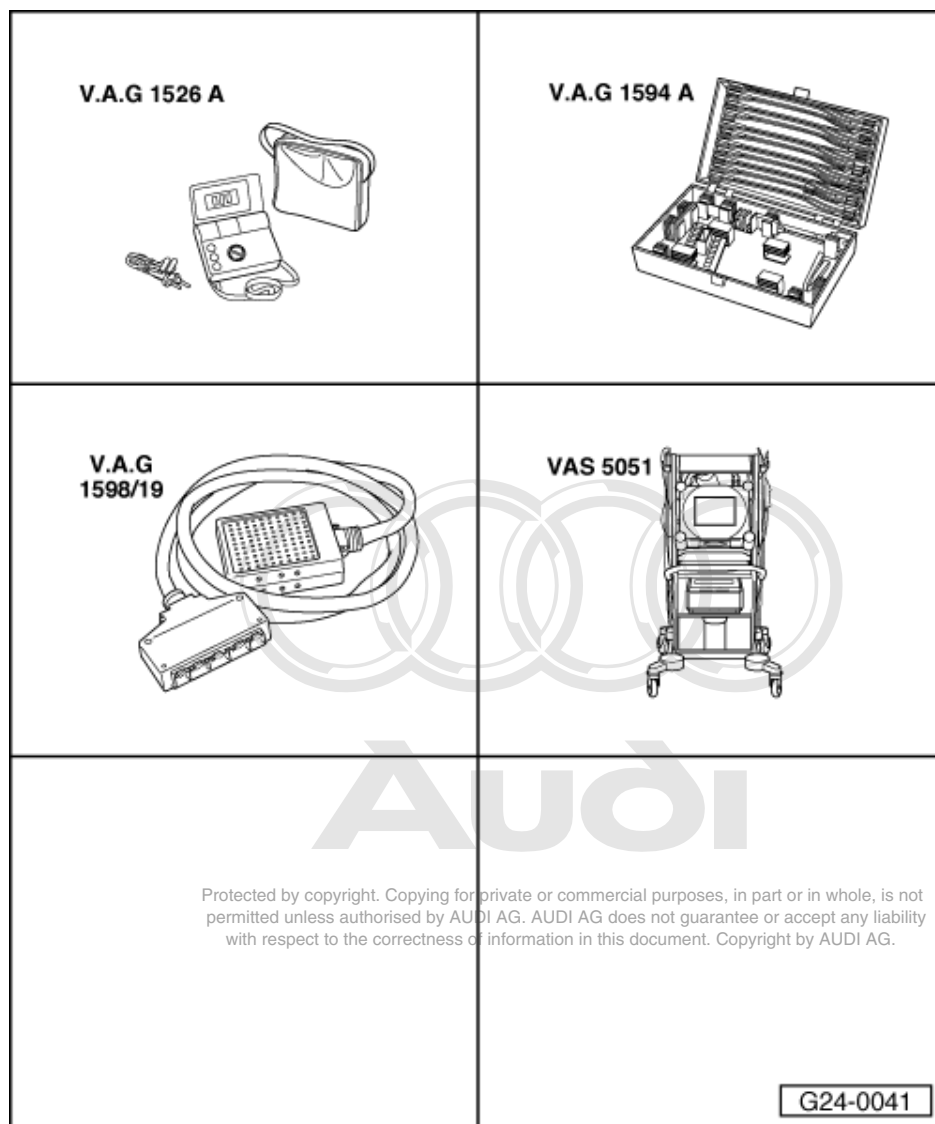
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- ◆ Engine started during adaption process or accelerator pedal pressed
- ◆ Throttle valve housing strained (check bolted joint)
- Conclude basic setting of engine by pressing⇒ key.

-> Indicated on display (function selection):

Rapid data transfer HELP
Select function XX

5.3 - Checking idling switch -F60



Special tools and workshop equipment required

- ◆ V.A.G 1526 A
 - ◆ V.A.G 1594 A
 - ◆ V.A.G 1598/19
 - ◆ VAS 5051 with VAS 5051/1 and VAS 5051/2
- or

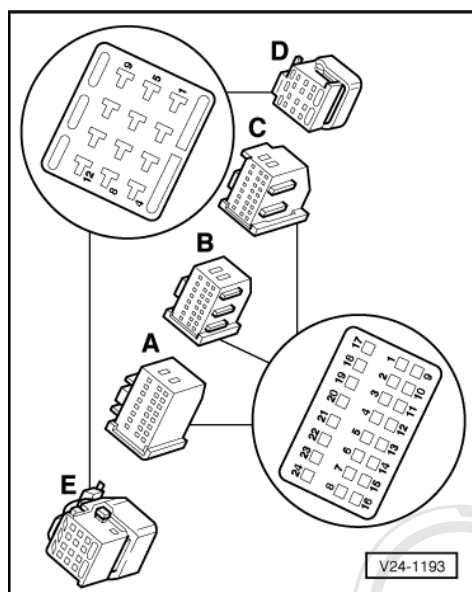
- ♦ V.A.G 1551 with V.A.G 1551/1

Test sequence

Reading measured value block 98
1 2 3 4

- > Read measured value block, display group 098, engine not running => Page 49 .
- Check display in zone 3.
 - Specification: Idling speed
- Press accelerator pedal.
 - Specification: Part throttle

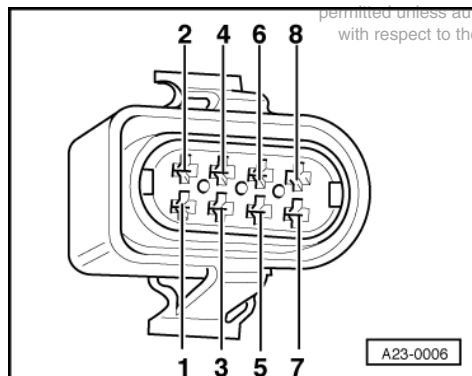
If reading does not match specification:



- Switch off ignition.
- Unplug connector of throttle valve control part.
- -> With ignition switched off, connect test box V.A.G 1598/19 to connectors A and B of engine control unit (not to control unit) => Page 64 .
- Connect up multimeter for resistance measurement between sockets A15 and B4.
 - Specification: approx. 0 Ω
- Press accelerator pedal.
 - Specification: $\infty \Omega$ (no continuity)

If readings do not match specifications:

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

Connector Contact	Test box V.A.G 1598/19 Socket
3	B4
7	A15

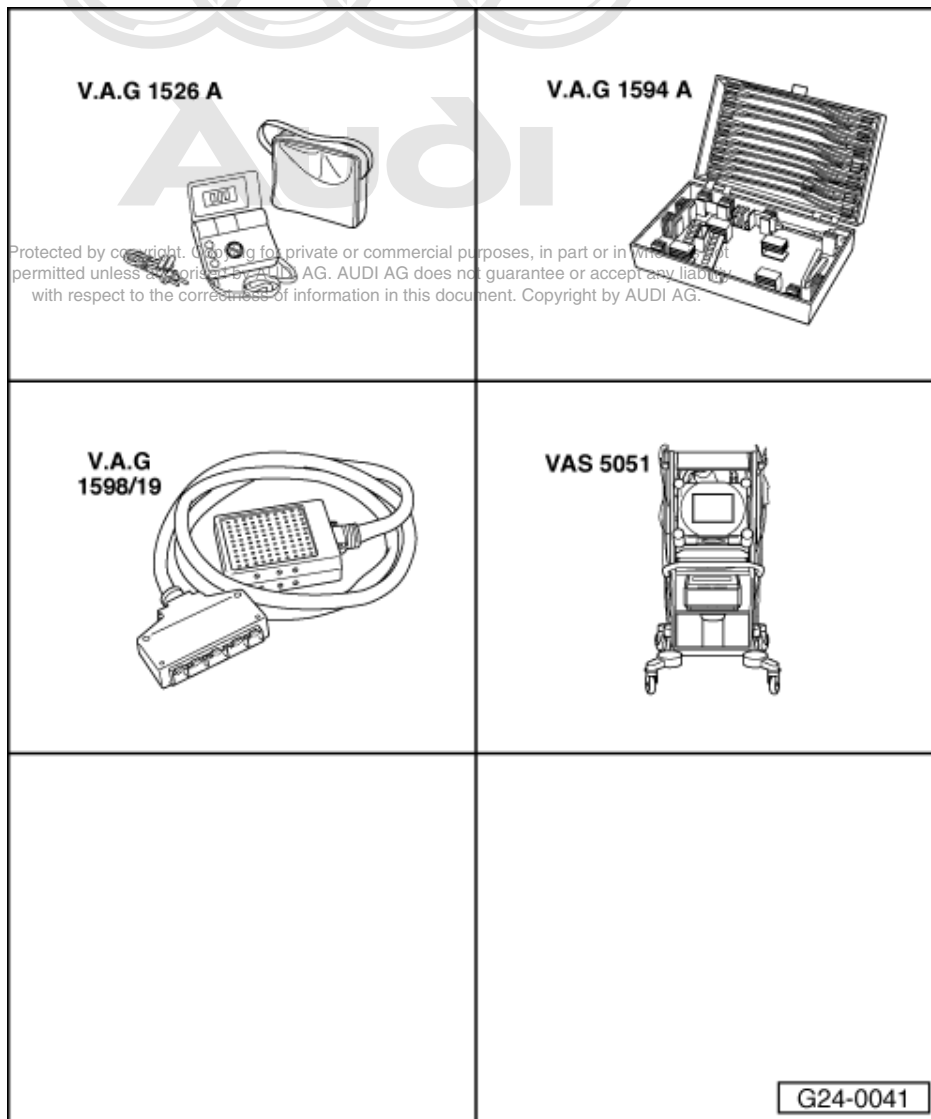
- If necessary, eliminate open circuit in wiring/short circuit.

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

If no fault is found in wiring:

- Check throttle valve for dirt/stiffness and clean if necessary.
- Repeat adaption of throttle valve control part => Page 114 .
- Disengage throttle cable if adaption of throttle valve control part cannot be started or successfully completed.
- Repeat adaption of throttle valve control part again => Page 114 .
- Replace throttle valve control part if adaption can still not be started or successfully completed.

5.4 - Checking sender for throttle valve positioner and throttle valve potentiometer





Special tools and workshop equipment required

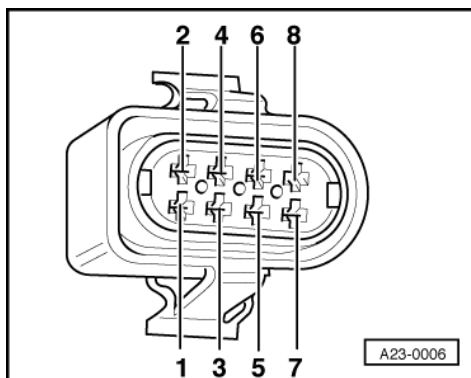
- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/19
- ♦ VAS 5051 with VAS 5051/1 and VAS 5051/2

or

- ♦ V.A.G 1551 with V.A.G 1551/1

Checking sender voltage values

- Unplug connector of throttle valve control part.



- -> Connect up multimeter for voltage measurement between contacts 4 (positive) and 7 (earth).
- Switch on ignition.
 - Specification: min. 4.8 V

If reading does not match specification:

- Attach connector of throttle valve control part.
- Start engine and let it idle.

Reading measured value block 98

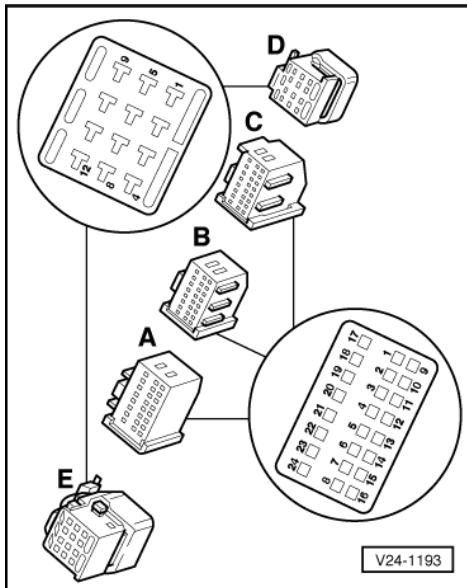
1	2	3	4

- > Read measured value block, Display group 098 =>Page 49 .
- Check display in zones 1 and 2.
 - Specification: 0.500 ... 4.900 V

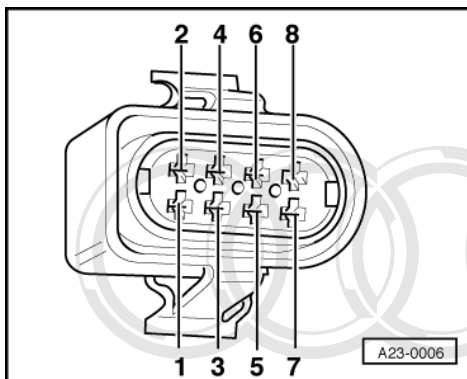
If readings do not match specifications:

- Switch off ignition.
- Unplug connector of throttle valve control part.

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- -> With ignition switched off, connect test box V.A.G 1598/19 to connectors A and D of engine control unit (not to control unit) => Page 64 .



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

Connector Contact	Test box V.A.G 1598/19 Socket
1	D5
2	D1
3	A3
5	A14
7	A15
8	A13

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

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

If no fault is found in wiring:

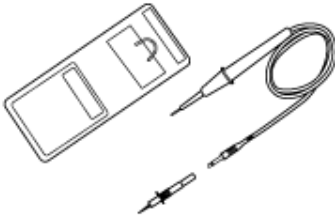
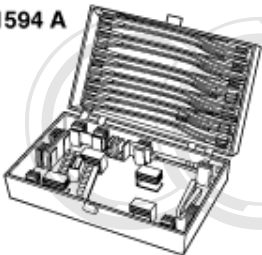
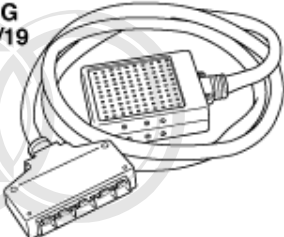
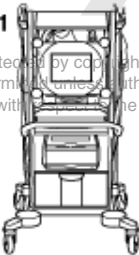
- Check throttle valve for dirt/stiffness and clean if necessary.
- Repeat adaption of throttle valve control part => Page 114 .
- Replace throttle valve control part if adaption can still not be started or successfully completed.
- Repeat adaption of throttle valve control part => Page 114 .



- Replace engine control unit if adaption of throttle valve control part can still not be started or successfully completed.

6 - Checking additional signals

6.1 - Checking additional signals

V.A.G 1526 A 	V.A.G 1527 B 
V.A.G 1594 A 	V.A.G 1598/19 
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Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1527 B
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/19
- ♦ VAS 5051 with VAS 5051/1 and VAS 5051/2

or

- ♦ V.A.G 1551 with V.A.G 1551/1

6.2 - Checking air-conditioner compressor shutoff

Notes:

- ◆ The air-conditioner compressor signal provides the engine control unit with the information that the compressor is to be switched on in 140 ms.
- ◆ The engine control unit can use the same wire to shut off the air-conditioner compressor.
- ◆ The air-conditioner compressor is shut off by the engine control unit:
 - On accelerating powerfully (full throttle)
 - In emergency program (emergency running mode)
 - If coolant temperature exceeds 120°C

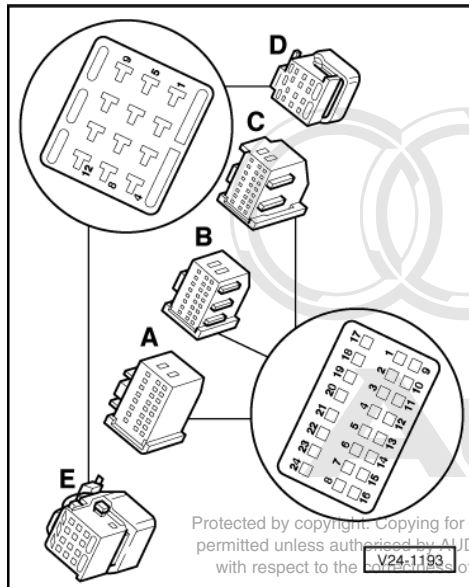
Test requirements:

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

Test sequence

Reading measured value block 20
 1 2 3 4

- > Read measured value block, Display group 020, engine idling
 => Page 47 .
- Check display in zone 4.
 - Specification: Compr. OFF
- Switch on air conditioner by pressing "Auto" button. Compressor must run.
 - Specification in display zone 4: Compr. ON



- Abruptly floor accelerator pedal and release it again (brief burst of throttle).
- Specification in display zone 4: Display switches for several seconds from "Compr. ON" to "Compr. OFF" (compressor shut-off on vehicle acceleration)

If display is not as described:

- -> With ignition switched off, connect test box V.A.G 1598/19 to connector C of engine control unit only (not to control unit) => Page 64 .
- Check for open circuit and short to earth/positive in the following wiring.



Test box V.A.G 1598/19 Socket	Operating and display unit -E87 Contact
C11	=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

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

=> Heating, Air Conditioner; Repair Group 01; Performing Self-diagnosis - fully automatic air conditioner Performing Self-diagnosis **fully automatic air conditioner**

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6.3 - Checking speed increase for air conditioner

Notes:

- ♦ Switching on air conditioner causes positive signal to be applied to contact C14 at engine control unit.
- ♦ The effect of the signal is that the engine control unit maintains the idling speed at a constant level irrespective of air conditioner power requirement.

Test requirements:

- No faults stored in fault memory
- Vehicle at ambient temperature (more than +15 °C)
- Air conditioner OK
- Vehicles ▶ 1996: Heated rear window switched off

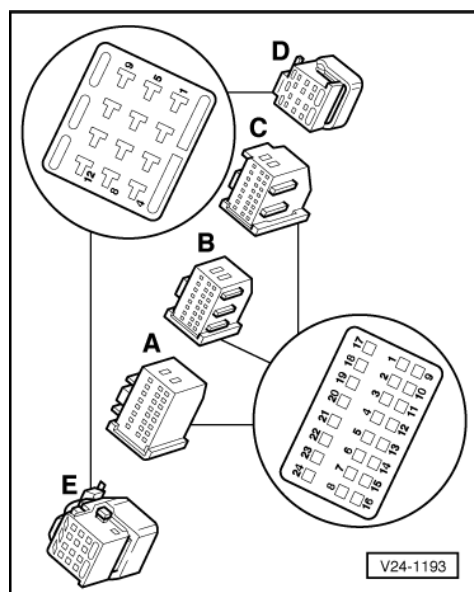
Test sequence

Reading measured value block 20

1 2 3 4

-> Read measured value block, Display group 020, engine idling
=> Page 47 .

- Switch off air conditioner
 - Specification in display zone 4: Compr. OFF
- Switch on air conditioner by pressing "Auto" button. Compressor must run.
 - Specification in display zone 1: Idling speed must remain constant (brief drop in speed lasting less than 1 second is permissible)
 - Specification in display zone 3: A/C High
 - Specification in display zone 4: Compr. ON



If display is not as described:

- -> With ignition switched off, connect test box V.A.G 1598/19 to connector C of engine control unit only (not to control unit) => Page **64** .
- Check for open circuit and short to earth/positive in the following wiring.

Test box V.A.G 1598/19 Socket	Operating and display unit -E87 Contact
C14	=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

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

=> Heating, Air Conditioner; Repair Group 01; Performing Self-diagnosis - fully automatic air conditioner Performing Self-diagnosis - fully automatic air conditioner

6.4 - Checking heated rear window signal - vehicles > 1996

Notes:

- ◆ Switching on heated rear window causes positive signal to be applied to contact C14 at engine control unit.
- ◆ The effect of the signal is that the engine control unit maintains the idling speed at a constant level in spite of the additional load.

Test sequence

Reading	measured	value	block	20
1	2	3	4	

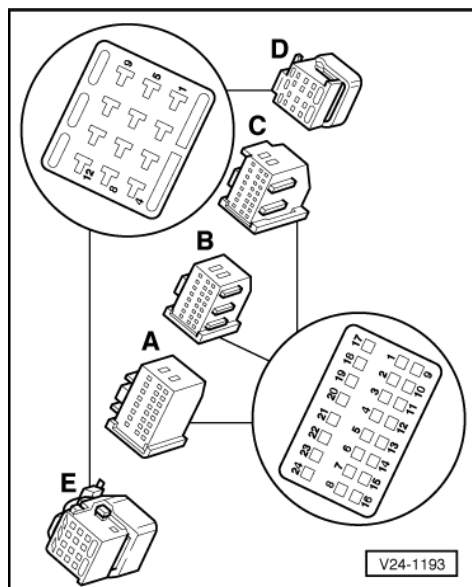
- > Read measured value block, Display group 020, engine idling
=> Page **47** .
- Switch off air conditioner
- Check display in zone 3.
 - Specification: A/C Low
- Switch on heated rear window.
 - Specification in display zone 1: Idling speed must remain constant (brief drop in speed lasting less than 1 second is permissible)
 - Specification in display zone 3: A/C High

Note:

As contact C14 at engine control unit receives both signal from air conditioner and signal from heated rear window, switching on heated rear window causes "A/C High" to be displayed.

If display is not as described:

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- -> With ignition switched off, connect test box V.A.G 1598/19 to connector C of engine control unit only (not to control unit) => Page 64 .
- Connect up voltage tester V.A.G 1527 B as follows.

Test box V.A.G 1598/19 Socket	Measure to
C14	Engine earth

- Switch on ignition and heated rear window.
- LED must light

If LED does not light:

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

Test box V.A.G 1598/19 Socket	Heated rear window switch Contact
C14	=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

If wiring is OK:

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- Check heated rear window

6.5 - Checking engine-speed signal

Notes:

- ♦ The signal is generated by the engine-speed sender -G28, conditioned in the engine control unit and relayed by the engine control unit to various electronic systems (e.g. control unit for automatic gearbox and ABS / EDL). The engine-speed signal and the wiring are monitored by these systems.
- ♦ Checking engine-speed signal

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

6.6 - Checking consumption signal for on-board computer

Notes:

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

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

6.7 - Checking vehicle-speed signal

Notes:

- ◆ The vehicle-speed signal is generated by the speedometer sender -G22 and conditioned in the dash panel insert.
- ◆ The conditioned signal is received at contact C13 of the engine control unit, where it is used for idling-speed stabilisation and damping of load change jolts on shifting gear.

Test requirement:

- Speedometer function and display OK

Test sequence

Attention:

Attach fault reader to rear seat and operate it from there. Pay attention to safety precautions => Page 55 .

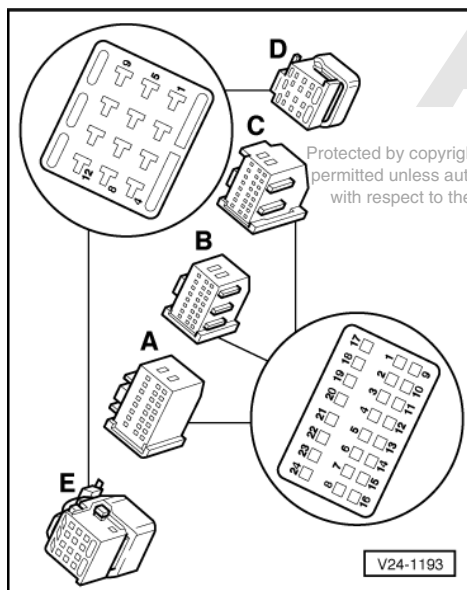
Reading measured value block 11
1 2 3 4

-> Read measured value block, Display group 011, engine idling
=>Page 43 .

- Perform test drive.
- Check display in zone 3.
 - Current vehicle speed must be displayed (comparison with speedometer)

If vehicle speed is not displayed:

- Raise vehicle (if at all possible using lifting platform) until front left wheel is free to turn.



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- -> With ignition switched off, connect test box V.A.G 1598/19 to connectors C and D of engine control unit (not to control unit) => Page 64 .
- Connect up voltage tester V.A.G 1527 B as follows.

Test box V.A.G 1598/19	
Socket	Socket
D9 (positive)	C13 (signal)

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

If LED does not flash:

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

Test box V.A.G 1598/19 Socket	Dash panel insert Contact
C13	=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

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

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If no fault is found in wiring:

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

6.8 - Checking gear signal

Note:

This signal enables the engine control unit to detect the selector lever position with an automatic gearbox. If gear is engaged (selector lever set to R / D / 3 / 2 / 1) idling speed is lowered by approx. 50 rpm to reduce tendency of vehicle to creep.

Test requirement:

- Control unit encoding OK => Page 28

Test sequence

Reading measured value block 20
1 2 3 4

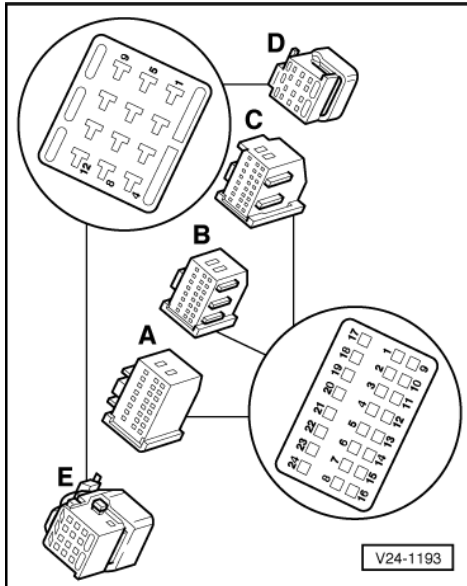
-> Read measured value block, display group 020, engine not running => Page 47 .

Indicated on display:

- Check display in zone 2.
 - Specification: "Neutral" (selector lever set to P or N)
- Press foot brake and engage gear.
 - Specification: "Gear ENGAGED"

If display is not as described:

- Switch off ignition.



- -> With ignition switched off, connect test box V.A.G 1598/19 to connectors B and D of engine control unit (not to control unit) => Page 64 .
- Connect up voltage tester V.A.G 1527 B as follows.

Test box V.A.G 1598/19	
Socket	Socket
D9 (positive)	B11 (signal)

- Switch on ignition.
- Set selector lever to P or N.
 - LED must light
- Press foot brake and engage gear.
 - LED must go out

If LED does not light at all or lights constantly:

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

Test box V.A.G 1598/19 Socket	Automatic gearbox control unit Contact
B11	=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- If necessary, eliminate open circuit in wiring/short circuit.
- If there is no fault in the wiring, check multi-function switch.

=> Automatic Gearbox 01N Self-diagnosis; Repair Group 01; Electrical Check Electrical Check

6.9 - Checking ignition timing retardation on changing gear

Notes:

- ♦ The engine control unit receives the gearshift signal from the gearbox control unit and briefly retards the ignition timing as a function of vehicle and engine speed. This reduces torque and makes for smoother gear change.



- ♦ On account of the very brief signal, the torque reduction request is not always detected by V.A.G 1551 and thus also not displayed.

Test requirement:

- Control unit encoding OK => Page 28

Test sequence

Attention:

Attach fault reader to rear seat and operate it from there. Pay attention to safety precautions => Page 55 .

Reading measured value block 19

1 2 3 4

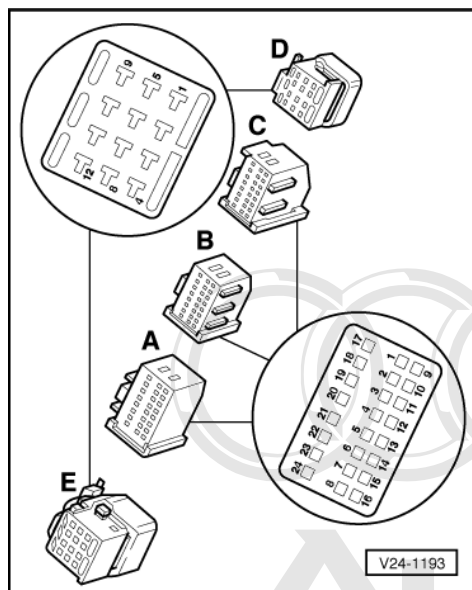
-> Read measured value block, Display group 019, engine idling
=>Page 46 .

- Check display in zone 3.
 - Specification: X 1 X

Note:

Switching inputs at locations marked "X" can be ignored for test purposes.

- Perform test drive.
- Check display in zone 3 on changing gear.
 - Specification: X 0 X



If display is not as described:

- -> With ignition switched off, connect test box V.A.G 1598/19 to connector B of engine control unit only (not to control unit) => Page 64 .
- Check for open circuit and short to earth/positive in the following wiring.

Test box V.A.G 1598/19 Socket	Automatic gearbox control unit Contact
B9	=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- If wiring is OK, establish defect in automatic gearbox control unit.

6.10 - Checking output signal for throttle valve position

Note:

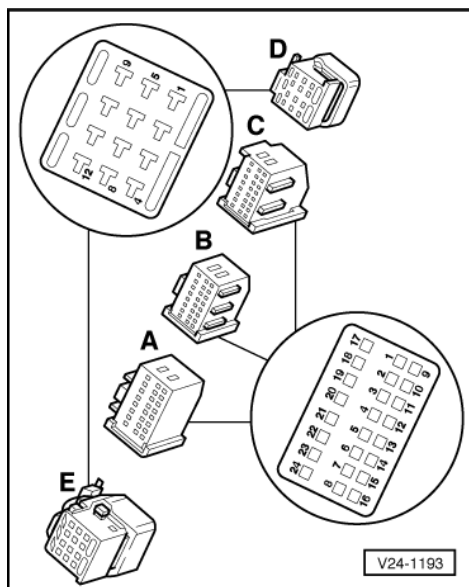
In conjunction with engine speed, this signal is used by the automatic gearbox control unit as information for calculating gearshift points.

- Connect up vehicle diagnostic, testing and information system VAS 5051 or fault reader V.A.G 1551 => Page 1 .
Ignition must be on.
- Start gearbox control unit self-diagnosis.

=> Automatic Gearbox 01V Self-diagnosis; Repair Group 01; Performing self-diagnosis Performing self-diagnosis

- If gearbox control unit displays fault 00638 "Engine/gearbox electrical connection 2", interrogate fault memory of engine control unit => Page 4 .
- If a fault relating to throttle valve potentiometer has been stored in engine control unit, start by eliminating this fault (fault in gearbox control unit is then only a resultant fault).

If no fault relating to throttle valve potentiometer is displayed:



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- -> With ignition switched off, connect test box V.A.G 1598/19 to connector B of engine control unit only (not to control unit) => Page 64 .
- Check for open circuit and short to earth/positive in the following wiring.



Test box V.A.G 1598/19 Socket	Automatic gearbox control unit Contact
B1	=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

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



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28 - Ignition system

1 - Checking ignition system

1.1 - Checking ignition system

1.2 - Safety precautions

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

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

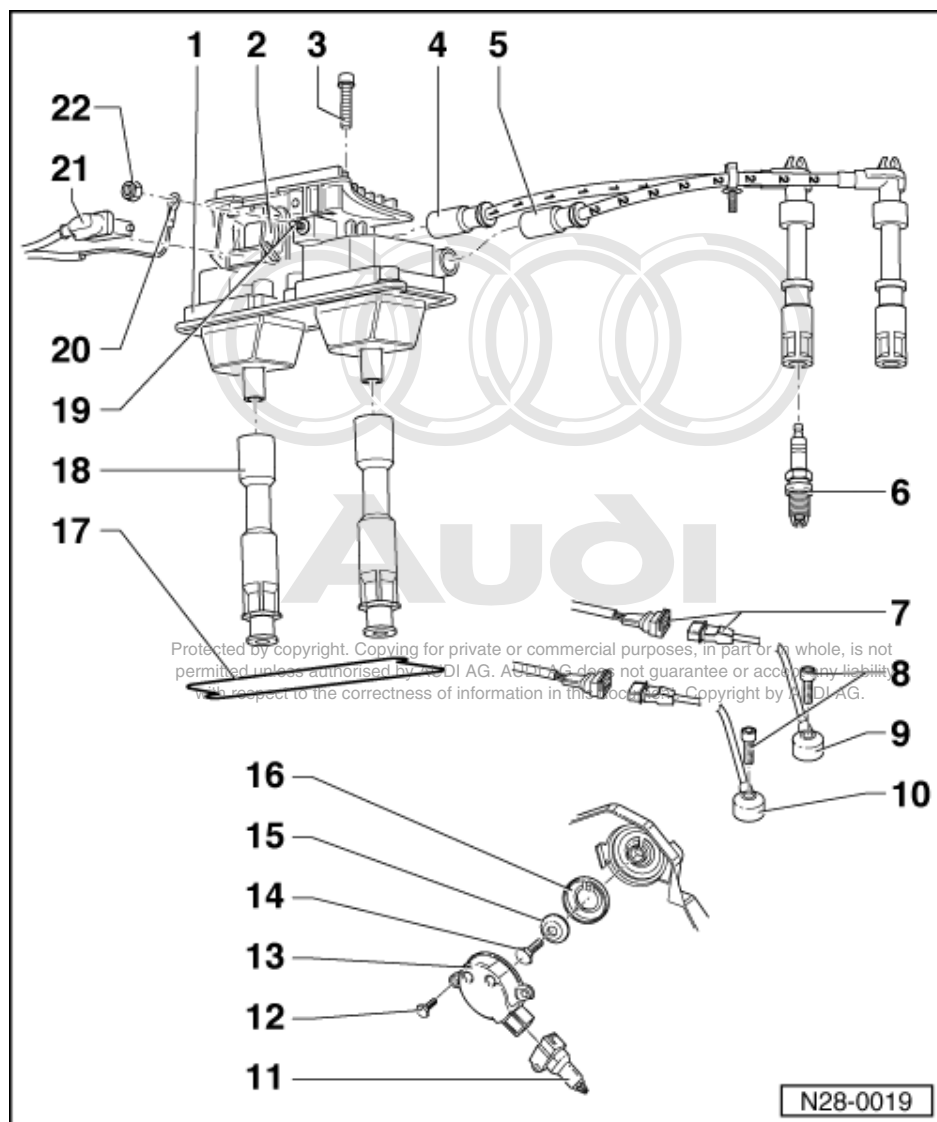
1.3 - Technical data

Engine codes	ADR (1.8 l / 92 kW engine)
Ignition point is determined in control unit Ignition point cannot be adjusted	
Ignition system	Double-spark ignition system with two ignition coils
Spark plugs 1)	Tightening torque 30 Nm
Spark plug connector	Resistance approx. 2 kΩ
Firing order	1-3-4-2
Speed governing By deactivation of injectors	approx. 6800 rpm

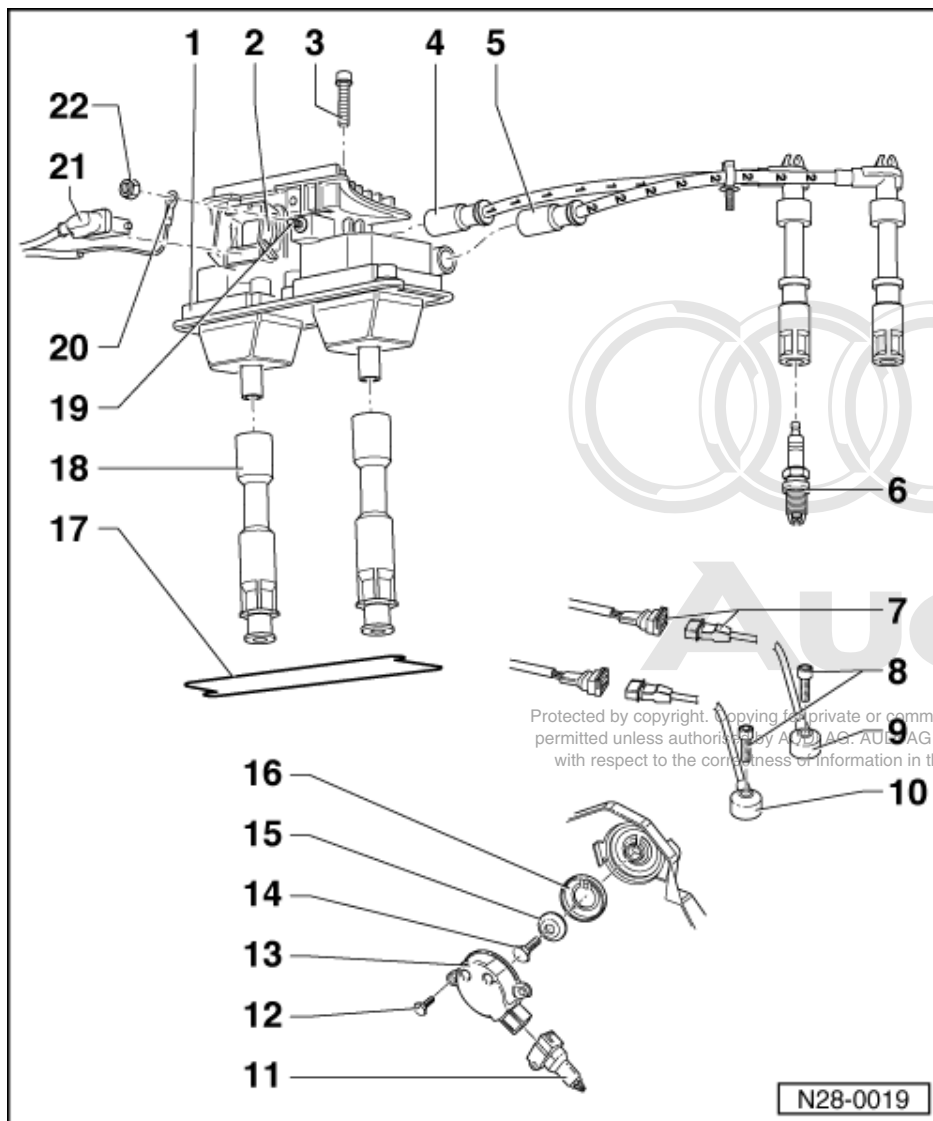
1) Current values:

=> Exhaust emission test binder

1.4 - Removing and installing ignition system components



- 1 Ignition coils -N70, -N127
 - ♦ With output stages
- 2 Catch
 - ♦ For connector
- 3 6 Nm
- 4 Spark plug connector with ignition cable
 - ♦ For cylinder 1
- 5 Spark plug connector with ignition cable
 - ♦ For cylinder 2



6 Spark plug, 30 Nm

- ♦ Type and spark gap

=> Exhaust emission test binder

- ♦ Use 3122 B for removal and installation

7 3-pin connector

- ♦ Gold-plated contacts
- ♦ For knock sensor 1 -G61
- ♦ For knock sensor 2 -G66

8 20 Nm

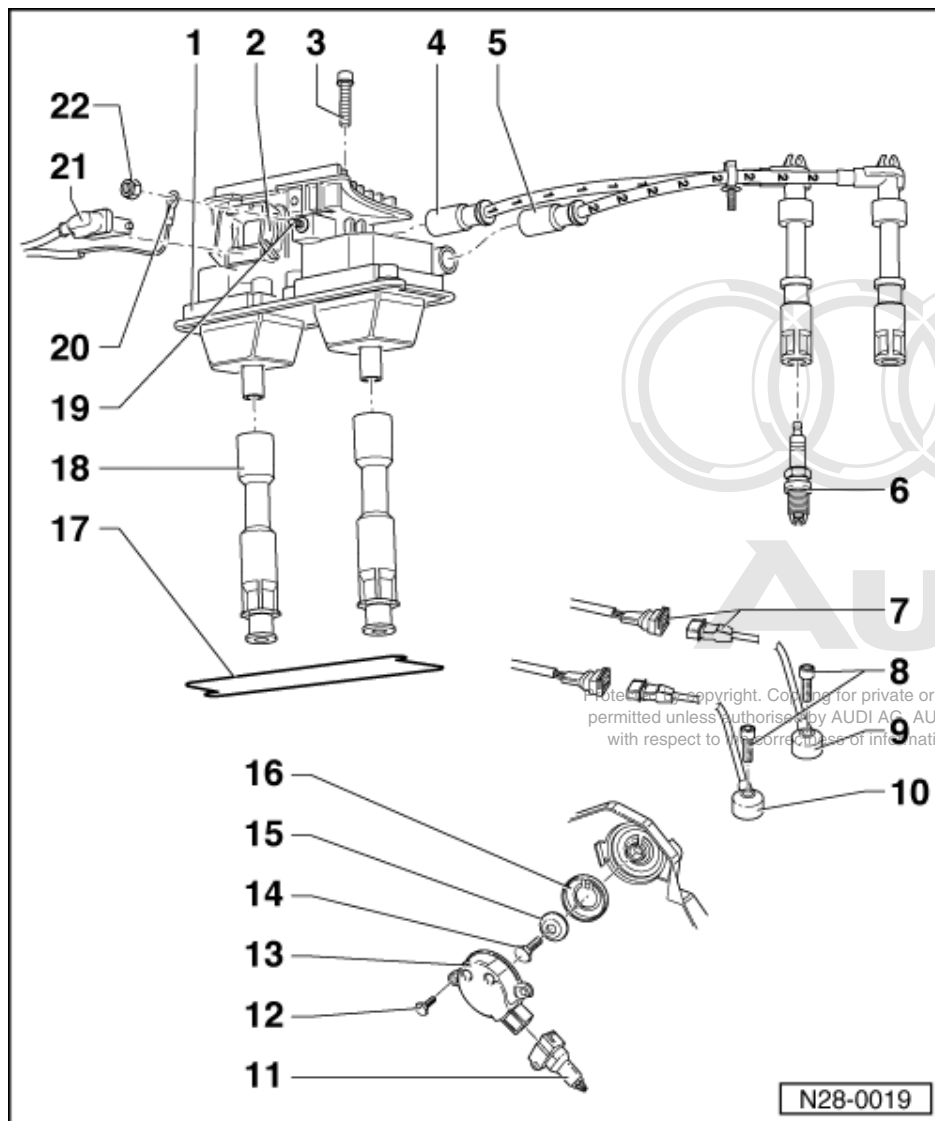
- ♦ Tightening torque affects operation of knock sensor

9 Knock sensor 1 -G61

- ♦ Gold-plated contacts

10 Knock sensor 2 -G66

- ♦ Gold-plated contacts


11 3-pin connector

- ◆ black
- ◆ For Hall sender -G40

12 10 Nm
13 Hall sender -G40

- ◆ Checking => Page 155

14 25 Nm
15 Washer

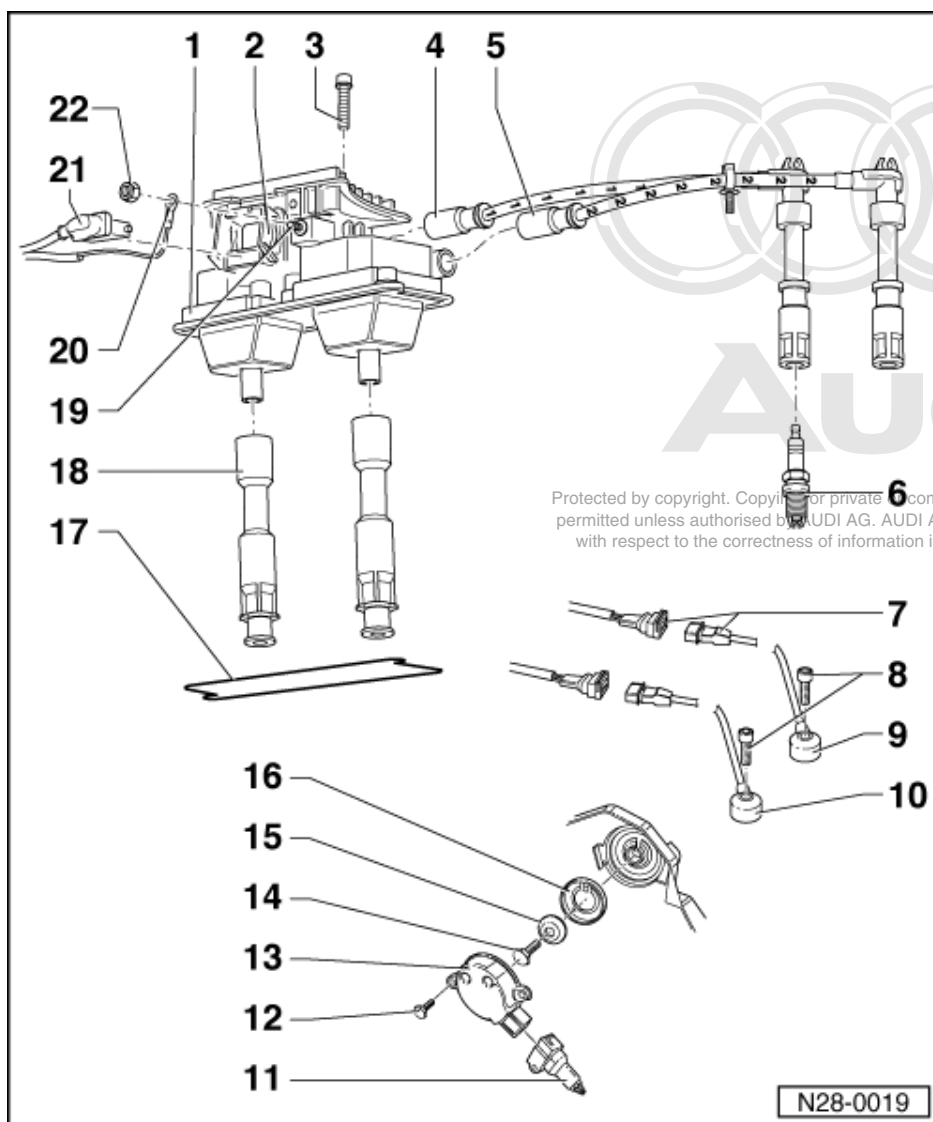
- ◆ Tapered

16 Rotor

- ◆ For Hall sender -G40
- ◆ Pay attention to locating element on assembly

17 Sealing ring

- ◆ Replace if damaged



18 Spark plug connector

- ♦ For cylinders 3 and 4

19 Terminal stud

20 Earth wire

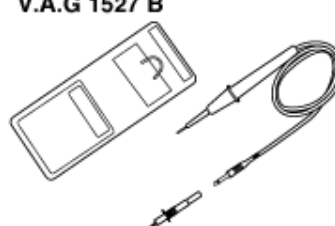
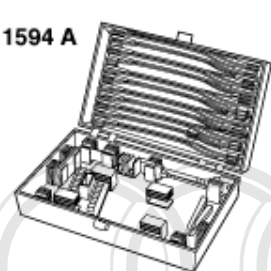
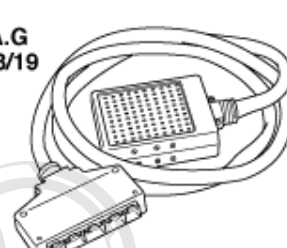
- ♦ Switch off ignition before unfastening or securing

21 Connector

22 6 Nm

- ♦ Switch off ignition before unfastening or securing

1.5 - Checking ignition coils

V.A.G 1526 A 	V.A.G 1527 B 
V.A.G 1594 A 	V.A.G 1598/19 
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G24-0042

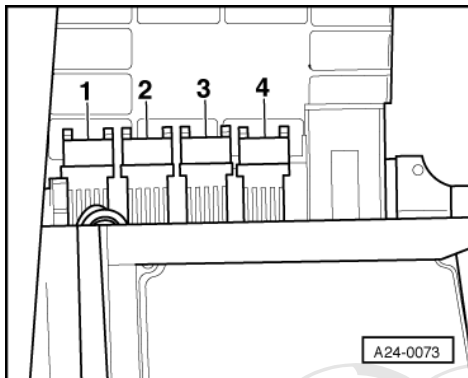
Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1527 B
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/19

Ignition coils and output stage form a joint component.

Fitting location => Exploded view of fitting locations - Page 57

Test requirement:



- -> Fuse S115 OK (in black box in electronics box in passenger's footwell)

Test sequence

If there is a fault in the ignition system:

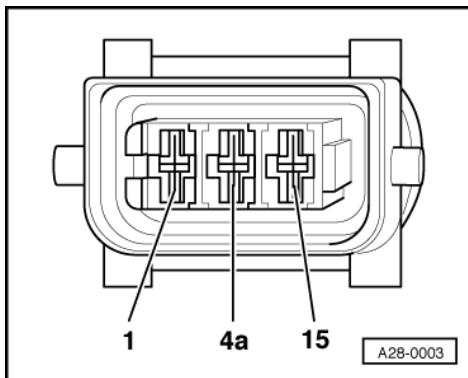
- With ignition switched off, check connection of earth wire -item **135** .
- Check power supply =>Page **137** .
- Check actuation of output stages => Page **138** .

If tests do not reveal any faults, but there is nevertheless no spark:

- Replace output stage with ignition coils
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Checking power supply

- Unplug connector at ignition coils
=> Exploded view of fitting locations - Page **57** .



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

Connector Contact	Measure to
4a	Engine earth

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

If reading does not match specification:

- Check wiring.

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

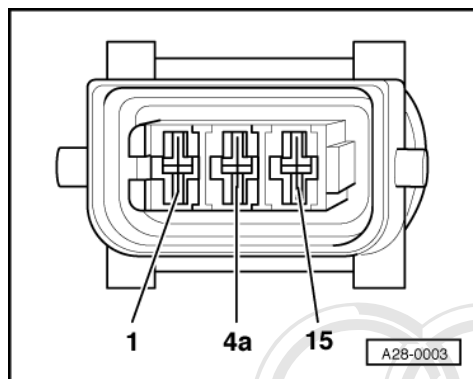
Checking actuation of output stages

- Unplug connectors at all injectors.

Note:

Fuel must not be injected during test so as to prevent catalytic converter damage. Connectors must therefore be unplugged from injectors.

- Unplug connector at ignition coils
=> Exploded view of fitting locations - Page 57 .



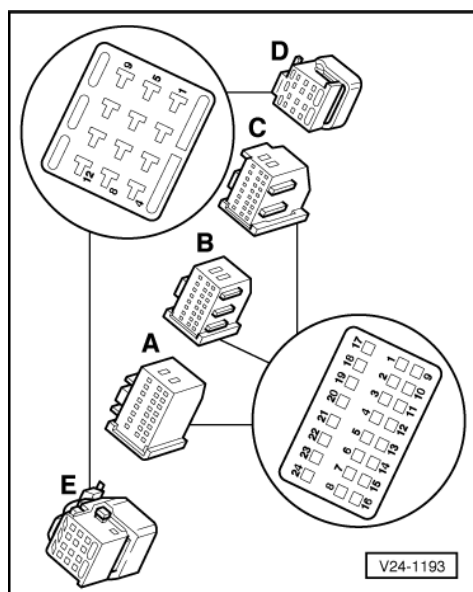
- -> Consecutively connect up voltage tester V.A.G 1527 B as follows.

Connector Contact	Measure to
1	Engine earth
15	Engine earth

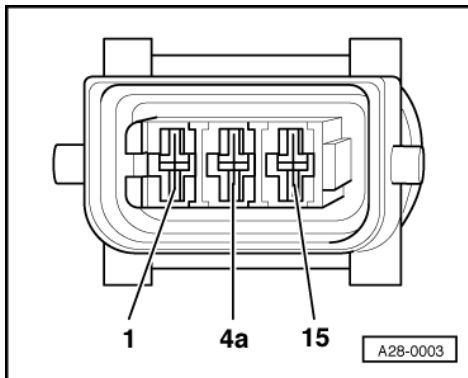
- Briefly operate starter.
 - LED must flash in each case (brief flashing signal)

If readings do not match specifications:

- Switch off ignition.



- -> With ignition switched off, connect test box V.A.G 1598/19 to connector B of engine control unit only (not to control unit) => Page **64** .

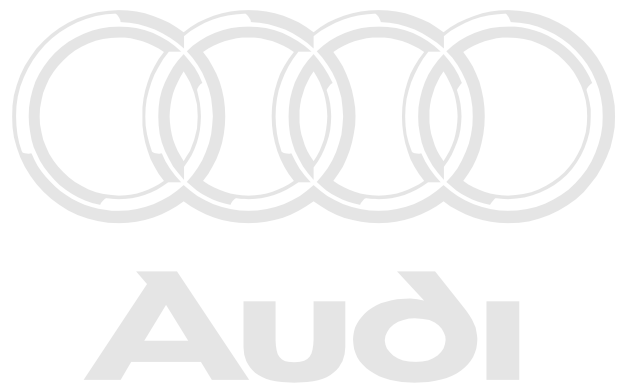


- -> Check for open circuit and short to earth/positive in the following wiring.

Connector Contact	Test box V.A.G 1598/19 Socket
1	B13
15	B5

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

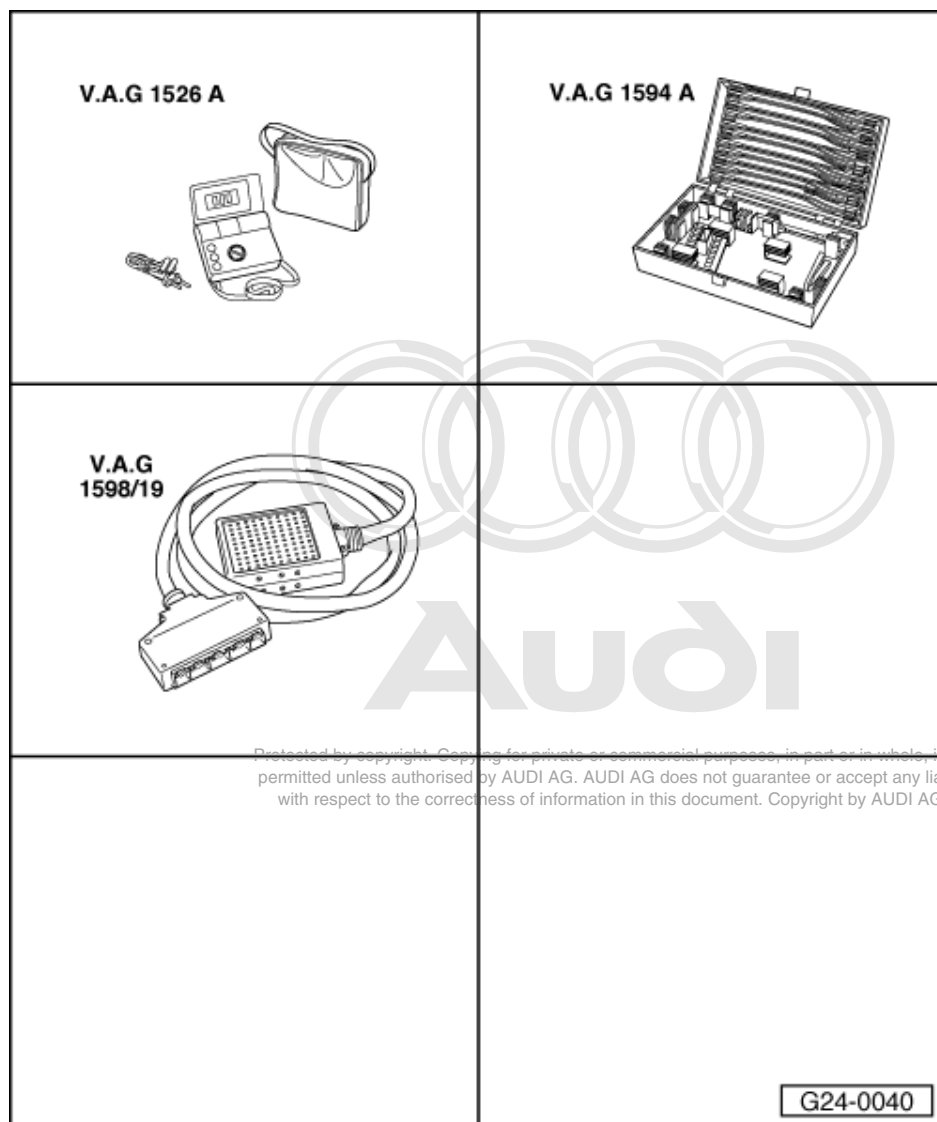
=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder



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1.6 - Checking engine speed sender -G28



Special tools and workshop equipment required

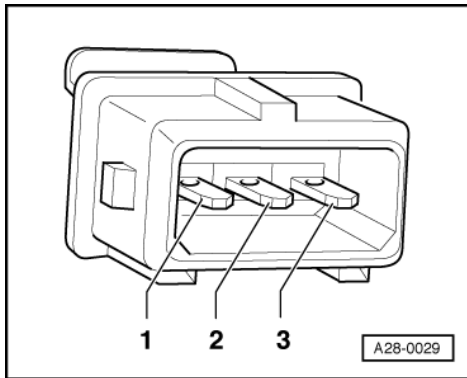
- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/19

The engine speed sender is an engine-speed and reference-mark sender. Sender failure causes engine to stop.

Fitting location => Exploded view of fitting locations - Page **57**

Checking internal resistance

- Switch off ignition.
- Unplug grey 3-pin connector at engine speed sender.



- -> Connect up multimeter for resistance measurement to contacts 1 and 2.
- Specification: 480 ... 1000 Ω

If reading does not match specification:

- Replace engine speed sender.

If reading matches specification:

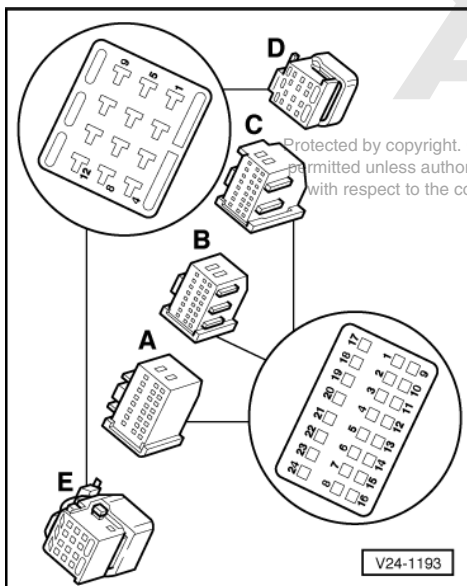
- Connect up multimeter for resistance measurement between contacts 1 and 3 as well as 2 and 3 at sender.
- Specification: in each case $\infty \Omega$ (no continuity)

If readings do not match specifications:

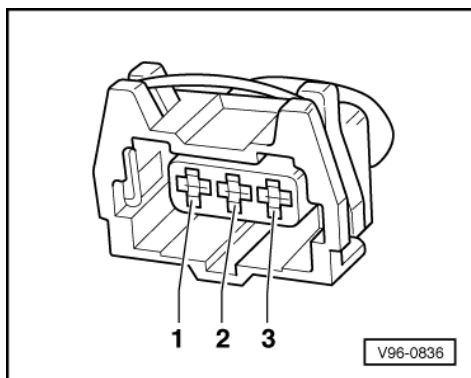
- Replace engine speed sender.

If readings match specifications:

Checking wiring



- -> With ignition switched off, connect test box V.A.G 1598/19 to connectors B and D of engine control unit (not to control unit) => Page 64 .



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

Connector Contact	Test box V.A.G 1598/19 Socket
1	B16
2	B15
3 (screen)	D11 (earth)

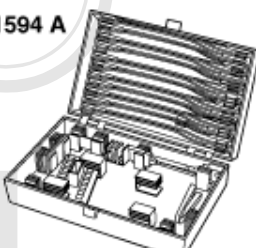
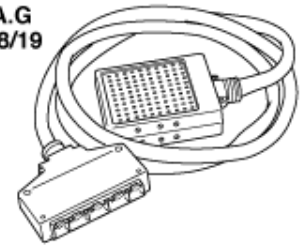
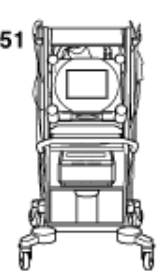
- If necessary, eliminate open circuit in wiring/short circuit.

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



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1.7 - Checking intake-air temperature sender -G42

V.A.G 1526 A 	V.A.G 1594 A 
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V.A.G 1598/19 	VAS 5051 
G24-0041	

Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/19
- ♦ VAS 5051 with VAS 5051/1 and VAS 5051/2

or

- ♦ V.A.G 1551 with V.A.G 1551/1

Fitting location => Exploded view of fitting locations - Page **57**

Test sequence

Reading measured value block 3			
1	2	3	4

- > Read measured value block, display group 003 (engine cooled down and not running) => Page **37**.
- Check display in zone 4.



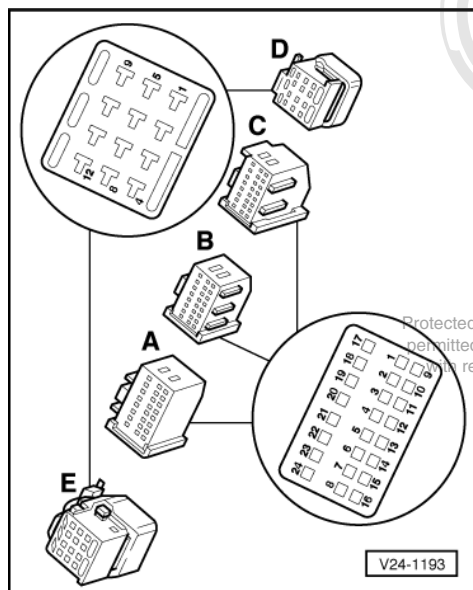
- Specification: Roughly equivalent to ambient temperature

Notes:

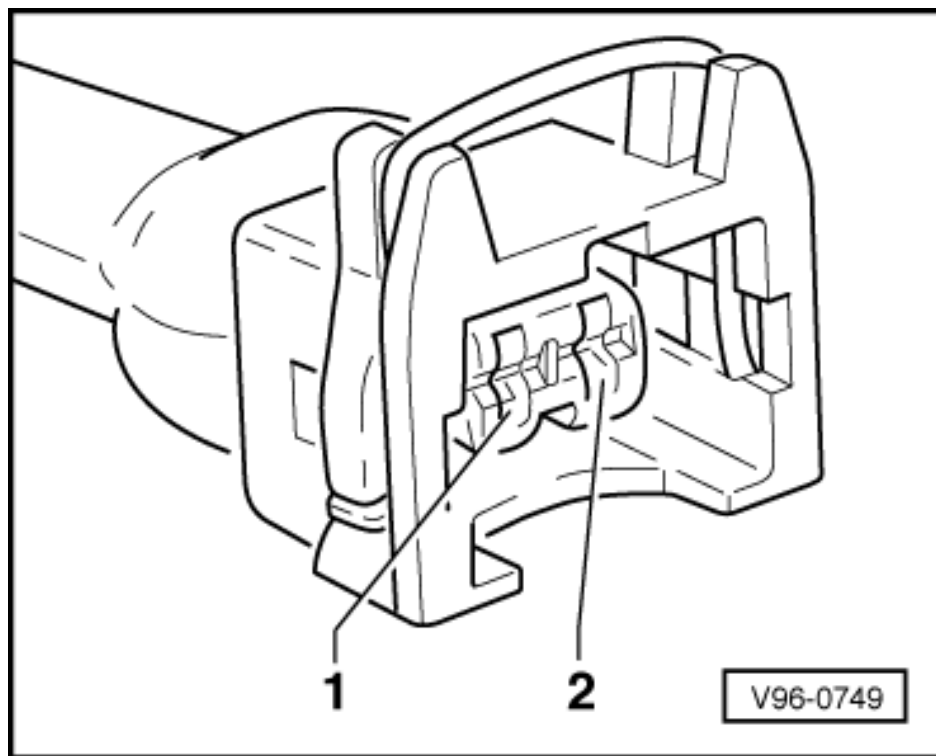
- ♦ If temperature displayed deviates considerably from sender ambient temperature, check sender/sender wiring for contact resistance and open circuit.
- ♦ Substitute value of 19.5 °C is displayed in the event of an open circuit in the wiring to the sender.

If display in zone 4 is not realistic:

- Switch off ignition.
- Unplug connector at intake-air temperature sender.



- -> With ignition switched off, connect test box V.A.G 1598/19 to connector A of engine control unit only (not to control unit) => Page 64 .



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

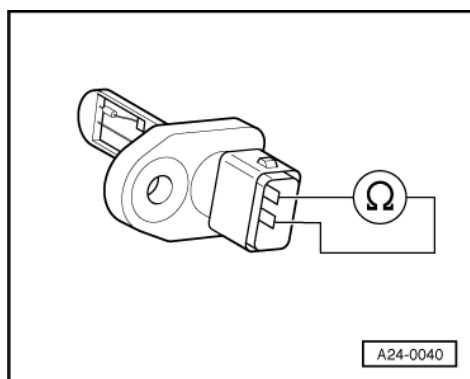
Connector Contact	Test box V.A.G 1598/19 Socket
1	A2
2	A15

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

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

If no fault is found in wiring:

Checking sender



- -> Connect multimeter to sender for resistance measurement.

Specifications

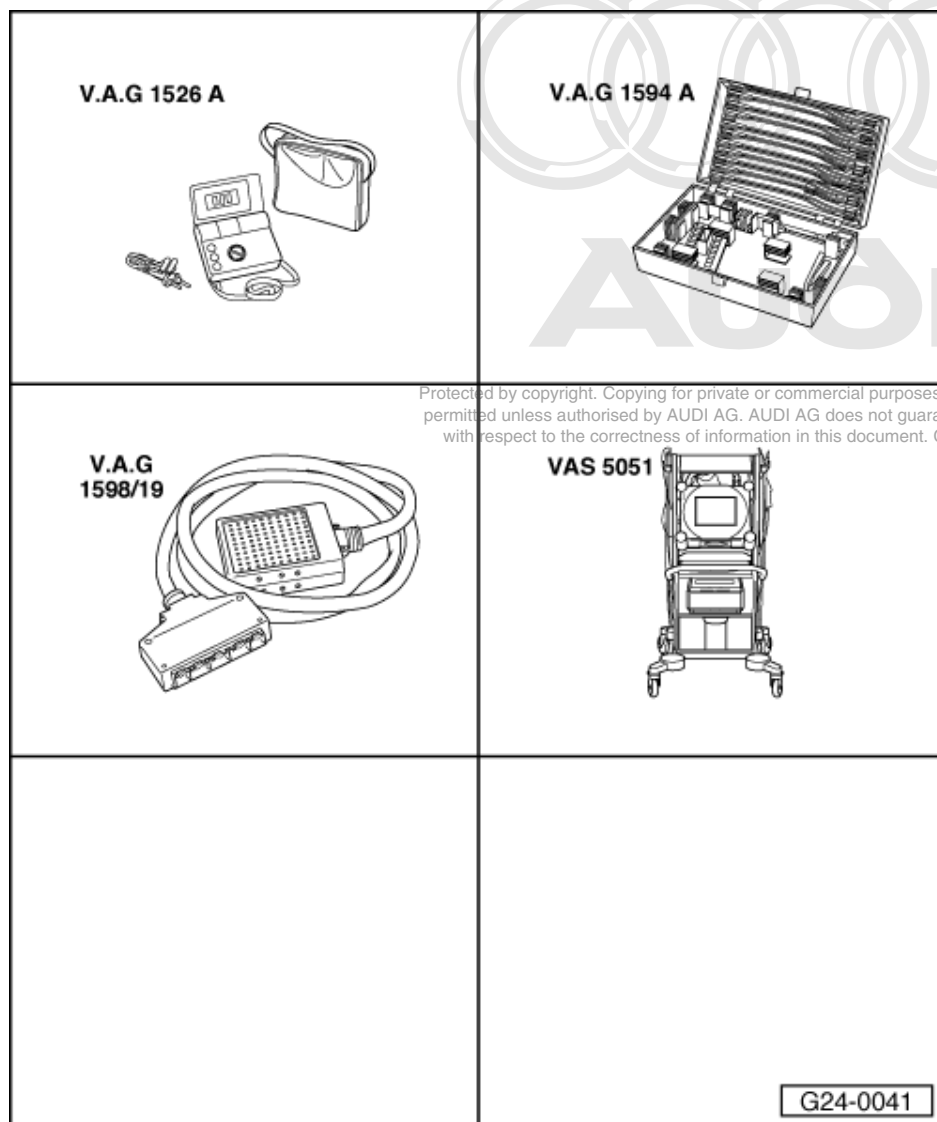
Temperature °C	Resistance kΩ
-20	approx. 13.8
0	approx. 5.5
20	approx. 2.4
40	approx. 1.1
60	approx. 0.6

If reading does not match specification:

- Replace intake-air temperature sender.



1.8 - Checking coolant temperature sender -G62



Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/19
- ♦ VAS 5051 with VAS 5051/1 and VAS 5051/2

or

- ♦ V.A.G 1551 with V.A.G 1551/1

Fitting location => Exploded view of fitting locations - Page 57

Test sequence

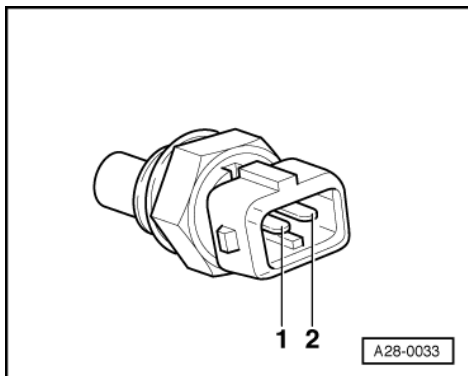
Reading measured value block 3			
1	2	3	4

- > Read measured value block, Display group 003, engine cold and idling=>Page 37 .
- Check display in zone 3.

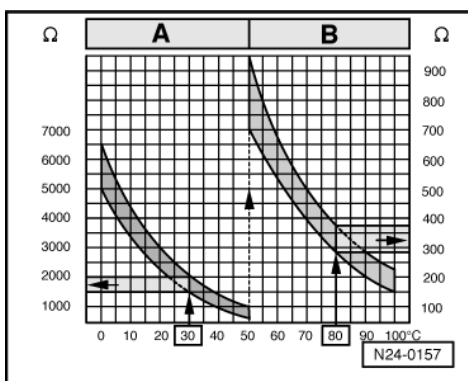
- Specification: Temperature value must increase steadily

If display in zone 3 is not realistic:

- Switch off ignition.
- Unplug connector at coolant temperature sender.



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

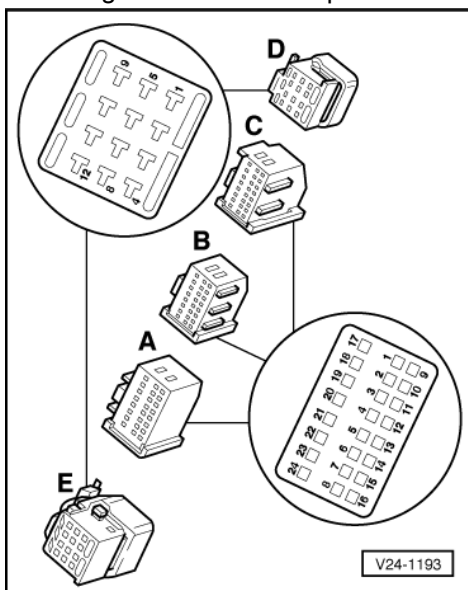


Ranges A and B indicate resistance values for temperature ranges 0...50 °C and 50...100 °C respectively.

-> Specimen readings:

- ♦ 30 °C corresponds to a resistance of 1500...2000 ω
- ♦ 80 °C corresponds to a resistance of 275...375 ω

If reading does not match specification:

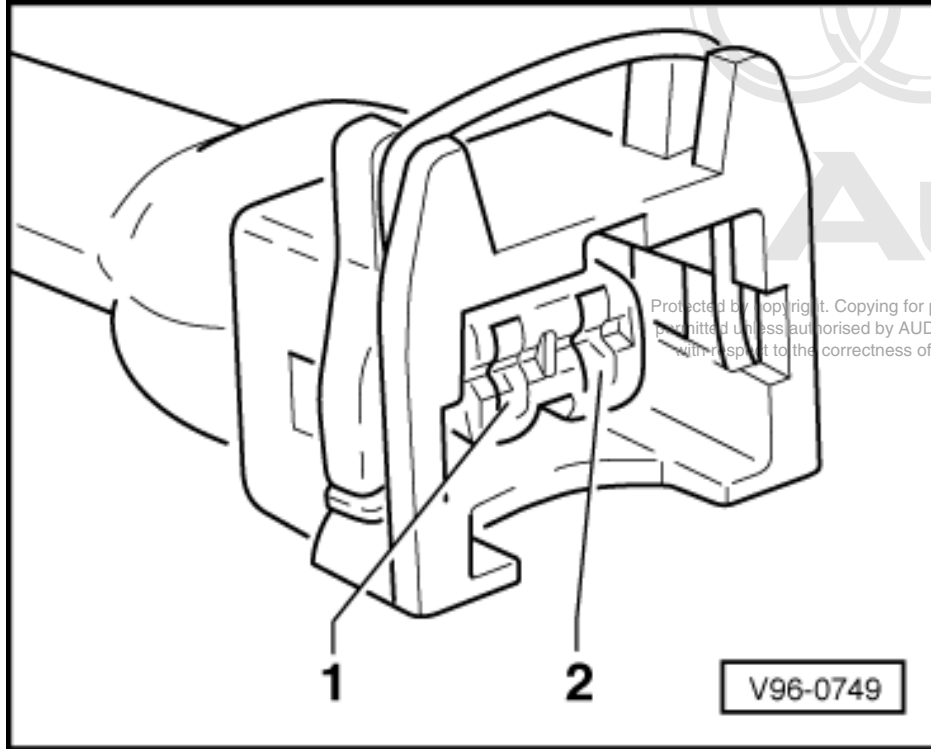


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- Replace coolant temperature sender.

If reading matches specification:

- -> With ignition switched off, connect test box V.A.G 1598/19 to connector A of engine control unit only (not to control unit) => Page 64 .



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

Connector Contact	Test box V.A.G 1598/19 Socket
1	A5
2	A15

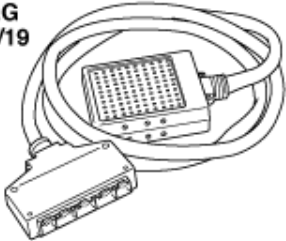
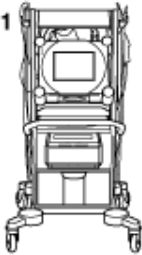
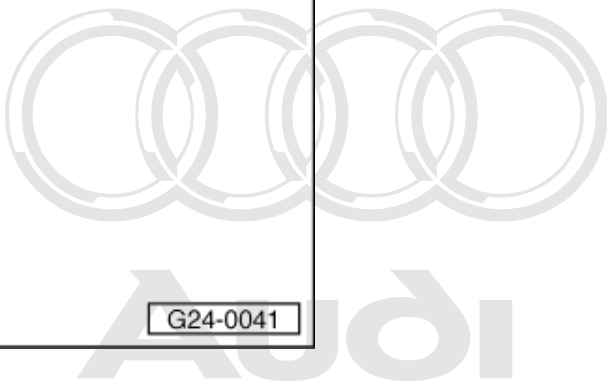
- Check both wires for mutual short circuit.
- If necessary, eliminate open circuit in wiring/short circuit.

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

If no fault is found in wiring:

- Replace engine control unit => Page 65 .

1.9 - Checking control unit power supply

V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598/19 	VAS 5051 
	 G24-0041

Special tools and workshop equipment required

- ◆ V.A.G 1526 A
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598/19
- ◆ VAS 5051 with VAS 5051/1 and VAS 5051/2

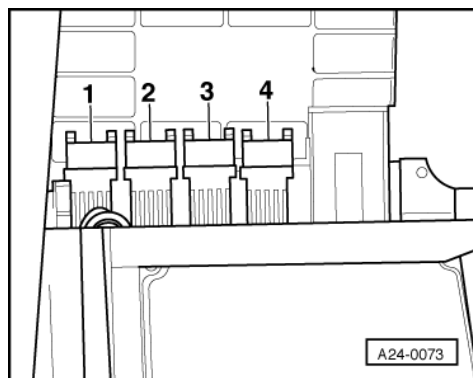
or

- ◆ V.A.G 1551 with V.A.G 1551/1

Test requirements:

- Battery voltage at least 12.7 V

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- -> Fuse S115 OK (in black box in electronics box in passenger's footwell)

Test sequence

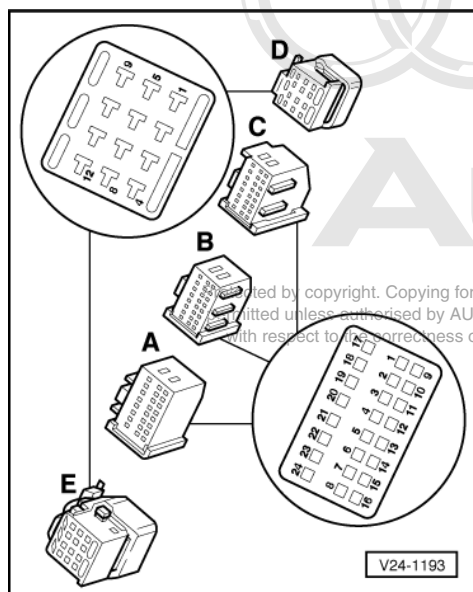
Reading measured value block 3

1 2 3 4

- > Read measured value block, display group 003, engine not running => Page 37 .
- Check display in zone 2.
- Specification: approx. battery voltage

If reading does not match specification:

- Switch off ignition.



- -> With ignition switched off, connect test box V.A.G 1598/19 to connectors D and E of engine control unit (not to control unit) => Page 64 .
- Connect up multimeter for voltage measurement as follows.

Test box V.A.G 1598/19 Socket	Measure to
D9	Engine earth
D11	Battery positive
D12	Battery positive
E11	Battery positive

Test box V.A.G 1598/19 Socket	Measure to
E12	Battery positive

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

Test box V.A.G 1598/19 Socket	Measure to
D10	Engine earth

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

If readings do not match specifications:

- Check wiring.

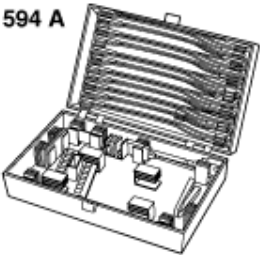
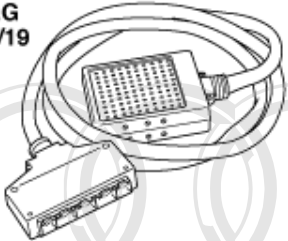
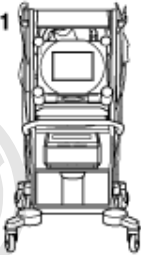
=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder



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1.10 - Checking knock sensors

V.A.G 1526 A 	V.A.G 1594 A 
V.A.G 1598/19 	VAS 5051 
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Special tools and workshop equipment required

- ♦ V.A.G 1526 A
- ♦ V.A.G 1594 A
- ♦ V.A.G 1598/19
- ♦ VAS 5051 with VAS 5051/1 and VAS 5051/2

or

- ♦ V.A.G 1551 with V.A.G 1551/1

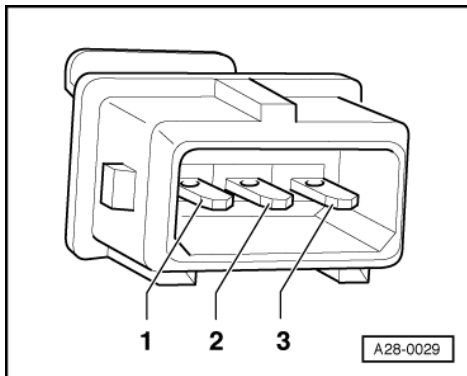
Fitting location => Exploded view of fitting locations - Page **57**

Notes:

- ♦ To check operation of knock sensors "Reading measured value block", display groups 013, 014, 015 and 016.
- ♦ The actual knock sensors 1 and 2 -G61 and -G66 cannot be electrically checked.
- ♦ Exclusive use is to be made of gold-plated contacts when repairing cable connectors for knock sensors.
- ♦ Exact compliance with tightening torque of 20 Nm is essential to proper knock sensor operation.

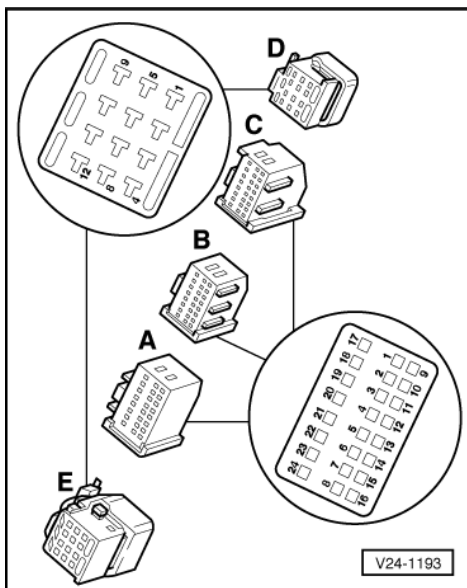
- ♦ Check connector between knock sensor and wiring harness for corrosion.

Checking knock sensor wiring



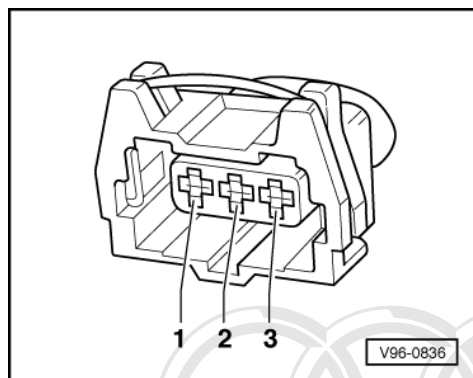
- Unplug connector of appropriate knock sensor in engine compartment.
- -> Check all three contacts at knock sensor connector for mutual short circuit (contacts 1+2, 1+3, 2+3).
 - Specification: $\infty \omega$ (no continuity) - there must be no contact between wires
- Replace knock sensor if there is contact.
- Check knock sensor wiring if no short circuit is found.

Checking wiring between knock sensors and engine control unit



- -> With ignition switched off, connect test box V.A.G 1598/19 to connectors A and D of engine control unit (not to control unit) => Page 64 .
- Check for open circuit and short to earth/positive in the following wiring.

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- -> Knock sensor 1

Connector Contact	Test box V.A.G 1598/19 Socket
1	A8
2	A15
3	D11

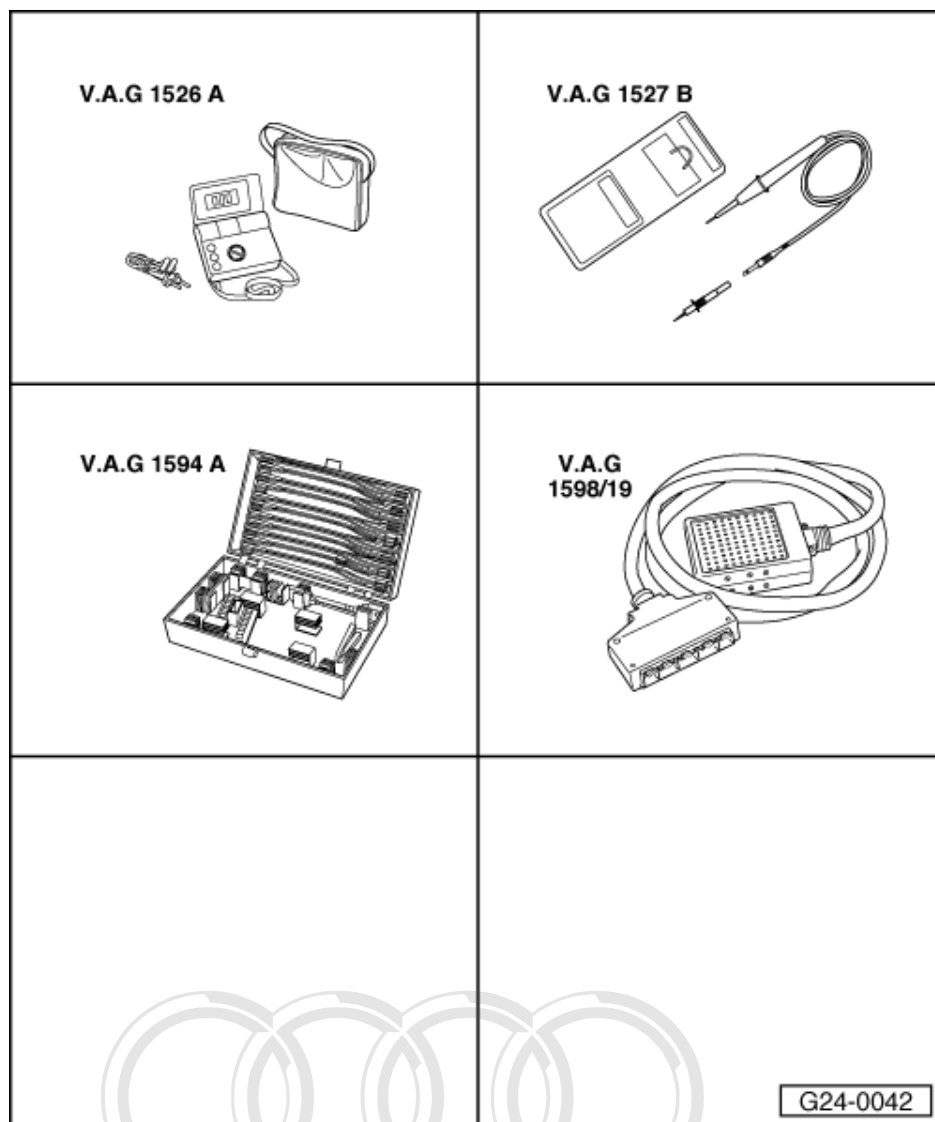
- Knock sensor 2

Connector Contact	Test box V.A.G 1598/19 Socket
1	A16
2	A15
3	D11

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

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

1.11 - Checking Hall sender -G40



Special tools and workshop equipment required

- ◆ V.A.G 1526 A
- ◆ V.A.G 1527 B
- ◆ V.A.G 1594 A
- ◆ V.A.G 1598/19

Fitting location => Exploded view of fitting locations - Page 57

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The Hall sender supplies the ignition position for cylinder 1.

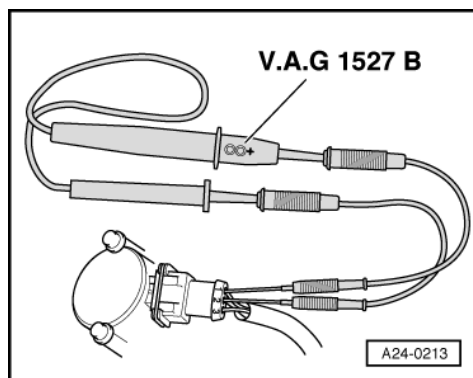
In the event of failure, knock control is deactivated and the ignition angle retarded slightly as cylinder assignment is no longer possible.

The engine continues to run without Hall sender signal and can also be re-started.

- ◆ If a fault is detected, the engine control unit triggers one spark per cylinder on each crankshaft revolution.
- ◆ The offset by one engine revolution has no noticeable effect on injection. Instead of injection taking place when the inlet valve is open, it is "advanced" to before closed inlet valve, which only slightly impairs the quality of mixture preparation.

Test sequence

- Push back rubber grommet at connector of Hall sender.



- -> Connect up voltage tester V.A.G 1527 B between contact 2 (Hall sender signal) and contact 2 (positive).

Note:

Pin assignment is marked on back of connector.

- Operate starter for several seconds.
 - LED must flash briefly on every second engine revolution

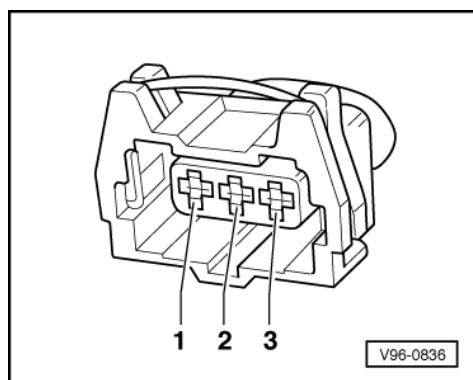
Note:

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

If LED does not flash:

Checking power supply

- Unplug connector at Hall sender.



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

Connector Contact	Measure to
1	Engine earth

- Specification: approx. 5 V

Checking signal wire

- Connect up multimeter for voltage measurement as follows.

Connector Contact	Measure to
2	Engine earth

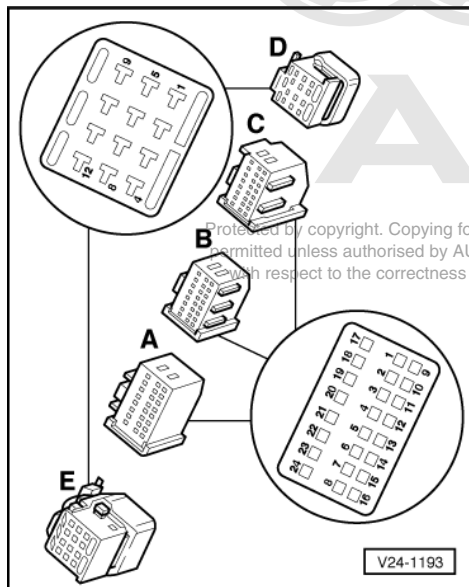
- Specification: approx. battery voltage

Checking earth wire

- Connect up multimeter for voltage measurement as follows.

Connector Contact	Measure to
3	Battery positive

- Specification: approx. battery voltage
If necessary, eliminate open circuit in wiring/short circuit.



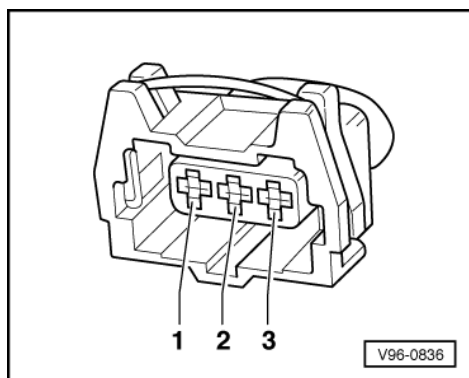
If all readings match specifications and LED does not flash (measured between contacts 1 and 2 with connector attached):

- Replace Hall sender.

If readings do not match specifications:

Checking wiring between Hall sender and engine control unit

- Switch off ignition.
- -> With ignition switched off, connect test box V.A.G 1598/19 to connectors A and B of engine control unit (not to control unit) => Page 64 .





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

Connector Contact	Test box V.A.G 1598/19 Socket
1	A3
2	B2
3	A15

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

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