

Audi 100 1991 ➤

Motronic fuel injection and ignition system (8-cyl.)

Engine ID

AHK

Edition 06.1996



Audi

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

Motronic fuel injection and ignition system (8-cyl.)

Repair Group

01 - Self-diagnosis

24 - Mixture preparation, Injection

28 - Ignition system

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

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01 - Self-diagnosis

1 - Self-diagnosis of Motronic system

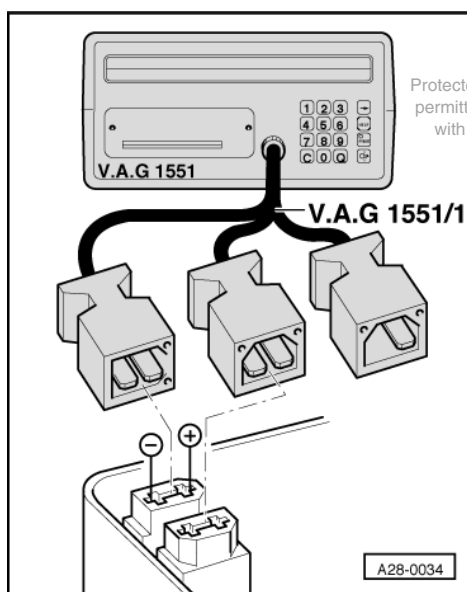
1.1 - Self-diagnosis of Motronic system

1.2 - Technical data of self-diagnosis

Available functions

Function	Ignition on	Engine idling
00 Automatic test routine	x	x
01 Interrogating control unit version	x	x
02 Interrogating fault memory	x	x
03 Final control diagnosis	x	-
04 Starting basic setting	x	x
05 Erasing fault memory	x	x
06 Ending output	x	x
07 Coding control unit	x	-
08 Reading measured value block	x	x
10 Adaptation	x	x

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



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**Note:**

Vehicle system tester V.A.G 1552 can be used instead of fault reader V.A.G 1551, but in this case no print-out can be produced.

Test conditions

- Fuses for engine electronics OK
- Battery voltage at least 11 V
- Fuel pump relay OK
- -> Connect fault reader with diagnostic cable V.A.G 1551/1 to the diagnostic sockets as follows:
- Black connector to "black" diagnostic socket

-> Readout on display:

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

* Appears alternately

- If no readout appears in the display, check voltage supply to black connector.

=> Current Flow Diagrams, Electrical Fault-Finding and Fitting Locations binder, Fault-finding program "Diagnostic wiring"

- White connector to "white" diagnostic socket
- Blue connector is not required.

Note:

- ♦ Additional operating instructions can be displayed by pressing the HELP key of V.A.G 1551.
- ♦ Use the ➔ button to move on to the next step of the program.
- Switch ignition on.
- Switch on printer with PRINT key (indicator lamp in key illuminates).
- Press key 1 for "Rapid data transfer" mode.

-> Readout on display:

Rapid data transfer	HELP
Enter address word	XX

- Press keys 0 and 1

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(01 enters address word "Engine electronics")

-> Readout on display:

Rapid data transfer	Q
01	Engine electronics

- Confirm entry with Q key.

-> Readout on display:

Rapid data transfer	
Tester sends address word	01

Note:

When the address word 00 has been entered and confirmed with the Q button, an automatic test sequence is implemented (fault memory interrogation of all systems with rapid data transfer).

-> Readout on display:

Rapid data transfer HELP
Control unit does not answer

-> If one of these messages appears in the display, carry out fault finding of diagnostic wires.

Rapid data transfer HELP
Communications problem

=> Current Flow Diagrams, Electrical Fault-Finding and Fitting Locations binder, Fault-finding program, "Diagnostic wiring"

Rapid data transfer HELP
K-wire not switching to earth

Rapid data transfer HELP
K-wire not switching to positive

- After rectifying the cause of the fault, enter address word 01 for brake electronics again and confirm with the Q key.

-> The control unit identification and the coding appear in the display.

4D0907557H 4, 2L V8/4V MOTR HS
D. ☐
Coding 04212 WSC 06388

The readout contains the following information:

4D0907557H	Control unit number (current control unit version - see Parts Programme)
4.2 L	Engine capacity
V8/4V	Type of engine (V engine, 8-Cyl., 4-valve)
MOTR	Motronic
HS	Handshift (manual gearbox)
D...	Software version of control unit
Coding 04212	Coding of engine control unit
WSC 06388	Workshop Code from V.A.G 1551 used to perform the last coding

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Note:

Incorrect coding can result in increased exhaust emission levels and in non-existent faults being stored in the fault memory.

1.4 - Interrogating and erasing fault memory

- Connecting fault reader V.A.G 1551 and selecting control unit for engine electronics
=>Page 1
- Start engine and run at idling speed, or crank engine with starter for at least 5 seconds, without subsequently switching off the ignition

-> Readout on display:

Rapid data transfer HELP
Select function XX

- Press keys 0 and 2



(02 selects the function "Interrogate fault memory".)

-> Readout on display:

Rapid data transfer Q
02 - Interrogating fault memory

- Confirm entry with Q key.

-> The display will either show the number of faults stored ...

X faults detected!

-> ... "No fault detected" appears in the display.

No fault detected

Note:

- ♦ If the printer is switched on, the stored faults will be displayed and printed out in sequence.
- ♦ If the printer is switched off the ➡ key must be pressed to display the next fault.

- Press ➡key after the last fault has been displayed.

-> Readout on display:

Rapid data transfer HELP
Select function XX

- Press keys 0 and 5

(05 selects the function "Erase fault memory".)

-> Readout on display:

Rapid data transfer Q
05 - Erase fault memory

- Confirm entry with Q key.

-> If this display appears:

Attention!
Fault memory not interrogated

Notes:

- ♦ If the ignition is switched off between interrogating the fault memory and erasing the fault memory, then the fault memory will not be erased.
- ♦ Adhere strictly to procedure, i.e. interrogate fault memory first.

-> Readout on display:

Rapid data transfer
Fault memory is erased

- Press ➡key.

-> Readout on display:

Rapid data transfer HELP
Select function XX

- Rectify the faults that are printed out in accordance with the fault table
=> Page 5 .
- Other faults can be stored when carrying out the repair work (e.g. by removing connector). Erase the fault memory again.
- Switch off engine and restart.
- Perform test drive for at least 10 minutes.



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- Perform automatic test sequence by entering address word 00.

1.5 - Fault table

The following table (arranged by fault code number) lists all the faults which the engine control unit can recognise and which can be displayed on the V.A.G 1551 printer.

If a fault occurs only occasionally or if the fault memory is not erased after the repair has been carried out, the fault will appear on the display as a "sporadic fault" (SP).

If a stored fault does not appear within the next 40 engine starts, the fault code will be automatically erased.

The fault memory is independent of the power supply.

The engine should be running at idling speed in order to interrogate the fault memory. If this is not possible, crank the engine with the starter for at least 5 seconds without then switching off the ignition.

Before rectifying a fault or replacing components, inspect the earth connections of the engine control unit and the earth connections at the engine for signs of corrosion and damage, also test the fuel pump relay.

1.6 - Fault codes 16486 to 17546

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
16486 Air mass meter -G70 Signal too small	- Open circuit in wiring between air mass meter and engine control unit -J220	- Emergency running mode (substitute value from throttle valve angle and engine speed), thus no noticeable effect on engine running	- Rectify short circuit or open circuit => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder
16487 Air mass meter -G70 Signal too high	- Air mass meter defective - Short circuit to positive or short to earth in signal wire to engine control unit -J220 - Faulty signal input in engine control unit (control unit defective)		- Test air mass meter => Page 90 - Replace engine control unit =>Page 54

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
16496 Intake air temperature sensor - G42 Signal too small	- Short to earth in wiring between intake air temperature sensor -G42 and engine control unit -J220 - -G42 defective - Faulty signal input in engine control unit (control unit defective)	- Emergency operation (substitute value constant +20 °C)	- Rectify short circuit or open circuit => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder - Test -G42 => Page 96 - Replace engine control unit =>Page 54 .

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
16497 Intake air temperature sensor - G42			



Signal too high	- Open circuit or short to positive in wiring between intake air temperature sensor -G42 and engine control unit -J220 - -G42 defective - Earth supply for -G42 defective - Faulty signal input in engine control unit (control unit defective)	- Emergency operation (substitute value constant +20 °C)	- Rectify short circuit or open circuit => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder - Read measured value block, display group 03, display zone 4 =>Page 31 - Test -G42 => Page 96 - Replace engine control unit =>Page 54 .
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V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
16500 Coolant temperature sensor - G62 Implausible signal	- Coolant temperature sensor -G62 supplies implausible signal due to loose contact/corrosion caused by moisture in connector - Faulty signal input in engine control unit (control unit defective)	- Cold start problems at very low temperatures - Engine running problems when warm - Increased fuel consumption - Increased emissions	- Read measured value block, display group 03 => Page 94 - Replace engine control unit =>Page 54 .

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
16501 Coolant temperature sensor - G62 Signal too small	- Short to earth in wiring between coolant temperature sensor -G62 and engine control unit -J220 - Coolant temperature sensor -G62 defective - Faulty signal input in engine control unit (control unit defective)	- Cold start problems at very low temperatures - Engine running problems when warm - Increased fuel consumption - Increased emissions	- Rectify short circuit or open circuit => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder - Read measured value block, display group 03 => Page 31 - Test -G62 => Page 94 - Replace engine control unit =>Page 54 .

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
16502 Coolant temperature sensor - G62			

Signal too high	- Open circuit or short to positive in wiring between -G62 and engine control unit -J220 - Coolant temperature sensor -G62 defective - Earth supply for -G62 defective - Faulty signal input in engine control unit (control unit defective)	- Cold start problems at very low temperatures - Engine running problems when warm - Increased fuel consumption - Increased emissions	- Rectify short circuit or open circuit => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder - Read measured value block, display group 03 => Page 31 - Test -G62 => Page 94 - Replace engine control unit =>Page 54
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Note:

If no signal is received from the coolant temperature sensor, the engine control unit calculates a substitute value.

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
16505 Throttle valve potentiometer - G69 Implausible signal	- Moisture or corrosion on plug connector for potentiometer - Potentiometer defective	- Jolting on acceleration	- Read measured value block, display group 04 =>Page 32 - Test throttle valve potentiometer -G69 => Page 87

Note:

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

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
16506 Throttle valve potentiometer - G69 Signal too small	- Short circuit to earth in potentiometer or in wiring between potentiometer and engine control unit -J220	- Jolting on acceleration - Load change jolt on accelerator release	- Test and adjust throttle valve potentiometer -G69 => Page 87
16507 Throttle valve potentiometer - G69 Signal too high	- G69 throttle valve potentiometer defective - Open circuit or short circuit to positive in potentiometer or in wiring between potentiometer and engine control unit -J220		- Rectify short circuit or open circuit => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

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**Note:**

As soon as one of the faults is identified, the control unit uses a computed substitute value.

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
16514 Bank 1, probe 1 Electrical fault in circuit	- Corrosion due to moisture in connector for lambda probe 1 -G39	- Emission levels not OK	- Test lambda control =>Page 69
16534 Bank 2, probe 1 Electrical fault in circuit	- Short circuit between lambda probe signal wire and lambda probe reference earth wire - Amplitude of signal voltage too small (lambda probe -G39 intoxicated or probe slots clogged or dirty)	- Increased fuel consumption - Soot on spark plugs - Lambda control switches to open loop control	- Read measured value block, display group 10 or 11 =>Page 35 - Rectify short circuit or open circuit => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
16515 Bank 1, probe 1 Voltage too low	- Lambda probe defective - Short to earth or short to screening in signal wire	- Emission levels not OK - Soot on spark plugs - Lambda control switches to open loop control - Increased fuel consumption - Black smoke	- Rectify short circuit or open circuit => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder - Test lambda control =>Page 69 - Read measured value block, display group 11 =>Page 36
16535 Bank 2, probe 1 Voltage too low			

Note:

- ♦ Bank 1 = cylinders 1 ... 4, right
- ♦ Bank 2 = cylinders 5 ... 8, left

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
16516 Bank 1, probe 1 Voltage too high	- Lambda probe defective - Short to positive in signal wire	- Emissions not OK - Increased fuel consumption - Black smoke - Soot on spark plugs	- Rectify short circuit or open circuit => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder - Test lambda control =>Page 69
16536 Bank 2, probe 1 Voltage too high			

		- Lambda control switches to open loop control	- Read measured value block, display group 11 =>Page 36
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V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
16518 Bank 1, probe 1 No activity	- No probe heating function - Wiring between probe heating and engine control unit -J220 - Heating resistor in probe faulty - Lambda probe defective (dirty)	- Black smoke - Soot on spark plugs - Emissions not OK - Lambda control switches to open loop control - Increased fuel consumption	- Read measured value block, display group 11 =>Page 36 - Rectify short circuit or open circuit => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder - Test lambda control =>Page 69
16538 Bank 2, probe 1 No activity			

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V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
16684 Misfire detected	- Open circuit between - J220 and power output stage for ignition coils	- CAT warning lamp flashes	- Test power output stages => Page 104
16685 Cyl. 1 misfire detected	- Open circuit between power output stage and ignition coils	- Emission levels not OK - Idling speed not OK	- Rectify open circuit => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder
16686 Cyl. 2 misfire detected	- Power output stage for ignition coils faulty		- Read measured value block, display groups 17 to 20 =>Page 39
16687 Cyl. 3 misfire detected	- Open circuit in positive supply for ignition coils	- Engine may cut out - Lambda control switches to open loop control	- Test ignition coils =>Page 101
16688 Cyl. 4 misfire detected	- Signal output in control unit faulty		- Test injectors =>Page 61
	- Defective spark plug	- Loss of power - Rough engine running	
	- Ignition coil faulty		
	- Valve spring broken		

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
16689 Cyl. 5 misfire detected	- Open circuit between - J220 and power output stage for ignition coils	- CAT warning lamp flashes	- Test power output stages => Page 104
16690 Cyl. 6 misfire detected	- Open circuit between power output stage and ignition coils	- Emission levels not OK - Idling speed not OK	- Read measured value block, display groups 17 to 20 =>Page 39
16691 Cyl. 7 misfire detected	- Power output stage for ignition coils faulty		- Rectify open circuit => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder
	- Open circuit in positive supply for ignition coils	- Engine may cut out - Lambda control switches to open loop control	
	- Signal output in control unit faulty		



16692 Cyl. 8 misfire detected	- Open circuit between - J220 and injector - Injector defective - Defective spark plug - Ignition coil faulty - Valve spring broken	- Loss of power - Rough engine running	- Test ignition coils =>Page 61
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V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
16705 Engine speed sensor -G28 Implausible signal	- Metal swarf on sensor - Sensor base loose - Gap between sensor and ring gear greater than 2.2 mm	- Engine misfiring	- Test engine speed sensor =>Page 92

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
16706 Engine speed sensor -G28 No signal	- -G28 loose or defective - Open circuit or short to earth or short to positive in signal wire - Open circuit or short to positive in earth wire - Open circuit in screening for -G28 - Faulty signal input in engine control unit (control unit defective)	- Engine will not start - Engine cuts out	- Test -G28 => Page 92 - Rectify open circuit or short circuit => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder - Replace engine control unit =>Page 54

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
16711 Knock sensor 1 -G61 Signal too small	- Knock sensor loose or corrosion on connector - Open circuit or short to earth/screen in signal wire between knock sensor and engine control unit - Short circuit between knock sensor and earth or to screening - Knock sensor defective - Faulty signal input in engine control unit (control unit defective)	- High fuel consumption - Loss of power	- Test knock sensor =>Page 107 - Tightening torque for knock sensor: 20 Nm - Rectify short circuit or open circuit - Replace engine control unit =>Page 54
16716 Knock sensor 2 -G66 Signal too small			

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
16712 Knock sensor 1 -G61			

Signal too high	- Abnormal engine running noise (ancillaries loose)		
16717 Knock sensor 2 -G66 Signal too high	- Knock sensor loose - Knock sensor defective - Short to positive between knock sensor and engine control unit - Faulty signal input in engine control unit (control unit defective)	- High fuel consumption - Loss of power	- Test knock sensor =>Page 38 - Rectify short circuit or open circuit => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder - Replace engine control unit =>Page 54

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
16885 Vehicle speed signal Implausible signal	- Vehicle speed sensor -G68 defective - Short circuit or open circuit between -G68 and speedometer -G21 - Open circuit or short in wiring between dash panel insert and engine control unit -J220 - Speedometer -G21 defective	- No air-conditioner compressor shut-off in first gear at full throttle - Brief deviation between idling speed and specified speed - Malfunctioning of systems which use the vehicle speed signal	- Test speed signal => Page 99 - Read measured value block, display group 08, display zone 4 => Page 34 - Rectify open circuit or short circuit => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
16944 Power supply Implausible signal	- Motronic fuse - Power supply relay faulty	- Engine control unit -J220 destroyed - Engine will not run	- Test fuse for Motronic and injectors - Check voltage
16946 Power supply Voltage too low	- Contact resistance in power supply relay - Battery discharged, voltage less than 10 V	- Idling speed outside specified range	- Check battery charge level
16947 Power supply Voltage too high	- Poor earth connection to engine control unit -J220 - Supply voltage greater than 16 V - Current drain - Alternator defective - Open circuit in wiring from power supply relay to engine control unit (10D)		- Test power supply relay of engine control unit => Page 85 - Read measured value block, display group 03 =>Page 31

Notes on fault codes 16944, 16946 and 16947:

- ♦ If the fault is shown as a sporadic fault, ignore the fault message on the display. This fault is often stored when the engine is left idling for a long period with a large number of electrical consumers switched on, causing the battery charge to become very low.
- ♦ The fault message "Signal too low" is stored if the supply voltage falls below 10.08 V for more than 2 seconds (the control unit will not function at less than 6.5 V).
- ♦ Testing for "Signal too low" does not take place during starting, as voltage may then drop below 10.08 V.



V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
16985 Control unit faulty	- Engine control unit defective	- Engine will not run	- Replace engine control unit => Page 54
16988 Control unit faulty			

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
17510 Bank 1, probe 1, heating circuit Short circuit to positive	- Short circuit to positive in the lambda probe or in the cable between the relevant lambda probe and engine control unit - One or both lambda probes faulty	- During lengthy periods of idling the ACF reservoir is overfilled and fuel drips out of the air admission/vent pipe of the ACF reservoir	- Rectify short circuit or open circuit => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder Test lambda probe heating =>Page 70
17515 Bank 2, probe 1, heating circuit Short circuit to positive			

Notes on fault codes 17510 and 17515:

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- ♦ If one of the two faults is recognised, it is always stored in the fault memory together with the other one. Both faults are always stored in the fault memory, which does not mean that both lambda probes are faulty.
- ♦ Both lambda probes are connected to the same electrical circuit.

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
17535 Bank 1, mixture adaptation (mult.) System too rich	- Fuel pressure too high	- Jolting may occur	- Fill up vehicle, check fuel system pressure => Page 57
17545 Bank 1, mixture adaptation (add.) System too rich	- Injectors leaking - Incorrect signal from air mass meter - Leaks in exhaust system as far as catalytic converter - Fuel in engine oil (possibly from driving short distances)	- Formation of black smoke, soot deposits on spark plugs - Increased fuel consumption - Formation of black smoke and/or soot deposits on spark plugs - Poor idling may occur	- Test injection quantity - Test air mass meter => Page 90 - Rectify leaks - Drive vehicle on a motorway for 15 minutes or change oil

Notes:

- ♦ mul = multiplicative means that the fault has an effect over the entire engine speed and load range.
- ♦ add = additive means that the fault only has an effect during idling

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
17536 Bank 1, mixture adaptation (mult.)			

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
System too lean	- Fuel system pressure too low	- Jolting may occur	- Fill up vehicle, check fuel system pressure => Page 57
17544 Bank 1, mixture adaptation (add.)	- Unmetered air downstream of air mass meter	- Poor idling may occur	- Read measured value block, display group 10 => Page 35
System too lean	- Incorrect signal from air mass meter -G70 - Solenoid valve 1 for activated charcoal filter - N80 sticking	- Increased fuel consumption - Formation of black smoke and/or soot deposits on spark plugs	- Test air mass meter => Page 90 - Test ACF valve -N80 => Page 83

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
17537 Bank 2, mixture adaptation (mult.)			
System too rich	- Fuel pressure too high	- Jolting may occur	- Fill up vehicle, check fuel system pressure => Page 57
17547 Bank 2, mixture adaptation (add.)	- Injectors leaking	- Formation of black smoke, soot deposits on spark plugs	- Check injection quantity
System too rich	- Incorrect signal from air mass meter - Leaks in exhaust system as far as catalytic converter - Fuel in engine oil (possibly from driving short distances)	- Increased fuel consumption - Formation of black smoke and/or soot deposits on spark plugs - Poor idling may occur	- Test air mass meter => Page 90 - Rectify leaks - Drive vehicle on a motorway for 15 minutes or change oil

Note:

- ♦ mul = multiplicative means that the fault has an effect over the entire engine speed and load range.
- ♦ add = additive means that the fault only has an effect during idling

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
17538 Bank 2, mixture adaptation (mult.)			
System too lean	- Fuel system pressure too low	- Jolting may occur	- Fill up vehicle, check fuel system pressure => Page 57
17546 Bank 2, mixture adaptation (add.)	- Unmetered air downstream of air mass meter	- Poor idling may occur	- Read measured value block, display group 10 => Page 35
System too lean	- Incorrect signal from air mass meter -G70 - Solenoid valve 1 for activated charcoal filter - N80 sticking	- Increased fuel consumption - Formation of black smoke and/or soot deposits on spark plugs	- Test air mass meter => Page 90 - Test ACF valve -N80 => Page 83

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1.7 - Fault codes 17604 to 18101

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
17604 Bank 1, probe 1, heating circuit Electrical fault	- Open circuit in lambda signal wire - Fuse defective	- Emission levels not OK	- Test lambda probe heating =>Page 70 Check fuse
17605 Bank 2, probe 1, heating circuit Electrical fault	- Voltage supply for lambda probe heating circuit interrupted - Short circuit to earth or open circuit in the lambda probe or in the cable between the relevant lambda probe and the engine control unit	- Fuel odours - During lengthy periods of idling the ACF reservoir is overfilled and fuel drips out of the air admission/vent pipe of the ACF reservoir	- Rectify short circuit or open circuit => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

Note:

If both faults are stored simultaneously in the fault memory, this does not mean that both lambda probes are faulty, as both lambda probes are connected to the same electrical circuit.

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V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
17609 Injector, cylinder 1 -N30 Electrical fault in circuit	- Short circuit to earth - Open circuit	- Rough engine running - CAT warning lamp flashes or lights up continuously	- Test actuation of injectors =>Page 61
17610 Injector, cylinder 2 -N31 Electrical fault in circuit			
17611 Injector, cylinder 3 -N32 Electrical fault in circuit			
17612 Injector, cylinder 4 -N33 Electrical fault in circuit			

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
17613 Injector, cylinder 5 -N83 Electrical fault in circuit	- Short circuit to earth - Open circuit	- Rough engine running - CAT warning lamp flashes or lights up continuously	- Test actuation of injectors =>Page 61
17614 Injector, cylinder 6 -N84 Electrical fault in circuit			
17615 Injector, cylinder 7 -N85 Electrical fault in circuit			
17616 Injector, cylinder 8 -N86 Electrical fault in circuit			

V.A.G 1551 print-out 17621 Injector, cylinder 1 -N30 Short circuit to positive	Possible cause of fault - Short to positive in wiring between engine control unit and injector - Short circuit to positive in injector	Possible effects - CAT warning lamp is actuated by the misfire detection (flashes or lights up continuously) - Rough engine running	Fault remedy - Test actuation of injectors =>Page 61
17622 Injector, cylinder 2 -N31 Short circuit to positive			
17623 Injector, cylinder 3 -N32 Short circuit to positive			
17624 Injector, cylinder 4 -N33 Short circuit to positive			

V.A.G 1551 print-out 17625 Injector, cylinder 5 -N83 Short circuit to positive	Possible cause of fault - Short to positive in wiring between engine control unit and injector - Short circuit to positive in injector	Possible effects - CAT warning lamp is actuated by the misfire detection (flashes or lights up continuously) - Rough engine running	Fault remedy - Test actuation of injectors =>Page 61
17626 Injector, cylinder 6 -N84 Short circuit to positive			
17627 Injector, cylinder 7 -N85 Short circuit to positive			
17628 Injector, cylinder 8 -N86 Short circuit to positive			

V.A.G 1551 print-out 17733 Knock control, cyl. 1, control limit reached 17734 Knock control, cyl. 2, control limit reached 17735 Knock control, cyl. 3, control limit reached 17736 Knock control, cyl. 4, control limit reached	Possible cause of fault - Poor quality fuel (less than RON 95) - Abnormal engine running noise (ancillaries loose) - Loose contact in the connector - Open circuit in screen wiring of knock sensor 1 or 2 - Knock sensor tightened to incorrect torque	Possible effects - High fuel consumption - Loss of power - Rough engine running	Fault remedy - Fill up with petrol of at least RON 95 Check knock sensor =>Page 107 - Read measured value block, display groups 13, 14, 15, 16 => Page 37 - Rectify short circuit or open circuit => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder - Tighten knock sensor (20 Nm)
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V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
17737 Knock control, cyl. 5, control limit reached	- Poor quality fuel (less than RON 95)	- High fuel consumption	- Fill up with petrol of at least RON 95 Check knock sensor =>Page 107
17738 Knock control, cyl. 6, control limit reached	- Abnormal engine running noise (ancillaries loose)	- Loss of power	- Read measured value block, display groups 13, 14, 15, 16 => Page 37
17739 Knock control, cyl. 7, control limit reached	- Loose contact in the connector - Open circuit in screen wiring of knock sensor 1 or 2	- Rough engine running	- Rectify short circuit or open circuit => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder
17740 Knock control, cyl. 8, control limit reached	- Knock sensor tightened to incorrect torque		- Tighten knock sensor (20 Nm)

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
17794 Control unit faulty	- Engine control unit defective	- Engine will not run	- Replace engine control unit => Page 54
17799 Bank 2, camshaft position sensor => -G40 Short circuit to earth	- Short to earth between Hall sensor -G40 and engine control unit -J220 - Hall sensor -G40 defective - Faulty signal input in engine control unit (control unit defective)	- Loss of power - High fuel consumption - Emission levels not OK	- Rectify short circuit => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder - Check Hall sensor -G40 => Page 108 - Replace engine control unit =>Page 54

Note:

Bank 2 = cylinders 5 ... 8, left

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
17800 Bank 2, camshaft position sensor => -G40 Open circuit / short to positive	- Open circuit or short to positive between Hall sensor -G40 and engine control unit -J220 - Hall sensor -G40 defective - Faulty signal input in engine control unit (control unit defective)	- Loss of power - High fuel consumption - Emission levels not OK	- Rectify short circuit => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder - Check Hall sensor -G40 => Page 108 - Replace engine control unit =>Page 54 .

Note:

Bank 2 = cylinders 5 ... 8, left

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
17817 Tank breather valve -N80 Electrical fault in circuit	- Fuse defective - Short circuit to earth or open circuit between activated charcoal filter solenoid -N80 and engine control unit -J220 - Open circuit between solenoid valve and fuse	- Possibility of jolting in part throttle range - Activated charcoal filter may overflow, there may also be a smell of fuel in the car	- Check fuse - Read measured value block, display group 12 => Page 37 - Check solenoid valve for activated charcoal filter -N80 => Page 83 - Rectify short circuit or open circuit => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
17818 Tank breather valve -N80 Short circuit to positive	- Short circuit to positive between solenoid valve for activated charcoal filter - N80 and engine control unit -J220	- Activated charcoal filter may overflow, there may also be a smell of fuel in the car	- Check solenoid valve for activated charcoal filter - N80 => Page 83

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
17908 Fuel pump relay -J17 Electrical fault in circuit	- Short circuit to earth or open circuit between fuel pump relay -J17 and engine control unit -J220 - Fuel pump relay defective	- In the event of a short circuit to earth: engine runs normally - Current draw when ignition switched on due to relay picking up - Fuel pump runs constantly, even when the engine is not running - In the event of an open circuit: Engine will not run	- Check fuel pump relay -J17 => Page 64 - Rectify short circuit or open circuit => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder
17910 Fuel pump relay -J17 Short circuit to positive	- Short circuit to positive between fuel pump relay and engine control unit - J220	- Engine will not run	- Rectify short circuit => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
17913 Idling switch -F60			



Does not close / open circuit	- Setting of idling switch - Throttle cable setting - Throttle valve sticking - Floor mat pressing down on accelerator pedal - -F60 defective - Open circuit or short to positive or earth between idling speed switch -F60 and engine control unit -J220	- Idling speed control switches to open loop control - Idling speed outside specified range	- Test idling switch -F60 =>Page 76 - Adjust throttle cable => 8-cylinder engine, Mechanical components; Repair Group. 20; Servicing throttle control; Adjusting throttle cable - Rectify open circuit or short circuit - => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder
17914 Idling switch -F60			
Does not open/short to earth	- Moisture in throttle valve connector - Faulty signal input in engine control unit		- Replace engine control unit =>Page 54 .

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
17915 Idling system learned value Lower limit reached	- Idling stabilisation valve sticking in open position - Unmetered air downstream of throttle valve body - Unmetered air upstream of throttle valve body	- Idling speed too high or engine surges when idling	- Test idling stabilisation =>Page 73 - Eliminate air leak
17916 Idling system learned value Upper limit reached	- Incorrect signal from air mass meter - Idling stabilisation valve sticking in closed position	- Poor load changes as a result of safety fuel shutoff - Idling speed too low or engine surges when idling	- Read measured value block, display group 07 =>Page 34 - Test air mass meter -G70 => Page 90

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
17917 Idling stabilisation valve - N71 Electrical fault in circuit	- Short circuit to earth or open circuit between idling stabilisation valve - N71 and engine control unit - Valve -N71 defective	- Variation from specified idling speed when engine at operating temperature - Cold engine may cut out - Jerky acceleration or surging when idling - Cold engine may cut out	- Read measured value block, display group 07 =>Page 34 - Test idling stabilisation =>Page 73
17918 Idling stabilisation valve - N71 Short circuit to positive	- Short circuit to positive in idling stabiliser or in wiring between idling positioner and contacts 1D or 5D of engine control unit -J220	- Variation from specified idling speed when engine at operating temperature	- Check wiring => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
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17919 Intake manifold changeover valve -N156 Electrical fault in circuit	- Short to earth or open circuit in wiring between valve -N156 and engine control unit -J220 - Intake manifold changeover valve -N156 faulty	- In the event of an open circuit: loss of power above 4000 rpm (top speed is not reached) - In the event of a short circuit to earth: loss of torque up to 4000 rpm	- Test variable intake manifold changeover =>Page 78 - Read measured value block, display group 22 =>Page 41
17920 Intake manifold changeover valve -N156 Short circuit to positive	- Short to positive between intake manifold changeover valve -N156 and engine control unit -J220 - Faulty signal input in engine control unit	- Loss of power above 4000 rpm (top speed is not reached)	- Check wiring connections => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder - Replace engine control unit =>Page 54

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
17925 Main relay => -J271 Electrical fault in circuit	- Short circuit to earth	- Current drawn by permanently picked up relay (battery discharges)	- Test wiring connections for short circuit or open circuit
17926 Main relay => -J271	- Open circuit in wiring between power supply relay -J271 and engine control unit -J220	- Engine will not start	=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder
Short circuit to positive	- Short circuit to positive		- Test power supply relay =>Page 85

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
17968 Maximum engine speed exceeded	- Engine overrevs	- Possible engine damage	- Rectify mechanical damage

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
17978 Engine control unit Inhibited	- Wiring connection or short circuit to earth or positive between immobiliser control unit and engine control unit - Attempt made to start vehicle with unauthorised key	- Engine starts briefly and cuts out again after approx. 1 second - Immobiliser lamp flashes	- Test wiring connection to immobiliser => Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder Check and if necessary perform key adaptation => Electrical System; Repair Group 96; Servicing immobiliser; Carrying out adaptation of car keys

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	- Engine control unit replaced and not adapted to immobiliser		- Perform adaptation of engine control unit to immobiliser control unit. => Electrical system; Repair group 96; Servicing immobiliser; Adaptation procedure after renewing engine control unit
--	---	--	---

Note on fault code 17978:

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

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
18010 Power supply terminal 30 Voltage too low	Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability for the correctness of information in this document. Copyright by AUDI AG. - Battery was disconnected - Permanent power supply at control unit disconnected (connector D) or open circuit in wiring - Battery not fully charged		- Test power supply relay - J271 for engine control unit => Page 85 - Test battery
18048 Control unit faulty	- Engine control unit defective	- Engine will not run	- Replace engine control unit => Page 54

V.A.G 1551 print-out	Possible cause of fault	Possible effects	Fault remedy
18098 Fault lamp for self-diagnosis - K83 Electrical fault in circuit	- Incorrect coding	- Lamp is permanently lit up	- Encoding =>Page 43
18101 Fault lamp for self-diagnosis - K83 Short circuit to positive	- Short to positive between CAT warning lamp and engine control unit - CAT warning lamp faulty - Short to earth or open circuit between CAT warning lamp and engine control unit -J220	- Lamp does not light up - Lamp does not light up - Lamp is permanently lit up	- Test actuation of CAT warning lamp => Page 99 - Replace lamp

1.8 - Final control diagnosis**Note:**

- ♦ The final control diagnosis can only be performed with the engine stopped and the ignition switched on.
- ♦ The final control diagnosis is terminated if the engine is started or if an engine speed pulse is detected.
- ♦ During the final control diagnosis, individual control elements are actuated until the test programme is advanced to the next control element by pressing the ➡ key.
- ♦ The operation of the control elements is checked either by listening or by touching.
- ♦ If the final control diagnosis is to be repeated without first starting the engine briefly, switch off the ignition for approx. 20 seconds.

Actuation sequence of control elements:

1. Injector, cylinder 1 -N30

2. Injector, cylinder 2 -N31
3. Injector, cylinder 3 -N32
4. Injector, cylinder 4 -N33
5. Injector, cylinder 5 -N83
6. Injector, cylinder 6 -N84
7. Injector, cylinder 7 -N85
8. Injector, cylinder 8 -N86
9. Idling stabilisation valve -N71
10. Solenoid valve 1 for activated charcoal filter -N80
11. Intake manifold changeover valve -N156

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

-> Readout on display:

Rapid data transfer HELP
Select function XX

- Press keys 0 and 3

(03 selects the "Final control diagnosis" function).

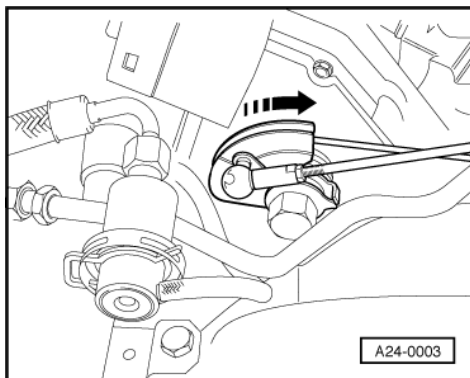
-> Readout on display:

Rapid data transfer Q
03-Final control diagnosis

- Confirm entry with Q key.

-> Readout on display:

Final control diagnosis
Injector, cylinder 1 -N30



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- -> The selected injector is actuated 5 times (can be heard and felt) by briefly operating the throttle valve (open idling speed contact).
- The injectors of the individual cylinders can be selected one after the other by pressing the => key.
- Use this procedure to check all the injectors in sequence.
- If one of the injectors is not actuated (does not click), test injectors => Page 61 .

After selecting all 8 injectors, move forward to the next control element by pressing the =>key.

-> Readout on display:

Final control diagnosis
Idling stabilisation valve -N71

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



- If the valve is not actuated (does not click), test idling stabilisation => Page **73**.
- Press => key.

-> Readout on display:

Final control diagnosis ACF solenoid valve 1 -N80
--

The ACF solenoid valve 1 is actuated (clicks) until the =>key is pressed to switch to the next control element.

- If the valve is not activated (i.e. does not click), test ACF solenoid -N80
=>Page **82**
- Press => key.

-> Readout on display:

Final control diagnosis Intake manifold changeover valve - N156

This valve is actuated (clicks) until the => key is pressed to end the final control diagnosis.

- If the valve is not activated (i.e. does not click), test intake manifold changeover valve -N156 => Page **78**.

-> Readout on display:

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

Note:

After completing the final control diagnosis, enter 06 for the function "End output" and confirm entry with the Q key.

1.9 - Reading measured value block: list of display groups

Test conditions

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- Coolant temperature at least 80 °C.
 - All electrical loads switched off.
 - Air conditioner switched off.
 - No faults stored in fault memory

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

-> Readout on display:

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

- Press keys 0 and 8

(08 selects function "Read measured value block").

-> Readout on display:

Rapid data transfer 08-Read measured value block	HELP
---	------

- Confirm entry with Q key.

-> Readout on display:

Read measured value block HELP
Enter display group number XXX

- Select the desired display group number according to the list of display groups
=>Page 23

Note:

Display group number 01 is used here as an example to demonstrate the procedure.

- Press keys 0,0 and 1.

(001 is used to select the function "Display group 01").

-> Readout on display:

Read measured value block Q
Enter display group number 01

- Confirm entry with Q key.

-> Readout on display:

Read measured value block 1 Q
1 2 3 4

Note:

- ◆ In display group 00 the measured values are shown in decimal form.
- ◆ Each time the PRINT key is pressed, the current display is printed out.
- ◆ Press the C key before selecting further display groups.

- If specified values are achieved in all display zones, press the => key.

-> Readout on display:

Rapid data transfer HELP
Select function XX

- Press keys 0 and 6

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

-> Readout on display:

Rapid data transfer Q
06-End output

- Confirm entry with Q key.

-> Readout on display:

Rapid data transfer HELP
Enter address word XX

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List of display groups

Display group number	Readout on display	Designation	
00	Read measured value block 0	1 =	Coolant temperature
Basic function	1 2 3 4 5 6 7 8 9 10	2 =	Engine load
		3 =	Engine speed



Display group number	Readout on display	Designation
		4 = Operating range of idling stabilisation valve -N71
		5 = Zero point of idling stabilisation valve -N71
		6 = Ignition angle
		7 = Control value of mixture formation (lambda control value) for cylinder bank 1
		8 = Control value of mixture formation (lambda control value) for cylinder bank 2
		9 = Learned value of mixture formation (lambda learned value) for cylinder bank 1
		10 = Learned value of mixture formation (lambda learned value) for cylinder bank 2

Display group number	Readout on display	Designation
01 Basic function	Read measured value block 1 1 2 3 4	1 = Idling speed 2 = Engine load (injection period per crankshaft revolution) 3 = Throttle valve angle 4 = Ignition angle
02 Basic function	Read measured value block 2 1 2 3 4	1 = Idling speed 2 = Engine load (injection period per crankshaft revolution) 3 = Air mass flow 4 = Ignition angle
03 Basic function	Read measured value block 3 1 2 3 4	1 = Engine speed 2 = Battery voltage 3 = Coolant temperature 4 = Intake air temperature

Display group number	Readout on display	Designation
04 Basic function	Read measured value block 4 1 2 3 4	1 = Absolute throttle valve angle 2 = Learned throttle valve angle 3 = Injection period 4 = Operating status: Idling Part throttle Full throttle Overrun Enrichment
05 Idling stabilisation	Read measured value block 5 1 2 3 4	1 = Idling speed (actual) 2 = Idling speed (specified) 3 = Air mass of idling speed controller 4 = Operating conditions: 1 0 0 A/C on or high cooling or heating power 0 0 1 A/C compressor on

Display group number	Readout on display	Designation
06 Idling stabilisation	Read measured value block 6 1 2 3 4	1 = Idling speed (actual) 2 = Air mass of idling speed controller 3 = Learned value for idling stabilisation 4 = Operating conditions: 1 0 0 A/C on or high cooling or heating power 0 0 1 A/C compressor on
07 Idling stabilisation	Read measured value block 7 1 2 3 4	1 = Air mass (specified) 2 = Air mass (actual) 3 = Control factor of current from idling speed stabilisation valve -N71 4 = Learned value for idling stabilisation
08 Fuel consumption	Read measured value block 8 1 2 3 4	1 = Engine speed 2 = Engine load 3 = Fuel consumption (not suitable for measuring consumption in l/100 km) 4 = Vehicle speed

Display group number	Readout on display	Designation
09 Torque reduction	Read measured value block 9 1 2 3 4	1 = Engine speed (actual) 2 = Engine torque (specified) (ignore readout in the case of manual gearbox) 3 = Engine torque (actual) (ignore readout in the case of manual gearbox) 4 = Gearbox intervention (no function in the case of manual gearbox)
10 Lambda learned value	Read measured value block 10 1 2 3 4	1 = Learned value of mixture formation (lambda) at idling, bank 1 2 = Learned value of mixture formation (lambda) at idling, bank 2 3 = Learned value of mixture formation (lambda) at part throttle, bank 1 4 = Learned value of mixture formation (lambda) at part throttle, bank 2
11 Lambda control	Read measured value block 11 1 2 3 4	1 = Control value of mixture formation (lambda control value), bank 1 2 = Control value of mixture formation (lambda control value), bank 2 3 = Lambda probe voltage, bank 1 4 = Lambda probe voltage, bank 2

Display group number	Readout on display	Designation
12 Tank breather	Read measured value block 12 1 2 3 4	1 = Duty cycle of ACF solenoid valve 1 -N80 2 = Fill level of activated charcoal filter 3 = Learned value for mixture formation with active fuel tank breather 4 = Fuel tank breather system: TB active (tank breather active) λ-Adaptation (tank breather not active)

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Display group number	Readout on display	Designation
13 Knock control	Read measured value block 13 1 2 3 4	1 = Ignition timing retardation by knock control, cylinder 1 2 = Ignition timing retardation by knock control, cylinder 2 3 = Ignition timing retardation by knock control, cylinder 3 4 = Ignition timing retardation by knock control, cylinder 4
14 Knock control	Read measured value block 14 1 2 3 4	1 = Ignition timing retardation by knock control, cylinder 5 2 = Ignition timing retardation by knock control, cylinder 6 3 = Ignition timing retardation by knock control, cylinder 7 4 = Ignition timing retardation by knock control, cylinder 8

Display group number	Readout on display	Designation
15 Knock control	Read measured value block 15 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
16 Knock control	Read measured value block 16 1 2 3 4	1 = Knock sensor signal, cylinder 5 2 = Knock sensor signal, cylinder 6 3 = Knock sensor signal, cylinder 7 4 = Knock sensor signal, cylinder 8
17 Misfire detection	Read measured value block 17 1 2 3 4	1 = Engine speed 2 = Engine load 3 = No. of misfires per 200 crankshaft revolutions 4 = Sensor rotor check (ring gear check): ADP running ADP OK

Display group number	Readout on display	Designation
18 Misfire detection	Read measured value block 18 1 2 3 4	1 = Sensor rotor check (ring gear check): ADP running ADP OK 2 = Correction value ring gear segment 2 3 = Correction value ring gear segment 3 4 = Correction value ring gear segment 4
19 Misfire detection	Read measured value block 19 1 2 3 4	1 = No. of misfires per 200 crankshaft revolutions (cyl. 1) 2 = No. of misfires per 200 crankshaft revolutions (cyl. 2) 3 = No. of misfires per 200 crankshaft revolutions (cyl. 3) 4 = No. of misfires per 200 crankshaft revolutions (cyl. 4)
20 Misfire detection	Read measured value block 20 1 2 3 4	1 = No. of misfires per 200 crankshaft revolutions (cyl. 5) 2 = No. of misfires per 200 crankshaft revolutions (cyl. 6) 3 = No. of misfires per 200 crankshaft revolutions (cyl. 7) 4 = No. of misfires per 200 crankshaft revolutions (cyl. 8)

Display group number	Readout on display	Designation
21 Operating states	Read measured value block 21 1 2 3 4	1 = Selector lever position (ignore readout in the case of manual gearbox)
		2 = Air conditioner: A/C low A/C high (air conditioner requests increased heating or cooling power)
		3 = A/C compressor: Compr. OFF Compr. ON
		4 = Gearbox intervention (no function in the case of manual gearbox)
22 Intake manifold changeover	Read measured value block 22 1 2 3 4	1 = Engine speed Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.
		2 = Engine load
		3 = Coolant temperature
		4 = Intake manifold changeover IMC-V OFF IMC-V ON

1.10 - Reading measured value block: display groups 00 to 08

Display group 00, engine idling (warm engine, coolant temperature not below +80 °C)

Display zone	Specified readout	Corresponds to measured value	Designation
1	171...204	80...105 °C	Coolant temperature (requirement for basic setting)
2	21...38	1.05..1.9 ms	Engine load (no consumers)
3	76...84	760..840 rpm	Engine speed (no consumers)
4	125...133	-	Operating range of idling stabilisation valve -N71
5	85...110	-	Zero point of idling stabilisation valve -N71
6	69...82	6.0...14.25 °CA BTDC	Ignition angle
7	123...133	±4 %	Control value of mixture formation (lambda control value), bank 1 (only pay attention to readout in basic setting and after approx. 1.5 minutes)
8	123...133	±4 %	Control value of mixture formation (lambda control value), bank 2 (only pay attention to readout in basic setting and after approx. 1.5 minutes)
9	120...136	±6 %	Learned value of mixture formation (lambda learned value), bank 1 (if not within tolerance, perform test drive)
10	120...136	±6 %	Learned value of mixture formation (lambda learned value), bank 2 (if not within tolerance, perform test drive)



Test table, Display group 00

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1	Less than 171	- Coolant temperature sensor -G62 - Wiring connection to engine control unit -J220 - Coolant thermostat constantly open	- Check -G62 => Page 94 - Check coolant thermostat
	Greater than 204	- Coolant temperature sensor -G62 - Wiring connection to engine control unit -J220	- Check -G62 => Page 94

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
2	Less than 21	- Lower values can only occur when vehicle is in overrun	
	Greater than 38	- Air conditioner switched on - Electrical consumers switched on - Lambda control at rich or lean stop - Poor idling (not running on all cylinders) - Mass air flow meter -G70 faulty - Idling stabilisation valve -N71 faulty - Electrical consumers switched on - Steering wheel at full lock	- Switch off the air conditioner - Switch off the consumers - Test lambda control =>Page 69 - Injector or spark plugs defective - Interrogate fault memory => Page 3 - Test idling stabilisation =>Page 73 - Switch off the consumers - Centre steering wheel

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
3	Less than 76	- Idling stabilisation valve -N71 sticking	- Check idling stabilisation valve - N71 => Page 73 .
	Greater than 84	- Idling stabilisation valve -N71 at lower control stop - Unmetered air downstream of throttle valve at injector or vacuum hose has dropped off - Engine speed increased by air conditioner - Idling stabilisation valve -N71 in emergency running mode	- Briefly blip throttle 4 times at intervals of 15 seconds - Eliminate cause - Read measured value block, display group 05 =>Page 33
4	At 125 or greater than 133	- Unmetered air downstream of throttle valve - Idling stabilisation valve -N71	- Blip throttle four times, each time waiting 10 seconds and allowing demand adaptation to be learned - If not within tolerance, read measured value block, display group 07 =>Page 34

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
5	Less than 85	- Idling stabilisation valve -N71 sticking in open position - Incorrect signal from air mass meter - Unmetered air downstream of throttle valve	- Check idling stabilisation valve - N71 => Page 73 - Check air mass meter -G70 =>Page 90 - Eliminate cause

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
		- Unmetered air upstream of throttle valve	- Read measured value block, display group 07 =>Page 34
	Greater than 110	- Idling stabilisation valve -N71 sticking in closed position - Incorrect signal from air mass meter	- Check idling stabilisation valve - N71 => Page 73 - Check air mass meter -G70 =>Page 90

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
6	Less than 69 or greater than 82	- Idling control moves against stop - Digital ignition angle control also activated	- Blip throttle, wait 10 seconds and observe readout; readout should settle between 70 and 80
7 and 8	Less than 123 or greater than 133	- Lambda control at control stop - Fuel system pressure - Unmetered air	- Test lambda probe by reading measured value block, display groups 10 and 11 =>Page 35
	Readout fluctuates or remains constant at 128	- Fuel level too low - Lambda control has changed to open loop control	- Ensure that there are at least 10 litres of fuel in the tank - Test lambda probe by reading measured value block, display group 11 =>Page 36
9 and 10	Less than 120 or greater than 136	- Lambda adaptation - Lambda probe - Lambda adaptation- at control stop - Unmetered air	- Test lambda probe by reading measured value block, display groups 10 and 11 =>Page 35 - Eliminate cause

Display group 01, basic function with engine idling: (coolant temperature not less than +80 °C)

Read measured value block 1	⇒	Readout on display
760..840 rpm	9..16 %	5..10 °
		6.0..14.25° BTDC
		Ignition angle
		Throttle valve angle
		Engine load
		Idling speed (shown in increments of 40)

Test table 01, basic function

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1	Less than 760 rpm	- Additional engine load due to ancillaries - Idling stabilisation valve -N71 sticking or faulty	- Remove load (air conditioner, power steering etc.) - Test idling stabilisation =>Page 73
	Greater than 840 rpm	- Idling switch -F60 not closed/defective - Large quantity of unmetered air (cannot be compensated by idling stabilisation)	- Check/adjust idling switch =>Page 76 - Eliminate air leak



Test table 01, basic function

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
2	Less than 9%	- Lower values can only occur when vehicle is in overrun	
	Greater than 16%	- Poor idling (not running on all cylinders) - Mass air flow meter -G70 faulty - Idling stabilisation valve -N71 faulty - Electrical consumers switched on - Steering wheel at full lock	- Injector or spark plugs defective - Interrogate fault memory => Page 3 - Test idling stabilisation =>Page 73 - Switch off the consumers - Centre steering wheel

Test table 01, basic function

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
3	Less than 5 <°	- Throttle valve potentiometer - G69 faulty or incorrectly adjusted - Setting of throttle cable	- Interrogate fault memory => Page 87 - Adjust throttle cable => 8-cylinder engine, Mechanical components; Repair Group. 20; Servicing throttle control; Adjusting throttle cable
	Greater than 10 <°	- Throttle valve potentiometer - G69 faulty or incorrectly adjusted - Throttle valve sticking - Setting of throttle cable	- Interrogate fault memory => Page 87 - Eliminate cause - Adjust throttle cable => 8-cylinder engine, Mechanical components; Repair Group. 20; Servicing throttle control; Adjusting throttle cable

Test table 01, basic function

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
4	Less than 6.0 ° BTDC	- Idling stabilisation valve -N71 sticking or at stop due to unmet-tered air	- Perform final control diagnosis =>Page 73
	Greater than 14.25°BTDC	- Idling stabilisation valve -N71 sticking	- Perform final control diagnosis =>Page 20 - Test idling stabilisation =>Page 73

Display group 02, basic function with engine idling: (coolant temperature not less than +80 °C)

Read measured value block 2				⇒	Readout on display
...	9...16	3.9...7.1	6.0...14.25°		
rpm	%	g/s	BTDC		
					Ignition angle
					Intake air mass
					Engine load

Idling speed (shown in increments of 40)

Test table, Display group 02

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1		- See display group 01, display zone 1 => Page 29	
2		- See display group 01, display zone 2 => Page 29	

Test table, display group 02

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
3	Less than 3.9 g/s	- Large quantity of unmetered air between intake manifold and air mass meter	- Eliminate air leak
	Greater than 7.1 g/s	- Increased engine load due to ancillaries	- Switch off load (air conditioner, electrical consumers, power assisted steering)
4	Less than 6.0° BTDC	- Idling stabilisation valve -N71 sticking or at stop due to unmetered air	- Perform final control diagnosis =>Page 73
	Greater than 14.25°BTDC	- Idling stabilisation valve -N71 sticking	- Perform final control diagnosis =>Page 73

Display group 03, basic function: (engine idling):

Read measured value block 3	⇒	◀ Readout on display
760...840 rpm	11..14.5 V	85..105 °C
		 °C
		Intake air temperature
		Coolant temperature
		Battery voltage
		Idling speed (shown in increments of 40)

Test table, Display group 03

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1		- See display group 01, display zone 1 => Page 29	
2	Less than 11 V	- Alternator faulty, battery discharged - Contact resistance in power supply or earth connection for engine control unit - Current drain with ignition off	- Check voltage, charge battery - Test power supply relay -J271 for engine control unit => Page 85 - Eliminate current drain

Test table, display group 03

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
2	Greater than 14.5 V	Voltage regulator at alternator defective	- Check voltage; if necessary, fit a new voltage regulator.

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Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
		- Overvoltage from assisted start or high speed charger	- Interrogate fault memory =>Page 3
3	Greater than 105°	- Radiator dirty - Radiator fan inoperative - Coolant thermostat defective - Coolant temperature sensor or wiring connection to engine control unit	- Clean radiator - Check function - Renew coolant thermostat => 8-cylinder engine, Mechanical components; Repair Group 19; Cooling; Coolant thermostat - Test coolant temperature sensor - G62 => Page 94
4	Constant 20 °C	- Substitute value if fault detected at intake air temperature sensor - G42	- Interrogate fault memory => Page 96

Display group 04, basic function with engine idling: (coolant temperature not less than +80 °C)

Read measured value block 4 ⇒				• Readout on display
5..10 <°	0 <°	1.5..3.5 ms	Idling	
				Operating status (idling, part throttle, full throttle, enrichment, overrun)
				Engine load (injection time)
				Throttle valve angle (learned)
				Throttle valve angle (absolute)

Test table, display group 04

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1			- Check and adjust throttle valve potentiometer -G69 => Page 87
2	Greater than 0 <°	- Learning process not yet performed after adjusting the throttle valve potentiometer	

Test table, display group 04

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
3	Less than 1.5 ms	- Large quantity of fuel from the ACF system - Wrong injectors installed (delivery rate too high)	- Test tank breather => Page 82 - Test injection quantity => Page 59
	Greater than 3.5 ms	- Engine load due to electrical consumers, air conditioner or power assisted steering - Fuel pressure - Lambda probe	- Remove load(s) - Test fuel pressure => Page 57 - Test lambda probe by reading measured value block, display groups 10 and 11 => Page 35
4	Idling Part throttle		

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
	Full throttle Enrichment Overrun (only possible above approx. 1800 rpm)		

Display group 05, idling stabilisation with engine idling: (coolant temperature not less than +80 °C)

Read measured value block 5	⇒	Readout on display
760...840 rpm	... -0.2...+0.2 g/s	0 0 0
		Operating conditions: 1 0 0 A/C on or high cooling or heating power 0 0 1 A/C compressor on
		Air mass of idling speed controller
		Idling speed (specified)
		Idling display (actual - readout in steps of 10)

Note on display zone 2:

The specified engine speed set by the engine control unit is displayed.

Display group 06, idling stabilisation with engine idling: (coolant temperature not less than +80 °C)

Read measured value block 6	⇒	Readout on display
760...840 rpm	-0.4...+0.4 g/s	-1.4...+1.4 g/s 0 0 0
		Operating conditions: 1 0 0 A/C on or high cooling or heating power 0 0 1 A/C compressor on
		Learned value for idling stabilisation
		Air mass of idling speed controller
		Idling display (actual - readout in steps of 10)

Note on Display zone 2:

During idling, the air mass requirement varies with changing load conditions, even though the engine speed is constant. The change in air mass during idling is shown. As soon as the change has been compensated by the idle stabilisation learning process, the mean value is restored. The amount of deviation from the mean value depends on the extent of the load change (e.g. as a result of switching electrical consumers on or off). The learning process proceeds in small stages each time the idling switch closes. In the event of a large deviation, several stages are required. In this case the accelerator should be briefly blipped at intervals of 10 seconds so that the idling switch is opened and closed each time. Each time this is done, a further stage of the learning process is performed.

Note on Display zone 3:

The display shows how far the learned values of the idle stabilisation have "drifted away" from the pre-programmed mean value. With a new engine, the display will show a positive value because of the greater friction; if the engine has been run in it will show a negative value. A value of -1.4 g/s combined with values in display zone 2 that are too low indicates the presence of unmetered air.



Display group 07, idling stabilisation with engine idling: (coolant temperature not less than +80 °C)

Read measured value block 7		⇒	◀ Readout on display
3.9...7.1	...	0.8...1.2	85...110
g/s	g/s		
Learned value for idling stabilisation			
Control factor of current from idling speed stabilisation valve -N71			
Intake air mass (actual when idling)			
Air mass (specified when idling)			

Note on Display zone 2:

The display shows the air mass measured by the air mass meter. Differences between the specified air mass (display zone 1) and the actual air mass (display zone 2) indicate unmetered air between air mass meter and throttle valve body or idling stabilisation valve. Temporary deviations of ± 0.3 g/s can be ignored.

Note on display zone 3:

The internal resistance of the coil of the idling stabilisation valve changes as a result of the coil heating up. The required current needs to flow if the opening of the idling stabilisation valve computed by the control unit is to be achieved. If this current is not achieved because the coil resistance has increased as a result of it heating up, then this needs to be offset by altering the duty cycle in order to achieve the computed current. If the engine is cold (room temperature) the readout is in the range of 1.0. When the coil heats up, the control factor is increased. Readouts of more than 1.2 indicate contact resistance in the wiring connection between the engine control unit and the idling stabilisation valve.

Note on display zone 4:

The current required for the idling stabilisation valve for a particular air flow is computed by the control unit. If this air flow is not achieved because, for example, the flow resistance has increased as a result of the valve being contaminated, the idling stabilisation valve should be continuously opened a little further as compensation. This deviation is detected by the control unit and compensated for by changing the pilot control valve (learning process). Readouts which differ greatly indicate contamination of the valve or a valve which is not operating freely.

Display group 08, fuel consumption: (idling and driving)

Read measured value block 8		⇒	◀ Readout on display
0...7000	9...16	1.4...2.0	0
rpm	%	l/h	km/h
Vehicle speed			
Fuel consumption (idling)			
Engine load (idling)			
Engine speed (shown in increments of 40)			

Notes on display zone 2:

- ♦ Readouts of 80...100% are achieved when driving at full throttle.
- ♦ The maximum engine load decreases by about 10% for every 1000 m above sea level.

Notes on display zone 3:

- ♦ Not suitable for measuring fuel consumption in l/100 km.
- ♦ The specified readout relates only to idling (friction power) without any additional load from ancillaries (air conditioner, heater, alternator, power steering pump).

1.11 - Reading measured value block: display groups 09 to 22

Display group 09, torque reduction during gearshift

Readout only for models with automatic gearbox

Read measured value block 9 ⇒				Readout on display
0...7000 rpm	0...410 Nm	...	No interv. Engine interv.	
				Gearbox intervention (readout for manual gearbox: no intervention)
				Actual torque 0...400 Nm
				Specified torque (request from automatic gearbox control unit)
				Engine speed (shown in increments of 40)

Display group 10, lambda learned values, engine idling and part throttle: (coolant temperature not less than +80 °C)

Read measured value block 10 ⇒				Readout on display
-14...+9 %	-14...+9 %	-10...+10 %	-10...+10 %	
				Lambda learned value at part throttle, cyl. bank 2
				Lambda learned value at part throttle, cyl. bank 1
				Lambda learned value with engine idling, cyl. bank 2
				Lambda learned value with engine idling, cyl. bank 1

Notes on display group 10:

- ♦ All values are reset to 0.0% if control unit is deenergised. Basic setting.
- ♦ Differences in lambda learned values of more than 8 % between cylinder bank 1 and cylinder bank 2 may be due to the following:

- Defective spark plug

- Defective injector (leaking, blocked)

- Lambda probe defective (dirty)

- Mechanical basic setting (valve timing) of engine not OK

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Test table, display group 10

Display zones	Readout on V.A.G 1551	Cause of fault	Fault remedy
1, 2, 3, 4	Low lambda learned values	- Lambda learned values low for idling and normal for part throttle: oil may be diluted (high petrol content in oil) - Injector leaking - Display zones 1, 2, 3 and 4, readout too low: fuel pressure too high - Air mass meter -G70 defective	- Problem eliminated after motorway drive or oil change - Test injectors =>Page 61 - Test fuel system pressure and holding pressure => Page 57 - Test mass air flow meter -G70 =>Page 90



Display zones	Readout on V.A.G 1551	Cause of fault	Fault remedy
		- Lambda probe heating defective or lambda probe dirty	- Test lambda probe and probe heating =>Page 70 - Test activated charcoal filter solenoid valve -N80 => Page 82

Test table, display group 10

Display zones	Readout on V.A.G 1551	Cause of fault	Fault remedy
1, 2, 3, 4	High lambda learned values	- Lambda learned values high for idling and less high for part throttle: unmetered air possible around intake manifold - Injector blocked - Display zones 1, 2, 3, 4 high: Air mass meter -G70 defective - Fuel system pressure too low (fuel supply) - Unmetered air between -G70 and throttle valve - Unmetered air at manifold gasket - Lambda probe heater faulty or lambda probe dirty	- Eliminate cause of fault - Test injectors => Page 61 - Test mass air flow meter -G70 =>Page 90 - Test fuel system pressure -and holding pressure => Page 57 - Eliminate cause - Test lambda probe and probe heater =>Page 70

Display group 11, lambda control, engine idling: (coolant temperature not less than +80 °C)

Read measured value block 11	⇒	Readout on display
-12.5 to 12.5 %	-12.5 to 12.5 %	-0.17 to +0.9 V
		-0.17 to +0.9 V
		Lambda probe voltage, cylinder bank 2
		Lambda probe voltage, cylinder bank 1
		Lambda control value for engine idling, cylinder bank 2
		Lambda control value for engine idling, cylinder bank 1

Test table, Display group 11

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
1 and 2	Outside tolerance range	- Negative readout, engine too rich, effect: lambda control produces leaner mixture - Positive readout ("+" is not displayed), engine too lean, consequence lambda control enriches mixture - Unmetered air - Faulty injector - Not successfully learned (refer to learning demand display) - Lambda -learned values have reached stop	- Wait 30 seconds for the display to stabilise - Eliminate cause - Test injector => Page 59 - Read measured value block, display group 10 =>Page 35
3 and 4	Less than -0.17 V	- Not possible	

Display zone	Readout on V.A.G 1551	Cause of fault	Fault remedy
	Greater than +0.9 V	- Short circuit to positive in signal wire of lambda probe	- Check wiring =>Page 72

Display group 12, tank breather, engine idling: (coolant temperature not less than +80 °C)

Read measured value block 12 ⇒				◀ Readout on display
0..65 %	-5..+85 %	-20..+18 %	TB active or λ adaptation	
				"TB active" means that solenoid valve 1 for the activated charcoal filter is pulsed (6 min) "λ adaptation" means that solenoid valve 1 for the activated charcoal filter is constantly closed (1min)
				Lambda correction factor with active tank breather
				Fill level of activated charcoal filter
				Duty cycle of solenoid valve 1 for activated charcoal filter

Notes on display group 12:

- ♦ At idling speed, the engine can only process a certain maximum volume of fuel from the ACF system. For this reason, the opening of the solenoid valve is restricted to 65% during idling. At part and full throttle, the duty cycle may increase up to 99%.
- ♦ During λ adaptation, the lambda control "learns" the operating conditions without any variation resulting from petrol vapours from the activated charcoal filter (ACF valve closed).

Notes on display group 12:

- ♦ At a fill level of -5% there are no petrol vapours in the ACF filter.
- ♦ At a fill level of +95% the ACF filter is completely filled with petrol vapours.
- ♦ At a fill level of +100% the ACF filter is leaking, e.g. as a result of foreign bodies.

Notes on display zone 4:

- ♦ During the "TB active phase" (display zone 4), the engine control unit supplies a certain quantity of fuel from the ACF system. If the ACF valve is closed further (lower duty cycle) at a high fill level of the ACF filter in order to maintain the specified ACF rate, the reaction of the λ control is to alter the correction factor (display zone 3). If this reaction is lower than expected because fuel vapours from the fuel tank have increased the fill level in the mean time, then the control unit calculates from this a higher fill level. If the ACF valve is faulty (e.g. a leak resulting from a foreign body) then the reduction of the ACF rate is likewise not achieved. In this case, the duty cycle is constantly reduced until the lower stop is reached. The system erroneously calculates from this a filling level of 100%.
- ♦ With a fuel concentration of about 18 % from the ACF system, the λ control operates in the neutral range, in other words without any correction factor. As soon as fewer petrol vapours are supplied from the ACF system, the λ control has to produce a richer mixture (with an empty ACF filter of 18%). If the ACF system is providing an extremely rich mixture, the λ control has to effect leaning. This leaning may be up to 20% (display zone 3).

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Display group 13, knock control: (driving)

Read measured value block 13 ⇒				◀ Readout on display
0...15° CA	0...15° CA	0...15° CA	0...15° CA	
				Ignition timing retardation by knock control, cylinder 4
				Ignition timing retardation by knock control, cylinder 3
				Ignition timing retardation by knock control, cylinder 2



Ignition timing retardation by knock control, cylinder 1

Display group 14, knock control: (driving)

Read measured value block 14				⇒	◀ Readout on display
0...15° CS	0...15° CS	0...15° CS	0...15° CS		
					Ignition timing retardation by knock control, cylinder 8
					Ignition timing retardation by knock control, cylinder 7
					Ignition timing retardation by knock control, cylinder 6
					Ignition timing retardation by knock control, cylinder 5

Notes on knock control:

- ♦ The knock control is active over the entire engine speed range from engine loads above 30 %. At engine loads of more than 40%, the display will show the current ignition timing retardation values. At engine loads of less than 40% the display will constantly show the last values used.
- ♦ If there is audible knocking without any perceptible retardation of ignition timing, increase engine speed for 6 to 12 seconds to more than 3300 rpm in order to activate knock sensor fault recognition (diagnosis).
- ♦ If there is a significant difference between the ignition timing retardation value for one of the cylinders and the values for the other cylinders, the following faults are possible:

- Loose ancillaries

- Corrosion at plug connection

- Engine damage (e.g. oil combustion because of defective piston)

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

- Knock sensor not tightened to correct torque (20 Nm).

- Open circuit in wiring

- Knock sensor defective

- Loose ancillaries

- Poor fuel quality

- ♦ Average ignition angle retardation as a result of fuel quality (at outside temperature of 20°C, approx. 2000 rpm and full throttle).

RON 98 0...8 °CA
RON 95 3...10.5 °CA

Display group 15, knock control: (idling):

Read measured value block 15				⇒	◀ Readout on display
0.273 to 2.5 V	0.273 to 2.5 V	0.273 to 2.5 V	0.273 to 2.5 V		
					Knock sensor signal, cylinder 4
					Knock sensor signal, cylinder 3
					Knock sensor signal, cylinder 2

Knock sensor signal, cylinder 1

Display group 16, knock control: (idling):

Read measured value block 16				⇒	Readout on display
0.273 to 2.5 V	0.273 to 2.5 V	0.273 to 2.5 V	0.273 to 2.5 V		
					Knock sensor signal, cylinder 8
					Knock sensor signal, cylinder 7
					Knock sensor signal, cylinder 6
					Knock sensor signal, cylinder 5

Notes on display groups 15 and 16:

- ♦ At higher engine speeds, the signal voltage of the knock sensors may reach values of up to 30 V.
- ♦ Signal differences of more than 50% between display group 15 (cylinders 1 to 4) and display group 16 (cylinders 5 to 8) may result from the following faults:
 - Contact resistances in the wiring and plug connections (corrosion)
 - Knock sensor defective
- ♦ If no faults are found as a result of the electrical check on the knock sensor, the wiring and the plug connection, check the engine for loose ancillaries or mechanical damage.

Display group 17, misfire detection: (driving)

Read measured value block 17				⇒	Readout on display
0000...7000 rpm	15..100 %	0	ADP running ADP OK		
					Sensor rotor check (ring gear check)
					No. of combustion misfires per 200 crankshaft revolutions (all cylinders)
					Engine load
					Engine speed (shown in increments of 40)

Note on display zone 3:

Carry out a road test if necessary to detect misfiring at higher engine loads than idling.

Note on display zone 4:

The readout "ADP running" (adaptation running) means that the check of the sensor rotor is not yet completed. The check of the sensor rotor can only be carried out when the engine is on overrun. Misfire detection is restricted while adaptation is in progress.

Display group 18, misfire detection: (driving)

Read measured value block 18				⇒	Readout on display
ADP running ADP OK	-0.5 up to +0.5 ° CA	-0.5 up to +0.5 ° CA	-0.5 up to +0.5 ° CA		
					Correction value ring gear segment 4
					Correction value ring gear segment 3



	Correction value ring gear segment 2
	Sensor rotor check (ring gear check)

Notes on display group 18:

- ♦ Misfire detection operates over the entire engine speed range from engine loads above 15 %.
- ♦ The number of combustion misfires is displayed for the last completed interval of 200 crankshaft revolutions.
- ♦ To detect ignition misfires, the acceleration of the crankshaft due to the ignition of the relevant cylinder is checked. The acceleration (change in rotational speed) of the cylinders is compared with each other. In order to be able to determine this acceleration reliably, the concentricity of the toothed disk for the speed sensor is checked on overrun at speeds of 1520...3520 rpm, in other words when no ignition occurs (ignition spark) and there is thus no acceleration. A minor out-of-roundness resulting from production tolerances is stored as an initial value.

Display group 19, misfire detection: (driving)

Read measured value block 19	⇒	◀ Readout on display
0 0 0 0		
		No. of misfires per 200 crankshaft revolutions (cylinder 4)
		No. of misfires per 200 crankshaft revolutions (cylinder 3)
		No. of misfires per 200 crankshaft revolutions (cylinder 2)
		No. of misfires per 200 crankshaft revolutions (cylinder 1)

Display group 20, misfire detection: (driving)

Read measured value block 20	⇒	◀ Readout on display
0 0 0 0		
		No. of misfires per 200 crankshaft revolutions (cylinder 8)
		No. of misfires per 200 crankshaft revolutions (cylinder 7)
		No. of misfires per 200 crankshaft revolutions (cylinder 6)
		No. of misfires per 200 crankshaft revolutions (cylinder 5)

Notes on display groups 19 and 20:

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- ♦ The number of combustion misfires on the relevant cylinder is displayed for the last completed interval of 200 crankshaft revolutions.
- ♦ If the cylinder combinations 1-4-6-7 or 5-8-3-2 occur, this indicates a fault at the relevant power output stage for the ignition coils.

Display group 21, operating states: (idling and driving)

Read measured value block 21	⇒	◀ Readout on display
Neutral A/C High Compr. ON No interv. A/C Low Compr. OFF Engine interv.		
		Torque reduction during a gearshift (automatic gearbox) (ignore readout in the case of manual gearbox)
		AC compressor
		Air conditioner High = high heating or cooling power Low = low heating or cooling power

Selector lever position
(ignore readout in the case of manual gearbox)

Display group 22, intake manifold changeover (driving)

Read measured value block 22			⇒	• Readout on display
0000..7000 rpm	0...20 ms	-40...125 °C	IMC-V OFF IMC-V ON	
				Intake manifold changeover
				Coolant temperature
				Engine load (injection time)
				Engine speed (shown in increments of 40)

Notes on display zone 4:

- ◆ Increasing engine speed: variable intake manifold switches over at about 4500 rpm.
- ◆ Dropping engine speed: variable intake manifold switches over at about 4300 rpm.

1.12 - Basic setting of engine

Notes:

- ◆ All learned values in the engine control unit are erased when the connector on the engine control unit is disconnected or when the battery is disconnected.
- ◆ Do not carry out the basic setting if a fault affecting the lambda control has been stored in the fault memory (does not apply to sporadic faults).
- ◆ In the first learning phase irregular idling and slight jolting when driving are possible.
- ◆ In display group 00 the measured values are shown in decimal form.
- ◆ The specified values and display ranges are identical with those of function 08, Reading measured value block.
- ◆ After selecting the function 04, the engine control unit carries out the following operations:
 - ACF valve is closed.
 - Renewed learning of lambda learned values is prompted.

Test conditions

- Coolant temperature at least 80 °C.
 - All electrical consumers switched off.
 - Air conditioner switched off
 - Do not operate accelerator pedal.
 - No fault stored in fault memory
- Connect fault reader V.A.G 1551 and select control unit for engine electronics
=>Page 1
 - Interrogate and erase fault memory
=>Page 3 No faults must be stored (if necessary, rectify fault, erase fault memory, switch off and re-start engine, perform test drive and interrogate the fault memory again as a check.
 - Leave engine idling.

-> Readout on display:

Rapid data transfer	HELP
Select function XX	

- Press keys 0 and 4

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

-> Readout on display:



Rapid data transfer Q
04 - Basic setting

- Confirm entry with Q key.

-> Readout on display:

Basic setting Q
Enter display group number XXX

- Enter the required display group number according to the list of display groups in "Reading measured value block" => Page 23.

Note:

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

- Press key 0 three times.

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

-> Readout on display:

Basic setting Q
Enter display group number 00

- Confirm entry with Q key.

-> Readout on display:

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

Display group 00 during idling (warm engine, coolant temperature not below +80 °C)

Display zone	Specified readout	Corresponds to measured value	Designation
1	171...204	80...105 °C	Coolant temperature (requirement for basic setting)
2	21...38	1.05...1.9 ms	Engine load (no consumers)
3	76...84	760...840 rpm	Engine speed (no consumers)
4	125...133	-	Operating range of idling stabilisation valve -N71
5	85...110	-	Zero point of idling stabilisation valve -N71
6	69...82	6.0...14.25 °CA BTDC	Ignition angle
7	123...133	±4 %	Control value of mixture formation (lambda control value), bank 1 (only pay attention to readout in basic setting and after approx. 1.5 minutes)
8	123...133	±4 %	Control value of mixture formation (lambda control value), bank 2 (only pay attention to readout in basic setting and after approx. 1.5 minutes)
9	120...136	±6 %	Learned value of mixture formation (lambda learned value), bank 1 (if outside tolerance, perform test drive)
10	120...136	±6 %	Learned value of mixture formation (lambda learned value), bank 2 (if outside tolerance, perform test drive)

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

(Display zone 1: specified value at least 171)

Note:

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

→ Readout on display:

Rapid data transfer	HELP
Select function XX	

- Press keys 0 and 6

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

→ Readout on display:

Rapid data transfer	Q
06 - End output	

- Confirm entry with Q key.

→ Readout on display:

Rapid data transfer	HELP
Select function XX	

1.13 - Coding of engine control unit

Note:

- ◆ The engine control unit is supplied with a fixed code. It is not possible to encode the engine control unit anew.
- ◆ The coding is checked by using fault reader V.A.G 1551 or 1552.
- ◆ A 5-digit code should always be displayed during control unit identification.

The code number is put together as shown in the example below:

Member states of the European Union (MVEGII)	0 4
4WD without traction control system	. . 2
6-speed manual gearbox	. . . 1
Audi A6	 2
Code number	0 4 2 1 2



24 - Mixture preparation, Injection

1 - Servicing Motronic fuel injection system

1.1 - Servicing Motronic fuel injection system

1.2 - Safety precautions

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

- ♦ Do not touch or disconnect ignition wiring when the engine is running or at starter speed.
- ♦ Always switch off the ignition before connecting or disconnecting injection or ignition system wiring or tester cables.
- ♦ To operate the engine at starter speed without the engine actually starting (e.g. when testing compression pressure), unplug connectors of the power output stages for the ignition coils and remove both fuses for the Motronic system in the electronics box in the right footwell. After carrying out the work, erase the fault memory =>Page 3 .
- ♦ Always use adapter cable set V.A.G 1594 for connecting test equipment (diode test lamp, voltmeter etc.).

Important

For radios with anti-theft coding, ask for the code before disconnecting the battery.

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

1.3 - Rules for cleanliness

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

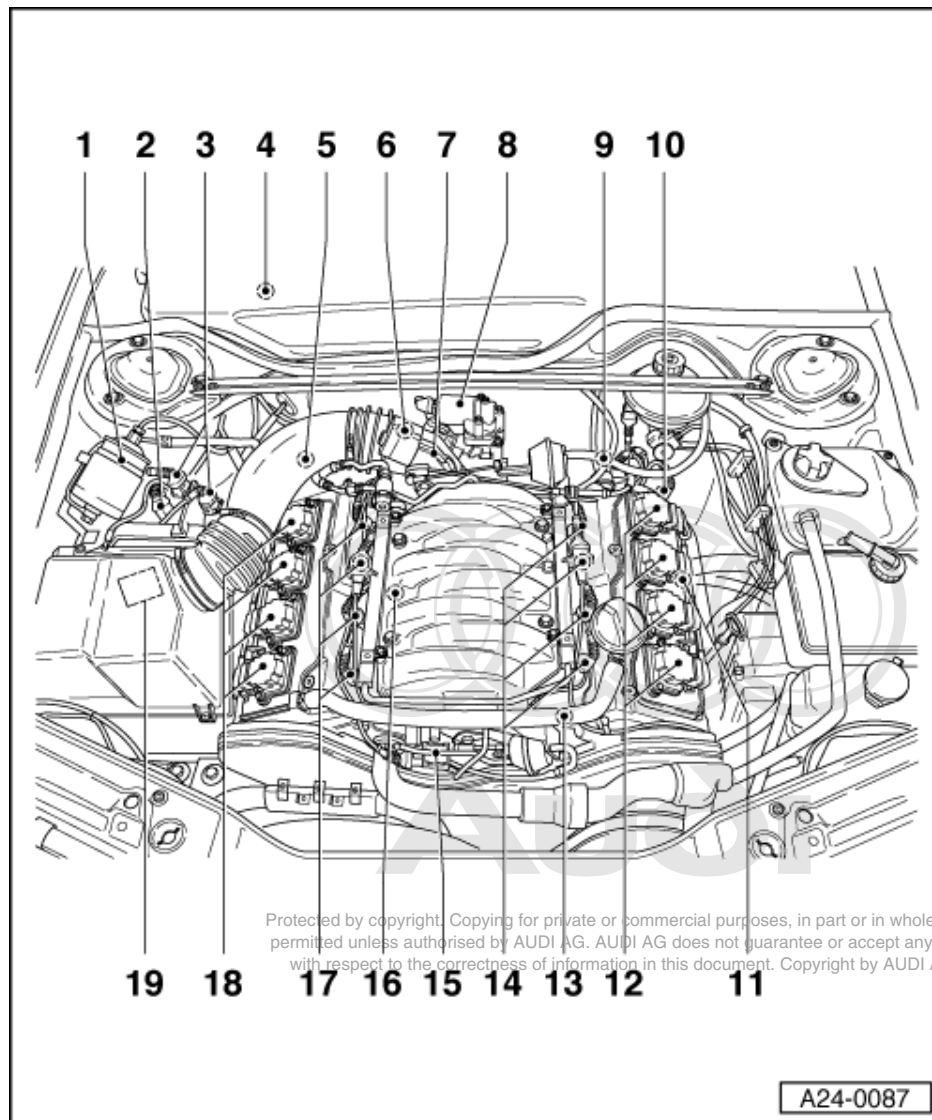
- ♦ Thoroughly clean all connections and the surrounding areas before disconnecting.
- ♦ Place removed parts on a clean surface and cover. Do not use fluffy cloths!
- ♦ Carefully cover or seal open components if repairs cannot be carried out immediately.
- ♦ Only install clean components:
 - Only remove replacement parts from packaging immediately prior to installation.
 - Do not use parts that have been stored loose (e.g. in tool boxes etc.).
- ♦ If the fuel pipes are disconnected:
 - Do not work with compressed air if this can be avoided.
 - Do not move the vehicle.

1.4 - Technical data

Engine code	AHK
Idling speed non-adjustable, is controlled by the idling stabilisation	760..840 rpm
Engine speed limited at by masking fuel injection signals	6960 rpm

Engine code		AHK
Fuel system pressure =>Page 57 at idling speed		Vacuum hose of pressure regulator connected: approx. 3.6 bar fuel pressure
		Vacuum hose of pressure regulator disconnected: approx. 4.2 bar fuel pressure
Fuel holding pressure =>Page 57		After 10 minutes at least 3.0 bar fuel pressure
Injectors		Spray jet same for all injectors
		Injection quantity 105...115 ml
		Resistance 15...17 ohm

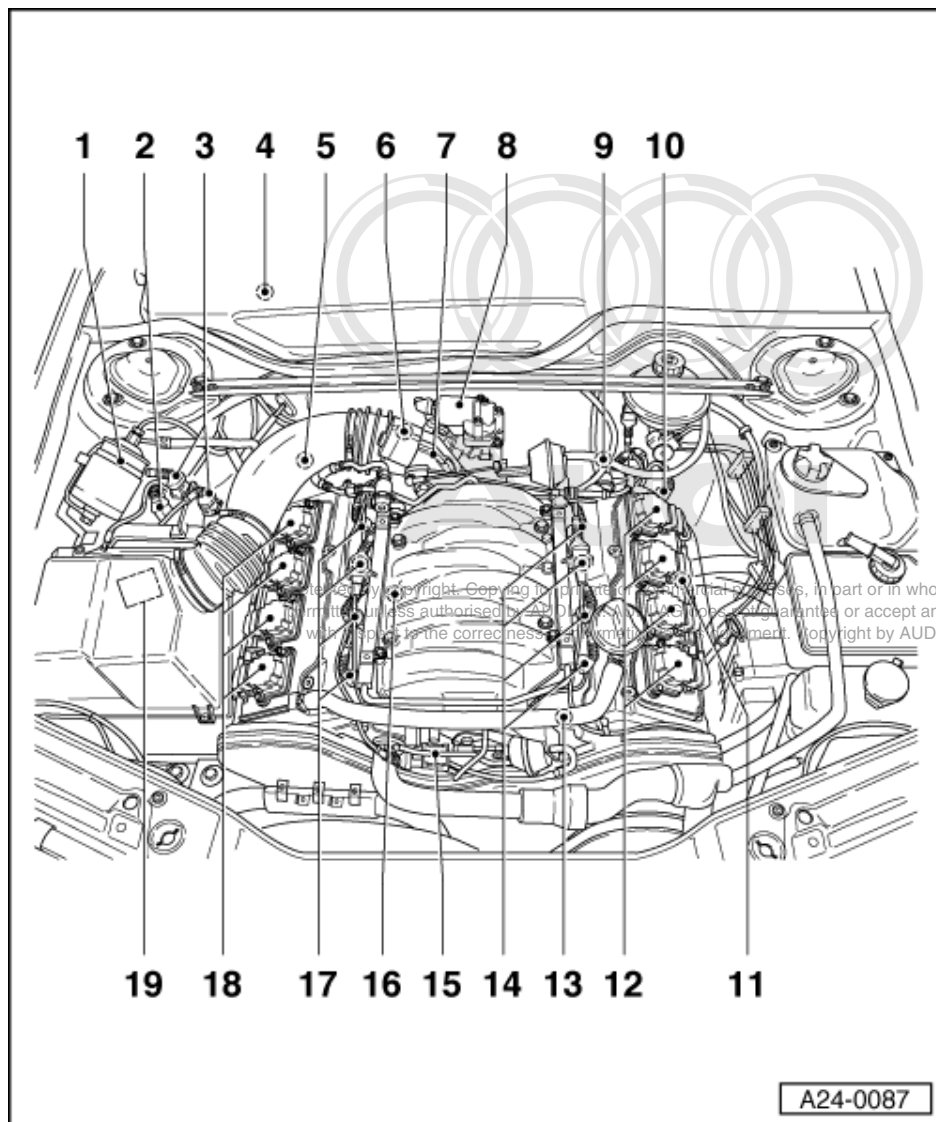
1.5 - Fitting locations overview



- 1 Fuel filter
- 2 Solenoid valve 1 for activated charcoal filter -N80

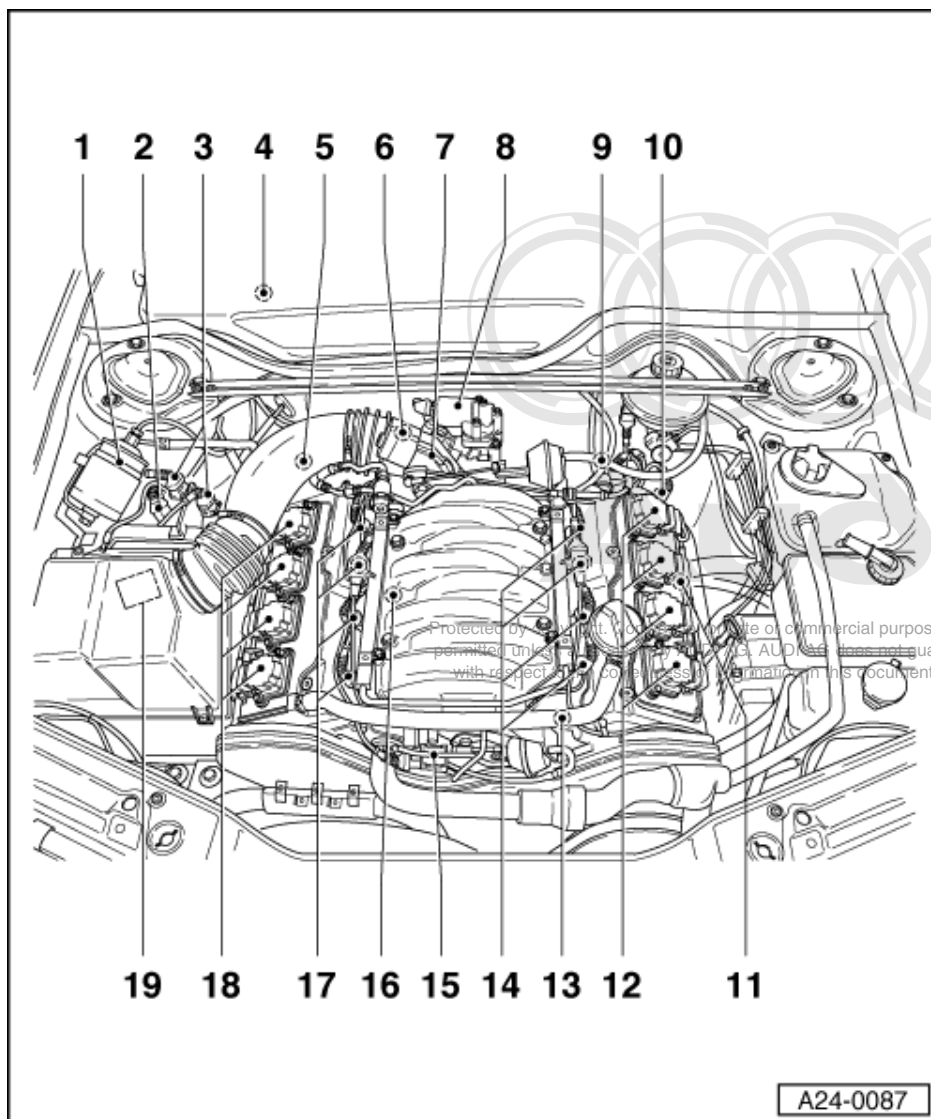


- 3 Power output stages for ignition coils -N122 and -N192
- 4 Motronic control unit -J220
 - ♦ In front passenger footwell
- 5 Plug connection of lambda probe -G39 and lambda probe heater -Z19
- 6 Intake air temperature sensor -G42
- 7 Throttle valve potentiometer -G69 with integral idling switch -F60



- 8 Idling stabilisation valve -N71
- 9 Plug connection of lambda probe -G108 and lambda probe heater -Z28
- 10 Hall sensor -G40
- 11 Knock sensor II -G66
- 12 Ignition coils, cyl. bank 2
 - ♦ Cylinder 5 -N164
 - ♦ Cylinder 6 -N189
 - ♦ Cylinder 7 -N190
 - ♦ Cylinder 8 -N191
- 13 Coolant temperature sensor -G62
- 14 Injectors, cyl. bank 2
 - ♦ Cylinder 5 -N83
 - ♦ Cylinder 6 -N84
 - ♦ Cylinder 7 -N85

- ♦ Cylinder 8 -N86



15 Intake manifold changeover valve -N156

16 Knock sensor I -G61

17 Injectors, cyl. bank 1

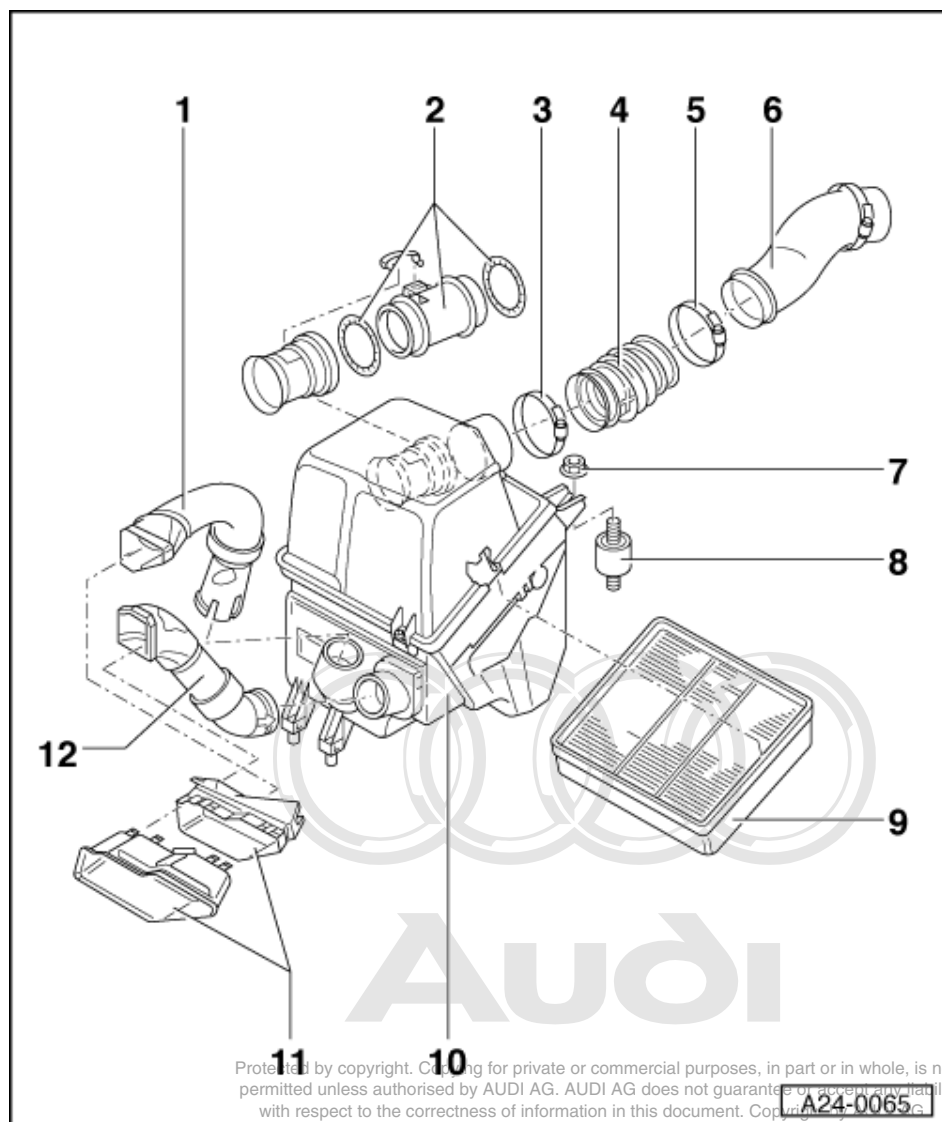
- ♦ Cylinder 1 -N30
- ♦ Cylinder 2 -N31
- ♦ Cylinder 3 -N32
- ♦ Cylinder 4 -N33

18 Ignition coils, cyl. bank 1

- ♦ Cylinder 1 -N
- ♦ Cylinder 2 -N128
- ♦ Cylinder 3 -N158
- ♦ Cylinder 4 -N163

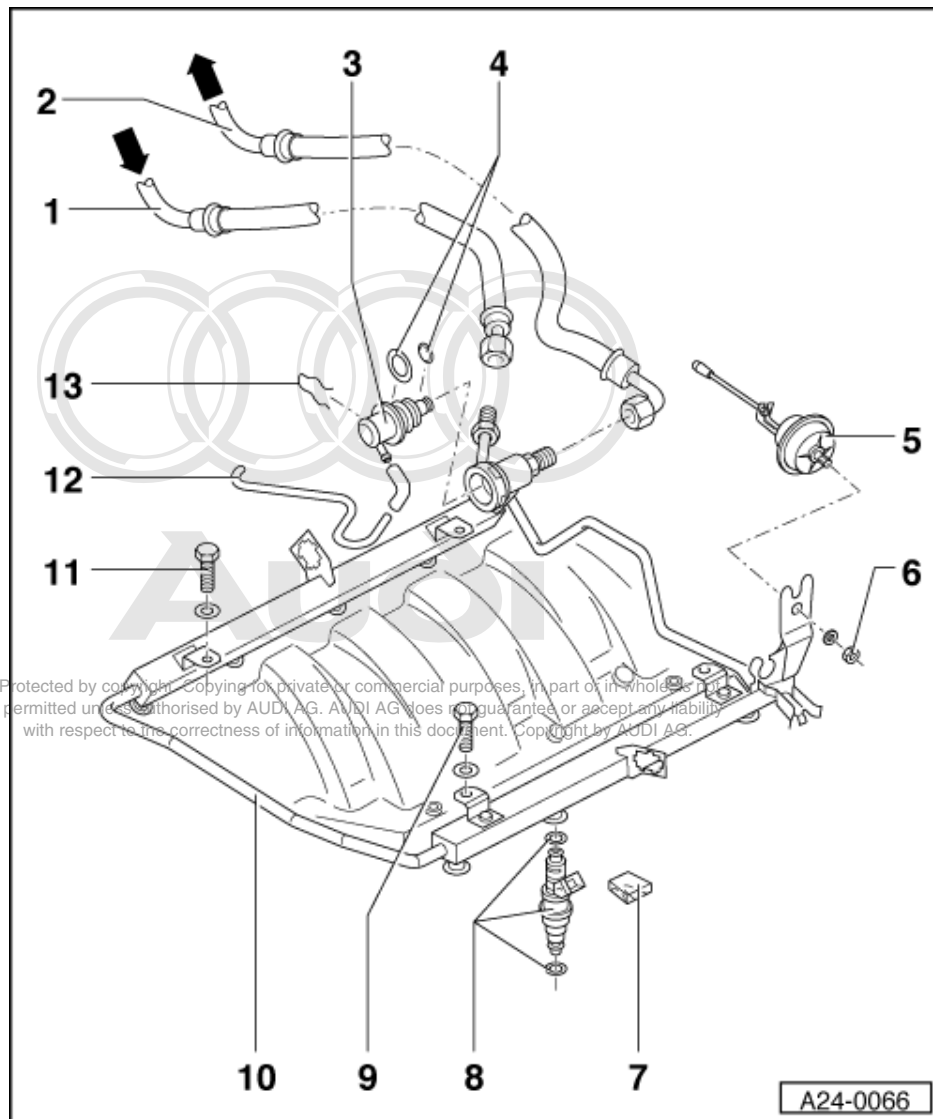
19 Air mass meter -G70 in top part of air cleaner housing

1.6 - Components of intake tract with air mass meter



- 1 Air duct
- 2 Air mass meter -G70
- 3 Hose clip
- 4 Intake hose
- 5 Hose clip
- 6 Intake pipe
- 7 Nut
- 8 Bonded rubber bush
- 9 Air cleaner element
- 10 Air cleaner housing
- 11 Air duct
- 12 Air duct

1.7 - Components of injection tract

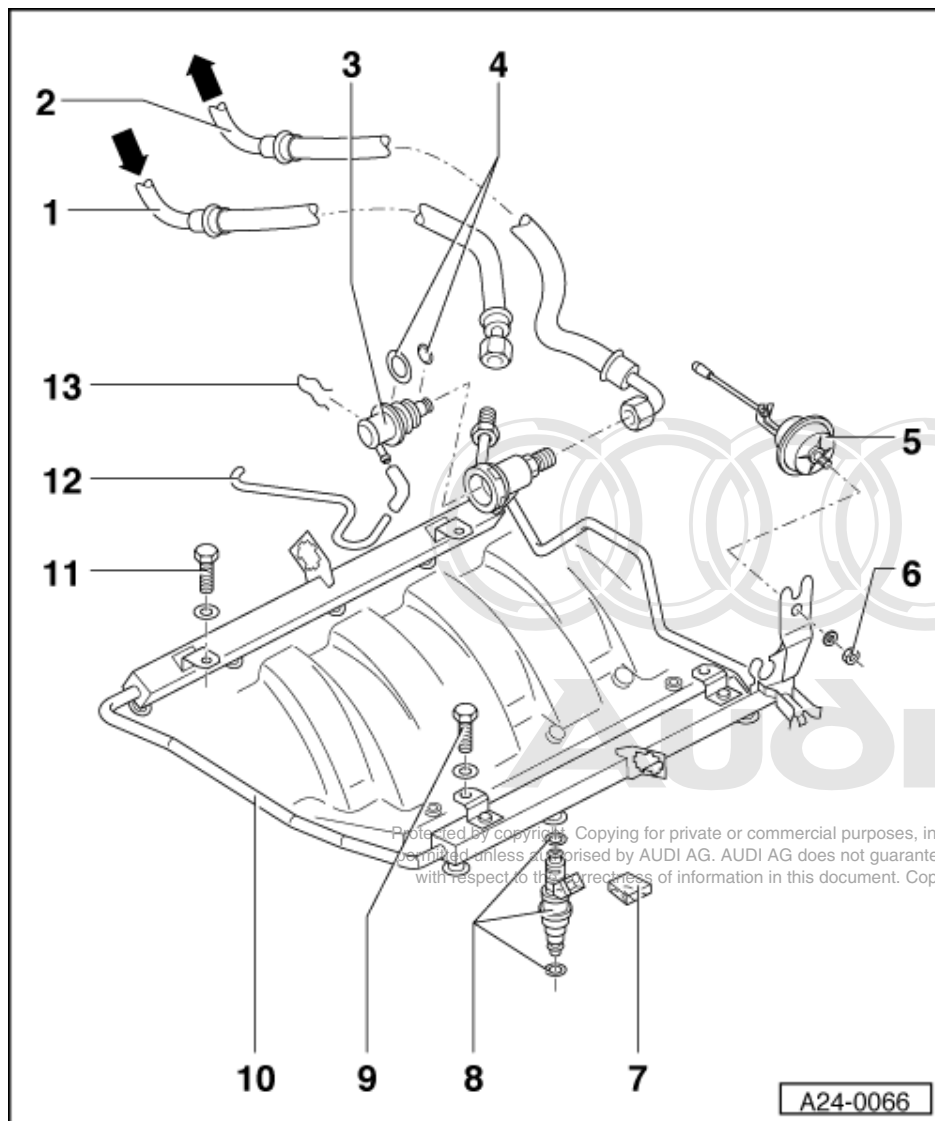


- Safety precautions
=> Page 44
- Cleanliness rules => Page 44

Note:

- ♦ Before carrying out any repair work on the fuel injection system, interrogate fault memory and carry out final control diagnosis
=>Page 20 .
- ♦ Always replace seals and gaskets.

- 1 Supply pipe**
 - ♦ Bolted connection 25 Nm
- 2 Return pipe**
 - ♦ Bolted connection 25 Nm
- 3 Pressure regulator**
- 4 O-rings**
 - ♦ Replace



5 Vacuum unit for cruise control system

6 20 Nm

7 Securing clip for injector

8 Injector

- ◆ Fit new O-rings.

Note:

The end cap must not be removed for replacing the O-rings.

9 10 Nm

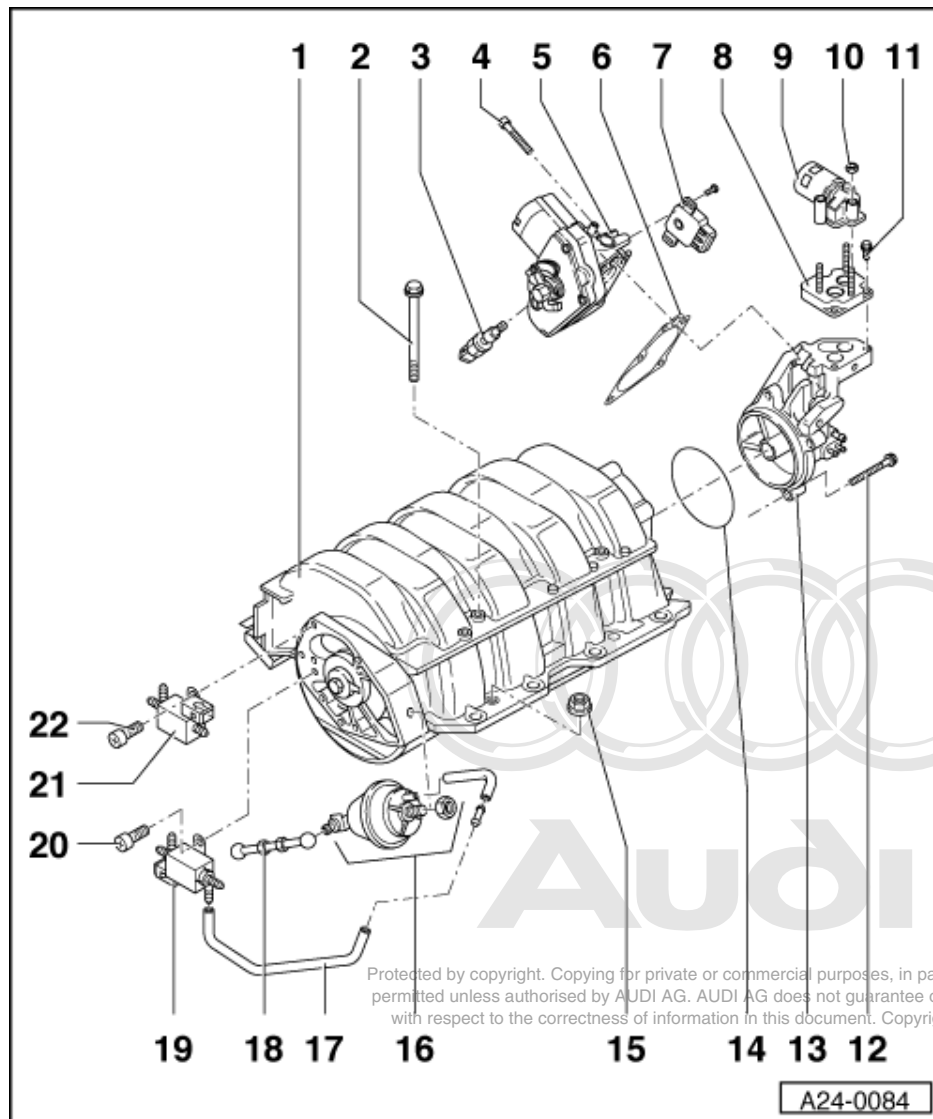
10 Fuel rail

11 10 Nm

12 Vacuum hose

13 Securing clip for pressure regulator

1.8 - Components of variable intake manifold

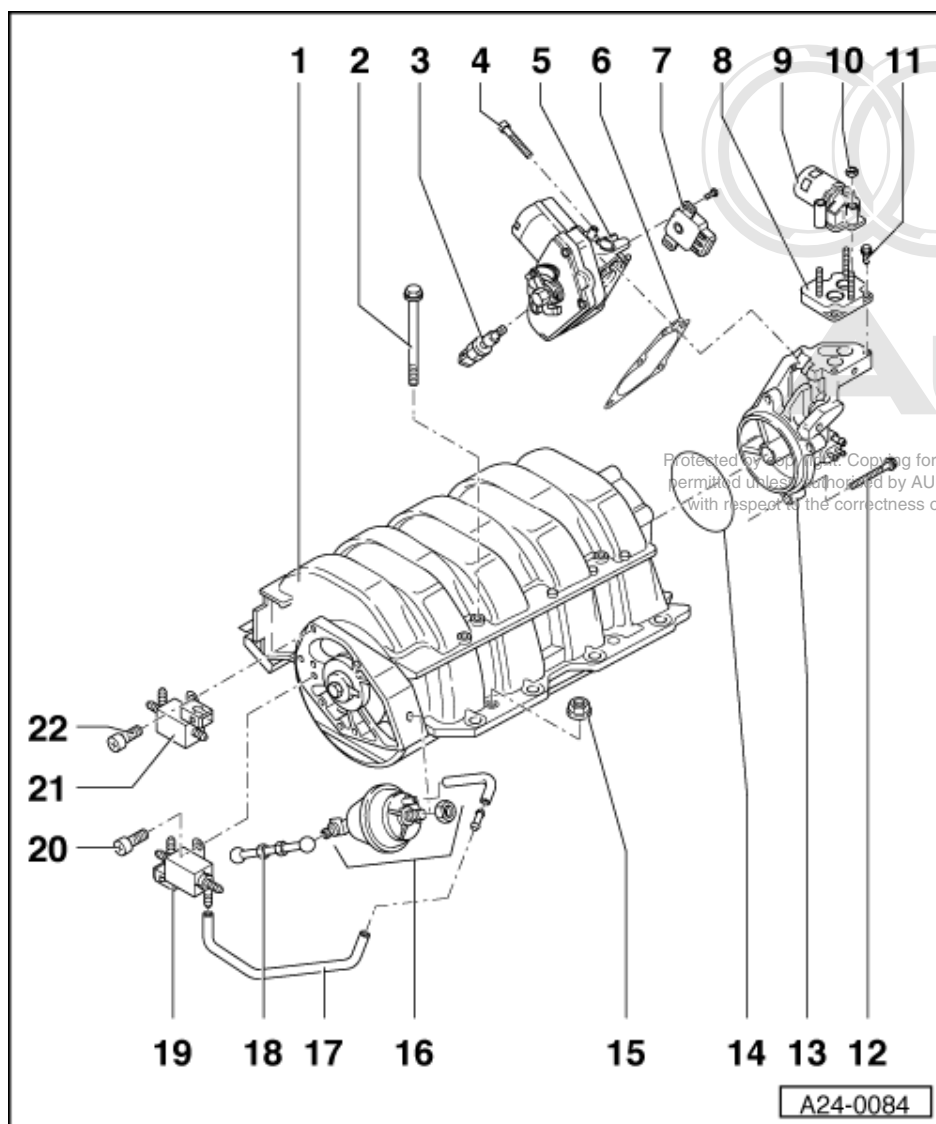


- Safety precautions
 => Page 44
- Cleanliness rules => Page 44

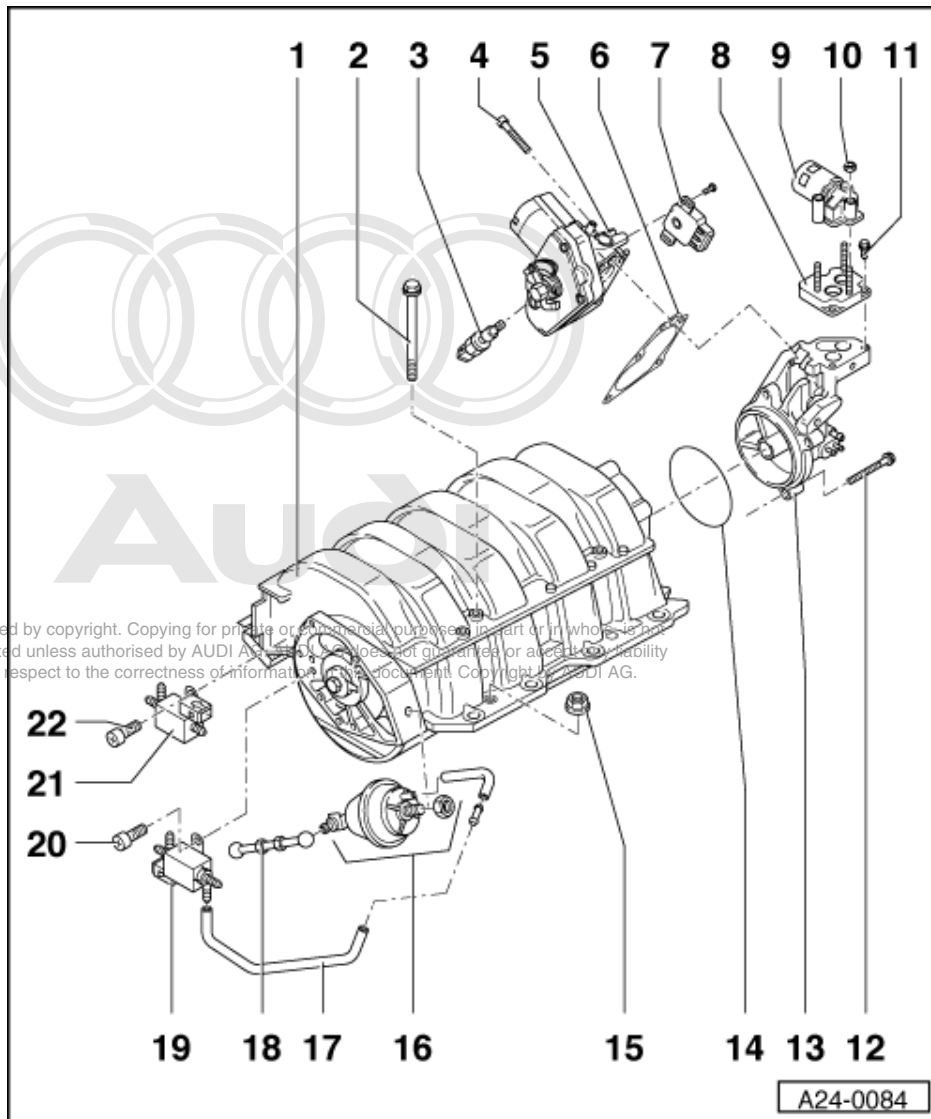
Note:

Before carrying out any repair work on the fuel injection system, interrogate fault memory and carry out final control diagnosis => Page 20.

- 1 Variable intake manifold with variable intake drum
- 2 25 Nm
- 3 20 Nm
- 4 15 Nm



- 5 Throttle valve body
- 6 Gasket
 - ◆ Replace
- 7 Throttle valve potentiometer with idling switch
- 8 Flange
- 9 Idling stabilisation valve
- 10 10 Nm
- 11 5 Nm
- 12 15 Nm
- 13 Angled connection



- 14 O-ring
- 15 25 Nm
- 16 Vacuum unit
 - ♦ Nut, 15 Nm
- 17 Vacuum hose
- 18 Linkage
- 19 Intake manifold changeover valve -N156
- 20 10 Nm
- 21 EGR valve
 - ♦ Only on vehicles with EGR
- 22 10 Nm

1.9 - Connecting test box V.A.G 1598/19

Note:

- ♦ The test box must not be connected when performing diagnosis with fault reader V.A.G 1551.
- ♦ Wait 10 seconds after switching off the ignition before unplugging the connectors from the engine control unit.



- ♦ When the connectors are unplugged, the learned values of the control unit are erased, although the contents of the fault memory are retained.
- ♦ After reconnecting the engine control unit pay attention to the following step:
 - Carry out basic setting of the engine
=>Page 41
- Switch off ignition.
- Remove engine control unit =>Page 54 .
- Connect test box V.A.G 1598 with adapter cable V.A.G 1598/19 to the wiring loom for the engine control unit.

1.10 - Replacing engine control unit

Note:

- ♦ When the connectors are unplugged, the learned values are erased, although the contents of the fault memory are retained.
 - ♦ After installing a new control unit, it is essential to carry out the following steps:
 - Adaptation to the electronic immobiliser
 - Coding of the engine control unit
 - Basic setting of the engine
 - ♦ In the first learning phase during the basic setting operation for the engine, slightly irregular idling and slight jolting while driving are possible.
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- Connect fault reader V.A.G 1551 and check the control unit identification
=> Page 1

-> The control unit identification and the coding appear in the display.

4D0907557B	4,2L V8/4V MOTR HS D..
Coding 04212	WSC 06388

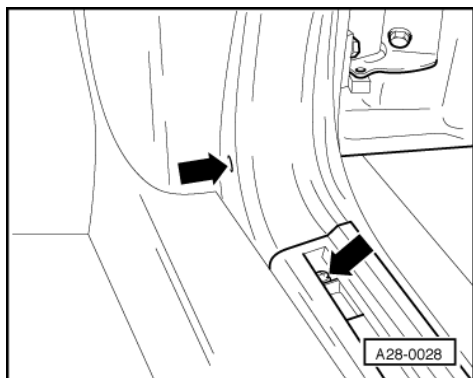
- Print out the control unit identification and compare the coding to the coding versions => Page 43 .
- Press => key.

-> Readout on display:

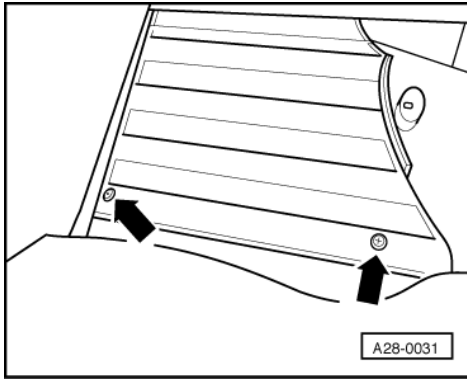
Rapid data transfer	HELP
Select function XX	

- Switch off ignition.

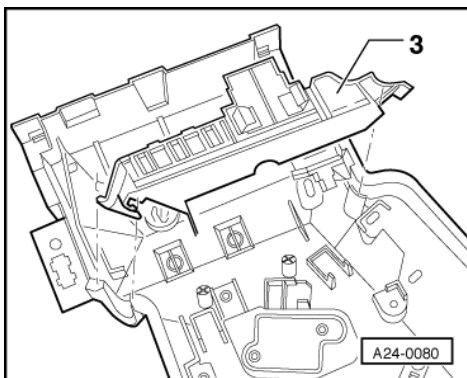
Removing engine control unit:



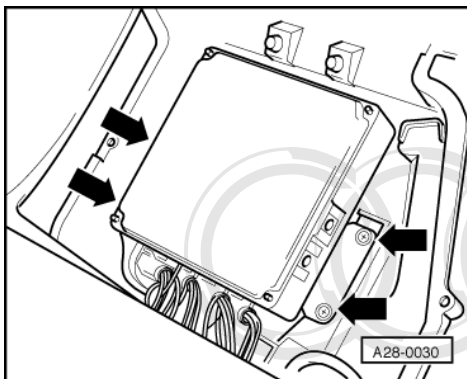
- -> Remove the bottom cover of the right A pillar.
- Fold back the carpeting in the front right footwell.



- -> Remove the screws of the electronics box cover.
- Detach the top and bottom lids.



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



- -> Unscrew the engine control unit from the electronics box.

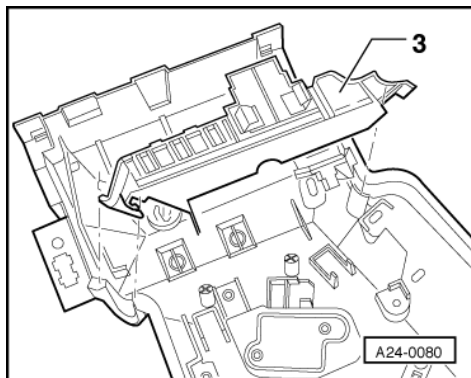
Note:

Switch off the ignition before disconnecting or connecting the control unit connectors.

- Lift out the engine control unit and unplug the connectors.

Installing engine control unit:

- Plug in the connectors at the control unit.
- Screw the control unit onto the fixture in the electronics box.



- -> Re-insert cross-strut -3-.
- Carefully insert the bottom lid into both openings of the electronics box and ensure it engages properly.
- Carefully attach the top lid into both openings of the electronics box.
- Screw both lids of the electronics box together.
- Cover the electronics box with the carpeting again.
- Re-install the A-pillar cover.

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

- Adaptation of the engine control unit to the immobiliser control unit

=> Electrical system; Repair group 96; Servicing immobiliser; Adaptation procedure after renewing engine control unit
Servicing immobiliser Adaptation procedure after renewing engine control unit

- Carry out coding of the new control unit => Page 43 .
- Carry out basic setting of the engine
=>Page 41

1.11 - Testing idling speed and CO content

Note:

- ♦ Idling speed, ignition timing and CO content cannot be adjusted.
- ♦ The idling speed is controlled to the specified value by the throttle valve positioner in combination with the digital idling stabilisation.
- ♦ The CO content is controlled to the specified value by the lambda control. Faults in the lambda control are detected by the self-diagnosis and stored in the fault memory.
- ♦ All learned values in the engine control unit are erased when the connectors on the engine control unit are disconnected or when the battery is disconnected.
 - Carry out basic setting of the engine
=>Page 41
- ♦ It is not possible to test the CO content upstream of the CAT.
- ♦ In order to assess the exhaust upstream of the CAT, it is necessary to test the lambda control values and the lambda learned values in self-diagnosis. Read measured value blocks 10 and 11 =>Page 35 .

Testing idling speed

Test conditions

- Coolant temperature at least 80 °C.
- No leaks in exhaust system
- Electrical consumers switched off (e.g. rear window heating).
- Interrogate fault memory => Page 3 . There must not be any faults stored. If necessary, rectify any faults and erase the fault memory. Switch off engine and restart. Carry out a road test and interrogate the fault memory again as a check.
- Leave the engine idling after interrogating the fault memory.

- Switch off air conditioner.

Attention

The electric radiator fan must not be running.

- Select Read measured value block (function 08) and display group 05 =>Page 33).

-> Readout on display:

Read measured value block 5

1 2 3 4

- Read off idling speed from display zone 1.

Specification: Display zone 2

- Press ⇒ key.
- Enter 06 for "End data transfer" and confirm entry with the Q key.

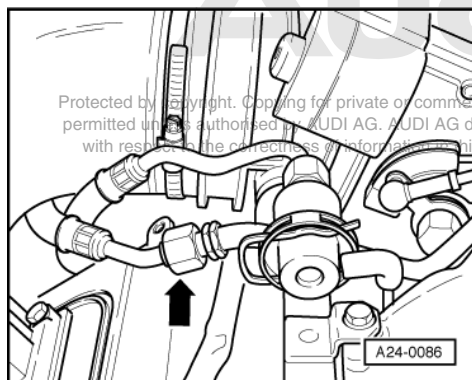
If the specification is not obtained:

- Check engine for inducted unmetered air.
- Test idling stabilisation valve -N71
=>Page 74
- Test idling switch =>Page 76.

1.12 - Testing fuel pressure regulator and holding pressure

Test conditions

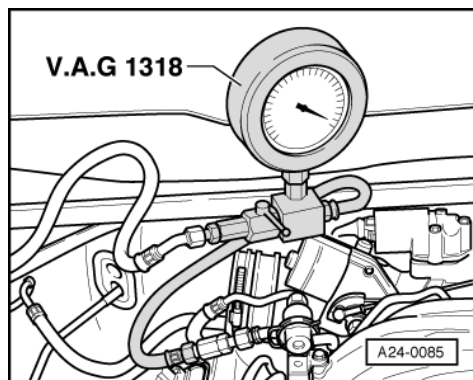
- Fuel pump relay OK
- Fuel pump OK
- Fuel filter OK
- Battery voltage at least 11 V.



Note:

Fuel pressure regulator regulates fuel pressure as a function of intake manifold pressure.

- Briefly open fuel filler cap (to release pressure).
- -> Cover over the pressurised bolted connection (-arrow-) of the feed pipe with a cleaning rag to prevent spraying fuel. Open the bolted connection and collect the fuel which flows out (place cleaning rags underneath).



- -> Install pressure gauge V.A.G 1318 together with adapters V.A.G 1318/15 or (1318/6) in the feed pipe.

Note:

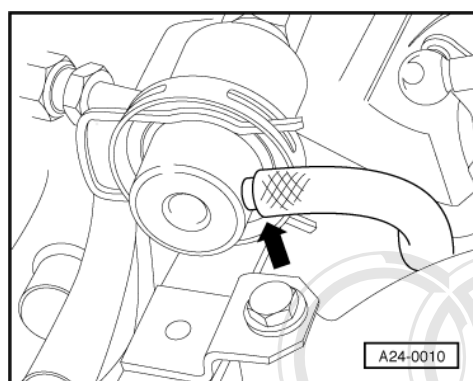
Shut-off cock of the pressure gauge must be open (lever pointing in direction of flow).

- Start engine and let it idle

Specification: fuel pressure approx. 3.6 bar

Note:

If no fuel pressure is built up, inspect the return and feed pipes for wrong connection.



- -> Disconnect vacuum hose (-arrow-) from fuel pressure regulator.
- The fuel pressure should rise to approx. 4.2 bar.
- Switch off ignition.
- Check for leaks and holding pressure by watching pressure drop on gauge.

After 10 minutes the remaining pressure should be at least 3 bar.

If the holding pressure drops below 3.0 bar:

- Start the engine and, once the fuel pressure has built up, switch the engine off again
- Close shutoff valve at pressure gauge V.A.G 1318.

If the holding pressure now does not drop:

- Union between pressure gauge and fuel supply pipe leaking
- Supply pipe leaking at fuel tank
- Non-return valve in fuel pump leaking

=> 8-cylinder engine, Mechanical components; Repair group 20; Removing and installing fuel pump, Testing non-return valve of fuel pump Removing and installing fuel pump, Testing non-return valve of fuel pump

If the holding pressure drops again:

- Union between pressure gauge and fuel pressure regulator leaking
- Fuel pressure regulator defective
- Injectors leaking

Note:

To remove the pressure gauge, close the shut-off valve, unscrew the union on adapter V.A.G 1318/15 or (1318/6), then open the shut-off valve to drain off excess fuel into a suitable container.

1.13 - Testing injection quantity, leak tightness and spray pattern of injectors

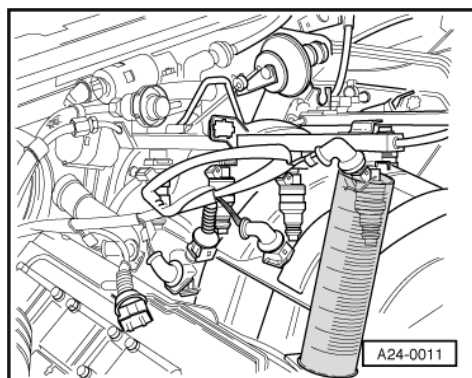
Test conditions

- Fuel pressure OK
- Remove engine compartment cover.
- Remove connecting pipe between air cleaner housing and throttle valve body
- Detach throttle cable at the support bracket.
- Detach ball head from the CCS linkage.
- Place cable over the CCS unit to the rear.
- Detach the vacuum hose from the CCS unit.
- Disconnect vacuum hose from fuel pressure regulator.
- Separate the plug connections for the knock sensors and remove cable ties as necessary.
- Unplug connector from intake manifold changeover valve.
- Unplug the connectors from the injectors and remove cable ties as necessary.
- Unbolt the fuel rail from the variable intake manifold and pull it upwards and off the intake manifold together with the injectors.
- Connect test box V.A.G 1598/19 to wiring harness of engine control unit =>Page 53 .
- Use cables from adapter cable set V.A.G 1594 to connect contact D11 with contact A4 at the test box. (This actuates the fuel pump relay).
- Switch ignition on.
- Check injectors for leaks (visual check).

When the fuel pump is running, only 1 or 2 drops a minute should escape from each injector.

- If fuel loss is greater, shut off fuel pump (remove bridge at test box V.A.G 1598/19) and replace the faulty injector.

Testing injection quantity



Note:

Before removing an injector, release the fuel pressure by briefly opening the fuel filler cap.

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- -> Place the injector which is to be tested into a measuring glass from injection quantity tester V.A.G 1602.
- Plug the connector of cylinder 1 for testing the right bank of cylinders or cylinder 5 for testing the left bank of cylinders into the injector to be tested.
- Switch ignition on.
- Use cables from adapter cable set V.A.G 1594 to connect contact A2 with contact E7 at the test box V.A.G 1598/19 (this actuates the power supply relay for the Motronic system to the positive supply of the injectors).
- Use cables from adapter cable set V.A.G 1594 to connect contact E11 (earth) to contact E1 for 30 seconds at test box V.A.G 1598/19 in order to actuate an injector in the right-hand bank of cylinders (bank 1).
- Use cables from V.A.G 1594 to connect contact E11 (earth) to contact E5 for 30 seconds at test box V.A.G 1598/19 in order to actuate an injector in the left-hand bank of cylinders (bank 2).

Specification: 105...115 ml

- If the reading obtained for one or more injectors is not within tolerance, switch off the fuel pump and power supply relay (remove bridges at test box V.A.G 1598/19) and replace the faulty injector.

Note:

Before removing an injector, release the fuel pressure by briefly opening the fuel filler cap.

- If the measured values for all the injectors are outside the tolerance range, check the fuel pressure => Page 57 .

Note:

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

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

- Renew the O-rings at all opened connections. (When renewing the front O-ring, make sure not to remove the plastic cap from the injector head. The O-ring must be pulled off over the plastic cap.)
- Moisten the O-rings with clean engine oil.
- Check that the injectors are installed in the correct position.

(Electrical connections face outwards.)

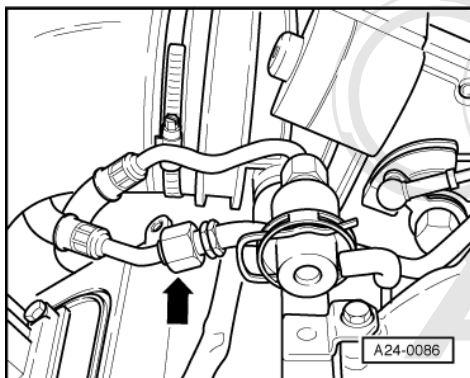
- Check to make sure that the retaining clips are properly seated.

1.14 - Removing and installing injectors

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Removing:

- Remove connecting pipe between air cleaner housing and throttle valve body
- Detach throttle cable at the support bracket.
- Detach ball head from the CCS linkage.
- Place cable over the CCS unit to the rear.
- Detach the vacuum hose from the CCS unit.
- Disconnect vacuum hose from fuel pressure regulator.
- Separate the plug connections for the knock sensors and remove cable ties as necessary.
- Unplug connector from idling stabilisation valve.
- Briefly open fuel filler cap (to release pressure).



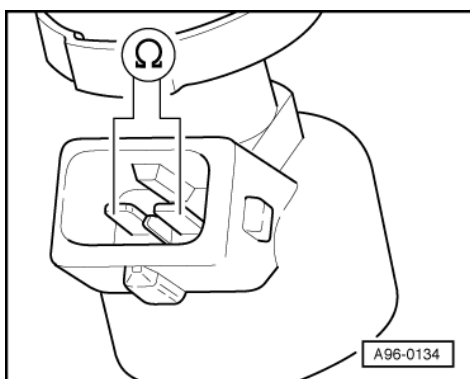
- -> Cover over the pressurised bolted connection (-arrow-) of the feed pipe with a cleaning rag to prevent spraying fuel. Open the bolted connection and collect the fuel which flows out (place cleaning rags underneath).
- Unplug the connectors from the injectors and remove cable ties as necessary.
- Unbolt the fuel rail from the variable intake manifold and pull it upwards and off the intake manifold together with the injectors.
- Pull off the retaining clip at the injector/fuel rail connection and pull the injectors out of the fuel rail.

Installing:

Note:

- ◆ Fit new O-rings. (When renewing the front O-ring, make sure not to remove the plastic cap from the injector head. The O-ring must be pulled off over the plastic cap.)
- ◆ Check to make sure that the retaining clips are properly seated.
- Moisten the O-rings with clean engine oil.
- Push injectors vertically into the fuel rail as far as the stop until they are properly located (electrical connections face outwards) and secure with retaining clips.
- Insert fuel rail with the secured injectors on the intake manifold and press in evenly as far as the stop.
- Insert securing bolts, press fuel rail gently by hand in the direction of the intake manifold and tighten securing bolts (10 Nm).
- The remaining installation is carried out in the reverse order of removal.

1.15 - Testing injectors

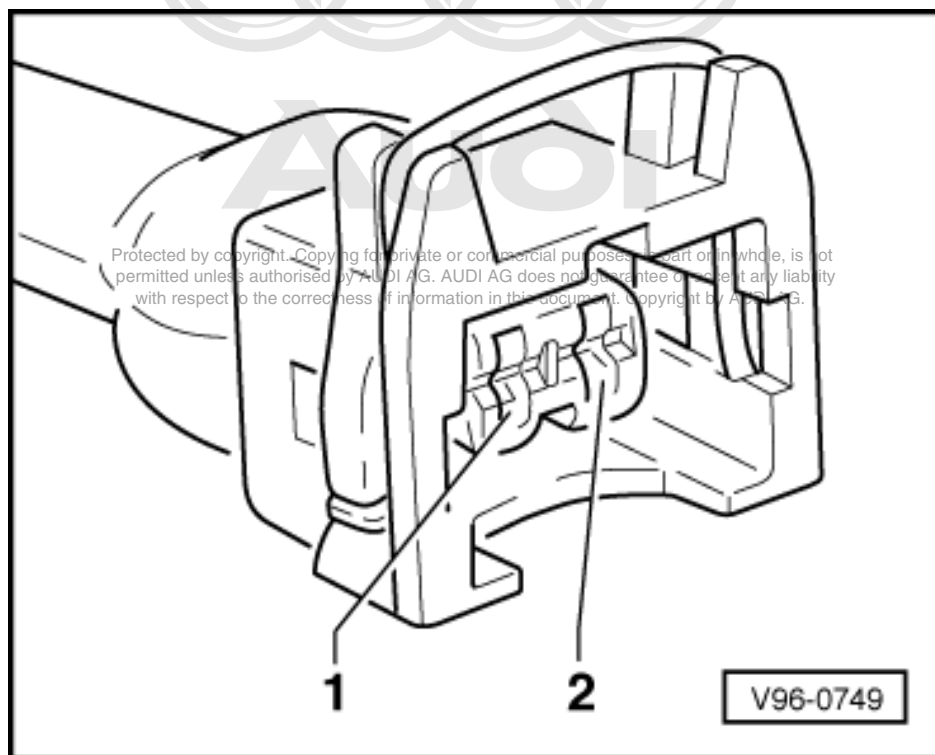


A - Electrical test of injectors

- Remove connector from the injector which is to be tested.
- -> Measure resistance between the injector contacts using V.A.G 1526.

Specified value at room temperature 15...17 ohm

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

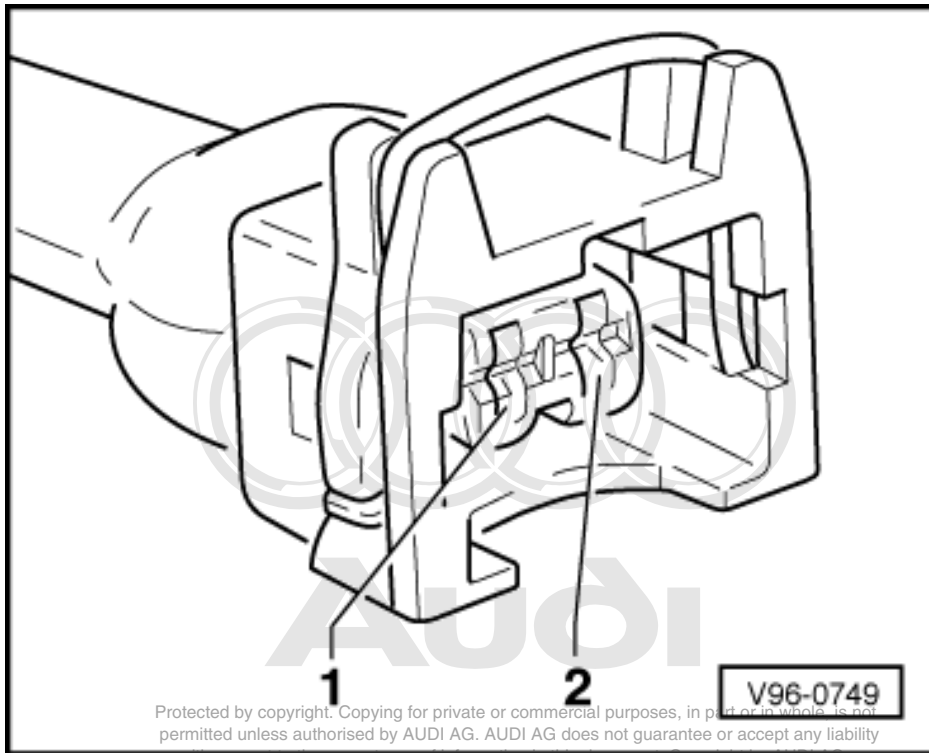
B - Testing the voltage supply to the injectors

- Remove connector from the injector which is to be tested.
- -> Connect diode test lamp V.A.G 1527 between engine earth and contact 1 on the connector.
- Switch ignition on.

The diode test lamp should light up.

- If the diode test lamp does not light up, test for open circuit in the wiring between contact 1 and the fuse for the injectors (brown fuse holder in electronics box).

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



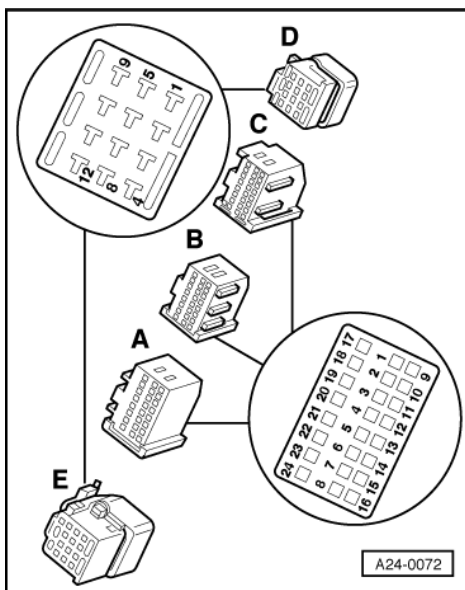
If the diode test lamp lights up, test the actuation of the injectors.

C - Testing actuation of injectors

- Remove connector from the injector which is to be tested.
- -> Connect diode test lamp V.A.G 1527 with cables from adapter cable set V.A.G 1594 between contacts 1 and 2.
- Operate starter for a few seconds (the engine can be allowed to start).

The diode test lamp should flash.

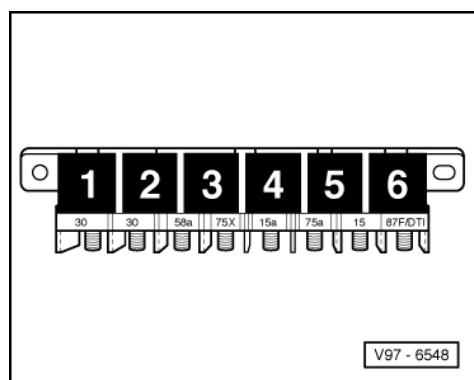
- If the diode test lamp does not flash, connect test box V.A.G 1598/19 to the wiring loom for the engine control unit =>Page 53 .
- Test for open circuit or short to positive in the wiring between the engine control unit and contact 2 on the plug connector for the injector being tested.



Contact 2 on plug connector for injector	Test box V.A.G 1598/19 or engine control unit->
1	E1
2	D7
3	D6
4	E2
5	E5
6	D2
7	D3
8	E6

- Rectify any open/short circuit as necessary.
- If the diode test lamp does not flash for any of the injectors, test power supply relay -J271 for the engine control unit => Page **85**.

1.16 - Testing fuel pump relay and actuation

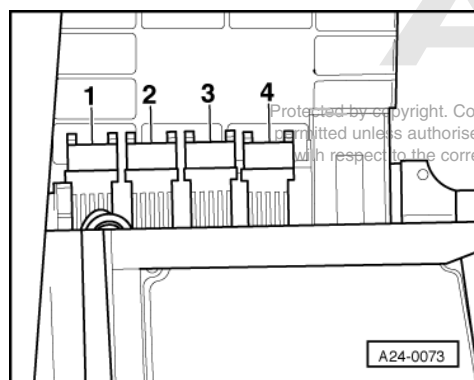


A - Functional test of fuel pump relay -J17

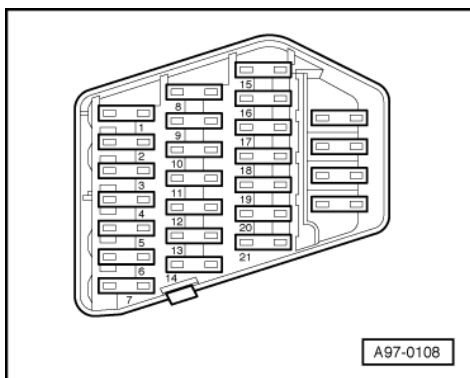
Note:

-> The fuel pump relay is located in the central electrics in the left hand footwell, relay position 6.

- Remove shelf in front left hand footwell.
- Remove the bottom trim panel from the right A pillar.
- Fold back carpeting in front right footwell and unscrew cover of electronics box.



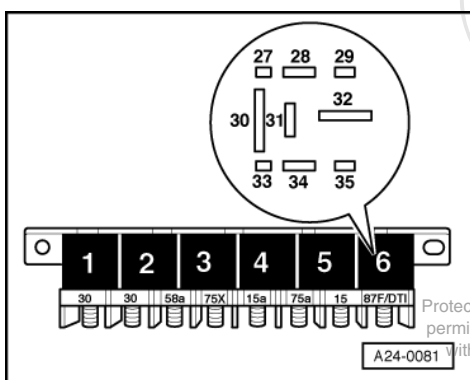
- -> Pull out fuse from brown fuse holder (fuse for injectors).
- Pull out fuse from black fuse holder (fuse for solenoid valves).



- -> Pull out fuse 17 at the fuse holder.
- Connect diode test lamp V.A.G 1527 between earth and one of the two contacts of fuse 17.
- Operate starter briefly

Fuel pump relay should pick up (can be felt and heard) and diode test lamp should briefly light up.

- If the fuel pump relay does not pick up, test actuation => Page 66 .



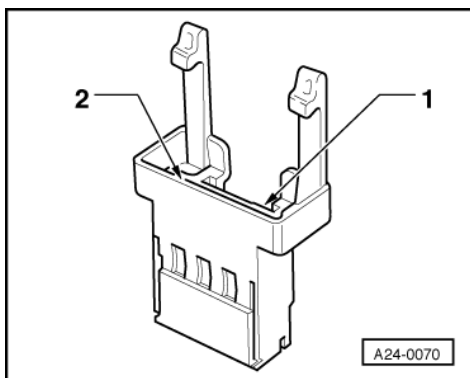
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- If the diode test lamp does not light up, repeat the test at the other contact of fuse 17.

If the diode test lamp still does not light up:

- Remove fuel pump relay from relay position 6.
- -> Test wiring connection from fuse 17 to contact 30 at relay position 6 for continuity.

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

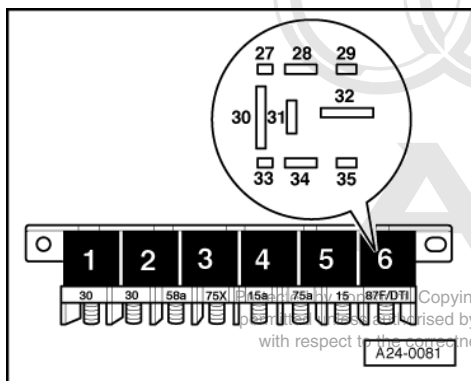


- -> Connect diode test lamp V.A.G 1527 between earth and contact 1 of the fuse (from the brown fuse holder).
- Switch ignition on.

The diode test lamp should light up.

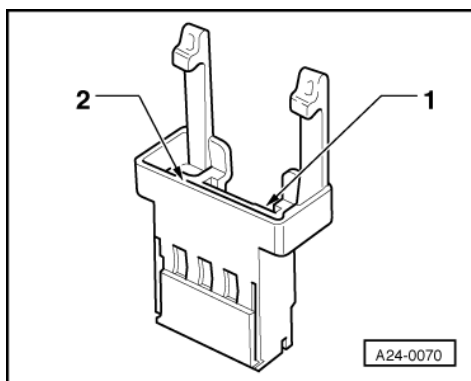
- If the diode test lamp does not light up, repeat the test at contact 2 of the fuse.

If the diode test lamp still does not light up:



- -> Test wiring connection from fuse (from brown fuse holder) to contact 31 at relay position 6 for continuity.

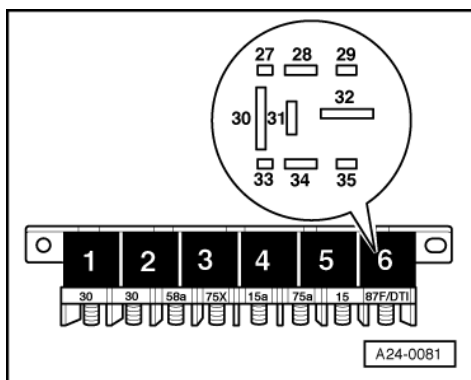
=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder



- -> Connect diode test lamp V.A.G1527 between earth and contact 1 of the fuse (from the black fuse holder).
- Operate starter briefly

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

- If the diode test lamp does not light up, repeat the test at contact 2 of the fuse.

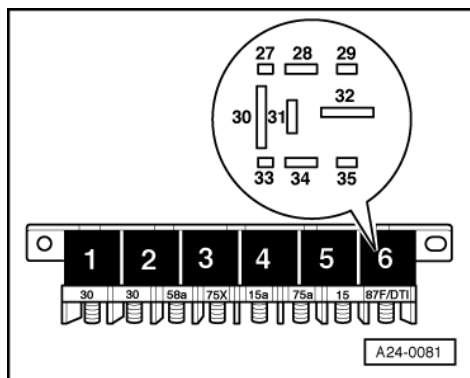


- -> If diode test lamp still does not light up, test wiring connection from fuse (from black fuse holder) to contact 30 at relay position 6 for continuity.

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

B - Testing voltage supply and actuation of fuel pump relay

- Pull out fuel pump relay -J17 from the central electrics, relay position 6.



Testing voltage supply

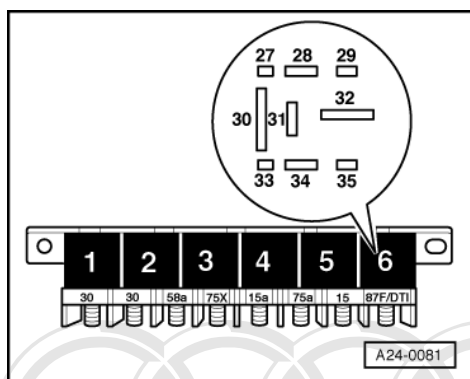
- Switch ignition on.
- -> Connect handheld multimeter V.A.G 1526 in turn between contacts 28 (positive, terminal 15) and 34 (earth), and 32 (positive, terminal 30) and 34 (earth) of the relay base.

Specification: approx. battery voltage in each case

- If battery voltage is not present, check the wiring for open circuit.

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

Testing actuation



- -> Connect diode test lamp V.A.G 1527 with adapter cable set 1594 between contacts 28 (positive) and 29 (earth, actuation of engine control unit -J220).
- The diode test lamp should come on for about 1 sec when the ignition is switched on, and then go out again. The diode test lamp should light up and remain lit when the starter is operated.

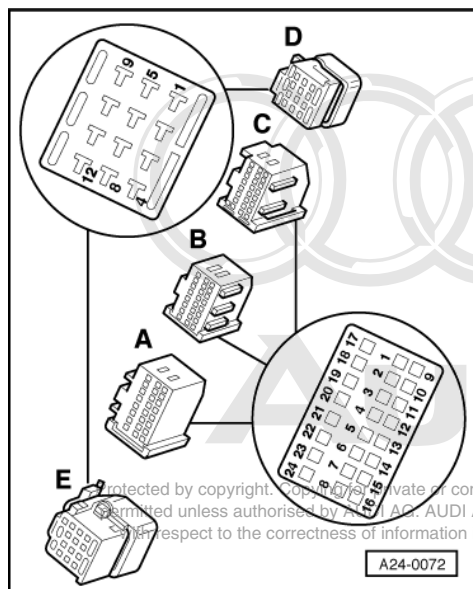
Note:

Diode test lamps with a low current consumption do not go out completely after 1 sec, but continue to glow faintly until the starter is operated.

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

Connect test box V.A.G 1598/19 to wiring harness of engine control unit =>Page 53 .

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- -> Connect handheld multimeter V.A.G 1526 between contact 29 of the relay base and socket A4 of the test box, and check the wiring for continuity.
- If the specified value is not attained, check the wiring for open circuit.

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

- If there is no open circuit and the diode test lamp still does not light up, fit a new engine control unit
=> Page 54
- If the actuation of the fuel pump relay and the wiring are OK, replace the fuel pump relay.
- Refit the fuses.

2 - Testing lambda control

2.1 - Testing lambda control

Note:

- ♦ The lambda probe compares the oxygen content in the air with the residual oxygen content in the exhaust gas and sends a voltage signal to the control unit.
- ♦ The voltage signal for "Mixture too rich" (low level of residual oxygen) is between about 0.7 and 0.9 V.
- ♦ The voltage signal for "Mixture too lean" (high level of residual oxygen) is between about -0.2 and +0.2 V.
- ♦ Due to the earth-insulated construction of the probe, negative voltages relative to engine earth are possible.
- ♦ The transition from "rich" to "lean" and vice versa ($\lambda = 1.0$) is accompanied by a voltage jump from between 0.7 and 0.9 V to between -0.2V and +0.2V or vice versa.
- ♦ Because of the sharp voltage jump the lambda control cannot maintain a constant ideal mixture composition of $\lambda = 1.0$. The system fluctuates continuously between "slightly too lean" and "slightly too rich".

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

- ♦ Slots or holes in probe head are blocked.
- ♦ Lambda probe has been subjected to excessive thermal stress.
- ♦ Probe contaminated by leaded fuel. Test lead content with "PLUMBTESMO" test strip.
- ♦ Contact resistance in signal wiring or reference earth line.
- ♦ Lambda probe too cold; lambda probe heating not working.
- ♦ Lambda probe damaged by contact spray or similar product. (The contact spray is drawn into the probe through the fine cavities in the electrical wiring as a result of thermal fluctuations and capillary effects.)
- ♦ Probe damaged by silicon vapours. The engine draws in traces of any silicone based sealants that may have been used. These silicone elements do not burn and damage the lambda probe.

2.2 - Testing operation of the Lambda control

- Connect fault reader V.A.G 1551 (V.A.G 1552) and select control unit for engine electronics => Page 1 .
- Read measured value block (function 08) and select display group 03 =>Page 31).

-> Readout on display:

Read measured value block 3			
1	2	3	4

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

- Press the C key
- Read measured value block (function 08) and select display group 11 =>Page 36).

-> Readout on display:

Read measured value block 11			
1	2	3	4

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

Specification: -0.17 to 0.9 V

Display zone 4 will show the signal voltage for lambda probe 2.

Specification: -0.17 to 0.9 V

- If the lambda probe voltage fluctuates very slowly, test the lambda probe heating => Page 70 .
- If no probe voltage is displayed, there is an open circuit in the signal wiring; check the wiring => Page 72 .
- If the display shows a constant voltage reading of -0.2...+0.2 V (mixture too lean), this means that the lambda control has reached the control stop in the "enrich" direction, but the lambda probe is still registering "Mixture too lean".
- If the display shows a constant voltage reading of 0.7...0.9 V (mixture too rich), this means that the lambda control has reached the control stop in the "lean" direction but the lambda probe is still registering "Mixture too rich".
- Press the C key
- Read measured value block (function 08) and select display group 10.

-> Readout on display:

Read measured value block 10			
1	2	3	4

The mixture learned values for idling appear in display zones 1 and 2.

Specified values for idling: -14...+9 %

The mixture learned values for part throttle appear in display zones 3 and 4.

Specified values for part throttle: -10...+10 %

- If the readouts are less than the specifications, then the system has to constantly make the mixture significantly leaner.
- If the specifications are exceeded, then the system has to constantly make the mixture significantly richer.

Causes for leaner mixture:

- Only during idling: oil dilution caused by fuel
- Idling and part throttle: fuel pressure too high

Note:

Oil dilution can be rectified by driving on the motorway or changing the oil.

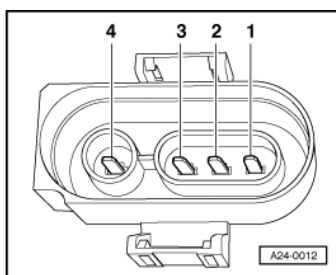
Causes for richer mixture:

- Only during idling: unmetered air in intake system.
- Idling and part throttle: fuel pressure too low

2.3 - Testing lambda probe heating

Note:

The lambda probe signals are monitored by the self-diagnosis.



- Interrogate fault memory => Page 3.
- If a fault is indicated in the heating circuit, unplug the connector for the relevant lambda probe at the rear of the cylinder head.
- -> Use V.A.G 1526 to test continuity (resistance measurement) between contacts 1 and 2 on lambda probe connector.

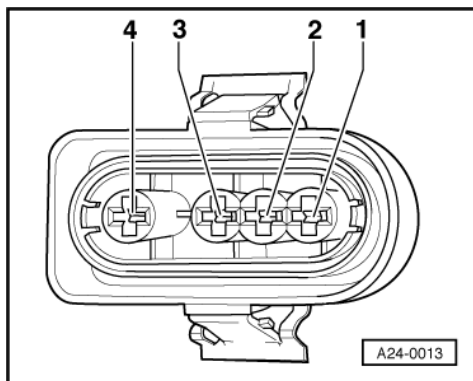
Specified value at room temperature 2...5 ohm

Note:

The resistance will increase sharply at higher temperatures.

- If an open circuit is detected, fit a new lambda probe.
- If the heating element has continuity, test the power supply for the relevant lambda probe heating as follows:
- Test fuse for lambda probe (electronics box).

If the fuse is OK:

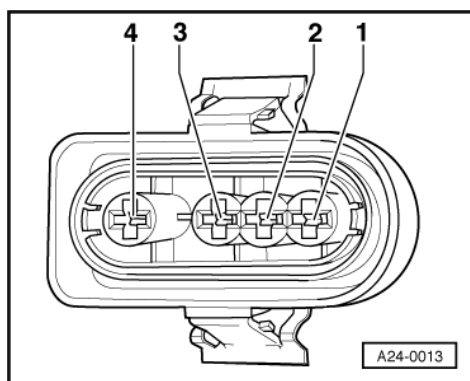


- -> Connect diode test lamp V.A.G 1527 between contact 1 of the connector at the wiring loom and engine earth.
- Briefly operate starter (engine can be allowed to start).

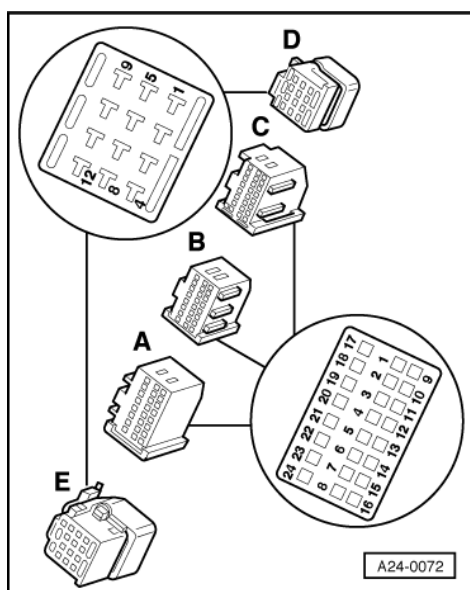
The diode test lamp should light up.

- -> If the diode test lamp does not light up, test wiring connection from contact 1 of the connector at the wiring loom to the fuse for open circuit or short circuit.

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



- If the voltage supply is OK:
- Connect test box V.A.G 1598/19 to wiring harness for engine control unit =>Page 53.
- -> Test the following wiring connections for short circuit or open circuit
- Right lambda probe 1 -G39
 - Lambda probe heater -Z19
- Left lambda probe 2 -G108



- Lambda probe heater -Z28

Connector on wiring harness, contact	Test box V.A.G 1598/19 or engine control unit->
2 (probe 1 -Z19)	E10
2 (probe 2 -Z28)	E9

- If the fuse and the wiring are OK but the diode test lamp still does not light up, test the fuel pump relay =>Page 64

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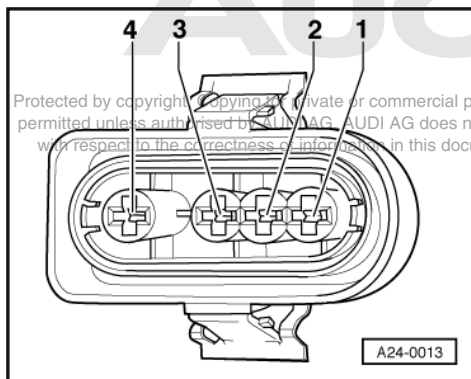


2.4 - Testing lambda probe signal wiring and actuation

Note:

The lambda probe signals are monitored by the self-diagnosis.

- Interrogate fault memory =>Page 3

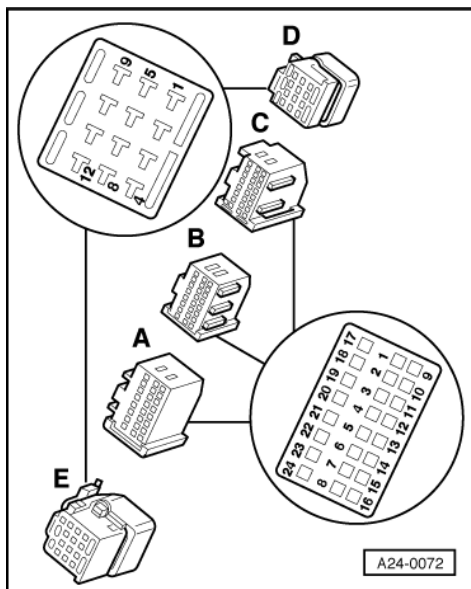


- If a fault in the lambda probe is displayed and the lambda probe heating is OK, unplug the connector for the relevant lambda probe connector at the rear of the cylinder head.
- -> Test voltage by connecting hand held multimeter V.A.G 1526 (measuring range 2 V) between contacts 3 and 4 of plug on wiring harness.
- Switch ignition on.

Specification: 450 ± 50 mV.

If the specification is not obtained:

- Connect test box V.A.G 1598/19 to wiring harness for engine control unit =>Page 53 .



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

Lambda probe, bank 1 -G39

Connector on wiring harness, contact	Test box V.A.G 1598/19 or engine control unit
3	B20

Connector on wiring harness, contact	Test box V.A.G 1598/19 or engine control unit
4	B24

Lambda probe, bank 2 -G108

Connector on wiring harness, contact	Test box V.A.G 1598/19 or engine control unit
3	B21
4	B23

- If the wiring is OK, fit a new engine control unit => Page 54 .

2.5 - Removing and installing lambda probe

The lambda probes are located on the left and right behind the cylinder heads.

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Note:

- ◆ Use V.A.G 3337/9 for removing and installing.
- ◆ When installing, the cable ties must be refitted at exactly the same points in order to prevent contact between the Lambda probe wire and the exhaust pipe.
- ◆ Tightening torque: 50 Nm.
- ◆ The screw thread on the lambda probe is coated with assembly paste. This paste must not be allowed to penetrate the openings on the probe.

3 - Testing idling stabilisation

3.1 - Testing idling stabilisation

3.2 - Testing operation of idling stabilisation

- Connect fault reader V.A.G 1551 (V.A.G 1552) and select control unit for engine electronics => Page 1 .
- Read measured value block (function 08) and select display group 03 =>Page 31

-> Readout on display:

Read measured value block 3			
1	2	3	4

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

- Press the C key
- Read measured value block (function 08) and select display group 04 =>Page 32).

-> Readout on display:

Read measured value block 4			
1	2	3	4

- Check display in display zone 4.

Specification: "Idling"

- If "part throttle" appears in display zone 4, test idling switch =>Page 76 .

- Press the C key
- Read measured value block (function 08) and select display group 06 =>Page 33).

-> Readout on display:

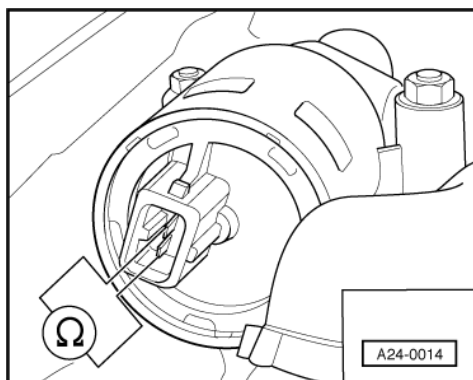
Read measured value block 6			
1	2	3	4

- Check readout in display zone 1:
Specification: 760...840 rpm
- Readout in display zone 4:
Specification: 0 0 0
- If all the electrical consumers are switched off and the idling speed is still not correct, check readout in display zone 2:
Specification: -0.4...+0.4 g/s
- If the specified value is not attained, "programme" the air mass of the idling speed adjuster by briefly blipping the throttle every 10 seconds.
- If this is not possible, and -0.85 appears in display zone 2 together with -1.4 in display zone 3, then there is a leak in the intake system.

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3.3 - Testing idling stabilisation valve

Electrical test of idling stabilisation valve -N71



- Unplug connector from valve -N71.
- -> Measure resistance between the valve contacts using V.A.G 1526.

Specification: 7.0...11.0 ohm

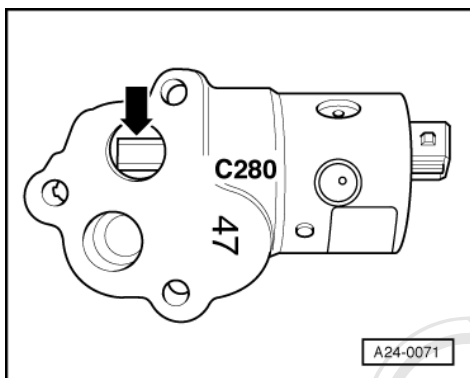
- If the specified value is not attained, replace idling stabilisation valve -N71.

Note:

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

Mechanical test of idling stabilisation valve -N71

- Unbolt valve -N71 from the engine (line remains connected).



- -> Inspect the rotary slide for signs of scoring (visual inspection).

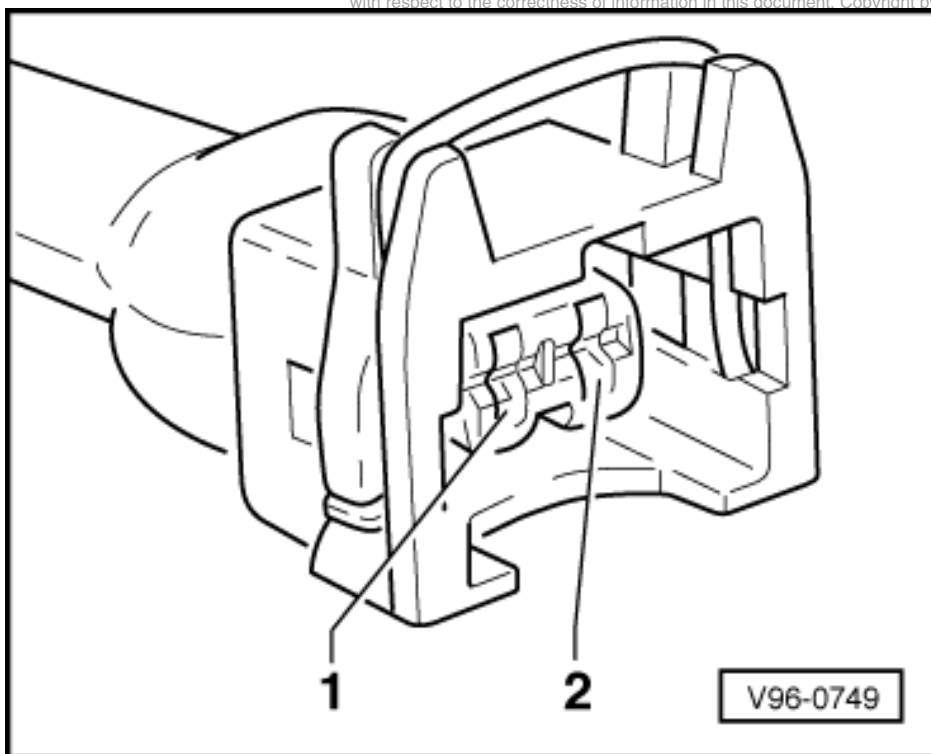
Note:

Do not attempt to move the rotary slide with a screwdriver or other tool to check the ease of movement.

- Initiate final control diagnosis and actuate idling stabilisation valve => Page 20 .
- Check whether rotary slide runs properly from stop to stop.
- If scoring is found which impairs freedom of movement or if rotary slide does not move freely (sticking or not running from stop to stop), replace the valve.
- If the valve does not respond during final control diagnosis, test actuation.

Testing actuation of idling stabilisation valve -N71

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- -> Unplug the connector from idling stabilisation valve -N71 and connect the V.A.G 1527 diode test lamp between connector contacts 1 and 2.
- Initiate final control diagnosis and actuate idling stabilisation valve => Page 20 .

The diode test lamp should flash.

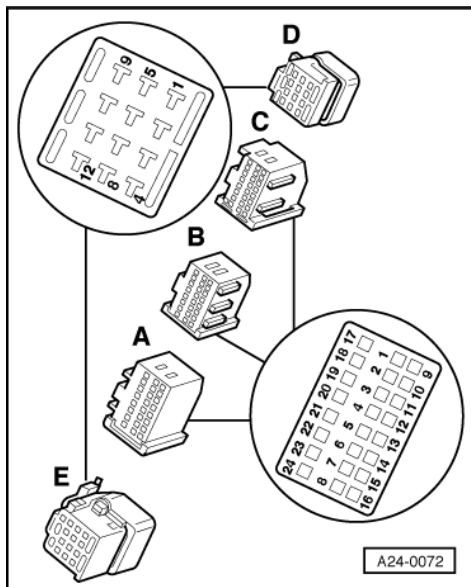
Note:

- ♦ The diode lamp does not go out fully, but only becomes brighter and darker

- ♦ Final control diagnosis for the idling stabilisation valve is terminated after one minute. To repeat the test, switch off the ignition for a moment and then initiate final control diagnosis again.
- If the actuation of the valve is OK but the valve still does not react then the valve is mechanically stuck. Replace idling stabilisation valve -N71.

If the diode test lamp does not flash:

- Connect test box V.A.G 1598/19 to wiring harness for engine control unit =>Page **53**.



- -> Check wiring connection from contact 1 on connector for valve -N71 to socket D5 of the test box, as well as between contact 2 and socket D1 for open circuit or short circuit.

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

- If the wiring connections are OK, but the valve is not actuated, renew the engine control unit => Page **54**.

3.4 - Testing and adjusting idling switch

The idling switch is located at the rear of the throttle valve body in the throttle valve potentiometer.

- Connect fault reader V.A.G 1551 (V.A.G 1552) and select control unit for engine electronics => Page **1**.
- Read measured value block (function 08) and select display group 04 =>Page **32**).

-> Readout on display:

Read measured value block 4			
1	2	3	4

- Check display in display zone 4.

Specification: "Idling"

- If "part throttle" does not appear until after considerable pedal travel, adjust the idling switch.
- Depress the accelerator pedal very slightly (only a few millimetres).

Specification: "Part throttle"

- If the readout does not change as described, check the setting of the accelerator cable.

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=> 8-cylinder engine, Mechanical components; Repair Group 20; Servicing throttle control; Adjusting throttle cable
 Servicing throttle control Adjusting throttle cable

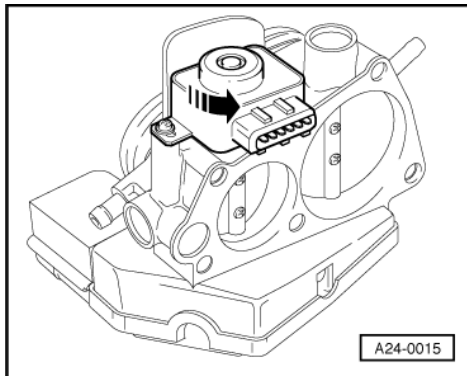
- If the setting of the throttle cable is OK, test the idling switch and the wiring connections.

Adjusting idling switch

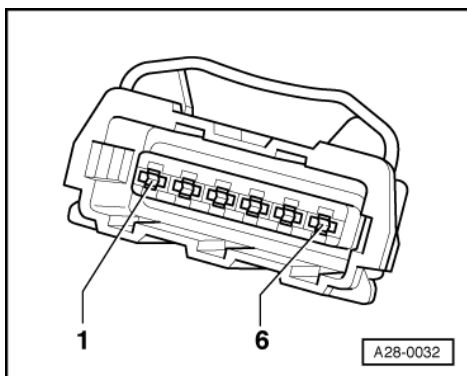
The throttle valve body needs to be removed in order to adjust the idling switch.

Note:

Adjusting the idling switch also automatically adjusts the throttle valve potentiometer.



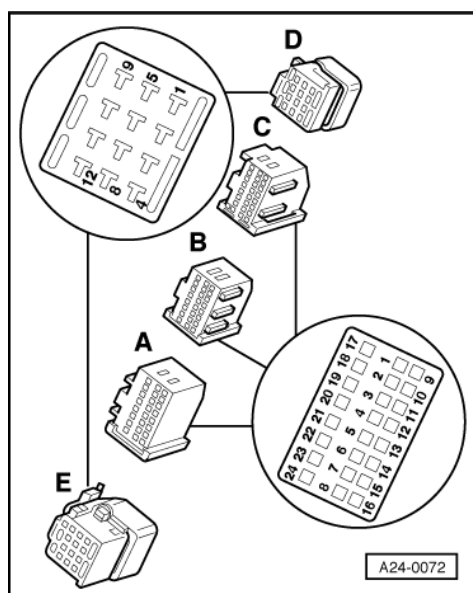
- Slacken both bolts of the throttle valve potentiometer.
- -> Turn throttle valve potentiometer in direction of arrow until a stop is felt. The throttle valve (throttle mechanism) must not be moved during this step.
- Tighten throttle valve potentiometer in this position.



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Testing wiring connections

- Connect test box V.A.G 1598/19 to wiring harness for engine control unit =>Page 53 .
- -> Unplug the connector from the throttle valve potentiometer.
- Test the following wires for continuity and short circuits:



Connector on wiring harness, contact	Test box V.A.G 1598/19 or engine control unit
4	D11
6	B4->

- Rectify any open/short circuit as necessary.

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

Note:

Only use gold-plated contacts when repairing the contacts in the throttle valve positioner connector.

- If the wiring is OK, replace the throttle valve potentiometer.

4 - Testing variable intake manifold changeover

4.1 - Testing variable intake manifold changeover

This test should only be carried out if the engine is losing power.

4.2 - Testing operation

- Connect fault reader V.A.G 1551 (V.A.G 1552) and select control unit for engine electronics => Page 1 .
- Read measured value block (function 08) and select display group 22 =>Page 41).

-> Readout on display:

Read measured value block 22			
1	2	3	4

- Check display in display zone 4.

Specification: "IMC-V OFF"

- Increase engine speed to above 4500 rpm

- Check display in display zone 4.

Specification: "IMC-V ON"

In this case the variable intake manifold changeover should take place.

- If "IMC-V ON" is displayed but the variable intake manifold does not change over, test intake manifold changeover valve => Page 79

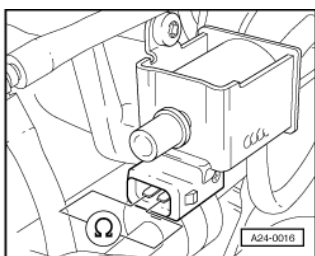
4.3 - Testing intake manifold changeover valve

- Run engine at idling speed for 2 or 3 minutes (to build up a vacuum).
- Stop engine.

-> Perform final control diagnosis and actuate intake manifold switchover valve => Page 20 .

Final control diagnosis
Intake manifold changeover valve - N156

The valve must click (can be felt and heard). The variable intake manifold must change over when this is done (approx. 2-3 times), as there is a vacuum supply. After the vacuum supply has been used up, only the valve continues to click. Final control diagnosis is terminated after one minute.

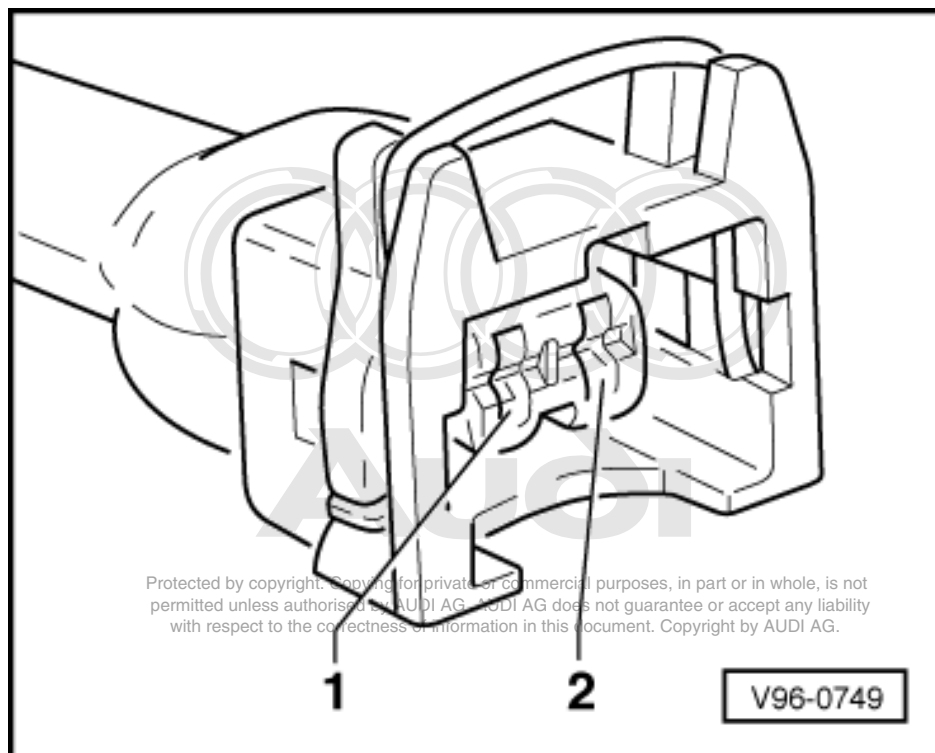


- If only the valve clicks from the beginning, perform a pneumatic test of the intake manifold changeover.
- If the valve does not click, switch off the ignition.
- Unplug connector from intake manifold changeover valve -N156.
- -> Measure resistance between the valve contacts using V.A.G 1526.

Specification: 25...35 ohm

- If the specified value is not attained, replace intake manifold changeover valve -N156.

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If the specified value is achieved:

- -> Connect diode test lamp V.A.G 1527 between engine earth and contact 1 on connector using cables from adapter set V.A.G 1594.
- Switch ignition on.

The diode test lamp should light up.

- If the diode test lamp does not light up:
- Test the fuse for the intake manifold switchover valve.

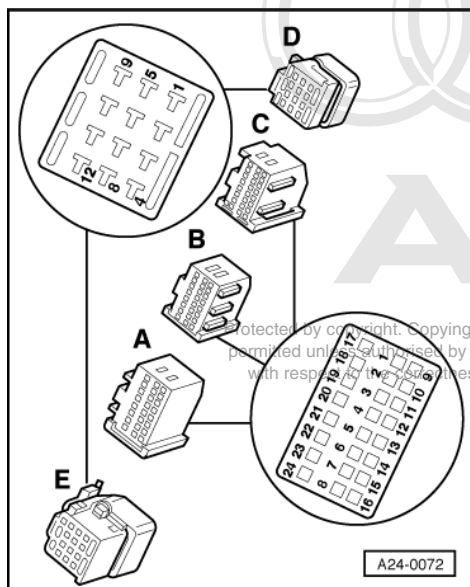
If the fuse is OK:

- Test the wiring connection from contact 1 of the connector to the fuse for the intake manifold switchover valve (in electronics box) for open circuit and short circuit.

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

If the voltage supply is OK:

- Connect test box V.A.G 1598/19 to wiring harness for engine control unit =>Page 53 .

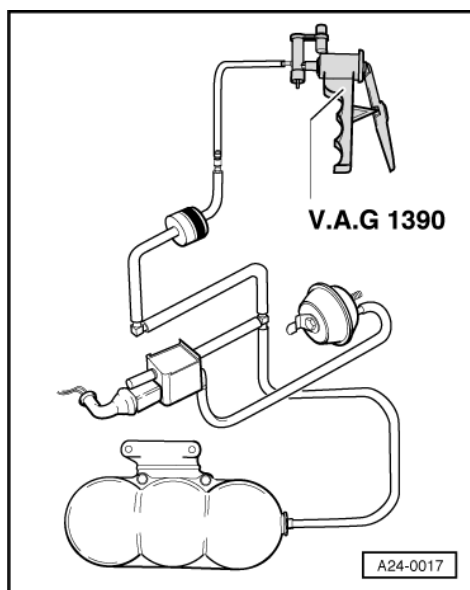


- Test wiring connection between contact 2 of the connector for the intake manifold switchover valve ...
- -> ... and contact A5 on the engine control unit for open circuit and short circuit.

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

- If the wiring is OK, replace the engine control unit => Page 54 .

4.4 - Pneumatic test of variable intake manifold changeover



- Detach vacuum line at intake manifold.
- -> Connect hand-operated vacuum pump V.A.G 1390 to the disconnected vacuum line.
- Operate the hand vacuum pump at least 50 times (the build-up of the vacuum must be felt when operating the pump).
- Detach the hose from the vacuum pump.

When this is done, the vacuum must only be released between the hand-operated vacuum pump and the non-return valve.

- If a continued release of the vacuum can be heard then there is a leak in the non-return valve (replace non-return valve)



-> Perform final control diagnosis and actuate intake manifold switchover valve => Page 20 .

Final control diagnosis	
Intake manifold changeover valve	-
N156	

The valve must click (can be felt and heard). The variable intake manifold must change over when this is done (approx. 2-3 times), as there is a vacuum supply. After the vacuum supply has been used up, only the valve continues to click. Final control diagnosis is terminated after one minute.

If the intake manifold does not change over then the following faults are possible:

- ♦ Changeover mechanism not operating freely (operate by hand as a check)
- ♦ Leak in vacuum system (connections, lines or reservoir)
- ♦ Non-return valve (black/white) leaking, blocked or installed the wrong way round
- ♦ Intake manifold changeover valve defective (not switching through or blocked).

Note:

The reservoir is located in the front left of the engine compartment.

5 - Testing fuel tank breather

5.1 - Testing fuel tank breather

5.2 - Testing operation

- Connect fault reader V.A.G 1551 (V.A.G 1552) and select control unit for engine electronics => Page 1 .
- Read measured value block (function 08) and select display group 03 =>Page 31 .

-> Readout on display:

Read measured value block 3
1 2 3 4

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

- Press the C key
- Read measured value block (function 08) and select display group 12 =>Page 37 .

-> Readout on display:

Read measured value block 12
1 2 3 4

- Observe display in display zone 4.

"TB active" = tank breather system operating

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"λ-adaptation" = tank breather system not operating, mixture correction is being learned

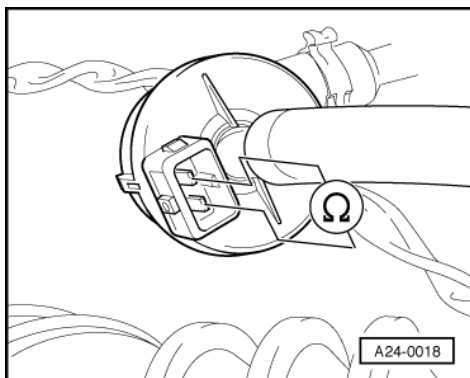
- If "λ-adaptation" is displayed, wait about 60 seconds until the display switches over again to "TB active".
- Observe display in display zone 2.

-5% = leak in ACF system (no petrol vapours in ACF container)

95% = ACF container completely filled with petrol vapours

100% = ACF system blocked by foreign bodies

5.3 - Testing solenoid valve 1 for activated charcoal filter



Electrical test of solenoid valve 1 for activated charcoal filter -N80

- Unplug connector at solenoid valve -N80.
- -> Use hand-held multimeter V.A.G 1526 to measure the resistance between the contacts of the solenoid valve.

Specification: 22...30 ohm

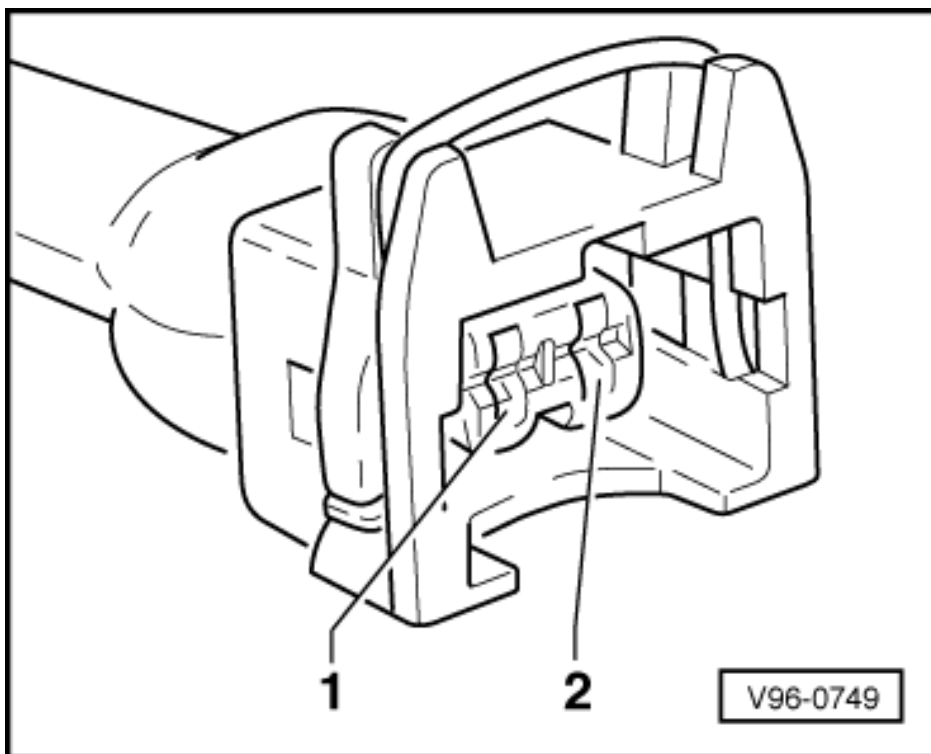
- If the measured value is not as specified, renew the solenoid valve.

Testing voltage supply of solenoid valve -N80

Test conditions

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- Fuse for solenoid valve -N80 OK

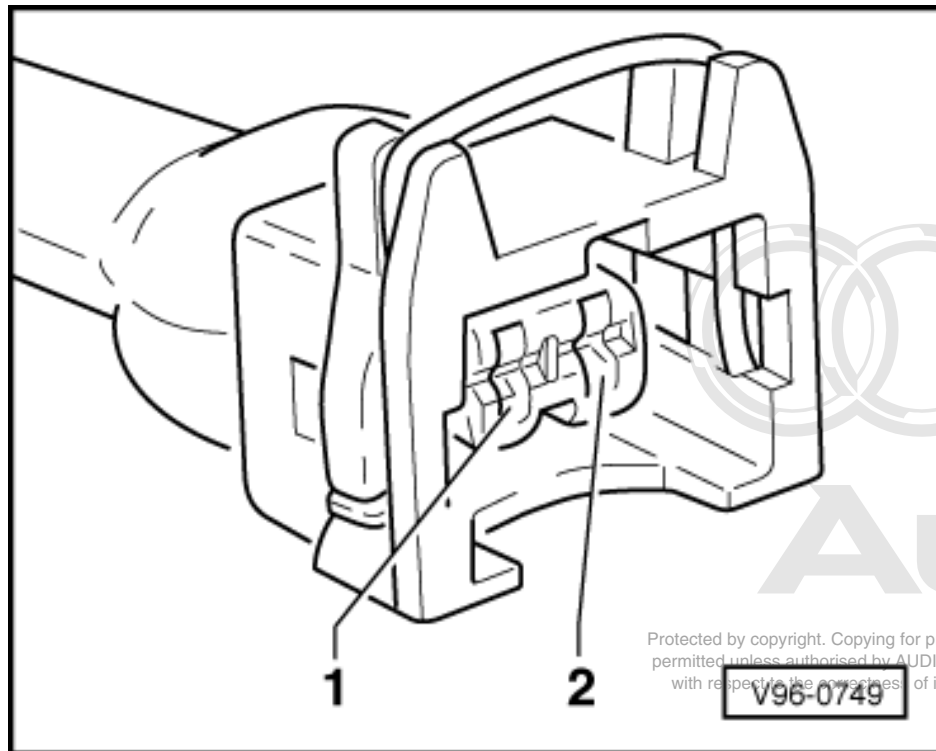


- Unplug connector at solenoid valve -N80.
- -> Connect diode test lamp V.A.G 1527 between engine earth and contact 1 on the connector.
- Switch ignition on.

The diode test lamp should light up.

- If the diode test lamp does not light up, test for open circuit in the wiring between contact 1 and the fuse for the Motronic system (in electronics box).

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



- If wiring connection is OK, check power supply relay for Motronic system -J271
=>Page **85**

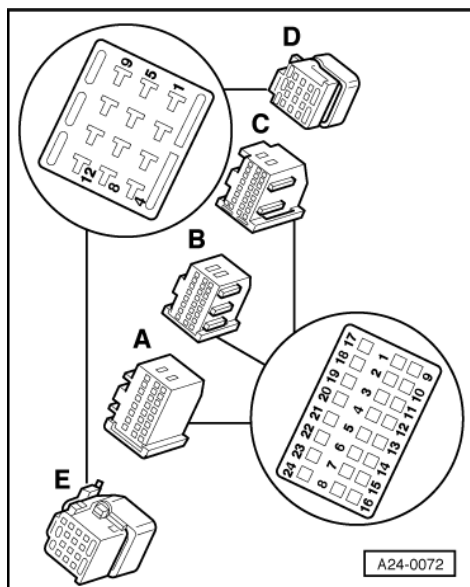
Testing actuation of solenoid valve -N80

- -> Connect the V.A.G 1527 diode test lamp between contact 2 and contact 1 (positive) of the connector.
- Start final control diagnosis and actuate solenoid valve 1 for activated charcoal filter -N80 =>Page **20** .

Diode test lamp should flash.

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

- Connect test box V.A.G 1598/19 to wiring harness for engine control unit =>Page **53** .



- Test wiring connection between contact 2 of the connector of the solenoid valve ...
- -> ... and contact A8 at the engine control unit for continuity and short circuit to positive, and repair as necessary.

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

- If there are no faults in the wiring connection, replace the engine control unit =>Page 54 .

6 - Testing control unit input values

6.1 - Testing control unit input values

6.2 - Testing power supply relay for Motronic system

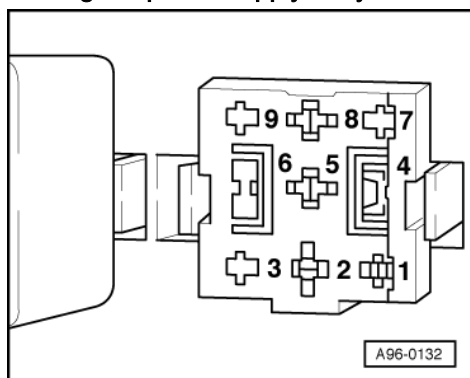
The power supply relay -J271 is located in the front passenger footwell (A pillar).

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

Voltage for the following components is supplied via this relay:

- Injectors
- Engine control unit -J220
- Solenoid valve for activated charcoal filter -N80
- Intake manifold changeover valve -N156

Testing the power supply relay



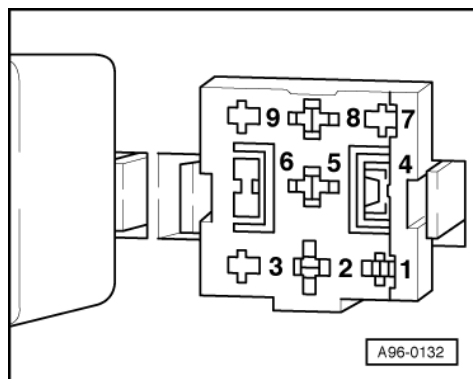
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- Remove power supply relay -J271 from the relay base.
- > Connect diode test lamp V.A.G 1527 between contact 2 (positive, terminal 30) and engine earth.
- Connect diode test lamp V.A.G 1527 between contact 4 (positive, terminal 30) and engine earth.

The diode test lamp should light up in each case.

- If the diode test lamp does not light up, test the wiring connection for open circuit.

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

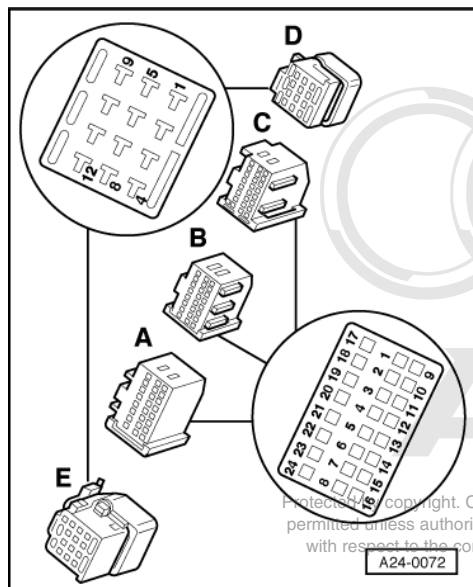


- > Connect diode test lamp V.A.G 1527 between contact 2 (positive, terminal 30) and contact 6 (earth signal from engine control unit -J220).
- Switch ignition on.

The diode test lamp should light up.

If the diode test lamp does not light up:

- Switch off ignition.
- Connect test box V.A.G 1598/19 to wiring harness for engine control unit =>Page 53 .

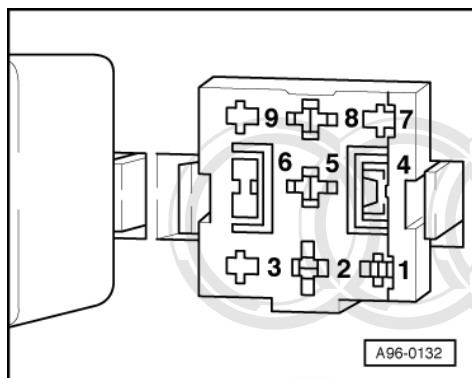


- > Test wiring connection from contact 6 at relay base to socket A2 of the test box for open circuit.

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

- If there is no open circuit and the diode test lamp still does not light, replace the engine control unit => Page 54 .
- Plug in the power supply relay at the relay base.
- Connect the wiring loom to the engine control unit.
- Remove the fuse for the engine control unit and/or the injectors.

- Remove the fuse for ACF solenoid valves -N80 and/or -N156.
- Switch ignition on.
- Connect diode test lamp to engine earth and to one of the two fuses in each case.



The diode test lamp should come on as both fuses are conducting voltage at one of the contacts.

- -> If the diode test lamp does not come on for one or both fuses, test the wiring connection from the fuses to contact 8 at the relay position for the power supply relay for open circuit.

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

- If there is no open circuit in the wiring, replace power supply relay -J271.
- Refit the fuses.

6.3 - Testing and adjusting throttle valve potentiometer

The throttle valve potentiometer -G69 is located at the rear of the throttle valve body.

Check function

- Connect fault reader V.A.G 1551 (V.A.G 1552) and select control unit for engine electronics => Page 1 .
- Read measured value block (function 08) and select display group 04 =>Page 32 .

-> Readout on display:

Read measured value block 4			
1	2	3	4

- Observe display in display zone 1.
Specification: 5...10o (accelerator in idling position)
- Fully depress accelerator pedal.
Specification: 80...98o
- If the specified results are not achieved, check the setting of the throttle cable

=> 8-cylinder engine, Mechanical components; Repair Group 20; Servicing throttle control; Adjusting throttle cable Servicing throttle control Adjusting throttle cable

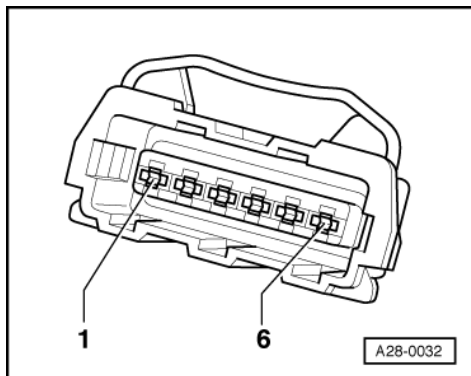
- If the setting of the throttle cable is OK, test idling switch and adjust as necessary => Page 76 .

Note:

Adjusting the idling switch also automatically adjusts the throttle valve potentiometer.

- If the setting of the idling switch is OK, test the voltage supply for the throttle valve potentiometer.

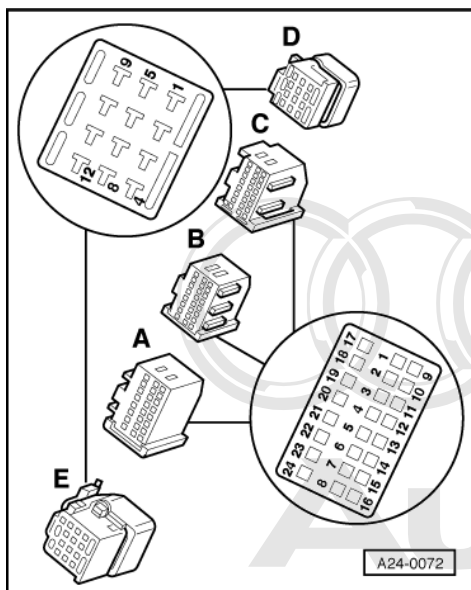
Testing voltage supply



- Pull connector off throttle valve potentiometer.
- Switch ignition on.
- -> Connect handheld multimeter V.A.G 1526 for voltage measurement in turn between contacts 1 and 3 and 2 and 3.

Specification: 4.5...5.5 V in each case.

- If the specifications are achieved, test the resistance of the throttle valve potentiometer
=>Page 89

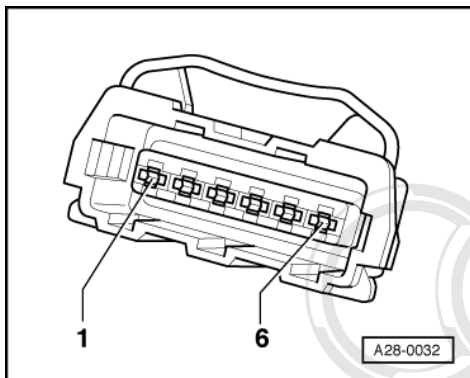


- If one of the specifications is not met, test the wiring to the engine control unit as follows:
- Switch off ignition.
- -> Connect test box V.A.G 1598/19 to wiring harness for engine control unit =>Page 53 .
- Unplug the connector from the throttle valve potentiometer.

Note:

Only use gold-plated contacts when repairing the contacts in the throttle valve positioner connector.

- Test the following wires for open circuit and short circuit:



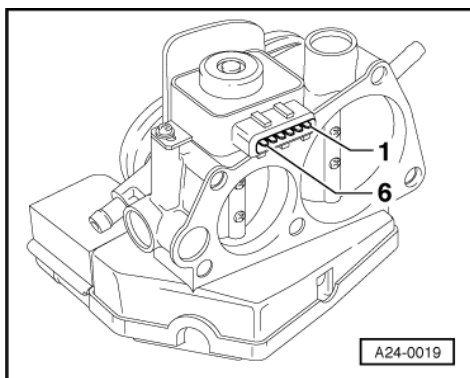
=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

Connector on wiring harness, contact	Test box V.A.G 1598/19 or engine control unit->
1	A3
2	A19
3	A24

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- If the wiring is OK, replace the engine control unit => Page 54 .

Testing resistance of throttle valve potentiometer



- Unplug the connector from the throttle valve potentiometer.
- -> Measure resistance between contacts 1 and 2 using V.A.G 1526.

Specification: 1.5...2.6 kW

- Measure resistance between contacts 2 and 3 using V.A.G 1526.

Specification: 0.75...1.3 kW

- Slowly operate throttle valve lever until it is in the end position (full throttle position).

Specification: 2.4...3.6 kW

- If one of the values is not as specified, replace the throttle valve potentiometer.

Adjusting throttle valve potentiometer

Adjusting the idling switch also automatically adjusts the throttle valve potentiometer.

Adjusting idling switch =>Page 76



6.4 - Testing air mass meter

Air mass meter -G70 is located in the top part of the air cleaner housing.

Testing operation

- Connect fault reader V.A.G 1551 (V.A.G 1552) and select control unit for engine electronics => Page 1.
- Read measured value block (function 08) and select display group 03 =>Page 31

-> Readout on display:

Read measured value block 3
1 2 3 4

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

- Press the C key
- Select Read measured value block (function 08) and display group 07 =>Page 30).

-> Readout on display:

Read measured value block 7
1 2 3 4

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Display zone 2 will show the intake air mass (grams per second).

Display zone 2: actual value during idling

Display zone 1: specified value during idling

If the specified values are not achieved:

Note:

The air mass measured by the air mass meter is displayed. Variations between the specified air mass (display zone 1) and the actual air mass indicate unmetered air between the air mass meter and the throttle valve body or idling stabilisation valve. Temporary deviations of ± 0.3 g/s can be ignored.

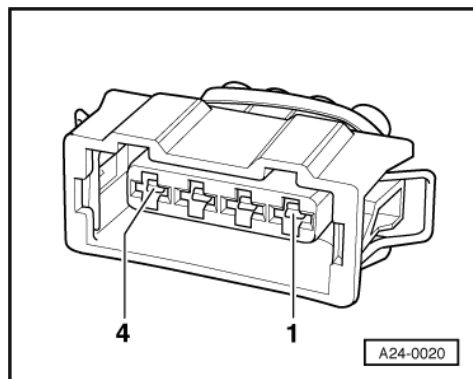
- If a fault relating to the air mass meter is stored in the fault memory, test the voltage supply for the air mass meter.

Testing voltage supply of air mass meter -G70

- Test fuse for air mass meter (electronics box).

If the fuse is OK:

- Remove top part of air cleaner.
- Unplug connector from air mass meter -G70



- -> Connect diode test lamp V.A.G 1527 between engine earth and contact 3 on the connector.
- Briefly operate starter (engine can be allowed to start).

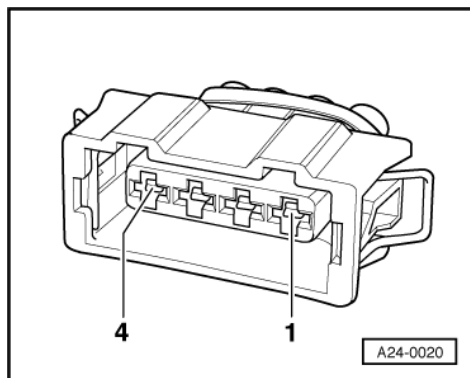
The diode test lamp should light up.

- -> If the diode test lamp does not light up, test for open circuit or short to earth in wiring from contact 3 on plug connector to fuse, and repair as necessary.

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

- If the fuse and the wiring are OK but the diode test lamp still does not light up, test the fuel pump relay
=>Page 64

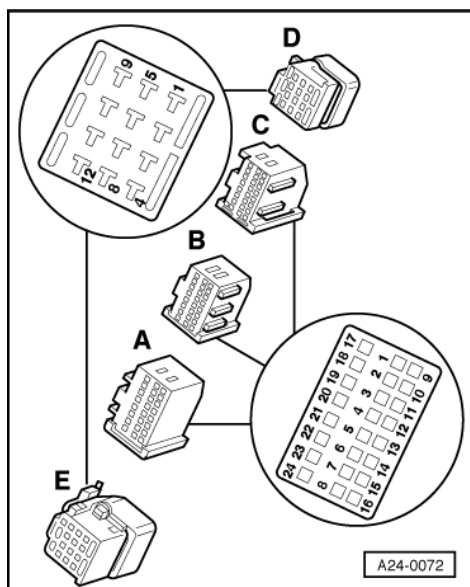
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If the voltage supply is OK:

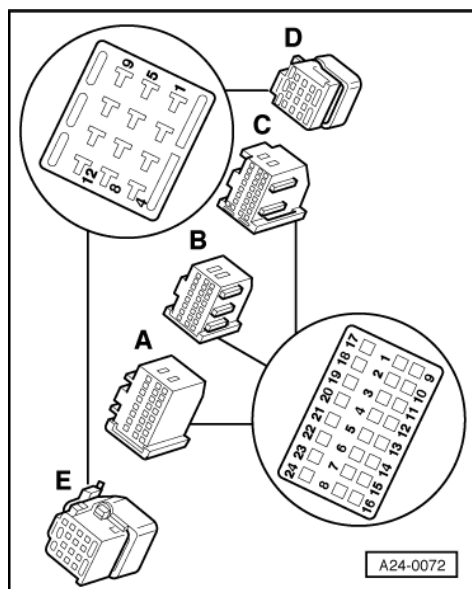
- Connect test box V.A.G 1598/19 to wiring harness for engine control unit =>Page 53 .
- -> Check the wiring from contact 1 on the connector (earth wire) to socket E7 on the test box for open circuit or short circuit.

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



- -> Rectify any open circuit in the wiring between contact 1 of the connector at the wiring loom and contact E7.
- If the voltage supply is OK, test the signal wire.

Testing signal wire for air mass meter -G70



- Connect test box V.A.G 1598/19 to wiring harness for engine control unit =>Page 53 .
- -> Test the following wiring connections for short circuit or open circuit

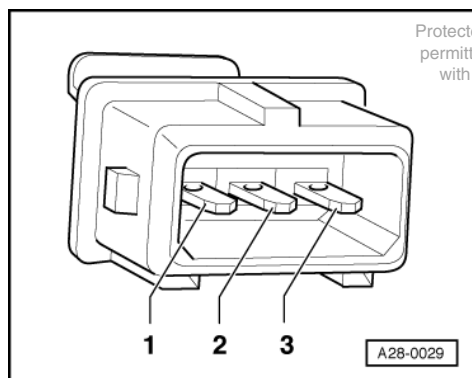
Connector for air mass meter -G70 Contact	Test box V.A.G 1598/19 or engine control unit
2	B18
4	B19

- If the wiring is OK, replace air mass meter -G70.

6.5 - Testing engine speed sensor

Installation position of engine speed sensor -G28 and connector => Page 45 .

- Before carrying out the test, make sure that the sensor is correctly installed and firmly seated.



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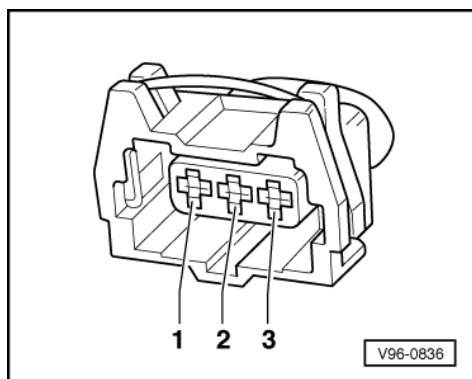
- Disconnect grey connector of engine speed sensor.
- -> Connect handheld multimeter V.A.G 1526 for resistance measurement to contacts 1 and 2 using adapter cables from V.A.G 1594.

Specified value: 0.8 to 1.2 kΩ

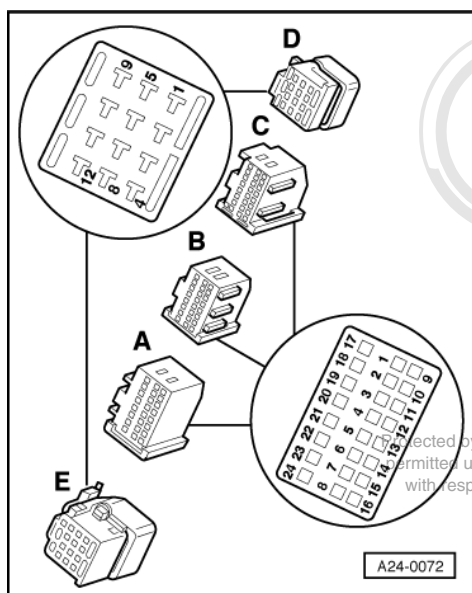
- If the value does not match the specification, fit a new engine speed sensor.
- If the specified value is attained, connect handheld multimeter to contacts 1 and 3 and 2 and 3.

Specification: infinite resistance (open circuit)

- If specified value is not attained, replace engine speed sensor -G28.
- If the specified value is attained, test the wiring between the sensor coupling and the engine control unit as follows:



- Connect test box V.A.G 1598/19 to wiring harness for engine control unit =>Page 53 .
- -> Test wiring connection from the 3-pin connector (sensor coupling) ...



- -> ... to engine control unit for open circuit and short to positive or earth.

Contact at sensor coupling	Test box V.A.G 1598/19 or engine control unit
1	A18
2	A17
3	D11 (earth)

- If no short circuit or open circuit is found, fit a new engine control unit
=> Page 54

6.6 - Testing coolant temperature sensor

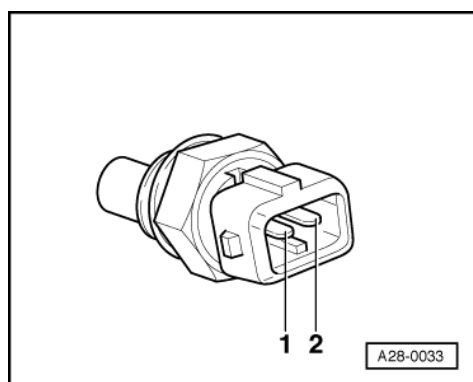
Installation position of coolant temperature sensor -G62 => Page **45** .

Note:

- The coolant temperature sensor -G62 is a temperature-dependent resistor. If the sensor signal is falsified, for example due to moisture in a connector (same effect as a resistor connected in parallel), this falsification may be in a range which the control unit is not able to detect.
- If a fault regarding the coolant temperature sensor is stored, a substitute value derived from the intake air temperature is displayed in the measured value block for a time determined by the control unit.
- After this time period has elapsed, a substitute value for an engine at normal operating temperature is assumed.

Test conditions

- Engine cooled to room temperature (approx. 20 oC).



- Pull connector off coolant temperature sensor -G62.
- -> Connect handheld multimeter V.A.G 1526 for resistance measurement to contacts 1 and 2 of the sensor using adapter cables from V.A.G 1594.

Specified value when testing at about 20 oC: 1.5...3.0 kohm

- If the value does not match the specification, fit a new sensor.

If the specified value is achieved:

- Start engine.
- Interrogate and erase fault memory => Page **3** .
- Read measured value block (function 08) and select display group 03 =>Page **31** .

-> Readout on display:

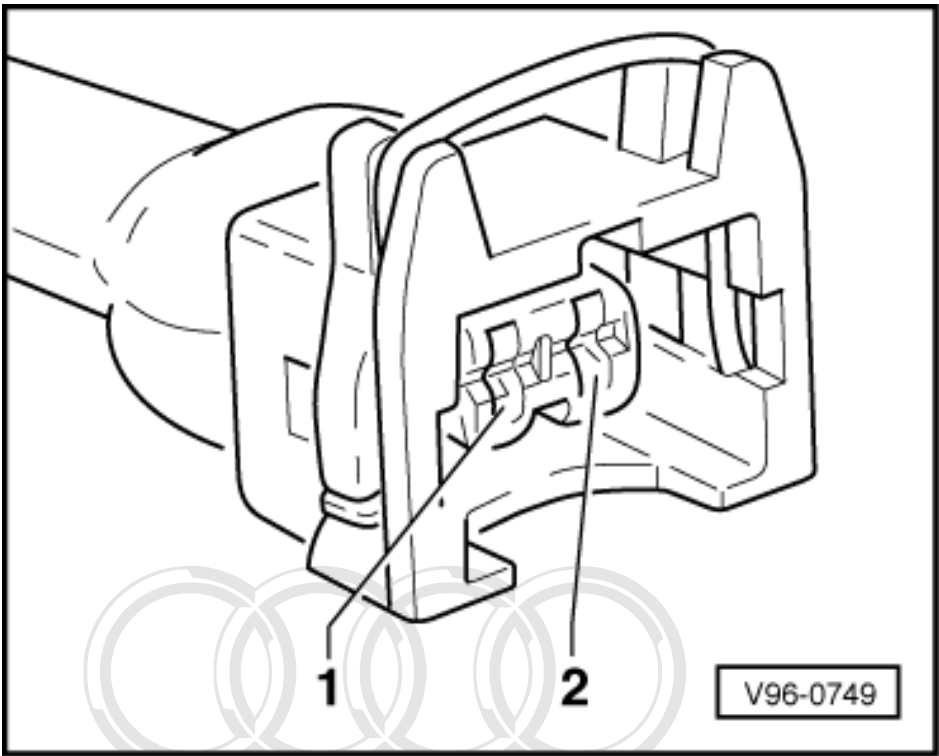
Read measured value block 3			
1	2	3	4

- Check display in display zone 3.

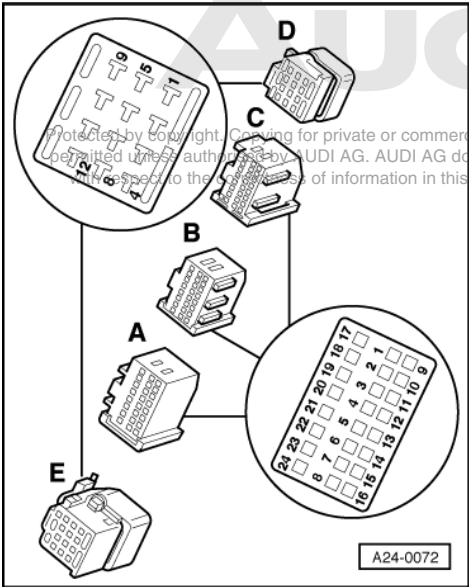
The coolant temperature is shown in oC.

Specification: The temperature reading should increase.

- If the readout in display zone 3 is not realistic:
- Connect test box V.A.G 1598/19 to wiring harness for engine control unit =>Page **53** .



- Pull connector off coolant temperature sensor.
- -> Test wiring connection from 2-pin connector at the wiring loom...



- -> ... to engine control unit for open circuit and short to positive or earth.

2-pin connector at wiring harness Contact	Test box V.A.G 1598/19 or engine control unit
1	A23
2	A19

- If no faults have been found in any of the above tests, fit a new engine control unit
=> Page 54

6.7 - Testing intake air temperature sensor

Installation position of intake air temperature sensor -G42 => Page 45 .

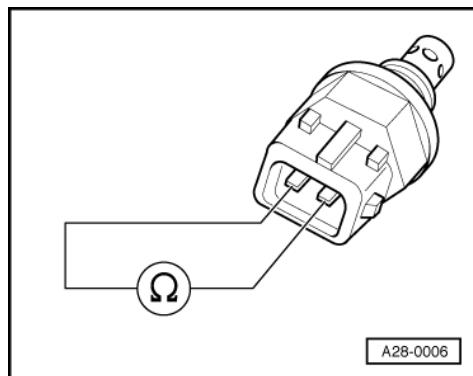
- Connect fault reader V.A.G 1551 (V.A.G 1552) and select control unit for engine electronics => Page 1 .
- Read measured value block (function 08) and select display group 03 (engine not running, ignition on) => Page 31 .

-> Readout on display:

Measured value block 3

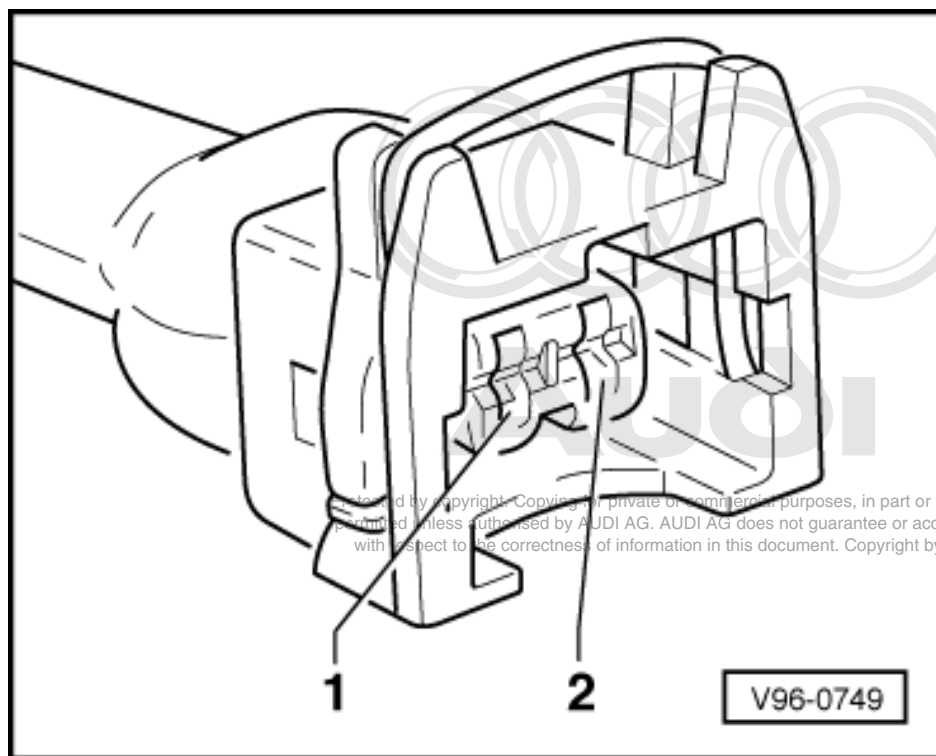
1 2 3 4

- Observe display in display zone 4.



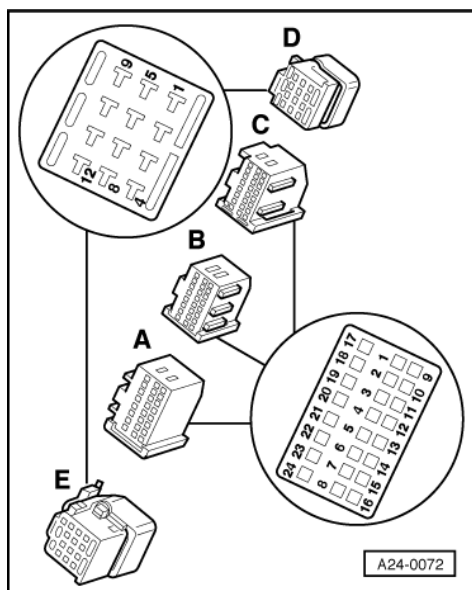
- If the readout that appears in display zone 4 is not realistic, or if a substitute value (fixed value) computed by the engine control unit is displayed:
- Pull connector off intake air temperature sensor.
- -> Connect handheld multimeter to intake air temperature sensor.

Specification: 5.0 ... 7.0 kw



- If specified value is not attained, replace intake air temperature sensor -G42.
- If the specified value is attained, test the wiring between the sensor coupling and the engine control unit as follows:

- Connect test box V.A.G 1598/19 to wiring harness for engine control unit =>Page 53 .
- -> Test wiring connection from 2-pin connector at the wiring loom ...



- -> ... to engine control unit for open circuit and short to positive or earth.

Contact on 2-pin connector	Test box V.A.G 1598/19 or engine control unit
1	A22
2	A19

- If no faults have been found in any of the above tests, fit a new engine control unit.
=> Page 54

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7 - Testing auxiliary signals

7.1 - Testing auxiliary signals

7.2 - Testing engine speed signal for rev counter and air conditioner

Testing engine speed signal

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

The signal shape generated by the engine speed sensor -G28 cannot however be evaluated and is therefore processed beforehand in the engine control unit.

Determine the engine speed signal as follows:

Dash panel insert

- Start engine.
- Observe rev counter reading.



The current engine speed should be displayed.

Air conditioner

- Connecting fault reader V.A.G 1551
=>Page 3
- Start engine.

-> Readout on display:

Rapid data transfer	HELP
Enter address word	XX

Rapid data transfer	Q
08 -	Air conditioner

- > Enter 08 for address word "Air conditioner" and confirm entry with Q.
- Press => key.

-> Readout on display:

Rapid data transfer	HELP
Select function	XX

- Enter 08 for function "Read measured value block" and confirm entry with Q.

-> Readout on display:

Read measured value block	HELP
Enter display group number	XX

- Press keys 0 and 9

(09 is used to select the function "display group 09").

- Confirm entry with Q key.

-> Readout on display:

Read measured value block 9
1 2 3 4

- Observe display in display zone 1.

The current engine speed should be displayed.

If the specified values are not achieved for any of the "users" of the engine speed signal, the following faults are possible:

- ♦ Open circuit in wiring or short circuit between engine control unit, contact C10, and distribution in dash panel wiring loom.

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

- ♦ Short circuit between distributor in instrument panel wiring loom and "user".
- ♦ Engine control unit -J220 defective.

If the specified value is achieved for at least one engine speed signal "user", the following faults are possible:

- ♦ Open circuit between distribution in dash panel wiring loom and "user", or "user" faulty.



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7.3 - Testing vehicle speed signal

Note:

The vehicle speed signal is generated by the vehicle speed sensor -G22 on the gearbox and is processed in the instrument cluster (dash panel insert).

Test conditions

- Speedometer operating properly with correct speed indication
- If no speed is indicated on speedometer

=> Electrical System; Repair Group 90

- Connect fault reader V.A.G 1551

=> Page 3

- Read measured value block (function 08) and select display group 08 =>Page 34 .

-> Readout on display:

Read measured value block 8

1 2 3 4

- Carry out a test drive.

Attention

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

- Observe display in display zone 4.

The current vehicle speed should be displayed (compare with speedometer).

If the vehicle speed is not displayed:

- Connect test box V.A.G 1598/19 to wiring harness for engine control unit =>Page 53 .
- Test wiring connection between test box, socket C13, and dash panel insert for continuity/short circuit.

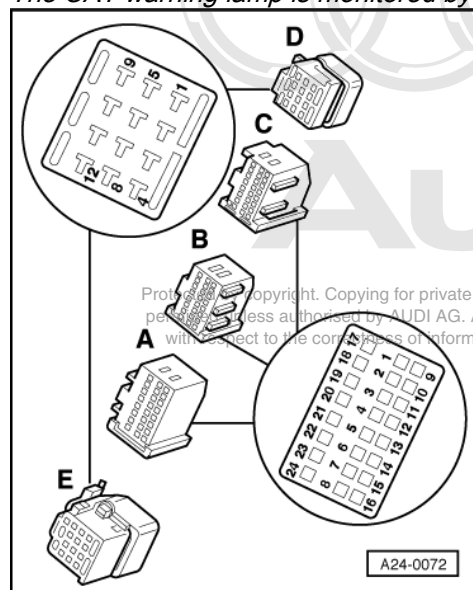
=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations binder

- Use current flow diagram to ascertain all additional "users" of vehicle speed signal (e.g. radio, automatic gearbox, A/C), switch off one after the other as the source of interference and repeat test until the cause has been established.

7.4 - Testing actuation of CAT warning lamp

Note:

The CAT warning lamp is monitored by the self-diagnosis of the Motronic system.





If a fault relating to the CAT warning lamp is displayed:

- Connect test box V.A.G 1598/19 to wiring harness for engine control unit =>Page **53**.
- -> Test for open/short circuit in wiring between contact C9 at engine control unit and dash panel insert.

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28 - Ignition system

1 - Technical data for ignition system

1.1 - Technical data for ignition system

Engine code letters	AHK
Idling speed Speed not adjustable, controlled by the idling speed stabilisation	800 rpm
Engine speed limited by Motronic system Cut-off speed	6960 ± 40 rpm
Engine speed sensor	Resistance approx. 1.0 kΩ
Firing order	1-5-4-8-6-3-7-2
Ignition coils	Individual ignition coils actuated by two ignition output stages
The ignition timing is determined in the control unit Ignition timing cannot be adjusted.	

1.2 - Safety precautions

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

- ◆ Do not touch or disconnect ignition wiring when the engine is running or at starter speed.
- ◆ Always switch off the ignition before connecting or disconnecting injection or ignition system wiring or tester cables.
- ◆ Wait 10 seconds after switching off the ignition before unplugging the connectors from the engine control unit.
- ◆ To operate the engine at starter speed without the engine actually starting (e.g. when testing compression pressure), unplug connectors of the power output stages for the ignition coils and remove both fuses for the Motronic system in the electronics box. After carrying out the work, erase the fault memory =>Page 3.
- ◆ Do not apply a voltage for simulating output signals at the control unit.
- ◆ If the injectors are removed do not operate the starter.

Attention

For radios with anti-theft coding, ask for the code before disconnecting the battery.
Always switch off the ignition before connecting or disconnecting the battery, otherwise the engine control unit may be damaged.

1.3 - Testing ignition coils

Note:

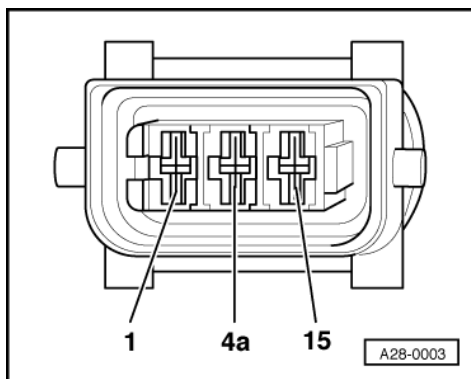
- ◆ Carry out a road test if necessary to detect misfiring at higher engine loads than idling.
 - ◆ No fault stored relating to the injectors
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- Connect fault reader V.A.G 1551 and interrogate fault memory =>Page 1.

If combustion misfiring faults are stored:

- Read measured value block (function 08) and check display groups 17 to 20 => Page 39 .
- If combustion misfiring occurs jointly at cylinders 1, 4, 6 and 7 or 3, 2, 5 and 8 then test the power output stages for the ignition coils
=>Page 104

If combustion misfiring occurs at a single cylinder, the causes of the fault may be the following:

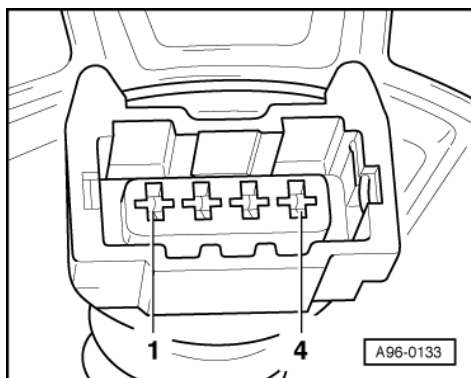
- Spark plug (to test, replace with spark plug of another cylinder)
- Ignition coil (to test, replace with ignition coil of another cylinder)
- Testing power output stages => Page 104



If the components are OK:

- -> Use handheld multimeter V.A.G 1526 to test earth wire of the relevant ignition coil from contact 4a of the 3-pin connector to engine earth for open circuit in wiring.

Testing primary wiring connections and voltage supply of ignition coils



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Test conditions

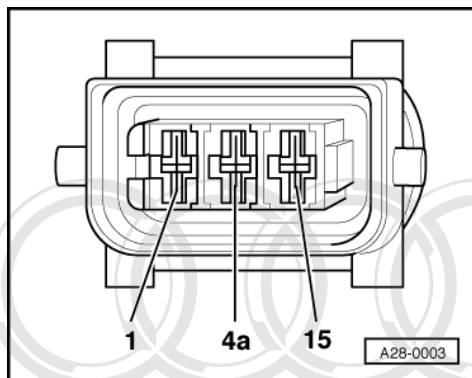
- Fuse for ignition coils (electronics box) OK
- Unplug both 4-pin connectors of the power output stages.
- Switch ignition on.
- -> Connect one contact of the diode test lamp to engine earth. Connect the other contact of the diode test lamp in turn to all contacts of both 4-pin connectors.

The diode test lamp should light up when it is connected to each of the 8 contacts.

Note:

The primary voltage supply through the primary coils of the relevant ignition coils is measured.

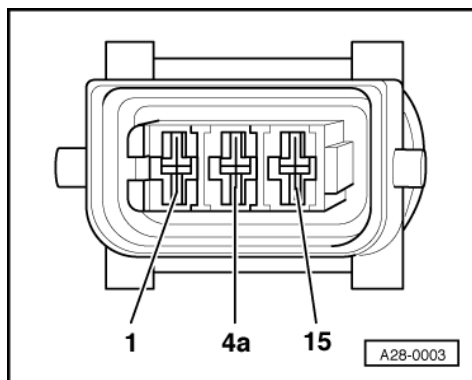
If the diode test lamp does not come on at one contact:



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

Contact on 4-pin connector for output stage	Contact 1 on 3 pin con- nector for ignition coil
(black)	Cyl.
1	1
2	4
3	6
4	7
(brown)	Cyl.
1	2
2	3
3	5
4	8

If the wiring connection is OK:



- -> Test wiring connection from contact 15 of the connector of the relevant ignition coil to the fuse (electronics box) for open circuit and short circuit.
- Test voltage supply to fuse for open circuit

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

Note:

- ♦ A measurement of the primary resistance of the ignition coils is not normally necessary when using this test method (primary resistance about 0.3 ... 0.5 ohm, measured between contacts 1 and 15 of the ignition coil).

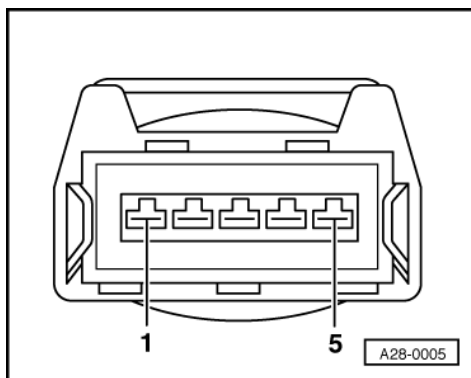
- ♦ A high voltage blocking diode is installed in the secondary circuit of the ignition coil. For this reason, it is not possible to carry out a resistance measurement of the secondary coil using conventional testers.

1.4 - Testing power output stages for ignition coils

For fitting location refer to list of engine compartment components =>Page 45 .

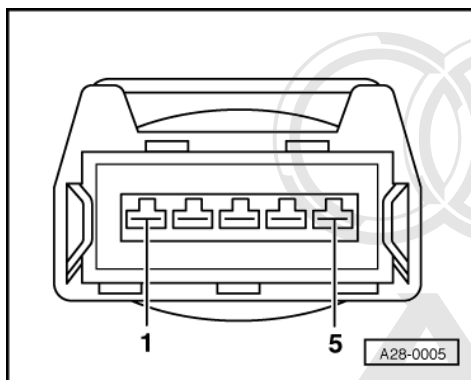
Testing actuation of power output stages

- Unscrew power output stages -N122 and -N192 from the bracket.
- Disconnect the connectors from all the injectors.
- Unplug the 5-pin connectors of both power output stages.



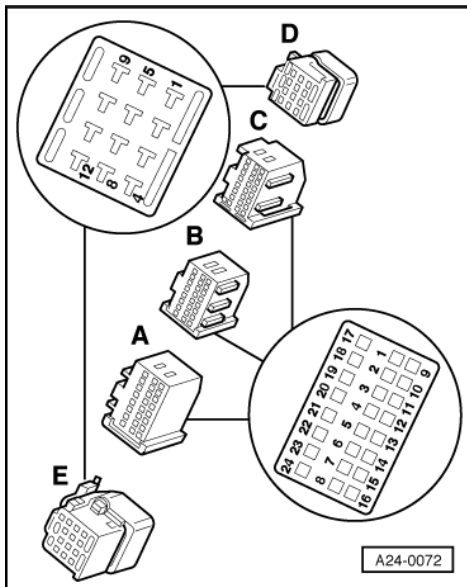
- -> Clamp one of the contacts of the diode test lamp to engine earth and the other contact in turn to contacts 1, 2, 4, and 5 on both 5-pin connectors.
- Operate the starter for a few seconds during each test.

The diode test lamp should flash each time.



If the diode test lamp does not flash:

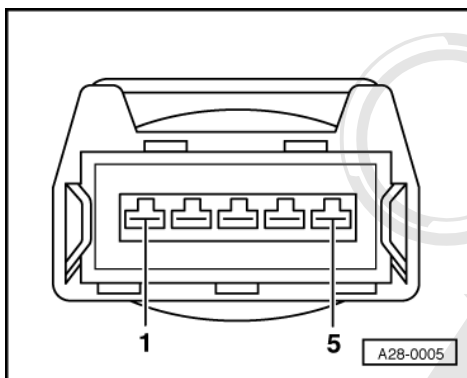
- Connect test box V.A.G 1598/19 to wiring harness for engine control unit =>Page 53 .
- -> Check the wiring from the 5 pin connector on the power output stage ...



- -> ... to the engine control unit for open circuit and short to positive or earth.

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

Contact on 5-pin connector of the power output stages	Contact at test box V.A.G 1598/19 and engine control unit
(black -N122) 1 2 4 5	B8 B7 B6 B5
(brown -N192) 1 2 4 5	B14 B13 B15 B16



If the wiring connections to the engine control unit are OK:

- -> Test earth cable from contact 3 of both 5-pin connectors to engine earth for continuity.
- If there are no faults in the wiring connection, replace the engine control unit =>Page 54 .

Testing operation of the power output stages

- Both 5-pin connectors remain plugged in at the power output stages.
- Unplug both 4-pin connectors at the power output stages.

- Connect diode test lamp between positive (e.g. external starting unit) and one of the contacts each of the 4-pin outputs of the power output stages.

Note:

Diode test lamps with very low current consumption already glow when the engine is not running and become brighter and darker during starting.

- Operate the starter for a few seconds during each test.

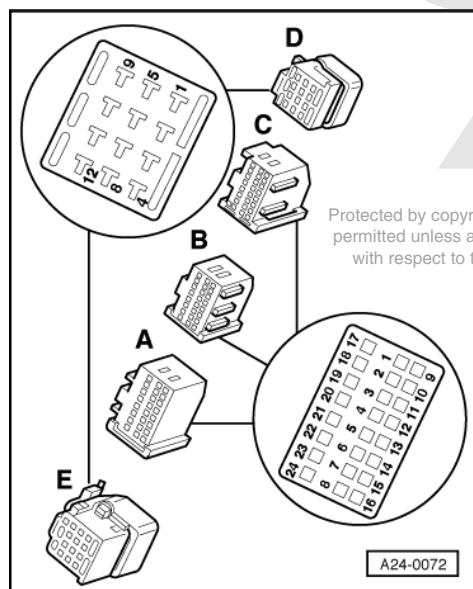
The diode test lamp should flash each time.

- If the diode test lamp does not flash in the case of one or several outputs, replace the power output stage.

1.5 - Testing power supply of the engine control unit

Test conditions

- Power supply relay -J271 for Motronic system OK => Page 85



- Test fuse for engine control unit (electronics box).
- -> Connect test box V.A.G 1598/19 to wiring loom for engine control unit =>Page 53 .
- Connect diode test lamp V.A.G 1527 to socket D9 (permanent positive) and in turn to sockets D11, E7, E11 and E12 (earth connections).

The diode test lamp should light up in each case.

- If the diode test lamp does not light up, test wiring for open circuit and rectify any open circuits.

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

- Connect diode test lamp V.A.G 1527 to socket E7 (earth) and socket B3 (ignition positive, terminal 15).
- Switch ignition on.

The diode test lamp should light up.

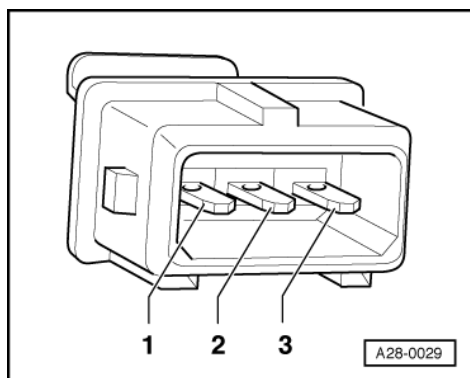
- If the diode test lamp does not light up, test wiring for open circuit and rectify any open circuits.

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

1.6 - Testing knock sensors

Notes:

- ◆ The knock sensors -G61 and -G62 cannot themselves be tested electrically.
 - ◆ Use only gold-plated contacts when repairing the cable connectors for the knock sensors.
 - ◆ To ensure that the knock sensors function properly it is important to keep exactly to the specified tightening torque of 20 Nm.
 - ◆ Check connector between knock sensor and wiring harness for corrosion.
 - ◆ Interrogate fault memory=> Page 3 .
 - ◆ Read measured value block, display groups 15 and 16 =>Page 38
- Separate the plug connections of the relevant knock sensor. The plug connections are located at the fuel rail below the centre engine cover.

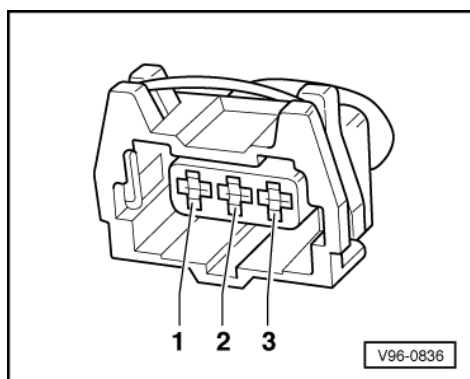


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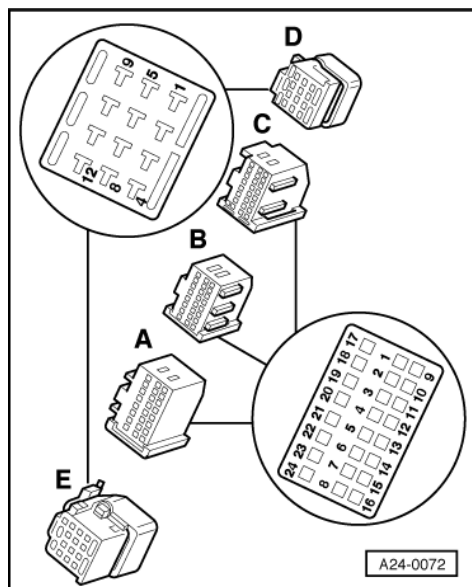
- -> Use handheld multimeter V.A.G 1526 to test all the three contacts at the connector of the knock sensor for short circuit to each other. There must be no connection between any of the wires.
- If there is a connection between the contacts, fit a new knock sensor.

Testing wiring from knock sensors to engine control unit

- Connect test box V.A.G 1598/19 to wiring harness for engine control unit =>Page 53 .



- -> Check the wiring from the relevant sensor coupling ...



- -> ... to the engine control unit for open circuit and short to positive or earth.

Knock sensor 1 -G61 (cyls. 1...4)

Contact on sensor coupling	Test box V.A.G 1598/19 or engine control unit
1	A20
2	A19
3	D11

Knock sensor 2 -G66 (cyls. 5...8)

Contact on sensor coupling	Test box V.A.G 1598/19 or engine control unit
1	A21
2	A19
3	D11

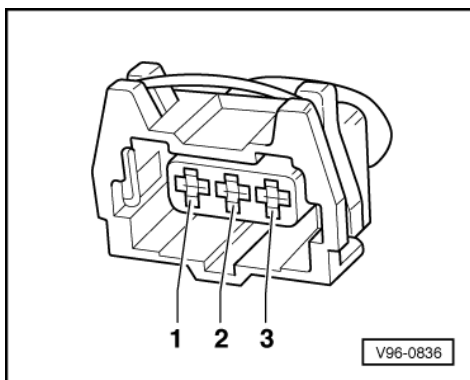
1.7 - Testing Hall sensor

Hall sensor -G40 is located at the rear of the left-hand cylinder head => for fitting location refer to Page 45 .

Note:

- ♦ In normal operation, the engine control unit detects the ignition position for cylinder 1 from the Hall sensor signal and performs ignition for each cylinder during every second engine revolution.
 - ♦ The engine starts and even runs if the Hall sensor is faulty or if the connector is unplugged, as the engine control unit performs an ignition on each cylinder for every revolution of the engine when a fault is detected.
 - ♦ The fact that the control unit is out of phase by one engine revolution does not have any noticeable effect on the injection system. If this happens, the fuel is injected "upstream" (before the closed inlet valve) instead of while the inlet valve is open. This has only a minor influence on the quality of the air/fuel mixture.
- Push back rubber grommet at connector of Hall sensor (connector remains connected to Hall sensor).

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- -> Connect diode test lamp V.A.G 1527 from the rear to contacts 1 and 2.

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Note:

Connector contacts are numbered accordingly on the back of the connector.

- Operate starter for a few seconds.

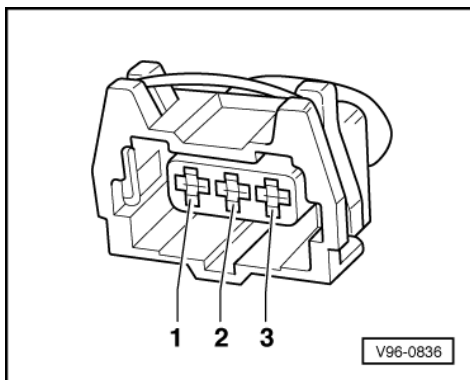
The diode test lamp must flash briefly on every second engine revolution.

- Pull connector off Hall sensor.
- Switch ignition on.
- Connect handheld multimeter V.A.G 1526 to contacts 1 and 3 of the Hall sensor connector.

Specification: 4.5 ... 5.5 V

- Connect handheld multimeter V.A.G 1526 to contacts 2 and 3 of the Hall sensor connector.

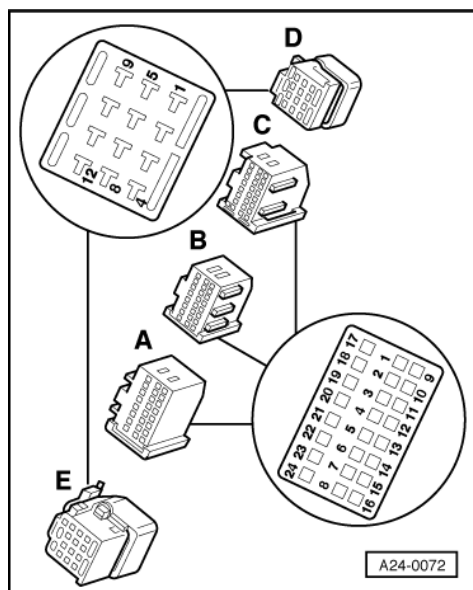
Specification: Battery voltage



- If the specified values are attained and the diode test lamp does not flash, replace the Hall sensor.

If the specified values are not attained, check the wiring as follows:

- Connect test box V.A.G 1598/19 to wiring harness for engine control unit =>Page 53 .
- -> Check the wiring connection from the Hall sensor ...



- -> ... to engine control unit for open circuit and short to positive or earth.

Contact on connector for Hall sensor	Test box V.A.G 1598/19 or engine control unit
1	A3 (positive, 5 V)
2	B2 (signal)
3	D11 (earth)

- First of all, erase the fault memory as a check. If a fault relating to the camshaft sensor (Hall sensor) is displayed again although the previous tests were OK, unbolt the Hall sensor and check whether the rotor orifice at the camshaft is correctly installed. (If not correctly installed, the detent lug is damaged when the securing bolt is tightened.)
- If the position of the rotor orifice is OK, check the setting of the toothed belt of the camshaft / crankshaft.

=> 8-cylinder engine, Mechanical components; Repair Group 15; Removing and installing toothed belt Removing and installing toothed belt



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