

Workshop Manual OCTAVIA 1997 ➤

**1.8 I/132 kW Engine, Fuel Injection and Ignition
System**
Edition 06.01

Engine code	AUQ								
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List of Supplements to Workshop Manual

OCTAVIA 1997 ➤

1.8 I/132 kW Engine, Fuel Injection and Ignition System

Edition 06.01

Supple- ment	Edition	Subject	Article Number
	06.01	Basic Edition	S00.5137.50.20

Table of Contents

01 – Self-diagnosis

Self-diagnosis I	01-1	page	1
- Properties of the self-diagnosis	01-1	page	1
- Technical data of self-diagnosis	01-1	page	1
- Connecting vehicle system tester -V.A.G 1552- and selecting the control unit for engine electronics	01-1	page	2
- Interrogating and erasing fault memory	01-1	page	4
- Final control diagnosis	01-1	page	6
Self-diagnosis II	01-2	page	1
- Fault table, fault codes 16395...17768	01-2	page	1
Self-diagnosis III	01-3	page	1
- Fault table, fault codes 17769..0,18262	01-3	page	1
Self-diagnosis IV	01-4	page	1
- Readiness code	01-4	page	1
- Reading readiness code	01-4	page	1
- Generating readiness code	01-4	page	2
Self-diagnosis V	01-5	page	1
- Measured value blocks	01-5	page	1
- Display groups 000...030	01-5	page	2
Self-diagnosis VI	01-6	page	1
- Display groups 032...046	01-6	page	1
Self-diagnosis VII	01-7	page	1
- Display groups 050...126	01-7	page	1

24 – Fuel Formation, Injection

Repairing the injection system	24-1	page	1
- Repairing the injection part	24-1	page	1
- Overview of fitting location	24-1	page	2
- Parts of injection system - Summary of components	24-1	page	3
- Disassembling and assembling fuel distributor with injectors	24-1	page	5
- Disassembling and assembling the air filter and air mass meter	24-1	page	6
- Safety measures	24-1	page	7
- Rules of cleanliness	24-1	page	7
- Testing lines and components with test box	24-1	page	7
Testing components and functions	24-2	page	1
- Adapting idling speed	24-2	page	1
- Inspecting electronic power control (electronic throttle)	24-2	page	2
- Testing throttle valve control unit	24-2	page	3
- Testing accelerator pedal position sender	24-2	page	3
- Testing voltage supply for control unit	24-2	page	4
- Procedure after voltage supply has been interrupted	24-2	page	5
- Testing the fuel pressure regulator and holding pressure (pressure in system)	24-2	page	6
- Inspecting the injection rate, tightness and jet formation of the injectors	24-2	page	8
- Testing the intake system for tightness (unmetered air)	24-2	page	10
Checking lambda probes	24-3	page	1

- Checking lambda control	24-3	page	1
- Testing lambda probe -G39- and lambda control upstream of catalytic converter	24-3	page	2
- Testing lambda probe ageing upstream of catalytic converter	24-3	page	3
- Testing lambda probe -G130- and lambda control downstream of catalytic converter	24-3	page	3
- Test exhaust emissions warning lamp -K83-	24-3	page	4
Replacing, coding and adapting the engine control unit	24-4	page	1
- Replacing engine control unit	24-4	page	1
- Coding engine control unit	24-4	page	2
- Adapting the engine control unit to the throttle valve control unit	24-4	page	2
Testing auxiliary signals	24-5	page	1
- Testing the speed signal	24-5	page	1
- Testing databus (CAN bus)	24-5	page	1
- Activating and deactivating cruise control system (CCS)	24-5	page	2

28 – Ignition System

Repairing ignition system	28-1	page	1
- Safety measures	28-1	page	1
- Parts of ignition system - Summary of components	28-1	page	2
- Testing hall sender -G40-	28-1	page	2

01 – Self-diagnosis

01-1 Self-diagnosis I



Note!

The self-diagnosis monitors only a part of the injection and ignition system.

Properties of the self-diagnosis

The control unit -J220- for the injection and ignition system Motronic is equipped with a fault memory. The fault memory is designed as a permanent memory and as a volatile memory.

If malfunctions occur in the monitored sensors or components, they are stored in the fault memory with indication of the fault type ⇒ Fault Table ⇒ Chap. 01-2.

Faults which occur only occasionally (sporadically), are displayed as „sporadically occurring faults“ with the suffix "SP". Possible causes of sporadic faults are e.g. a loose contact or a momentary line interruption. If a sporadic fault no longer occurs within 40 warm-up phases (engine start at a temperature below 50°C - engine stop at a more than 72°C), it is removed from the fault memory.

The stored faults can be read out with vehicle system tester -VAS 5051-, -V.A.G 1552- or -V.A.G 1551-⇒ **01-1** page 4.

After the fault(s) has(have) been removed the fault memory must be erased ⇒ **01-1** page 5.

If the engine control unit is disconnected, perform work sequence for voltage interruption ⇒ Chap. 24-2.

Whenever the fault memory is erased, it is necessary to generate a readiness code ⇒ Chap. 01-4.



Note!

- ♦ *The following description only relates to vehicle system tester -VAS 5051- or -V.A.G 1552 -using the program card version 6.0, or higher.*
- ♦ *The use of the fault tester -V.A.G 1551 - with integrated printer is similar. A minor deviation on the display read-out is possible.*

Technical data of self-diagnosis

Engine code letters	AUQ
System denomination	Motronic
Complies with EU-4	EU-4
Lambda control	2 lambda probes
Knock control	2 knock sensors

Variable intake manifold length	no
Camshaft adjustment	yes
Secondary air system	yes

Interrogating control unit version

The control unit version is displayed once the vehicle system tester -V.A.G 1552- is connected and the engine electronics control unit selected ⇒ **01-1** page 2.

Functions available when using the vehicle system tester -V.A.G 1552-

The preconditions for selecting the desired functions are given in the following table.

Operation		Condition		
Function at vehicle system tester -V.A.G 1552-		Engine not running, ignition switched on	Engine idling	Normal driving
01	Interrogating control unit version	yes	yes	yes
02	Interrogating fault memory	yes	yes	yes
03	Final control diagnosis	yes	no	no
04	Initiating basic setting	yes	yes	yes
05	Erasing fault memory	yes	yes	yes
06	Ending output	yes	yes	yes
07	Coding control unit	yes	no	no
08	Reading measured value block	yes	yes	yes
15	Readiness code	yes	yes	yes

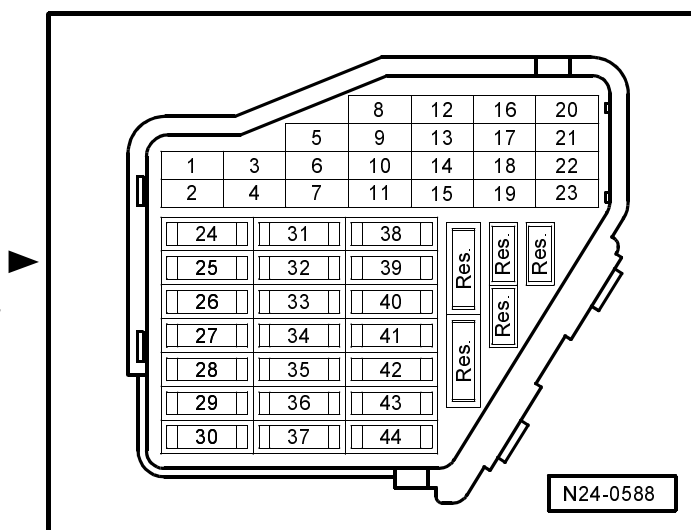
Connecting vehicle system tester -V.A.G 1552- and selecting the control unit for engine electronics

Special tools, test and measuring equipment and auxiliary items required

- ♦ Vehicle system tester -V.A.G 1552 - with cable -V.A.G 1551/3, 3A, 3B oder 3C-

Test conditions

- Battery voltage at least 11.5 V
- Fuses No. 10, 28, 29, 32, 34 and 43 OK.
- Earth connection at gearbox and on the left below battery O.K.



Procedure

- Connect vehicle system tester -V.A.G 1552- with cable -V.A.G 1551/3, 3A, 3B oder 3C.-.

Once the vehicle system tester has been connected:

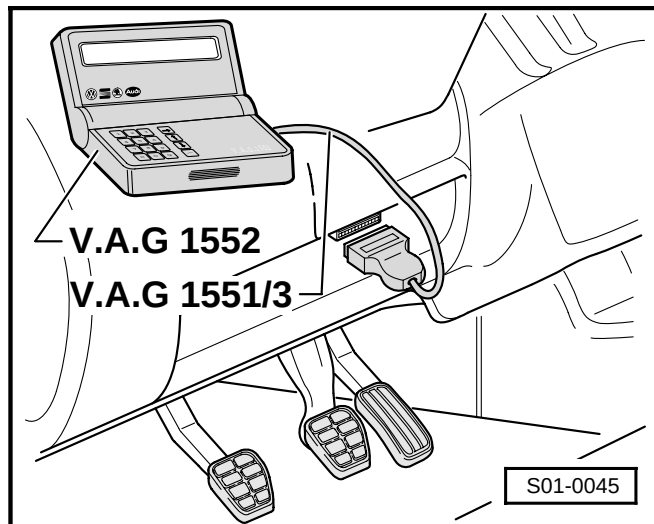
- Depending on the desired function either switch on the ignition or start the engine ⇒ **01-1** page 2, table „Available functions“.

If the read-outs as shown in the work sequence are not displayed, refer to the following notes:



Note!

- ♦ If „Error in data transmission“ is displayed because of an incorrect entry, unplug cable from vehicle system tester, plug in again and repeat all the steps.
- ♦ If one of the following messages appears in the display, carry out fault finding as specified in the fault finding program diagnostic cable ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations if necessary ⇒ Operating Instructions of vehicle system tester



Vehicle system test HELP
The control unit does not respond!

Vehicle system test HELP
Fault in communication set-up

Vehicle system test HELP
K cable does not connect to earth

Vehicle system test HELP
K cable does not connect to pos. term.



Note!

Operate the vehicle system tester by following the indication on the display:

Readout on display:

- Enter address word 01 „Engine electronics“ and confirm entry with the Q key.

The control unit identification appears in the display, e.g.:

- ♦ 06A906032BJ = Part No. of the control unit (for current control unit version - see spare parts catalogue)
- ♦ 1.8 ltr. = engine displacement
- ♦ R4/5VT = Engine version (4cyl. in-line engine /5 Valve/Turbo)
- ♦ G = GRA not switched, HS = gearbox
- ♦ -0004- = Program status number or D03 = data status (software version) of control unit
- ♦ Coding -11500- = Coding variant of control unit
- ♦ WSC -06388- = workshop coding from the -V.A.G 1552-, with which the last coding was carried out.

Vehicle system test HELP
Enter address word XX

06A906032BJ 1.8l R4/5VT G 0001 ->
Coding 11500 WSC 06388

**Note!**

- ♦ If the control unit version displayed does not correspond to the vehicle, replace the control unit ⇒ Chap. 24-4.
- ♦ Incorrect coding of the engine control unit results in:
 - ♦ Handling problems (jerky gear change, load change jolts etc.)
 - ♦ Increase in fuel consumption
 - ♦ Increase in pollution
 - ♦ Storage of non-existent faults in fault memory
 - ♦ Certain functions not being performed (lambda control, actuation of activated charcoal filter system, etc.)
 - ♦ Reduction of the gearbox life

If the code does not match the version of the vehicle:

- Check code of control units, code engine control unit ⇒ Chap. 24-4.
- Press key.

Readout on display:

- Further procedure, see repair sequences.



Vehicle system test
Select function XX

HELP

Interrogating and erasing fault memory

Special tools, test and measuring equipment and auxiliary items required

- ♦ Vehicle system tester -V.A.G 1552 - with cable
-V.A.G 1551/3, 3A ,3B oder 3C-

Procedure

- Connect vehicle system tester -V.A.G 1552-. Start engine and select address word 01 „Engine electronics“ ⇒ **01-1** page 2.

Only if the engine does not start:

- Operate starter for at least 6 seconds, do not switch off ignition.

Readout on display:

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

The number of stored faults or „No fault recognised“ appears in the display.



Vehicle system test
Select function XX

HELP



X faults detected!

If no fault is stored:

- Press key.

Readout on display:

- Enter 06 for the function „End output“ and confirm entry with key Q.



Vehicle system test
Select function XX

HELP

If one or several faults are stored:

Display of fault number, e.g.:

- Press  key.

▶

Fault number: 00515	->
---------------------	----

Fault source and fault type appear in the display, e.g.:

- Press  key.

▶

Hall sensor G40	->
Short circuit to earth	

Readout on display:

▶

Vehicle system test	HELP
Select function XX	

- Enter 06 for the function „End output“ and confirm entry with key Q.
- Rectify the faults displayed by referring to the fault table ⇒ Chap. 01-2 .



Note!

When carrying out test and repair and installation operations, faults, such as connectors unplugged, may also be detected by other control units. For this reason, when the work is concluded, it is necessary to interrogate and erase the fault memories of all control units. For this you must proceed as follows:

- Enter 00 for address word „Automatic test sequence“ and confirm entry with key Q. The - V.A.G 1552- sends all known address words in sequence.
- Erasing fault memory ⇒ **01-1** page 5.

Erasing fault memory

Special tools, test and measuring equipment and auxiliary items required

- ♦ Vehicle system tester -V.A.G 1552 - with cable -V.A.G 1551/3, 3A, 3B oder 3C-

Test condition



Note!

Whenever the fault memory is erased, it is necessary to generate a readiness code ⇒ Chap. 01-4.

- Repair completed
- Once the fault has been removed, perform a test drive. During the test drive the following operating conditions must be fulfilled:
 - Coolant temperature must rise to more than 80°C.
 - In case of full load the speed should be increased beyond -3500- rpm.
 - Once this temperature is reached, the following operating states must be set several times:

Idling

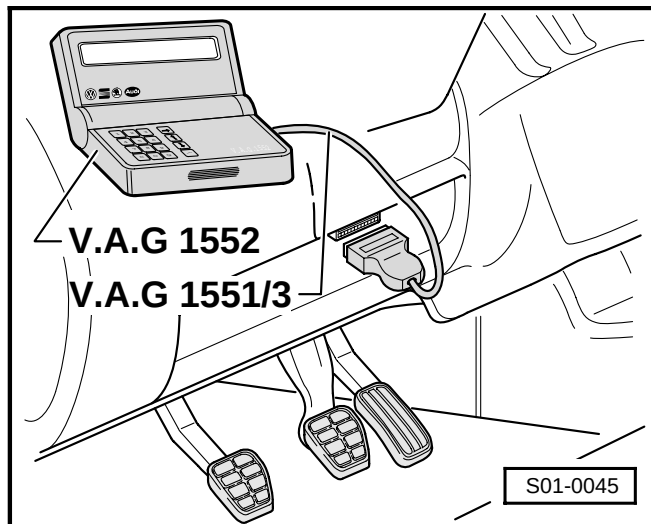
Partial load

Enrichment

Trailing throttle (overrun fuel cut-off)

Procedure

- Connect vehicle system tester -V.A.G 1552- with cable. ►
- Interrogate fault memory of control unit again (Function 02) ⇒ **01-1** page 4.



Readout on display:

- If test and repair and installation operations have only been performed on the engine electronics, enter 02 for function „Interrogate fault memory“ and confirm entry with key Q.

Vehicle system test
Select function XX

HELP

If the test and repair and installation operations have also affected other control units, interrogate and erase the fault memories of all control units upon completion. For this you must proceed as follows:

- Enter 00 for address word „Automatic test sequence“ and confirm entry with key Q. The - V.A.G 1552- sends all known address words in sequence.
- The number of faults stored appears on the display. ►

No fault detected!

If one or several faults are stored:

The stored faults are displayed in sequence.

- Rectify the faults displayed by referring to the fault table ⇒ Chap. 01-2 .
- Enter 05 for the function „Erase fault memory“ and confirm entry with key Q. Readout on display: ►

Vehicle system test
Fault memory erased!

->



Note!

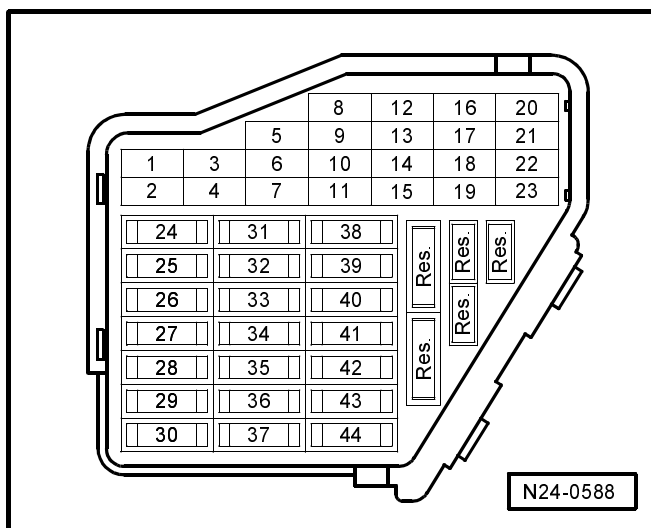
If the ignition is switched off between „Interrogate fault memory“ and „Erase fault memory“, the fault memory is not erased.

- Press key.
- Enter 06 for the function „End output“ and confirm entry with key Q.

Final control diagnosis

Test conditions

- Fuses No. 10, 28, 29, 32, 34 and 43 OK. ►



Special tools, test and measuring equipment and auxiliary items required

- ♦ Vehicle system tester -V.A.G 1552 - with cable
-V.A.G 1551/3, 3A, 3B oder 3C-

**Note!**

- ♦ *The actuator diagnosis can only be carried out when the engine is not running and the ignition is switched on.*
- ♦ *The final control diagnosis is aborted when the engine is started or when a moment of momentum is detected.*
- ♦ *During the actuator diagnosis the individual actuators remain activated until the next actuator is selected by pressing key .*
- ♦ *The actuators are tested acoustically or by contact.*
- ♦ *Before repeating final control diagnosis without briefly running the engine, switch the ignition off for about 2 seconds.*
- ♦ *The electric fuel pump runs during the entire final control diagnosis.*
- ♦ *Final control diagnosis is aborted after 10 minutes.*
- ♦ *The idling switch must be OK.*

With the actuator diagnosis the following parts are activated in the sequence indicated:

1. Tank vent valve -N80 -
2. Secondary air inlet valve -N112-
3. Secondary air pump relay -J299 -
4. Solenoid valve for charge pressure control -N75 -
5. Camshaft adjustment
6. Activated charcoal filter solenoid valve -N249 -
7. Injector cyl. 1 -N30-
8. Injector cyl. 3 -N32-
9. Injector cyl. 4 -N33-
10. Injector cyl. 2 -N31-

Procedure

- Connect vehicle system tester -V.A.G 1552-. Switch ignition on and select address word 01 „Engine electronics“ ⇒ **01-1** page 2.

Enter 03 for the function „Actuator diagnosis“.

Confirm entry with key Q.

Vehicle system test	HELP
Select function XX	

Vehicle system test	Q
03 - Actuator diagnosis	

Activated charcoal filter system solenoid valve 1 -N80-

The solenoid valve (before the coolant reservoir) must click.

Final control diagnosis	->
Tank vent valve -N80	

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

- Test resistance of injector ⇒ Chap. 24-1.
- Check wires to injector for short-circuit or open circuit
⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

If the solenoid valve clicks (opens and closes):

- Press  key.

Secondary air inlet valve -N112-:

The secondary air inlet valve - N112- must click until key  is pressed.

Final control diagnosis ->
Secondary air inlet valve-N112

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

- Inspect valve power supply.
- Check wires to injector for short-circuit or open circuit
⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.
- Press  key.

Secondary air pump relay -J299-:

Fitting location of secondary air pump relay -J299 - in holder in protective housing next to brake servo unit.

The secondary air pump relay -J299- is controlled by the secondary air pump motor, the motor runs at intervals until key  is pressed.

Final control diagnosis ->
Secondary air injection pump relay -J299

- If the secondary air pump motor does not run at intervals, check the secondary air pump motor ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.
- Press  key.

Solenoid valve for charge pressure control -N75-:

This injector is actuated (clicks) until key  is pressed.

Final control diagnosis ->
Charge press.control solenoid valve -N75

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

- Test resistance of injector ⇒ Chap. 24-1.
- Check wires to injector for short-circuit or open circuit
⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.
- Press  key.

Camshaft adjustment:

This injector is actuated (clicks) until key  is pressed.

Final control diagnosis ->
Camshaft adjustment

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

- Test resistance of injector ⇒ Chap. 24-1.
- Check wires to injector for short-circuit or open circuit
⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

- Press  key.

Activated charcoal filter solenoid valve -N249-:

This injector is actuated (clicks) until key  is pressed. ►

Final control diagnosis	->
Activated charcoal filter solenoid valve	

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

- Inspect valve power supply.
- Check wires to injector for short-circuit or open circuit
⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.
- Press  key.

Injection valve:

Press key  the injector for cylinder 1 clicks repeatedly. ►

Final control diagnosis	->
Injector cylinder 1 -N30	

- If you want to switch to the next injector press key . (Switching can also be performed without testing the relevant injector.)
- Test all the injectors one after the other in this way.

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

- Test resistance of injector ⇒ Chap. 24-1.
- Check wires to injector for short-circuit or open circuit
⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.
- Press  key.

Readout on display:

Final control diagnosis	->
END	

- End output and switch off ignition.

01-2 Self-diagnosis II

Fault table, fault codes 16395...17768



Note!

- ♦ The fault source table is ordered according to the 5-digit fault code on the left.
- ♦ Explanations concerning the types of faults (e.g. Interruption or short-circuit to earth): ⇒ Operating instructions of the vehicle system tester
- ♦ If parts are output as faulty: First of all, test all the cables and plug connections to these components as well as the earth cables of the system according to the current flow diagram. Replace component only if these tests do not reveal any fault. This applies in particular if the fault is shown as sporadic (SP).
- ♦ When testing senders and other components of the fuel injection system and when testing electric cables, proceed according to appropriate current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations



Note!

- ♦ 16486 = Fault denomination
- ♦ Air mass meter -G70- = current path or fault point defective
- ♦ Signal too small = designate fault type with text
- ♦ sporadically occurring fault = fault which does not occur often, e.g. loose contact

Readout on -V.A.G 1552-		Rectifying fault
16395 Bench2, camshaft adjustment	Malfunction	– Test camshaft adjustment ⇒ Chap. 01-1, Final control diagnosis
16396 Bench2, camshaft adjustment	Malfunction	– Test camshaft adjustment ⇒ Chap. 01-1, Final control diagnosis
16485 Air mass meter -G70-	Implausible signal	– Check sender -G70- in measured value block, display group 002 – Check wiring to sender -G70- ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
16486 Air mass meter -G70-	Signal too low	– Replace air filter element – Check sender -G70- in measured value block, display group 002
16487 Air mass meter -G70-	Signal too high	– Check wiring to sender -G70- ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
16490 Intake manifold pressure/air pressure ⇒ -G71-/-F96-	Implausible signal	– Check sender and wiring to charge pressure sender -G31- ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations

Readout on -V.A.G 1552-		Rectifying fault
16496 Intake manifold temperature sender -G42-	Signal too low	– Check sender -G42- in measured value block, display group 004 – Test sender resistance -G42- ⇒ Chap. 24-1
16497 Intake manifold temperature sender -G42-	Signal too high	
16500 Coolant temperature sender -G62-	Implausible signal	– Check sender -G62- in measured value block, display group 004 – Test sender resistance -G62- ⇒ Chap. 24-1 – Check coolant regulator ⇒ 1.8 I/132 kW Engine, Mechanical Components; Rep. Gr. 19
16501 Coolant temperature sender -G62-	Signal too low	
16502 Coolant temperature sender -G62-	Signal too high	
16514 Bench1-Probe 1	Electr. fault in the circuit	– Test lambda probe -G39- and lambda control upstream of catalytic converter ⇒ Chap. 24-3
16515 Bench1-Probe 1	Voltage too low	
16516 Bench1-Probe 1	Voltage too large	
16517 Bench1-Probe 1	Signal too slow	
16518 Bench1-Probe 1	No activity	
16519 Bank1, probe1 heating circuit	Electr. fault	
16520 Bench1-Probe 2	Electr. fault in the circuit	– Test lambda probe -G130 - and lambda control downstream of catalytic converter ⇒ Chap. 24-3
16521 Bench1-Probe 2	Voltage too low	
16522 Bench1-Probe 2	Voltage too large	
16523 Bench1-Probe 2	Signal too slow	
16524 Bench1-Probe 2	No activity	
16620 Charge pressure sender -G31-	Implausible signal	– Check sender and wiring to charge pressure sender -G31- ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
16621 Charge pressure sender -G31-	Signal too low	
16622 Charge pressure sender -G31-	Signal too high	

Readout on -V.A.G 1552-		Rectifying fault
16684	Combustion misfiring detected	– Check combustion misfiring in measured value block, display group 014, 015 and 016 – Fill up with fuel and check holding pressure ⇒ Chap. 24-2 – Test injectors ⇒ Chap. 01-1, Final control diagnosis – Test injected quantity and tightness ⇒ Chap. 24-2 – Test ignition cables and spark plugs – Test ignition coil ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
16685 Cyl. 1	Combustion misfiring detected	
16686 Cyl. 2	Combustion misfiring detected	
16687 Cyl. 3	Combustion misfiring detected	
16688 Cyl. 4	Combustion misfiring detected	
16705 Engine speed sender -G28-	Implausible signal	– Test resistance of engine speed sender -G28- ⇒ Chap. 24-1 – Check wiring to sender -G28- ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
16706 Engine speed sender -G28-	No signal	
16711 Knock sensor 1 -G61-	Signal too low	– Check knock sensor in measured value block, display group 020 – Check wiring to knock sensor ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations – Slacken knock sensor and tighten again to 20 Nm tightening torque
16712 Knock sensor 1 -G61-	Signal too high	
16716 Knock sensor 2 -G66-	Signal too low	
16717 Knock sensor 2 -G66-	Signal too high	
16725 Camshaft position sensor ⇒ sender -G40-	Implausible signal	– Test camshaft position sensor ⇒ Chap. 28-1
16726 Camshaft position sensor ⇒ sender -G40-	Signal too low	
16727 Camshaft position sensor ⇒ sender -G40-	Signal too high	
16795 Secondary air system	Flow faulty	– Test secondary air injector -N112- ⇒ Chap. 01-1, Final control diagnosis – Inspecting air intake system for tightness (unmetered air) ⇒ Chap. 24-2 – Test relay -J299- ⇒ Chap. 01-1, final control diagnosis – Test secondary air pump – Testing combination valve – Inspect hoses and connection pipes to individual components, and between components ⇒ 1.8 I/132 kW Engine, Mechanical Components; Rep. Gr. 26

Readout on -V.A.G 1552-		Rectifying fault
16804 Bank 1, catalyst system	Efficiency too low	– Generate readiness code ⇒ Chap. 01-4 – if the same faults are displayed, check emission levels ⇒ Inspection and Maintenance
16806 Bank 1, main catalytic converter	Efficiency too low	
16825 Tank ventilation system	Flow rate incorrect	– Test valve -N80- ⇒ Chap. 01-1, final control diagnosis – Check connection of fuel system to throttle valve ⇒ 1.8 I/132 kW ENGINE, Mechanics; Rep. Gr. 20
16885 Vehicle speed signal	Implausible signal	– Test vehicle speed signal in measured value block, display group 005 – Test vehicle speed signal ⇒ Chap. 24-5
16890 Idling control	Speed under nominal value	– Test throttle valve control unit ⇒ Chap. 24-2 – Test secondary air injector -N112- ⇒ Chap. 01-1, Final control diagnosis – Inspecting air intake system for tightness (unmetered air) ⇒ Chap. 24-2
16891 Idling control	Speed above nominal value	
16944 Voltage supply	Implausible signal	– Inspect engine control unit power supply ⇒ Chap. 24-2
16946 Voltage supply	Voltage too low	
16947 Voltage supply	Voltage too large	
16955 Brake light switch -F-	Implausible signal	– Check brake light switch and brake pedal switch in measured value block, display group 066
16985 16988 16989 16990 control unit defective		– Replace engine control unit ⇒ Chap. 24-4
17069 Main relay ⇒ -J271-	Open circuit	– Test voltage supply relay -J271- for engine control unit ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
17070 Main relay ⇒ -J271-	Short circuit to earth	
17071 Main relay ⇒ -J271-	Short circuit to positive	
17072 Main relay ⇒ -J271-	Open circuit	
17510 Bench1, probe1 heating circuit	Short circuit to positive	– Test lambda probe -G39 - and lambda control upstream of catalytic converter ⇒ Chap. 24-3
17511 Bench1, probe1 heating circuit	Output too low	
17513 Bench1, probe2 heating circuit	Short circuit to positive	– Test lambda probe -G130- and lambda control downstream of catalytic converter ⇒ Chap. 24-3

Readout on -V.A.G 1552-		Rectifying fault
17519 Lambda control (Bench 1)	System too lean	Test lambda probe -G39- and lambda control upstream of catalytic converter ⇒ Chap. 24-3
17520 Lambda control (Bench 1)	System too rich	
17521 Bench 1, probe 1	Internal resistance too great	
17522 Bench 1, probe 2	Internal resistance too great	Test lambda probe -G130- and lambda control downstream of catalytic converter ⇒ Chap. 24-3
17523 Bench1, probe1 heating circuit	Short circuit to earth	Test lambda probe -G39 - and lambda control upstream of catalytic converter ⇒ Chap. 24-3
17524 Bench1, probe1 heating circuit	Open circuit	
17525 Bench1, probe2 heating circuit	Short circuit to earth	Test lambda probe -G130 - and lambda control downstream of catalytic converter ⇒ Chap. 24-3
17526 Bench1, probe2 heating circuit	Open circuit	
17535 Bench1, mixture adaptation (mult.)	System too rich	- Testing fuel pressure regulator and system pressure ⇒ Chap. 24-2 - Test injected quantity and tightness ⇒ Chap. 24-2 - Test valve -N80- ⇒ Chap. 01-1, final control diagnosis
17536 Bench1, mixture adaptation (mult.)	System too lean	- Test injectors ⇒ Chap. 01-1, Final control diagnosis - Testing fuel pressure regulator and system pressure ⇒ Chap. 24-2 - Test injected quantity and tightness ⇒ Chap. 24-2 - Testing intake system for leaks ⇒ Chap. 24-2 - Checking the exhaust system for leaks
17544 Bench1, mixture adaptation (add.)	System too lean	- Test secondary air system for leaks ⇒ 1.8 I/132 kW Engine, Mechanical Components; Rep. Gr. 26 - Inspect vacuum lines for leaks
17545 Bench1, mixture adaptation (add.)	System too rich	- Testing fuel pressure regulator and system pressure ⇒ Chap. 24-2 - Test injected quantity and tightness ⇒ Chap. 24-2 - Test valve -N80- ⇒ Chap. 01-1, final control diagnosis
17551 Load detection	Above limit	- Check sender -G70- in measured value block, display group 002 ⇒ Chap. 01-5 - Test throttle valve control unit ⇒ Chap. 24-2
17557 Lambda control Bench 1	implausible control value	Test lambda probe -G39- and lambda control upstream of catalytic converter ⇒ Chap. 24-3

Readout on -V.A.G 1552-		Rectifying fault
17579 Angle sender 2 for TV drive -G188-	Implausible signal	– Check angle sender in measured value block, display group 060 ⇒ Chap. 01-7 – Test throttle valve control unit ⇒ Chap. 24-2
17580 Angle sender 2 for TV drive -G188-	Signal too low	
17581 Angle sender 2 for TV drive -G188-	Signal too high	
17584 Bank 1, lambda correc- tion downstream of cat.	Regulating limit reached	– Testing intake system for leaks (unmetered air) ⇒ Chap. 24-2 – Test lambda probe -G130- and lambda control downstream of cata- lytic converter ⇒ Chap. 24-3
17606 Bench1- probe2, heat- ing circuit	Electr. fault	– Test lambda probe -G130- and lambda control downstream of cata- lytic converter ⇒ Chap. 24-3
17621 Injector cyl. 1 -N30-	Short circuit to positive	– Test injectors ⇒ Chap. 01-1, Final control diagnosis
17622 Injector cyl. 2 -N31-	Short circuit to positive	
17623 Injector cyl. 3 -N32-	Short circuit to positive	
17624 Injector cyl. 4 -N33-	Short circuit to positive	
17633 Injector cyl. 1 -N30-	Short circuit to earth	
17634 Injector cyl. 2 -N31-	Short circuit to earth	
17635 Injector cyl. 3 -N32-	Short circuit to earth	
17636 Injector cyl. 4 -N33-	Short circuit to earth	
17645 Injector cyl. 1 -N30-	Open circuit	– Test injectors ⇒ Chap. 01-1, Final control diagnosis
17646 Injector cyl. 2 -N31-	Open circuit	
17647 Injector cyl. 3 -N32-	Open circuit	
17648 Injector cyl. 4 -N33-	Open circuit	
17658 Fuel level	too low	– Fill up with fuel, erase fault memory ⇒ Chap. 01-1 – Read in fault memory of dash panel insert ⇒ Electrical System; Rep. Gr. 01
17695 Turbocharger divert air valve -N249-	Open circuit	– Test turbocharger divert air valve -N249- ⇒ Chap. 01-1, final control diagnosis
17696 Turbocharger divert air valve -N249-	Short circuit to positive	
17697 Turbocharger divert air valve -N249-	Short circuit to earth	

Readout on -V.A.G 1552-		Rectifying fault
17705 Compressor - throttle valve connection	Pressure drop	– Check hose connections ⇒ 1.8 l/132 kW Engine, Mechanical Components; Rep. Gr. 21
17733 Knock control cyl. 1	Regulating limit reached	– Fill with fuel of minimum 95 RON. – Check knock control with measured value block, display group 020 ⇒ Chap. 01-5 – Check wiring to knock sensor ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations – Tighten knock sensor with 20 Nm
17734 Knock control cyl. 2	Regulating limit reached	
17735 Knock control cyl. 3	Regulating limit reached	
17736 Knock control cyl. 4	Regulating limit reached	
17743 Engine torque monitor- ing 2	Regulating limit exceed- ed	– Check hose connections ⇒ 1.8 l/132 kW Engine, Mechanical Components; Rep. Gr. 21 – Test sender resistance - G42- ⇒ Chap. 24-1 – Check sender -G70- in measured value block, display group 002 – Test sender resistance -G62- ⇒ Chap. 24-1
17744 Engine torque monitor- ing	Regulating limit exceed- ed	
17748 Camshaft pos./crank- shaft pos. sensor	Incorrect as- signment	
17763 Ignition control cyl. 1	Open circuit	– Check ignition coil with power amplifier ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
17764 Ignition control cyl. 1	Short circuit to positive	
17765 Ignition control cyl. 1	Short circuit to earth	
17766 Ignition control cyl. 2	Open circuit	
17767 Ignition control cyl. 2	Short circuit to positive	
17768 Ignition control cyl. 2	Short circuit to earth	

**Note!**

- ◆ regarding fault code 16496
- ◆ Fault „signal too low“ is stored after engine start after approx. 3 minutes idling.
- ◆ regarding fault code 16500
- ◆ The temperature sequence in the range 20 °C to 60 °C is compared to a model sequence stored in the control unit. The rise in the model sequence is slower than the real value. If the real values become too slow as a result of a fault they will eventually coincide with the model values. The engine control unit recognises such faults as implausible.
- ◆ regarding fault codes 16500, 16501, 16502
- ◆ As soon as one of these faults is detected the engine control unit uses the intake manifold temperature as a replacement value to start the engine. Then the temperature rises according to a model sequence stored in the engine control unit (5.25 °C every 65 sec.). If the

engine is warm after a certain period a fixed replacement value is displayed. This fixed substitute value depends on the intake air temperature.

- ♦ *regarding fault code 16705*
- ♦ *Burr on the sensor body can generate auxiliary signals.*
- ♦ *Fault „implausible signal“ is stored if the number of crankshaft signals (60), taken by the reference mark, does not correspond.*

**Note!**

- ♦ *regarding fault codes 16705 and 16706*
- ♦ *If the clearance between the rotor and the sensor is greater than recommended the signals need not be recognised.*
- ♦ *If the rotor is loose the signals may become irregular.*
- ♦ *The auxiliary signals can be detected by interference signals.*

**Note!**

- ♦ *regarding fault codes 16795 and 16804*
- ♦ *If this fault is displayed during three consecutive engine operating cycles (engine runs at least 5 seconds) the engine control unit activates the exhaust warning light on the dash panel insert.*

**Note!**

- ♦ *regarding fault codes 17069...17072*
- ♦ *If this fault is displayed during three consecutive engine operating cycles (engine runs at least 5 seconds) the engine control unit activates the exhaust warning light on the dash panel insert.*

**Note!**

- ♦ *regarding fault code 17072*
- ♦ *If this fault occurs the engine control unit switches on the EPC warning lamp on the dash panel insert.*

**Note!**

- ♦ *regarding fault code 17953*
- ♦ *If this fault is displayed during three consecutive engine operating cycles (engine runs at least 5 seconds) the engine control unit activates the exhaust warning light on the dash panel insert.*
- ♦ *If this fault occurs the engine control unit switches on the EPC warning lamp on the dash panel insert.*

**Note!**

When attempting to start with a non-adapted key a static fault is stored in the memory. If the engine is subsequently started with an adapted key, the fault is converted to a sporadic fault.

01-3 Self-diagnosis III

Fault table, fault codes 17769..0,18262

Readout on -V.A.G 1552-		Rectifying fault
17769 Ignition control cyl. 3	Open circuit	— Check ignition coil with power amplifier ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
17770 Ignition control cyl. 3	Short circuit to positive	
17771 Ignition control cyl. 3	Short circuit to earth	
17772 Ignition control cyl. 4	Open circuit	
17773 Ignition control cyl. 4	Short circuit to positive	
17774 Ignition control cyl. 4	Short circuit to earth	
17794 17795 17796 control unit defective		— Replace engine control unit ⇒ Chap. 24-4
17818 Tank ventilation valve -N80-	Short circuit to positive	— Test valve -N80 - ⇒ Chap. 01-1, final control diagnosis
17829 Secondary air injection valve -N112-	Short circuit to earth	— Test secondary air inlet valve -N112- ⇒ Chap. 01-1, final control diagnosis
17830 Secondary air injection valve -N112-	Short circuit to positive	
17832 Bench 1, secondary air system	Leak detected	— Test hose lines and components of the secondary air system ⇒ 1.8 I/132 kW Engine, Mechanical Components; Rep. Gr. 26
17833 Tank ventilation valve -N80-	Short circuit to earth	— Test valve -N80- ⇒ Chap. 01-1, final control diagnosis
17834 Tank ventilation valve -N80-	Open circuit	
17840 Secondary air injection valve -N112-	Open circuit	— Test valve -N112- ⇒ Chap. 01-1, final control diagnosis
17841 Secondary air pump re- lay -J299-	Open circuit	— Test relay -J299- ⇒ Chap. 01-1, final control diagnosis
17842 Secondary air pump re- lay -J299-	Short circuit to positive	
17843 Secondary air pump re- lay -J299-	Short circuit to earth	

Readout on -V.A.G 1552-		Rectifying fault
17908 Fuel pump relay -J17-	Electr. fault in the circuit	– Test fuel pump relay -J17- ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
17909 Fuel pump relay -J17-	Short circuit to earth	
17910 Fuel pump relay -J17-	Short circuit to positive	
17927 Bench1, camshaft adjustment	Malfunction	– Test solenoid valve for camshaft adjustment ⇒ Chap. 01-1, final control diagnosis
17931 Crash signal from airbag CU	Implausible signal	– Test airbag ⇒ Body Fitting Work; Rep. Gr. 01
17937 Camshaft adjustment	Short circuit to positive	– Test solenoid valve for camshaft adjustment ⇒ Chap. 01-1, final control diagnosis
17938 Camshaft adjustment	Short circuit to earth	
17939 Camshaft adjustment	Open circuit	
17947 Clutch pedal switch -F36-	Implausible signal	– Check clutch pedal switch -F36- in measured value block, display group 066
17950 Angle sender for TV drive -G187-	Implausible signal	– Check throttle valve control unit in measured value block, display group 060 – Test throttle valve control unit -J338- ⇒ Chap. 24-2
17951 Angle sender for TV drive -G187-	Signal too low	
17952 Angle sender for TV drive -G187-	Signal too high	
17953 Throttle valve control	Malfunction	– Check throttle valve control unit in measured value block, display group 060 – Test throttle valve control unit - J338- ⇒ Chap. 24-2

Readout on -V.A.G 1552-		Rectifying fault
17954 Solenoid valve for charge pressure control -N75-	Short circuit to positive	– Test valve -N75- ⇒ Chap. 01-1, final control diagnosis – Check charge pressure control ⇒ 1.8 I/132 kW Engine, Mechanical Components; Rep. Gr. 21
17955 Solenoid valve for charge pressure control -N75-	Short circuit to earth	
17956 Solenoid valve for charge pressure control -N75-	Open circuit	
17958 Charge pressure	Control differ- ence	
17963 maximum charge pres- sure exceeded		
17964 Charge pressure control	Regulating limit not reached	
17965 Charge pressure control	Regulating limit exceed- ed	
17966 Throttle valve drive -G186-	Electr. fault in the circuit	– Test throttle valve control unit ⇒ Chap. 24-2
17967 Throttle valve control unit -J338-	Incorrect ba- sic setting	– Adapt engine control unit to throttle valve control unit ⇒ Chap. 24-4
17968 Maximum engine speed exceeded		– Inspect engine for mechanical damage and erase fault memory ⇒ Chap. 01-1 – Test resistance of engine speed sender ⇒ Chap. 24-1
17972 Throttle valve control unit J338	Undervoltage on basic set- ting	– Check battery voltage if necessary recharge – Adapt engine control unit to throttle valve control unit ⇒ Chap. 24-4
17973 Throttle valve control unit -J338-	Bottom limit not reached	– Check throttle valve for damage and dirt
17976 Throttle valve control unit -J338-	Mechanical fault	– Test throttle valve control unit ⇒ Chap. 24-2 – Check throttle valve for damage and dirt
17977 CCS switch -E45-	Implausible signal	– Check cruise control system (CCS) in measured value block, display group 066
17978 Engine control unit in- hibited		– Adapt engine electronics control unit to electronic immobiliser ⇒ Electrical System; Rep. Gr. 96 – Test electronic immobiliser ⇒ Electrical System; Rep. Gr. 96
17987 Throttle valve control unit -J338-	Adaption not started	– Adapt engine control unit to throttle valve control unit ⇒ Chap. 24-4 – Test throttle valve control unit ⇒ Chap. 24-2
18010 Voltage supply tml. 30	Voltage too low	– Inspect engine control unit power supply ⇒ Chap. 24-2 – Perform procedure for voltage interruption ⇒ Chap. 24-2

Readout on -V.A.G 1552-		Rectifying fault
18011 18012 Control unit defective		— Replace engine control unit ⇒ Chap. 24-4
18017 Crash disconnect activated		— Interrogate and erase fault memory for airbag control unit ⇒ Body Work; Rep.-Gr. 01
18018 Control unit defective		— Replace engine control unit ⇒ Chap. 24-4
18020 Engine control unit	Incorrectly coded	— Code engine control unit ⇒ Chap. 24-4
18038 Sender for accelerator pedal position -G79-	Signal too low	— Check accelerator pedal position sender in measured value block, display group 062 ⇒ Chap. 01-7 — Test accelerator pedal position sender ⇒ Chap. 24-2
18039 Sender for accelerator pedal position -G79-	Signal too high	
18041 Sender 2 for accelerator pedal position -G185-	Signal too low	
18042 Sender 2 for accelerator pedal position -G185-	Signal too high	
18047 Sender 1/2 for accelerator pedal position -G79- + -G185-	Implausible signal	
18048 Control unit defective		— Replace engine control unit ⇒ Chap. 24-4
18056 Databus drive	defective	— Inspect databus ⇒ Chap. 24-5
18057 Databus drive	Missing message from ABS CU	— Read out fault memories of all control units (automatic test sequence) ⇒ Chap. 01-1 — Test ABS control unit ⇒ Running Gear; Rep. Gr. 45
18058 Databus drive	Missing message from combiinstrument	— Inspect databus ⇒ Chap. 24-5 — Test dash panel insert ⇒ Electrical System; Rep. Gr. 90
18085 Fault lamp for electr. accelerator control -K132-	Short circuit to positive	— Test fault lamp for electr. accelerator control ⇒ Chap. 24-2
18090 Databus drive	Missing message from ABS CU	— Inspect databus ⇒ Chap. 24-5
18261 Databus drive	implausible message from ABS CU	— Test ABS control unit ⇒ Running Gear; Rep. Gr. 45
18262 Databus drive	defective	— Inspect databus ⇒ Chap. 24-5

**Note!**

When attempting to start with a non-adapted key a static fault is stored in the memory. If the engine is subsequently started with an adapted key, the fault is converted to a sporadic fault.

01-4 Self-diagnosis IV

Readiness code

Operation

The readiness code is an 8-digit numerical code that provides information on the status of the emission-relevant diagnosis.

If a system diagnosis (e.g. for secondary air injection system) is performed, the relevant position in the number code is set from 1 to 0.

Readiness code -00000000- means that the individual diagnoses have been successfully performed.

Diagnoses in normal operation are performed at regular intervals. After a repair to a system which influences exhaust emission it is recommended to generate the readiness code as this ensures that the systems operate in conformity with specifications. If a fault is detected during diagnosis, it is then stored in the fault memory.

The readiness code is erased each time the fault memory is erased, or if there is an interruption to the voltage supply.

Reading readiness code

Special tools, test and measuring equipment and auxiliary items required

- ♦ Vehicle system tester -V.A.G 1552 - with cable
-V.A.G 1551/3, 3A, 3B oder 3C-

Procedure

- Connect vehicle system tester -V.A.G 1552-, switch ignition on and enter address word 01 „Engine electronics“ ⇒ Chap. 01-1.
- Enter function 15 „Readiness code“ and confirm entry with the  key.

After successfully completing all the diagnoses, the following readout must appear in the display:

Readiness code
00000000 - Test complete

Specified value: -00000000- Meaning ⇒ **01-4** page 2.

If the specified value is reached:

- Interrogate fault memory ⇒ Chap. 01-1.

If the specified value is not reached:

Readiness code
00101101 - Test not complete 00100000

- Generate readiness code ⇒ **01-4** page 2

Meaning of the 8-digit numerical block of the readiness code

The Readiness code is only generated when all display positions are 0								Diagnosis function
1	2	3	4	5	6	7	8	
							0	Catalytic converter
						0		always „0“
					0			Activated charcoal filter system (tank ventilation system)
				0				Secondary air system
			0					always „0“
		0						Lambda probes
	0							Lambda probe heater
0								always „0“

Generating readiness code

If the fault memory has been erased or if the continuous voltage supply from the engine control unit was interrupted, it is then necessary to re-generate the readiness code.

Special tools, test and measuring equipment and auxiliary items required

- ♦ Vehicle system tester -V.A.G 1552 - with cable
-V.A.G 1551/3, 3A, 3B oder 3C-

Test conditions

- Vehicle stopped
- all electrical consumers such as lights and rear window heater must be switched off
- Air conditioning switched off
- Coolant temperature at least 80 °C ⇒ display group 004, display field 3 ⇒ Chap. 01-5

Procedure

- Connect vehicle system tester -V.A.G 1552-, switch ignition on and enter address word 01 Engine electronics⇒ Chap. 01-1.



Note!

It is essential to carry out the individual steps in the correct order, otherwise the readiness code cannot be successfully generated.

1. step: Interrogating fault memory

- Enter function 02 for „Interrogate fault memory“ and confirm entry with key Q.

The number of stored faults, or „No fault recognised“ appears in the display. ➡

X No fault recognised!

If a fault is stored in the memory:

- Rectify the faults displayed by referring to the fault table ⇒ Chap. 01-2 .

If no fault is stored:

- Press  key.

2. step: Erasing fault memory

- Select function 05 „Erase fault memory“ and confirm entry with the  key.



Note!

The readiness code is reset or erased each time the fault memory is erased.

Readout on display:



Vehicle system test
Fault memory erased!

->



Note!

If the ignition is switched off between „Interrogating fault memory“ and „Erasing fault memory“, the fault memory is then not erased.

- Press  key.

3. step: Adapting throttle valve control unit to engine control unit

- Select function 04 „Initiate basic setting“ and display group 060.

Check values in display fields 3 and 4:



System in basic setting			60	->
14 %	85 %	8	ADP. running	

Specified value display field 3: 0...8

Specified value display field 4: ADP runs, ADP o.k.

If the specified values are reached:

- Press  key.

4. step: Check operating conditions of the lambda control

- Start engine and select address word 01 Engine electronics ⇒ Chap. 01-1.
- Select function 04 for „Basic setting“ and confirm entry with key Q.

For vehicles > 04.01

- The engine speed must increase to more than 2000 rpm.

For vehicles 05.01 >

- Depress brake pedal and accelerator simultaneously.



Note!

Engine speed is raised to 1800... 2200 rpm by engine control unit.

For all vehicles

- Enter display group number 030 and confirm entry with key Q.
- Check operating state of lambda control display fields 1 and 2:

System in basic setting	30	->
111	110	

Specified value display field 1: 111

Specified value display field 2: 110

Note!

- ♦ *This may take a few minutes.*
- ♦ *The first position in the 3-digit numerical block fluctuates initially between 0 and 1 (lambda probe heater off and on).*
- ♦ *The lambda control of lambda probe downstream of catalyst is not active without engine load and the third position in display field 2 indicates 0.*

If the specified values are not reached:

- Interrogate fault memory ⇒ Chap. 01-1.

If the specified values are reached at least once:

- Press  key.

5. step: Diagnosis of lambda probe ageing upstream of catalyst

- Enter display group number 034 and confirm entry with key Q.
- Run engine at high speed, the display in display field 4 will then switch from „Test OFF“ to „Test ON“. Catalytic converter temperature in display field 2 must be at least 350 °C.

System in basic setting	34	->
2000 rpm	350.0 °C	1.91 Test OFF

Note!

This may take a few minutes.

- Run engine at high speed until display field 4 indicates specified value „B1-S1 O.K.“.

If the specified value is not reached:

- Interrogate fault memory ⇒ Chap. 01-1.

If the specified value is reached:

- Press  key.

6. step: Check lambda probe preparation downstream of catalytic converter

- Enter display group number 036 and confirm entry with key Q.
- Run engine at high speed, the display in display field 2 will then switch from „Test OFF“ to „Test ON“:
- Run engine at high speed until display field 2 indicates specified value „B1-S2 O.K.“.

System in basic setting	36	->
0.640 V	Test OFF	

If the specified value is not reached:

- Interrogate fault memory ⇒ Chap. 01-1.

If the specified value is reached:

- Press  key.

7. step: Diagnosis of lambda control system

- Enter display group number 037 and confirm entry with key Q.
- Keep running engine at high speed, the display in display field 4 will then switch from „Test OFF“ to „Test ON“.
- Run engine at high speed until specified value „Syst. O.K.“ is displayed in display field 4.

System in basic setting	37	->
19.5 %	0.435 V	0.000 Test OFF

If the specified value is not reached:

- Interrogate fault memory ⇒ Chap. 01-1.

If the specified value is reached:

- Press  key.

8. step: Diagnosis of lambda probe ageing downstream of catalytic converter

- Enter display group number 043 and confirm entry with key Q.
- Run engine at high speed, the display in display field 4 will then switch from „Test OFF“ to „Test ON“. Catalytic converter temperature in display field 2 must be at least 350 °C.
- Run engine at high speed until display field 4 indicates specified value „B1-S2 O.K.“.

System in basic setting	43	->
2000 rpm	450.0 °C	0.435 V Test OFF

If the specified value is not reached:

- Interrogate fault memory ⇒ Chap. 01-1.

If the specified value is reached:

- Press  key.

9. step: Catalyst diagnosis

- Enter display group number 046 and confirm entry with key Q.
- Keep running engine at idling speed.
- The value in display field 4 initially switches from „Test OFF“ to „Test ON“. Catalytic converter temperature in display field 2 must be at least 440 °C.

System in basic setting	46	->
720 rpm	550.0 °C	0.07 Test OFF



Note!

This may take a few minutes.

- Run engine at idling speed until display field 4 indicates specified value „CatB1 O.K.“.

If the specified value is not reached:

- Interrogate fault memory ⇒ Chap. 01-1.

If the specified value is reached:

- Press  key.

10. step: Diagnosis of activated charcoal filter system (tank ventilation system)

- Enter display group number 070 and confirm entry with key Q.
- Keep running engine at idling speed, the display in display field 4 will then switch from „Test OFF“ to „Test ON“:
- Leave engine running at idling speed until „TVV o.k.“ is displayed in display field 4.

System in basic setting	70	->
0.0 %	-	0.0 %
		Test OFF

Note!

If the test is not initiated or if the display jumps from „Test ON“ to „Test OFF“, press accelerator pedal briefly and the test will start again.

If the specified value is not reached:

- Interrogate fault memory ⇒ Chap. 01-1.

If the specified value is reached:

- Press  key.

11. step: Diagnosis of secondary air injection system

Note!

- ♦ *Engine idling.*
- ♦ *During diagnosis the secondary air injection system the secondary air pump will run for a few seconds.*
- Enter display group number 077 and confirm entry with key Q.
- Suddenly press and release (briefly accelerate to min. -2500- rpm)
- Check value in display field 4, the message will then switch from „Test OFF“ to „Test ON“.
- Leave engine idling until the following readout appears in display field 4: „Syst. O.K.“.

System in basic setting	77	->
800 rpm	3.1 g/s	45.0 %
		Test OFF

Note!

This diagnosis will last approximately 60 seconds.

If the specified values are not reached:

- Interrogate fault memory ⇒ Chap. 01-1.

12. step: Reading Readiness Code

- Read readiness code ⇒ **01-4** page 1.

01-5 Self-diagnosis V

Measured value blocks

Safety measures

If test and measuring devices are required during test drives observe the following:

- ♦ Always secure the test and measuring devices on the rear seat and have a second person operate them there.

If the test and measuring devices are operated from the passenger seat the passenger could be injured by the release of the passenger airbag in the event of an accident.

Reading measured value block - Initiating basic setting of system

Special tools, test and measuring equipment and auxiliary items required

- ♦ Vehicle system tester -V.A.G 1552 - with cable
-V.A.G 1551/3, 3A, 3B oder 3C-.

Test conditions

- The coolant temperature must be at least 80 °C ⇒ display group 004, display field 3.
- All electrical components, e.g. lights and rear window heater, must be switched off.
- If the vehicle is equipped with air conditioning the system must be switched off.
- No fault must be present in the fault memory ⇒ Chap. 01-1, interrogate fault memory and erase.

Procedure

- Connect vehicle system tester -V.A.G 1552-. Start engine and select address word 01 „Engine electronics“ ⇒ Chap. 01-1.

Select per required function:

- 08 for the function „Read measured value block“ and confirm entry with key Q.

or

- 04 for the function „Initiate basic setting“ and confirm entry with key Q.

- Readout on display:

or

- Readout on display:

Read measured value block	HELP
Enter display group number	XXX

System in basic setting	->
Enter display group number	XXX

Note!

Display group number 002 is an example to represent the sequence.

- Enter 002 for display group number „1“ and confirm entry with key Q. Read-out on display, e.g.: (1...4 = display fields).



Reading measured value block 1				->
1	2	3	4	

or

- Readout on display:
- Ending output.



System in basic setting				1	->
1	2	3	4		

The measured values in the read measured value block and basic setting functions are described in the individual component tests.

Note!

Proceed according to the following table to switch to another display group:

Display group	-V.A.G 1551-	-V.A.G 1552-
higher	 Press key	 Press key
lower	 Press key	 Press key
skip	 Press key	 Press key

- If the specifications are achieved in all the display fields, press key .
- Select function 06 „End output“ and switch ignition off.

Display groups 000...030

Measured value blocks, display groups 000...009

Display group 000 in idle (coolant temperature not below +80 °C)

Display field	Displayed specified value	Corresponds to measured value	Denomination
1	180...210	80...110 °C	Coolant temperature (Precondition for basic setting)
2	14...39	10...30 %	Engine load (without consumers)
3	70...82	700...820 rpm	Engine speed (without consumers)
4	142...206	10...14.5 V	Battery voltage
5	1...10	0,4...4,0 %	Throttle valve angle
6	106...189	-4,3...12,2 %	Load (moment) at idling speed
7	113...143	-3...+3 %	Initialisation value idling air mass

Display field	Displayed specified value	Corresponds to measured value	Denomination
8	115...141	-10...+10 %	Control value of the fuel preparation (lambda control value) (if outside tolerance, perform test drive)
9	78...178	-10...+10 %	Initialisation value of the fuel preparation (lambda initialisation value) (if outside tolerance, perform test drive)
10	103...153	-10...+10 %	Initialisation value of the fuel preparation (lambda initialisation value) multiplicative (if outside tolerance, perform test drive)

Test table - Display group 000

Display field	Readout on -V.A.G 1552 -	Fault cause	Rectifying fault
1	less than 180	◆ Sender for coolant temperature -G62- defective ◆ Fault in wiring to engine control unit ◆ Coolant regulator (thermostat) remains open	— Test sender for coolant temperature -G62-, display group 004 — Check coolant regulator ⇒ 1.8 I/132 kW Engine, Mechanical Components; Rep. Gr. 19
	above 210	◆ Sender for coolant temperature -G62- defective ◆ Fault in wiring to engine control unit	— Test sender for coolant temperature -G62-, display group 004
2	less than 14	◆ Unmetered air downstream of air-mass meter ◆ Unmetered air to throttle valve ◆ Vacuum hose released ◆ Fuel pressure regulator	— Eliminate unmetered air
	above 39	◆ Air conditioning switched on ◆ Electrical consumers on ◆ Lambda control on rich or lean load ◆ AC compressor continues operating even though the air conditioning system is switched off	— Air conditioning switched off — switch off el. consumers — Check lambda control ⇒ Chap. 24-3 — Inspecting AC compressor disconnection ⇒ Chap. 01-7
3	less than 70	◆ Engine loaded by auxiliary equipment ◆ Throttle valve control unit -J338- blocks or is defective	— Eliminate load (air conditioning, power steering etc.) — Test throttle valve control unit - J338- ⇒ Chap. 24-2
	above 82	◆ large unmetered air volume (cannot be compensated by idle stabilizer) ◆ Throttle valve control unit -J338- blocks or is defective	— Eliminate unmetered air — Test throttle valve control unit - J338- ⇒ Chap. 24-2

Display field	Readout on -V.A.G 1552 -	Fault cause	Rectifying fault
4	less than 142	♦ Generator defective, battery heavily discharged ♦ Vehicle voltage heavily loaded just after start by a high charge current or by auxiliary equipment ♦ Transition resistance in the positive power supply or earth connection for engine control unit ♦ Current consumption with ignition off	– Test voltage, recharge battery – Increase engine speed slightly for a few minutes and switch off additional consumers – Inspect engine control unit power supply ⇒ Chap. 24-2 – Eliminate current consumption
	above 206	♦ Voltage regulator on generator defective ♦ Overvoltage due to starting aid or quick charger	– Test voltage, replace regulator if necessary – Interrogate fault memory ⇒ Chap. 01-1
5	less than 1	♦ not possible	
	above 10	♦ Basic setting of the throttle valve control unit not carried out ♦ Throttle valve potentiometer in throttle valve control unit defective ♦ Throttle valve mechanism jams	– Perform basic setting of the throttle valve control unit ⇒ Chap. 24-4 – Interrogate fault memory ⇒ Chap. 01-1 – Eliminate cause, if necessary replace
6	less than 106	♦ Unmetered air to throttle valve	– Eliminate unmetered air
	above 189	♦ increased engine load due to auxiliary equipment	– eliminate load, switch off additional consumers
7	less than 113	♦ Unmetered air to throttle valve	– Eliminate unmetered air
	above 143	♦ increased engine load due to auxiliary equipment	– eliminate load, switch off additional consumers
8	less than 115	♦ Mixture too rich, lambda control leans off ♦ a lot of fuel from the activated charcoal filter (not in basic setting) ♦ Vacuum hose for fuel pressure regulator leaks ♦ Lambda learned values on limit	– Press accelerator at 20 second intervals, until learning process is performed – Replace vacuum hose – Check lambda learned values in display group 032 ⇒ Chap. 01-6
	above 141	♦ Mixture too lean, lambda control enriches ♦ Unmetered air ♦ Injection valves defective ♦ Lambda learned values on limit	– Test fuel injection rate ⇒ Chap. 24-2 – Eliminate unmetered air – Testing injection valves – Check lambda learned values in display group 032 ⇒ Chap. 01-6
	Display switches or remains contact at 128	♦ Fuel level too low ♦ Lambda control is in operation	– Add fuel to at least 10 ltr.
9	below 78 or above 178		– Display group 032, ⇒ Chap. 01-6
10	below 103 or above 153		– Display group 032, ⇒ Chap. 01-6

Display group 001 - Basic functions

• Engine idling						
Reading measured value block 1 →				← Readout on display		
xxxx rpm	xx.x °C	xx.x %	xxxxxx			
1	2	3	4	← Display fields	Specification	Analysis
				Operating conditions	11111111	⇒ 01-5 page 5
				Lambda regulator upstream of catalytic converter	-10,0...10,0 %	---
				Coolant temperature	80.0...110.0 °C	⇒ 01-5 page 5
				Engine speed (idling speed)	700...820 rpm	⇒ 01-5 page 5

Analysis of display group 001, display field 1 - engine speed (idling speed)

Readout on -V.A.G 1552 -	Rectifying fault
less than 700 rpm	– Test throttle valve control unit ⇒ Chap. 24-2 – Inspect intake system for leaks
greater than 820 rpm	– Interrogate fault memory ⇒ Chap. 01-1 – Inspect intake system for leaks – Test throttle valve control unit ⇒ Chap. 24-2

Analysis of display group 001, display field 2 - coolant temperature

Readout on -V.A.G 1552 -	Rectifying fault
below 80 °C	– Conduct test drive if necessary – Test coolant temperature sender ⇒ Chap. 24-1
above 110 °C	– Clean radiator – Test function of the radiator fan – Test coolant thermostat, replace if necessary ⇒ 1.8 I/132 kW Engine, Mechanical Components; Rep. Gr. 19 – Test coolant temperature sender ⇒ Chap. 24-1

Analysis of display group 001, display field 4 - operating states

1	2	3	4	5	6	7	8	Meaning if display position
							1	Coolant temperature more than 80 °C
						1		Speed below 2000 rpm
					1			Throttle valve closed
				1				Lambda control: o.k.
			1					Idling detected
		1						AC compressor disconnected
	1							Catalytic converter temperature above 350 °C
1								No fault detected by self-diagnosis

Display group 002, Basic functions:

• Engine idling						
Reading measured value block 2 xxxx rpm xx.x % x.x ms x.x g/s				← Readout on display		
1	2	3	4	← Display fields	Specification	Analysis
				Drawn in air mass	2...4.5 g/s	⇒ 01-5 page 6
				Average injection period	2.0...4.0 ms	⇒ 01-5 page 6
				Engine load	15,0...25,0 %	---
				Idling speed	---	⇒ 01-5 page 2

Test table - Display group 002

Display field	Readout on -V.A.G 1552 -	Fault cause	Rectifying fault
3	less than 2.0	♦ high fuel volume from the activated charcoal filter system ♦ incorrect injection valve with too great flow rate fitted	– Test solenoid valve for activated charcoal filter ⇒ Chap. 01-1, final control diagnosis – Test injected quantity ⇒ Chap. 24-2
	above 4.0	♦ Increased engine load due to electric consumers, air conditioning system, engaged driving position or power steering to the stop	– Eliminate load
4	less than 2.0	♦ large volume of unmetered air between intake manifold and air-mass meter	– Eliminate unmetered air
	above 4.5	♦ Engine loaded by auxiliary equipment	– Eliminate load (air conditioning, power steering etc.)

Display group 003 - basic functions - air mass meter

• Engine idling						
Reading measured value block 3 xxxx rpm x.x g/s x.x % xx.x ° BTDC				← Readout on display		
1	2	3	4	← Display fields	Specification	Analysis
				Ignition angle	6...12.0 °BTDC	—
				Throttle valve angle	0,2...4,0 %	---
				Drawn in air mass	2.0...4.5 g/s	---
				Engine speed (idling speed)	---	⇒ 01-5 page 2

Analysis of display group 003, display field 3 - throttle valve angle

Readout on -V.A.G 1552 -	Rectifying fault
above 4.0 %	– Adapt engine control unit to throttle valve control unit ⇒ Chap. 24-4 – Interrogate fault memory ⇒ Chap. 01-1 – Test throttle valve control unit ⇒ Chap. 24-2

Display group 004, Basic functions:

• Engine idling						
Reading measured value block 4 →				⇐ Readout on display		
xxxx rpm	xx.xxx V	xxx.x °C	xxx.x °C			
1	2	3	4	⇐ Display fields	Specification	Analysis
				Intake manifold temperature	-48...110.0 °C	⇒ 01-5 page 7
				Coolant temperature	80.0...110.0 °C	⇒ 01-5 page 7
				Supply voltage of the engine control unit	12.000...15.000 V	⇒ 01-5 page 7
				Idling speed	---	⇒ 01-5 page 2

**Note!**

The displayed value must correspond to the ambient temperature.

Test table - Display group 004

Display field	Readout on -V.A.G 1552 -	Fault cause	Rectifying fault
2	below 12.0 V	♦ Generator defective, battery heavily discharged ♦ Vehicle voltage heavily loaded just after start by a high charge current or by auxiliary equipment ♦ Transition resistance in the power supply or earth connection for engine control unit ♦ Current consumption with ignition off	– Test generator and battery voltage, charge battery – Increase engine speed slightly for a few minutes and switch off additional consumers – Inspect engine control unit power supply ⇒ Chap. 24-2 – Eliminate current consumption
	above 15.0 V	♦ Voltage regulator on generator defective ♦ Overvoltage due to starting aid or quick charger	– Test voltage, replace regulator if necessary – Interrogate fault memory ⇒ Chap. 01-1

Display field	Readout on -V.A.G 1552	Fault cause	Rectifying fault
3	below 80 °C	- Engine too cold - Sender for coolant temperature or wiring to engine control unit	- If necessary perform test drive - Test sender resistance -G62- ⇒ Chap. 24-1 - Check wiring to sender and sender -G62- ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
	above 110 °C	- Radiator dirty - Radiator fan not operational - Coolant regulator defective (thermostat) - Sender for coolant temperature or wiring to engine control unit	- Clean radiator - Inspect proper operation - Inspect coolant regulator (thermostat) - Test sender resistance -G62- ⇒ Chap. 24-1 - Check wiring to sender and sender -G62- ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
	constant - 48.0 °C	Line interruption	
	constant 143 °C	Short circuit between wires 3 and 4	
4	constant - 48.0 °C	Line interruption	Interrogate fault memory ⇒ Chap. 01-1
	constant 143 °C	Short circuit between wires 1 and 2	- Test sender resistance -G42- ⇒ Chap. 24-1 - Check wiring to sender and sender -G42- ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations

Display group 005, Basic functions:

- Engine idling - Driving						
Reading measured value block 5				→ Readout on display		
xxxx rpm	xxx %	x km/h	Text			
1	2	3	4	← Display fields	Specification	Analysis
				Operating state (idling, part load, full load, enrichment, overrun)	---	---
				Driving speed	0...230 km/h	---
				Engine load	10...150 %	---
Engine speed					700...6800 rpm	⇒ 01-5 page 2

**Note!**

- ◆ regarding display field 3
- ◆ The source of the speed signal is speedometer sender -G22-. The signal is further regulated in the dash panel insert.
- ◆ The processed signal passes to the contact of the engine control unit and is used for idling speed stabilisation and for damping load change jolts during gearshifts.

Display group 006 - Basic functions

• Engine idling						
Reading measured value block 6 xxxx rpm xxx % xxx.x °C x.x %				← Readout on display		
1	2	3	4	← Display fields	Specification	Analysis
				Level correction factor	-50...20 % ^{a)}	—
				Intake manifold temperature	-45...110.0 °C	—
				Engine load	10...25 %	—
Engine speed (idling speed)					---	⇒ 01-5 page 2

^{a)} Displayed value applies for the mean sea level e.g. 0% = 0m; -50% = 5000m.

**Note!**

- ◆ Regarding display field 3:
- ◆ Specification is a random temperature within the temperature range. The readout must be higher than the temperature of the ambient air.

Display group 010 ignition

• Engine idling						
Reading measured value block 10 xxxx rpm xxx % x.x % xx.x ° BTDC				← Readout on display		
1	2	3	4	← Display fields	Specification	Analysis
				Ignition angle	5...15 °BTDC	—
				Throttle valve angle	0,3...4,0 %	
				Engine load	10...25 %	
Engine speed (idling speed)					---	⇒ 01-5 page 2

Display group 014, ignition-misfiring detection

• Engine idling						
Reading measured value block 14 →				⇐ Readout on display		
xxxx rpm	xx.x %	x	Text			
1	2	3	4	⇐ Display fields	Specification	Analysis
				Status misfiring detection (activated, deactivated)	activated	---
Total of ignition misfirings					0	⇒ 01-5 page 11
Engine load					10...25,0 %	---
Idling speed					---	⇒ 01-5 page 2

Display group 015, ignition - cylinder misfiring 1...3

• Driving						
Reading measured value block 15 →				⇐ Readout on display		
x	x	x	Text			
1	2	3	4	⇐ Display fields	Specification	Analysis
				Status misfiring detection (activated, deactivated)	activated	---
Ignition misfiring cylinder 3					0	⇒ 01-5 page 11
Ignition misfiring cylinder 2					0	⇒ 01-5 page 11
Ignition misfiring cylinder 1					0	⇒ 01-5 page 11

Display group 016, ignition - cylinder misfiring 4

• Normal driving						
Reading measured value block 16 →				⇐ Readout on display		
x	-	-	Text			
1	2	3	4	⇐ Display fields	Specification	Analysis
				Status misfiring detection (activated, deactivated)	activated	---
					---	---
					---	---
Ignition misfiring cylinder 4					0	⇒ 01-5 page 11

Analysis of display group 014, display field 3 and display groups 015 and 016, display fields 1, 2 and 3

Readout on -V.A.G 1552 -	Possible cause of fault	Rectifying fault
above 0	◆ Spark plug defective ◆ Ignition cable termination defective ◆ Ignition coil defective ◆ Power stages if ignition coil defective	– Test spark plugs and ignition cable guide with termination – Test ignition coil ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
	◆ Injection valve defective	– Test injectors ⇒ Chap. 01-1, Final control diagnosis – Test injected quantity and tightness ⇒ Chap. 24-2

Display group 020, ignition - knock control

• Normal driving						
Reading measured value block 20 →				⇐ Readout on display		
xx.x °KW	xx.x °KW	xx.x °KW	xx.x °KW			
1	2	3	4	⇐ Display fields	Specification	Analysis
				Ignition angle relief cylinder 4 through knock control	0.0...12.75 °CA	⇒ 01-5 page 11
				Ignition angle relief cylinder 3 through knock control	0.0...12.75 °CA	⇒ 01-5 page 11
				Ignition angle relief cylinder 2 through knock control	0.0...12.75 °CA	⇒ 01-5 page 11
				Ignition angle relief cylinder 1 through knock control	0.0...12.75 °CA	⇒ 01-5 page 11

**Note!**

At idling speed the displayed value is 0.0 °CA

Display group 020, display fields 1 ...4 - Ignition angle relief

Readout on -V.A.G 1552 -	Possible cause of fault	Rectifying fault
all cylinders greater than 12.0 °CA	◆ Knock sensor defective	– Testing knock sensor ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
	◆ Plug connection corroded	
	◆ Knock sensor not correctly tightened	– Slacken knock sensor and tighten again to 20 Nm
	◆ Engine parts loose	– Tighten loose parts
	◆ poor fuel quality	– Change type of fuel

Readout on -V.A.G 1552 -	Possible cause of fault	Rectifying fault
one cylinder differs significantly from the others	♦ Plug connection corroded	– Testing knock sensor⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
	♦ Engine damaged	– Testing compression pressure ⇒ 1.8 l/132 kW Engine, Mechanical Components; Rep. Gr. 15
	♦ Engine parts loose	– Tighten loose parts

Display group 028, ignition - testing knock sensor

• Normal driving						
Reading measured value block 28 xxxx rpm xxx.x % xxx.x °C Text				← Readout on display		
1	2	3	4	← Display fields	Specification	Analysis
				Test knock sensor (Test OFF, Test ON / Syst. O.K. / Syst. N.O.K.)	Syst. O.K.	—
				Coolant temperature	40...110 °C	
				Engine load	10...150 %	—
				Engine speed	1800...6800 rpm	—

Display group 030, Lambda control

• Engine idling						
Reading measured value block 30 xxx xxx --- ---				← Readout on display		
1	2	3	4	← Display fields	Specification	Analysis
					---	---
					---	---
				Status lambda control downstream of catalytic converter	110	⇒ 01-5 page 13
				Status lambda control upstream of catalytic converter	111	⇒ 01-5 page 13



Note!

- ♦ The specified values are reached faster by increasing the engine speed.
- ♦ The first position in the display number briefly switches between 0 and 1 (lambda probe heater on/off).
- ♦ Lambda probe downstream of catalytic converter is inactive without engine load.

Meaning of 3-digit numerical block in display fields 1 and 2:

1	2	3	Meaning, if display positions = 1
		1	Lambda control active
	1		Lambda probe operational
1			Lambda probe heater switched on

01-6 Self-diagnosis VI

Display groups 032...046

Display group 032, lambda control (lambda learned values)

- Engine idling - Control unit in function 04 „Initiate basic setting“						
System in basic setting 32 →				⇐ Readout on display		
x.x %		xx.x %				
1	2	3	4	⇐ Display fields	Specification	Analysis
					---	---
					---	---
		Lambda learned value under partial load (multiplicative)			-10,0...10,0 %	⇒ 01-6 page 2
		Lambda learned value in idling (additive)			-10,0...10,0 %	⇒ 01-6 page 2



Note!

- ♦ Low readouts indicate that the engine is running too rich and the lambda control therefore produces a leaner mixture.
- ♦ High readouts mean that the engine is running too lean and the lambda control therefore produces a richer mixture.
- ♦ If the control unit is dead all initialisation values are reset.
- ♦ add = additive - The fault (e.g. unmetered air) has an increasingly reduced effect as engine speed rises. In the case of an additive initialisation value the injection period is changed by a fixed rate. This rate is independent of the basic injection period.
- ♦ mul = multiplicative - The fault (e.g. faulty injector) has an increasingly intense effect as engine speed rises. The multiplicative learned value is a percentage change in the injection period. This change is dependent on the basic injection period.
- ♦ Initiate learning process: Control unit in basic setting (address word 04)
- ♦ Initialisation conditions for idling: Idling, coolant temperature at least 75 °C, intake air temperature max. 90 °C.
- ♦ Initialisation conditions at partial load: Coolant temperature at least 75 °C, intake air temperature max. 90 °C.

Analysis of display group 032, display fields 1 and 2 - lambda learned values

Readout on - V.A.G 1552 -	Possible cause of fault	Rectifying fault
low learned values	◆ low learned values in idling at normal lambda partial load learned values: Oil dilution (higher fuel content in the oil) possible ◆ Injection valve leaks ◆ Fuel pressure too high ◆ Solenoid valve for activated charcoal filter constantly open ◆ Air-mass meter defective ◆ Lambda probe heating defective or lambda probe dirty	– Disappears after driving on motorway or changing oil – Test injection valves ⇒ Chap. 24-2 – Test fuel pressure regulator and holding pressure ⇒ Chap. 24-2 – Test valve -N80- ⇒ Chap. 01-1, final control diagnosis – Check sender -G70- in measured value block, display group 002 – Test lambda probe -G39- and lambda control upstream of catalytic converter ⇒ Chap. 24-3
high learned values	◆ high idling learned values at less high lambda partial load learned values: Unmetered air in intake manifold region possible ◆ Injection valve leaks ◆ Display fields 1 and 2: Air-mass meter defective ◆ Fuel pressure too low ◆ Unmetered air between air-mass meter and throttle valve ◆ Unmetered air at the manifold gasket ◆ Lambda probe heating defective or lambda probe dirty	– Testing intake system for leaks ⇒ Chap. 24-2 – Test injected quantity and tightness ⇒ Chap. 24-2 – Check sender -G70- in measured value block, display group 002 – Test fuel pressure regulator and holding pressure ⇒ Chap. 24-2 – Eliminating unmetered air ⇒ Chap. 24-2 – Eliminate leak – Test lambda probe -G39- and lambda control upstream of catalytic converter ⇒ Chap. 24-3

Display group 033, lambda control (lambda learned values)

• Engine idling • Control unit in function 04 „Initiate basic setting“						
System in basic setting 33 →				← Readout on display		
xx.x %		x.xxx V				
1	2	3	4	← Display fields	Specification	Analysis
					---	---
					---	---
		Lambda probe voltage upstream of catalytic converter			0.0...5.0 V	⇒ 01-6 page 3
	Lambda controller upstream of catalytic converter				-10,0...10,0 %	---

**Note!**

- ♦ Voltage signal is generated and smoothened by the engine control unit.
- ♦ If the specified values are not reached: Conduct a test drive in order to eliminate any residues on the lambda probe and repeat the test.

Analysis of display group 033, display field 2 - lambda probe voltage upstream of catalytic converter

Readout on -V.A.G 1552 -	Possible cause of fault	Rectifying fault
above 5.000 V	♦ Line short-circuit to positive in the line from the engine control unit to the lambda probe ♦ Lambda probe defective	– Check lambda probe wire upstream of catalytic converter ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations – Replace lambda probe upstream of catalytic converter
below 0.130 V	♦ Line short-circuit to earth in the line from the engine control unit to the lambda probe ♦ Lambda probe defective	

Display group 034, lambda control - diagnosis of lambda probe ageing

• Vehicle stationary, engine running at fast idling^{a)} • Brake pedal and accelerator depressed^{b)} • Control unit in function 04 „Initiate basic setting“ • Catalytic converter temperature in display field 2 must be at least 350 °C			
System in basic setting 34 → xxxx xxx.x °C x.xx Text rpm			
⇐ Readout on display			
1	2	3	4
⇐ Display fields			
Result of test of lambda probe ageing upstream of catalytic converter (Test OFF/Test ON/B1 S1 O.K./B1-S1 N.O.K.)			
Period of lambda probe upstream of catalytic converter			
Catalytic converter temperature			
Engine speed			
		Specification	Analysis
		B1-S1 O.K.	---
		0,5...2,5	---
		280...500 °C	---
		1800...2200 rpm	---

^{a)} For vehicles ➤ 04.01

^{b)} For vehicles 05.01 ➤ (Engine speed is raised to 1800... 2200 rpm by engine control unit)

**Note!**

- ♦ regarding display field 2
- ♦ Value determined by engine speed and engine load.

i Note!

- ♦ regarding display fields 3 and 4
- ♦ The period indicates the time between two jumps (e.g. mixture rich - lean - rich) and is thus a measure of the ageing of the lambda probe. If the prescribed time is exceeded, the display in display field 4 = B1-S1 N.O.K..

i Note!

- ♦ regarding display field 4
- ♦ This diagnosis process may take a few minutes.

Display group 036, lambda control - preparation downstream of catalytic converter

• Vehicle standing, engine running at high speed^{a)} • Brake pedal and accelerator depressed^{b)} • Control unit in function 04 „Initiate basic setting“			
System in basic setting 36 →		← Readout on display	
x.xxx V	Text		
1	2	3	4
		← Display fields	Specification
			Analysis

		Test lambda probe downstream of catalytic converter (Test OFF/Test ON/B1-S2 N.O.K.)	B1-S2 O.K.

		Lambda probe voltage downstream of catalytic converter	0.000...1.000 V ⇒ 01-6 page 5

^{a)} For vehicles > 04.01

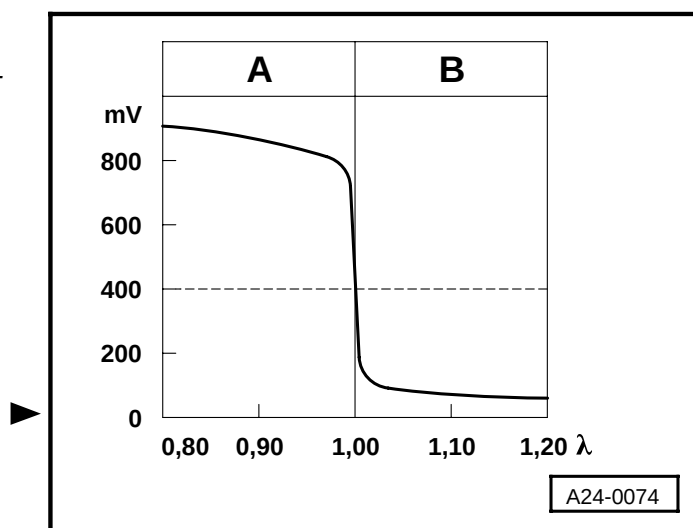
^{b)} For vehicles 05.01 > (Engine speed is raised to 1800... 2200 rpm by engine control unit)

i Note!

- ♦ The voltage signal „mixture rich (little residual oxygen)“ is at approx. 0.700...0.900V.
- ♦ Voltage signal „Mixture lean (high level of residual oxygen)“ is at approx. 0,000...0,300 V.
- ♦ A voltage jump from 0.700..0.900 V to 0.000...0.300 V or vice versa takes place at the transition from „rich“ to „lean“ and vice versa ($\lambda = 1.0$).
- ♦ In view of the steep voltage jump the lambda control is not able to maintain constant the ideal mixture composition which corresponds to $\lambda = 1.0$. The control constantly fluctuates back and forward between the „slightly too lean“ and „slightly too rich“ states.
- ♦ The control value ratio between rich and lean mixture is approx. 0.630 V.

Voltage of the 4-pin lambda probe in mV**i Note!**

- ♦ A: Lambda probe voltage high
- ♦ rich mixture (fuel surplus or air shortage)
- ♦ high CO value



- ♦ *B: Lambda probe voltage low*
- ♦ *lean mixture (fuel shortage or air surplus)*
- ♦ *low CO value*

Analysis of display group 036, display field 1 - lambda probe voltage, lambda probe downstream of catalytic converter

Display field: 1	Possible cause of fault	Rectifying fault
constant 1.085 V	♦ Short circuit to positive through: Lambda probe, lambda probe cable, earth lead, engine control unit	– Test lambda probe -G130- and lambda control downstream of catalytic converter ⇒ Chap. 24-3 – Test lambda probe cable downstream of catalyst ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
constant 0.400 ...0.500 V	♦ Line interruption through: Lambda probe, lambda probe cable, earth lead, engine control unit	
constant 0.000 V	♦ Short circuit to earth through: Lambda probe, lambda probe cable, earth lead, engine control unit	

Display group 037, diagnosis of lambda control system

• Vehicle standing, engine running at high speed approx. 2000 rpm^{a)} • Brake pedal and accelerator depressed^{b)} • Control unit in function 04 „Initiate basic setting“						
System in basic setting 37 →				⇐ Readout on display		
xx.x %	x.xxx V	x.xxx	Text			
1	2	3	4	⇐ Display fields	Specification	Analysis
				Lambda probe (Test ON/ Test OFF / Syst. O.K. / Syst. N.O.K.)	Syst. O.K.	---
				Correction value between lambda probe upstream and downstream of catalytic converter	-0,02...0,02	---
				Lambda probe voltage downstream of catalytic converter	0.000...1.000 V	⇒ 01-6 page 5
Engine load					10,0...150,0 %	---

^{a)} For vehicles ➤ 04.01

^{b)} For vehicles 05.01 ➤ (Engine speed is raised to 1800... 2200 rpm by engine control unit)



Note!

If the specified values are not reached: Conduct a test drive in order to eliminate any residues on the lambda probe and repeat the test.



Note!

- ♦ *regarding display field 2*
- ♦ *Lambda probe voltage downstream of catalytic converter may remain constant.*

**Note!**

- ♦ regarding display field 3
- ♦ If the lambda probe voltage is O.K. after a test drive and if the correction value between lambda probe upstream and downstream of the catalytic converter is above value 0.02 this means that the lambda probe upstream of the catalytic converter has aged.

Analysis of display group 037, display field 2

Readout on -V.A.G 1552 -	Possible cause of fault	Rectifying fault
constant 0.450 V	♦ Line interruption in line 4 from the engine control unit to the lambda probe ♦ Line interruption in line 3 from the engine control unit to the lambda probe	– Test lambda probe -G130- and lambda control downstream of catalytic converter ⇒ Chap. 24-3
above 0.950 V	♦ Short-circuit to positive in line 4 from the engine control unit to the lambda probe	– Test lambda probe cable downstream of catalyst ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
below 0.100 V	♦ Short-circuit to earth in line 4 from the engine control unit to the lambda probe	

Display group 041, diagnosis lambda probe heater

• Coolant temperature minimum 80 °C • Control unit in function 04 „Initiate basic setting“						
System in basic setting 41 →				← Readout on display		
Text		x.x Ohms	Text			
1	2	3	4	← Display fields	Specification	Analysis
				Lambda probe heater downstream of catalytic converter	Htg dC.OFF Htg dC.ON	---
				Resistance of lambda probe heater downstream of catalytic converter	0...2.0 kΩ	---
				Lambda probe heater upstream of catalytic converter	Htg.uC.OFF Htg.uC.ON	---

**Note!**

Depending on the engine operating condition the lambda probe heater is switched on or switched off.

Display group 043, diagnosis lambda probe ageing downstream of catalytic converter

- Vehicle standing, engine running at high speed^{a)} - Brake pedal and accelerator depressed^{b)} - Control unit in function 04 „Initiate basic setting“						
System in basic setting 43 →				⇐ Readout on display		
xxxx rpm	xxx.x °C	x.xxx V	Text			
1	2	3	4	⇐ Display fields	Specification	Analysis
				Test lambda probe (Test OFF / Test ON, B1-S2 O.K. / B1-S2 N.O.K.)	B1-S2 O.K.	---
				Lambda probe voltage downstream of catalytic converter	0.000...1.000 V	---
				Catalytic converter temperature	280...600 °C	---
Engine speed					1800...2200 rpm	---

^{a)} For vehicles ➤ 04.01

^{b)} For vehicles 05.01 ➤ (Engine speed is raised to 1800... 2200 rpm by engine control unit)

Display group 046, lambda control - diagnosis of catalytic converter

- Vehicle standing, engine running at high speed^{a)} - Brake pedal and accelerator depressed^{b)} - Control unit in function 04 „Initiate basic setting“						
System in basic setting 46 →				⇐ Readout on display		
xxxx rpm	xxx.x °C	x.xx	Text			
1	2	3	4	⇐ Display fields	Specification	Analysis
				Test result of catalytic conversion (Test OFF / Test ON / Cat B1 O.K. / Cat B1 N.O.K.)	Cat B1 O.K.	---
				Catalytic conversion	0...0,5	---
				Catalytic converter temperature	280...600 °C	---
Engine speed					1800...2200 rpm	---

^{a)} For vehicles ➤ 04.01

^{b)} For vehicles 05.01 ➤ (Engine speed is raised to 1800... 2200 rpm by engine control unit)

01-7 Self-diagnosis VII

Display groups 050...126

Display group 050, engine speed control (operating conditions)

• Engine idling						
Reading measured value block 50 xxxx rpm xxxx rpm Text Text rpm				← Readout on display		
1	2	3	4	← Display fields	Specification	Analysis
				Operating conditions air conditioning compressor (ON/OFF)	Compr. ON Compr. OFF	---
				Operating condition of air conditioning system	A/C High A/C Low	---
				Engine speed - specified value:	760 rpm	---
				Engine speed - actual value	---	⇒ Chap. 01-5



Note!

- ♦ *AC compressor deactivation: If full engine power is required during vehicle acceleration the engine control unit will disconnect the compressor on the standing vehicle or at low speed (1st gear) for approx. 6 seconds. If the accelerator pedal is briefly pressed the deactivation time drops to at least 3 seconds.*
- ♦ *Shortly before activating the AC compressor the voltage is applied to the engine control unit. This signal ensures the engine control unit maintains the idling at a constant speed given load differences in the air conditioning system.*

Display group 053, speed increase with raised generator load

• Engine idling						
Reading measured value block 53 xxxx rpm xxxx rpm xx V xxx %				← Readout on display		
1	2	3	4	← Display fields	Specification	Analysis
				Generator load	0...100 %	—
				Vehicle voltage	12...15 V	---
				Engine speed - specified value:	700...1400 rpm	—
				Engine speed - actual value	700...1400 rpm	---

Display group 056, engine speed control (idling speed stabilisation)

• Engine idling						
Reading measured value block 56 →				← Readout on display		
xxxx rpm	xxxx rpm	x.xx %	xxxxx			
1	2	3	4	← Display fields	Specification	Analysis
				Operating conditions	00000	---
				Idling regulator	-4,3...12,2 %	---
				Idling speed - specified value:	760 rpm	---
Idling speed					---	⇒ Chap. 01-5

**Note!**

- ♦ regarding display field 2
- ♦ What is displayed is the specification for the engine speed which is fixed by the engine control unit (internal computed value in control unit).

Meaning of the 5-digit numerical block display field 4

Meaning, if display positions = 1					
1	2	3	4	5	Meaning
				0	AC compressor: 1 = on, 0 = off
			0		Gearbox: always „0“
		0			air conditioning system ready: 1 = on, 0 = off
	0				always „0“
0					Steering wheel position: 0 = straight ahead, lightly against stop; 1 = on stop, while turning

Display group 060, engine speed control (adapting throttle valve control unit)

• Ignition on, engine stopped						
• Control unit in function 04 „Initiate basic setting“						
System in basic setting 60 →				← Readout on display		
xx %	xx %	x	Text			
1	2	3	4	← Display fields	Specification	Analysis
				Adaptation status (ADP running, ADP O.K. or ADP ERROR)	ADP. o.k.	---
				Learned stage counter	0...8	---
				Throttle valve angle (potentiometer 2 -G188 -)	97...3 %	---
				Throttle valve angle (potentiometer 1 -G187-)	3...93 %	---

**Note!**

- ♦ When display group 060 is selected in function 04 „Initiate basic setting“ the throttle valve control unit is adapted to the engine control unit. This adaptation

must be carried out if another throttle valve control unit (or complete engine), or another engine control unit, has been installed.

- ♦ *During adaptation the counter in the display field counts 3 to 8.*

**Note!**

- ♦ *regarding display field 4*
- ♦ *If „ERROR“ appears on the display, interrogate fault memory ⇒ Chap. 01-1.*

Display group 062, Electronic throttle system

• Ignition on, engine stopped						
Reading measured value block 62 →				← Readout on display		
xx %	xx %	xx %	xx %			
1	2	3	4	← Display fields	Specification	Analysis
				Sender 2 for accelerator pedal position - G185-	0...100 %	---
				Sender 1 for accelerator pedal position -G79-	12...97 %	---
				Throttle valve angle (potentiometer 2 -G188 -)	97...3 %	---
				Throttle valve angle (potentiometer 1 -G187-)	3...93 %	---

**Note!**

- ♦ *The engine control unit converts the voltage values of the accelerator pedal position sender in percentage (in relation to 5 Volts). A 5 V voltage supply corresponds to 100 %.*
- ♦ *If the accelerator pedal is fully pressed down, the specified value range changes.*
- ♦ *The value displayed in display field 3 must always be approximately double the value in display field 4.*

Display group 066, Cruise Control System:

• Engine idling						
Reading measured value block 66 →				← Readout on display		
xxx km/h	xxxxxxxx	xxx km/h	xxxxxxxx			
1	2	3	4	← Display fields	Specification	Analysis
				CCS switch position	0000xxxx	⇒ 01-7 page 4
				Specified vehicle speed (value last stored by CCS)	0 km/h	---
				Switch position of CCS, brake and clutch	0000xxxx	⇒ 01-7 page 4
				Driving speed	0 km/h	---

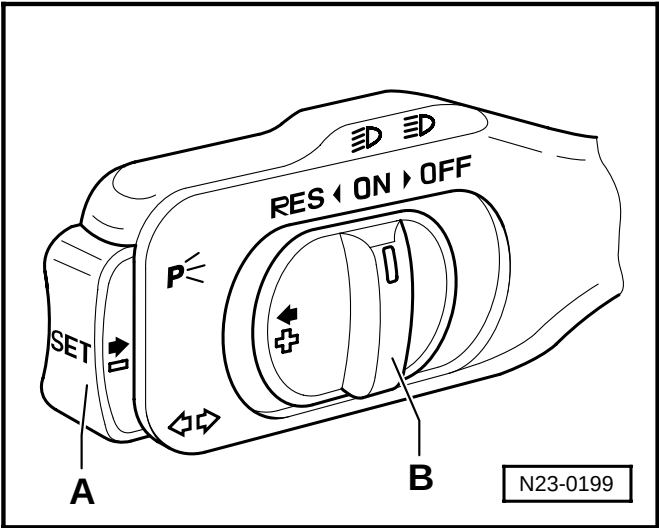
Note!

With the exception of an operating switch the CCS does not have any components of its own. All functions are performed by the engine control unit. The minimum vehicle speed for the CCS function is 30 km/h.

Meaning of 8-digit numerical block - display group 066, display field 2

Meaning of the digits in the 8-digit numerical block								Diagnosis function
1	2	3	4	5	6	7	8	
						1		• Brake pedal depressed (brake light switch)
						1		• Brake pedal depressed (brake light switch)
					1			• Clutch pedal depressed
				1				• CCS actuated
			x					No meaning
		x						No meaning
	x							No meaning
x								No meaning

Meaning of 8-digit numerical block - display group 066, display field 4



Meaning of the digits in the 8-digit numerical block								Diagnosis function
1	2	3	4	5	6	7	8	
				0	0	1	1	• Switch B on -ON-
				1	0	1	1	• Switch B on -RES-
				0	1	1	1	• Switch A operated
				0	0	0	1	• Switch B to -OFF- before operating point
				0	0	0	0	• Switch B locked to -OFF-
0	0	0	0					No meaning

Display group 070 - exhaust gas reduction - diagnosis of activated charcoal filter system

• Engine idling • Coolant temperature minimum 80 °C • Control unit in function 04 „Initiate basic setting“						
System in basic setting 70 →				⇐ Readout on display		
xx %	xx.x %	-	Text			
1	2	3	4	⇐ Display fields	Specification	Analysis
				Result of diagnosis (Test ON / Test OFF, TVV O.K. / TVV N.O.K. or interruption)	TVV O.K.	---
					---	---
Lambda controller variation during TVV diagnosis					-7,0...7,0 %	---
On/off ratio of activated charcoal filter solenoid valve					0...100 %	---

**Note!**

TVV means Tank Vent Valve (activated charcoal filter solenoid valve). Diagnosis can only be initiated once each time the engine is started.

Display group 077, diagnosis of secondary air injection system

• Engine idling • Control unit in function 04 „Initiate basic setting“						
System in basic setting 77 →				⇐ Readout on display		
xxxx rpm	x.x g/s	xx.x %	Text			
1	2	3	4	⇐ Display fields	Specification	Analysis
				Test result: Test ON/ Test OFF / Syst. O.K. / Syst. N.O.K., interruption)	Syst. O.K.	---
Air mass ratio, secondary air injection system					-100...100 %	---
Air mass					1...10 g/s	---
Engine speed (idling speed)					---	⇒ Chap. 01-5

**Note!**

If „Syst. N.O.K.“ appears on the display, interrogate fault memory ⇒ Chap. 01-1.

Display group 086 - Readiness code

• Ignition on, engine stopped						
Reading measured value block 86 00000000 xxxxxxxx xxxxxxxx - x x				← Readout on display		
1	2	3	4	← Display fields	Specification	Analysis
					---	---
Diagnosis status					xxxxxxx	---
Diagnosis status					xxxxxxx	---
Readiness code (text completed)					00000000	⇒ 01-7 page 6

**Note!**

Display field 1 indicates systems on which a test must be performed if the display indicates „1“ instead of „0“.

Meaning of 8-digit numerical block - display group 086, display field 1

Readiness code is only generated if a 0 is shown at all places								Diagnosis function
1	2	3	4	5	6	7	8	
							0	Catalytic converter
						0		always „0“
					0			Activated charcoal filter (tank vent system)
				0				Secondary air system
			0					always „0“
		0						Lambda probes
	0							Lambda probe heater
0								always „0“

Display group 113 - Charge pressure control

• Driving						
Reading measured value block 113 xxxx rpm xxx % xxx % xxxx mbar				← Readout on display		
1	2	3	4	← Display fields	Specification	Analysis
				Atmospheric pressure	500...1200 mbar	—
Throttle valve angle (potentiometer 1 -G187)					0...100 %	—
Engine load					10...150 %	—
Engine speed					700...6800 rpm	—

Analysis of display group 113, display field 4

Mean sea level	Air pressure
0 m	998 mbar
500 m	954 mbar
1000 m	902 mbar
1500 m	853 mbar
2000 m	805 mbar
2500 m	756 mbar
3000 m	704 mbar
3500 m	655 mbar
4000 m	607 mbar

**Note!**

The value may deviate depending on the weather conditions.

Display group 114 - Charge pressure control

• Driving						
Reading measured value block 114 →				← Readout on display		
xxx %	xxx %	xxx %	xxx %			
1	2	3	4	← Display fields	Specification	Analysis
				On/off ratio (actuation) of solenoid valve for charge pressure control	0...100 %	—
				Engine load	10...150 %	—
				Max. filling for turbo operation	10...150 %	—
Max. filling					10...150 %	—

Display group 115 - Charge pressure control

• Driving						
Reading measured value block 115 →				← Readout on display		
xxxx rpm	xxx %	xxx mbar	xxx mbar			
1	2	3	4	← Display fields	Specification	Analysis
				Charge pressure - momentary value	Ambient pressure ...2200 mbar	—
				Charge pressure - specified value	Ambient pressure ...2200 mbar	—
				Engine load	10...150 %	—
Engine speed					700...6800 rpm	—

Display group 117 - Charge pressure control

• Driving						
Reading measured value block 117 xxxx rpm xxx % xxx % xxx mbar				← Readout on display		
1	2	3	4	← Display fields	Specification	Analysis
				Charge pressure - specified value	Ambient pressure ...2200 mbar	—
				Throttle valve angle	0...100 %	—
				Sender for accelerator pedal position	0...100 %	—
Engine speed					700...6800 rpm	—

Display group 118 - Charge pressure control

• Driving						
Reading measured value block 118 xxxx rpm xxx °C xxx % xxx mbar				← Readout on display		
1	2	3	4	← Display fields	Specification	Analysis
				Charge pressure - momentary value	Ambient pressure ...2200 mbar	—
				On/off ratio (actuation) for solenoid valve of the charge pressure control	0...95 %	—
				Intake manifold temperature	max. 110 °C	—
Engine speed					700...6800 rpm	—

Display group 120 - traction control system -TCS-

• Driving						
Reading measured value block 120 xxxx rpm xxx Nm xxx Nm Text				← Readout on display		
1	2	3	4	← Display fields	Specification	Analysis
				Status	Status (TCS active / TCS not active)	—
				Actual engine load	0...260 Nm	—
				Nominal engine load	0...440 Nm	—
Engine speed					700...6800 rpm	—

Display group 122 - Gearbox

• Driving						
Reading measured value block 122				← Readout on display		
xxxx rpm	xxx Nm	xxx Nm	Text			
1	2	3	4	← Display fields	Specification	Analysis
				Status (engaged/not engaged)	Text	—
				Actual engine load	0...260 Nm	—
				Specified gearbox load	0...440 Nm	—
				Engine speed	700...6800 rpm	—

Display group 125 - communication, databus messages

• Engine idling						
Reading measured value block 125				← Readout on display		
—	Text	Text	—			
1	2	3	4	← Display fields	Specification	Analysis
					—	—
				Status of combiinstrument	Combi 1	—
				Status ABS	ABS 1	—
					—	—

Display group 126 - communication, databus messages

• Engine idling						
Reading measured value block 126				← Readout on display		
—	—	Text	—			
1	2	3	4	← Display fields	Specification	Analysis
					—	—
				Status airbag	Airbag 1	—
					—	—
					—	—

Analysis of display groups 125 and 126

Readout on -V.A.G 1552 -	Possible cause of fault	Rectifying fault
instead of 1 is 0	♦ CAB-BUS wiring defective ♦ CAN-BUS databus not used - control unit ♦ CAB-BUS databus defective - control unit	— Perform all automatic test sequence of all fault memories

24 – Fuel Formation, Injection

24-1 Repairing the injection system

Repairing the injection part

Repairing the ignition part ⇒ Rep. Gr. 28



Note!

- ♦ *The control unit for the injection and ignition system is equipped with a fault memory. Before repairs, setting operations and fault finding interrogate the fault memory and inspect the vacuum connections (unmetered air).*
- ♦ *Do not use sealants containing silicone. Traces of silicone elements drawn in by the engine are not burnt in the engine and damage the lambda probe.*
- ♦ *Components marked with an * are checked by self-diagnosis ⇒ Chap. 01-1, interrogate fault memory.*
- ♦ *Components marked with an ** are checked by actuator diagnosis ⇒ Chap. 01-1.*
- ♦ *A minimum voltage of 11.5 V is required for the perfect functioning of the electric components.*
- ♦ *If after the troubleshooting, repair or inspection of components the engine starts briefly and then stops, it is possible that the immobiliser blocks the 4AV control unit. Then interrogate the fault memory and if necessary adapt the control unit ⇒ Electrical System; Rep. Gr. 96.*
- ♦ *Certain inspections may cause the control unit to detect and store a fault. It is therefore necessary to interrogate the fault memory after having completed all inspections and repairs, and if necessary erase ⇒ Chap. 01-1, interrogate and erase fault memory.*

Whenever the fault memory is erased, it is necessary to generate a readiness code ⇒ Chap. 01-4.

Safety measures ⇒ **24-1** page 7.

Cleanliness rules ⇒ **24-1** page 7.

Test intake system for tightness (unmetered air) ⇒ Chap. 24-2.

Overview of fitting location

1 - Activated charcoal filter system solenoid valve 1 -N80-

- ☐ Activated charcoal filter system $\Rightarrow$ 1.8 I/132 kW Engine - Mechanical Components; Rep. Gr. 20
- ☐ required resistance 22...33 Ω

2 - Hall sender - G40-

- ☐ $\Rightarrow$ Chap. 28-1

3 - 6-pin plug and socket connector

- ☐ black for lambda probe 1 upstream of catalytic converter -G39- and lambda probe heater -Z19-
- ☐ on underside of vehicle on the right under a cover

4 - 4-pin plug connector

- ☐ brown for lambda probe 2 downstream of catalytic converter -G130- and lambda probe heater -Z29-
- ☐ on underside of vehicle on the right under a cover

5 - 4AV Control unit -J220-

6 - Ignition coils with power output stage -N70-, -N127-, -N291- and -N292-

7 - Solenoid valve for charge pressure control -N75-

- ☐ desired resistance: 25...35 Ω

8 - Air mass meter -G70-

9 - Secondary air pump relay -J299-

10 - Clutch pedal switch -F36-, brake light switch -F and brake pedal switch -F47-

11 - Sender for coolant temperature -G62-

12 - Solenoid valve for camshaft adjustment

- ☐ desired resistance: 12...18 Ω

13 - Injector -N30-...-N33-

14 - Fuel pressure regulator

15 - Engine speed sender -G28 -

- ☐ inductive pickup
- ☐ desired resistance: 730...1000 Ω

16 - Knock sensor 2 -G66-

17 - Activated charcoal filter solenoid valve -N249-

18 - Triple-pin plug and socket connector -G28-

- ☐ for engine speed sender

19 - Secondary air pump -V101-

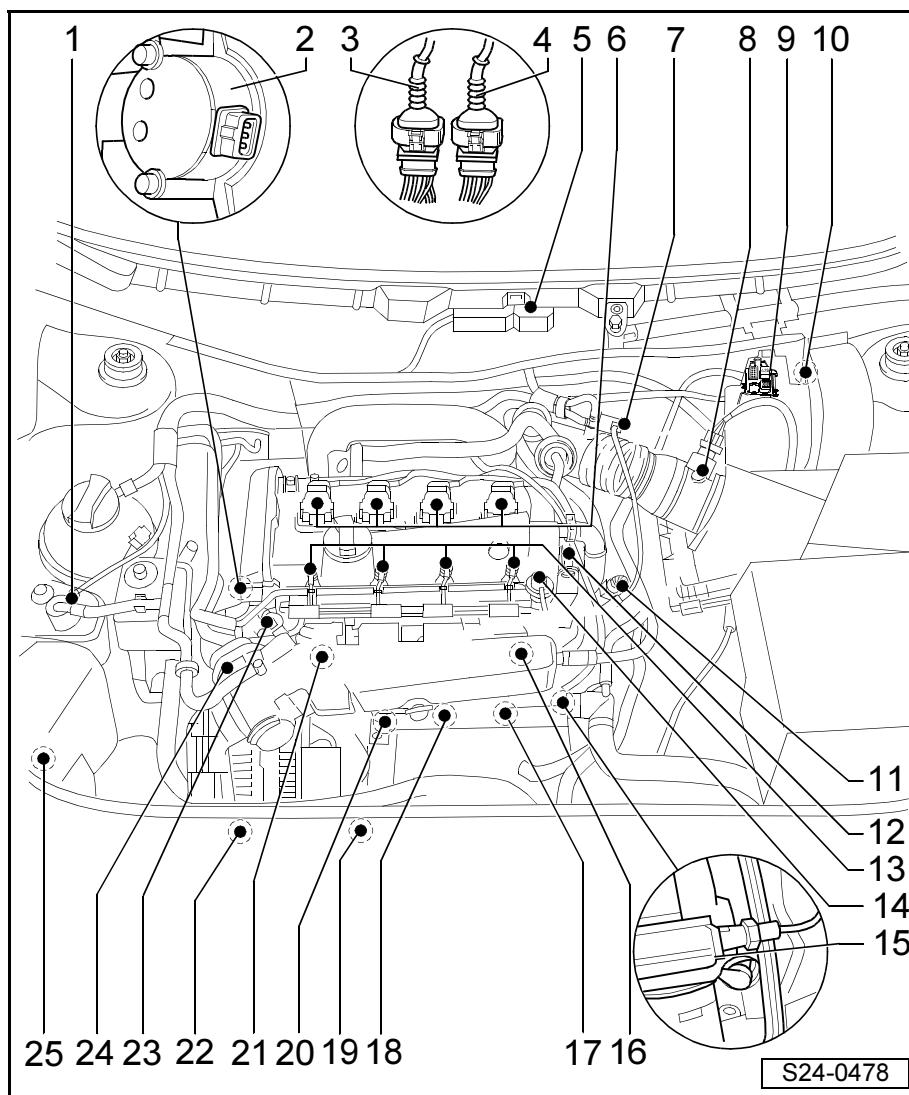
20 - Secondary air inlet valve -N112-

21 - Knock sensor 1 -G61-

22 - PAS pressure switch - F88-

- ☐ desired resistance: ∞ Ω
- ☐ Steering wheel at limit stop approx. 0 Ω

23 - Intake air temperature sender - G42-



S24-0478

24 - Throttle valve control unit -J338 -

25 - Charge pressure sender -G31-

Parts of injection system - Summary of components

1 - Air filter

- disassembling and assembling ⇒ **24-1** page 6

2 - 10 Nm

3 - 6 Nm

4 - Vacuum hose

- to intake manifold

5 - Connecting plug

- 40-pin
- insert or remove plug when the ignition is switched off
- unlock to remove

6 - Connecting plug

- 81-pin
- insert or remove plug when the ignition is switched off
- unlock to remove

7 - Motronic control unit -J220-*

- Fitting location: at centre of plenum chamber
- testing voltage supply ⇒ Chap. 24-2
- procedure if voltage interrupted ⇒ Chap. 24-2
- after replacing perform basic setting ⇒ Chap. 24-4
- replacing ⇒ Chap. 24-4

8 - 4-pin plug connector

- brown for lambda probe 2 downstream of catalytic converter -G130- and lambda probe heater -Z29-

- Fitting location ⇒ **24-1** page 2, Overview of fitting locations

9 - Connecting plug

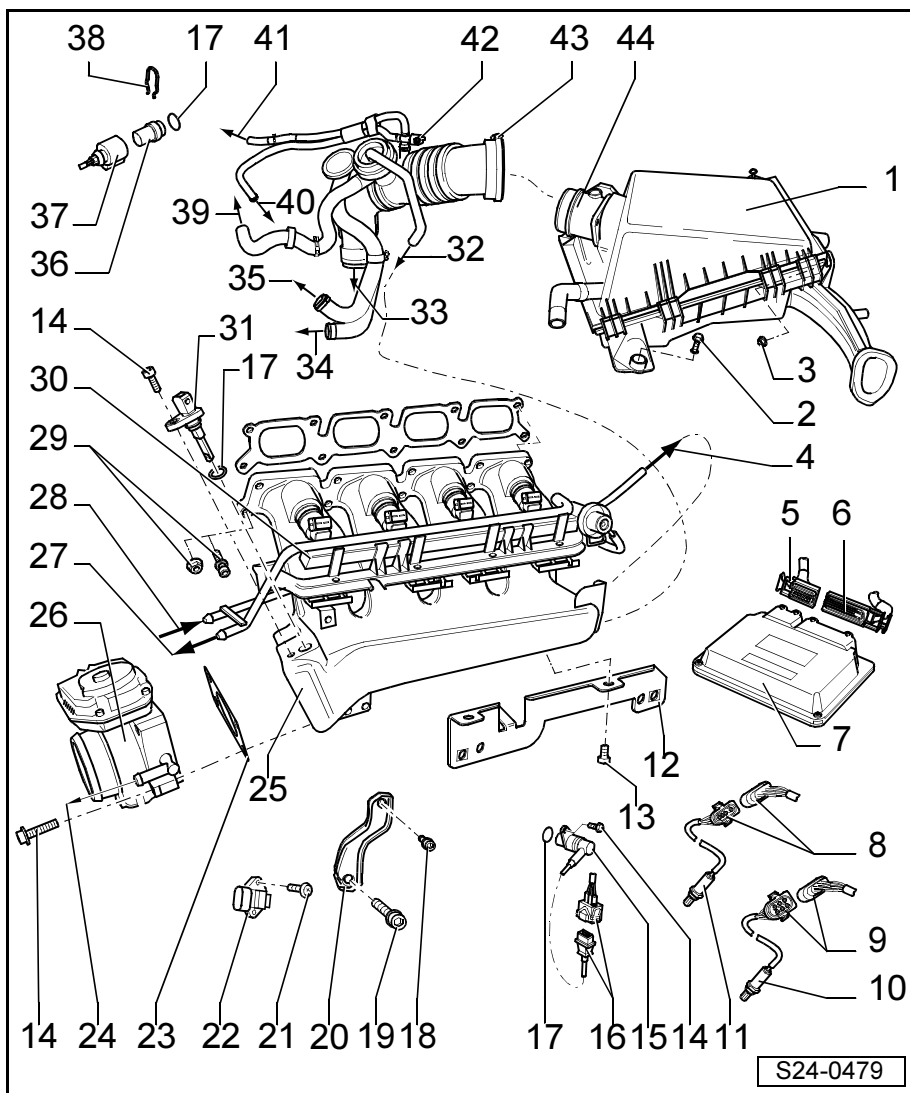
- 6-pin
- black for lambda probe 1 upstream of catalytic converter -G39- and lambda probe heater -Z19-
- Fitting location ⇒ **24-1** page 2, Overview of fitting locations

10 - Lambda probe 1 upstream of catalytic converter -G39 -*, 50 Nm

- Fitting location: exhaust tube front
- only grease thread with hot screw paste „G 052 112 A3“; hot screw paste must not get into the slots of the probe body.
- Test lambda probe -G39- and lambda control upstream of catalytic converter ⇒ Chap. 24-3
- voltage for probe heater supply through fuel pump relay -J17-

11 - Lambda probe 2 downstream of catalytic converter -G130 -*, 50 Nm

- Fitting location: downstream of catalytic converter
- only grease thread with hot screw paste „G 052 112 A3“; hot screw paste must not get into the slots of the probe body.
- Test lambda probe -G130- and lambda control downstream of catalytic converter ⇒ Chap. 24-3
- voltage for probe heater supply through fuel pump relay - J17-



12 - Bracket**13 - 10 Nm****14 - 10 Nm****15 - Engine speed sender -G28 -***

- ☐ desired resistance: 730...1000 Ω

16 - Triple-pin plug and socket connector

- ☐ grey
- ☐ for engine speed sender
- ☐ Fitting location ⇒ **24-1** page 2, Overview of fitting locations

17 - O-ring

- ☐ replace if damaged

18 - 20 Nm**19 - 45 Nm****20 - Support**

- ☐ between intake manifold and engine block

21 - 6 Nm**22 - Charge pressure sender -G31-****23 - Gasket**

- ☐ replace

24 - To activated charcoal filter solenoid valve -N80-

- ☐ Connect activated charcoal filter ⇒ 1.8 I/132 kW Engine, Mechanical Components; Rep. Gr. 20

25 - Intake manifold**26 - Throttle valve control unit -J338 -***

- ☐ inspecting ⇒ Chap. 24-2
- ☐ after replacing the engine control unit perform adaptation ⇒ Chap. 24-4

27 - Return-flow line

- ☐ secure with spring band clamps
- ☐ check tightness
- ☐ to fuel pump ⇒ 1.8 I/132 kW Engine, Mechanical Components; Rep. Gr. 20

28 - Feed line

- ☐ secure with spring band clamps
- ☐ to fuel filter ⇒ 1.8 I/132 kW Engine, Mechanical Components ; Rep. Gr. 20

29 - 10 Nm**30 - Fuel rail with injection valves**

- ☐ disassembling and assembling ⇒ **24-1** page 5

31 - Intake air temperature sender - G42-

- ☐ inspecting ⇒ Chap. 24-1

32 - To turbocharger divert air valve -N249-

- ☐ ⇒ item 17 in **24-1** page 2

33 - to turbocharger**34 - To crankcase housing ventilation****35 - To camshaft housing ventilation****36 - Sender for coolant temperature -G62-***

- ☐ blue
- ☐ with coolant temperature gauge sensor -G2-
- ☐ before removing, reduce pressure in cooling system if necessary
- ☐ Specified resistance values ⇒ Fig. 1 in **24-1** page 6

37 - 4-pin plug connector

- ☐ black
- ☐ Sender for coolant temperature - G62-

38 - Retaining clip

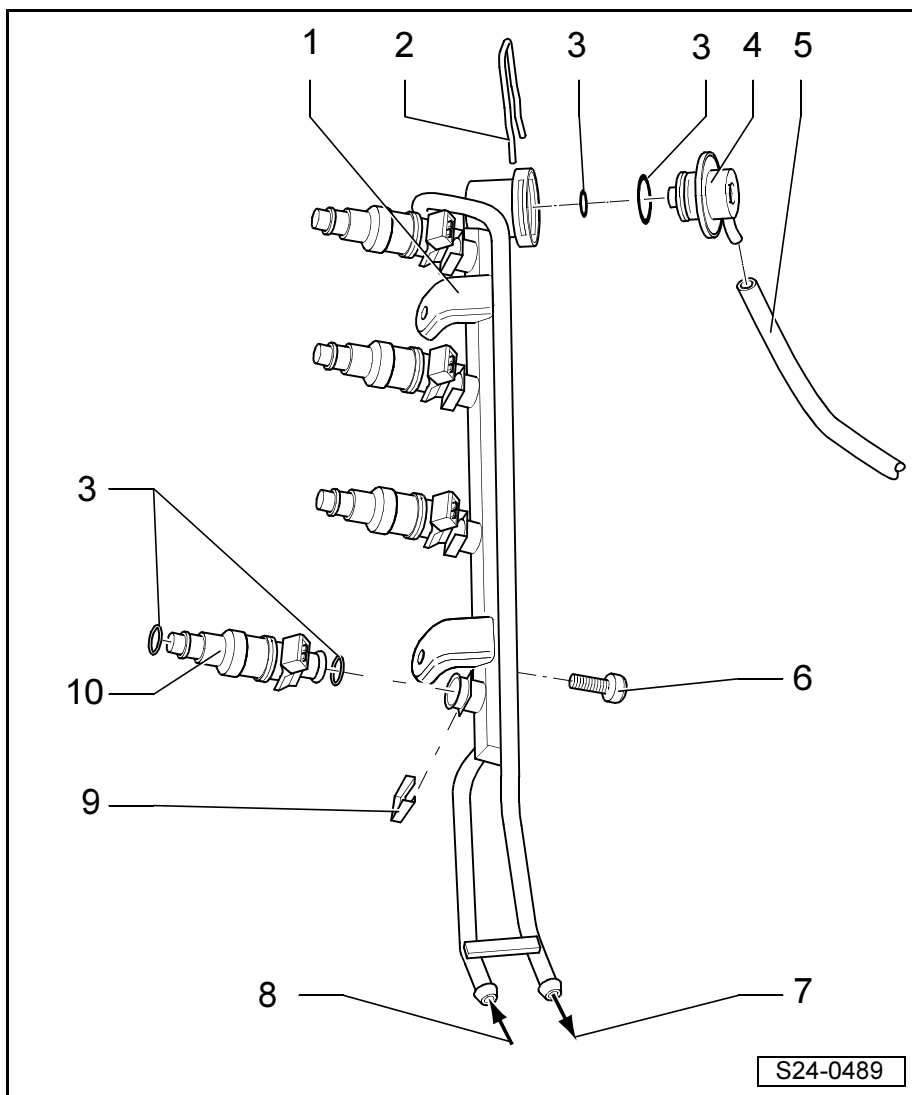
- ☐ check tightness

39 - To tube between turbocharger and charge air cooler

- 40 - To tube between turbocharger and charge air cooler
- 41 - To pressure unit on turbocharger ⇒ 1.8 l/132 kW Engine, Mechanical Components; Rep. Gr. 21
- 42 - Solenoid valve for charge pressure control -N75-*/**
- 43 - Intake hose ⇒ 1.8 l/132 kW Engine, Mechanical Components; Rep. Gr. 21
- 44 - Air mass meter -G70-*
 - ☐ 5-pin connector

Disassembling and assembling fuel distributor with injectors

- 1 - Fuel distributor
- 2 - Retaining clip
 - ☐ check tightness
- 3 - O-ring
 - ☐ replace if damaged
- 4 - Fuel pressure regulator
 - ☐ Test pressure regulator and holding pressure ⇒ Chap. 24-2
- 5 - Vacuum hose
- 6 - 10 Nm
- 7 - Connection return-flow line
- 8 - Connection feed line
- 9 - Retaining clip
 - ☐ check tight connection of injectors in fuel rail
- 10 - Injector -N30-...-N33-*/**
 - ☐ desired resistance 12...17 Ω (at a temperature of approx. 20 °C)
 - ☐ if the engine is warm the resistance increases by approx. 4...6 Ω



Disassembling and assembling the air filter and air mass meter

- 1 - Air mass meter -G70-*
- 2 - Gasket
- 3 - Air filter top part
- 4 - 6 Nm
- 5 - Filter insert
- 6 - Air filter bottom part
- 7 - Air deflector
 - to lock carrier
- 8 - Air deflector
 - in air filter top part

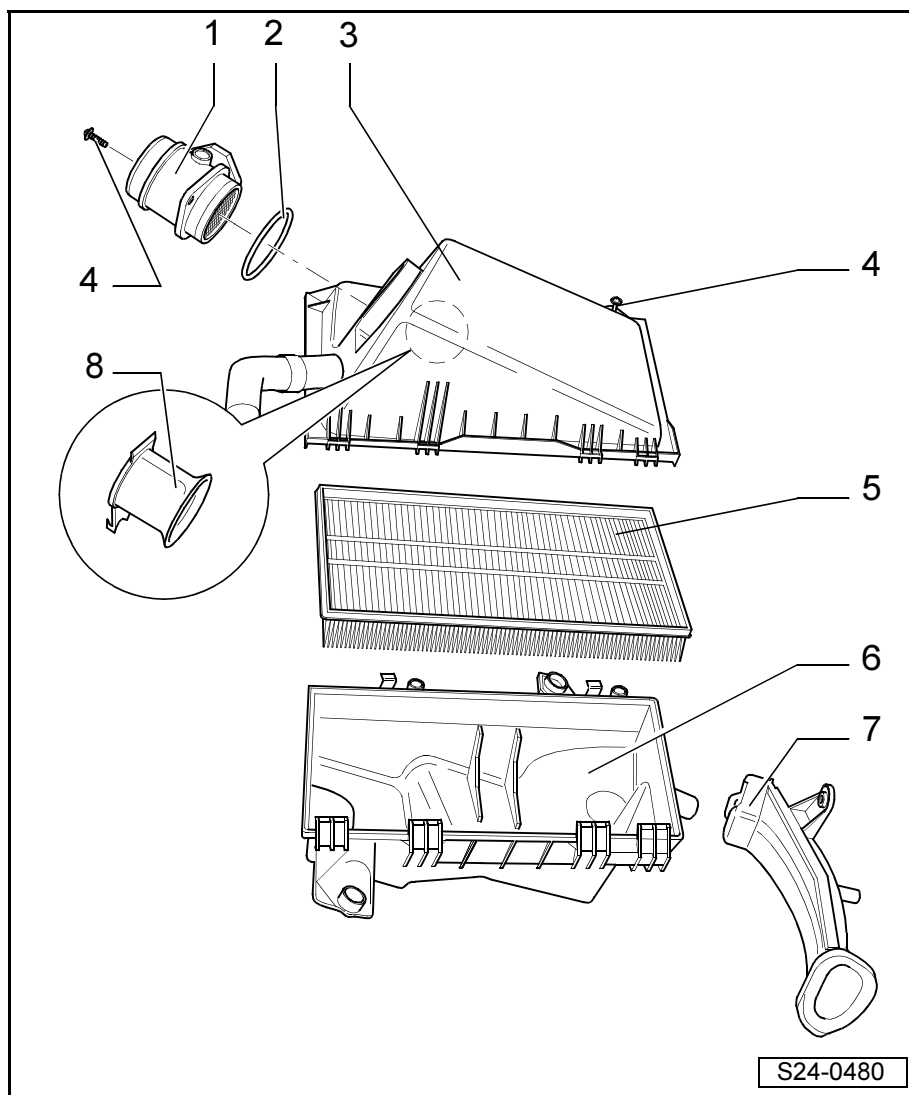


Fig. 1: Specified resistances for coolant temperature sender -G42- and intake air temperature sender -G62-

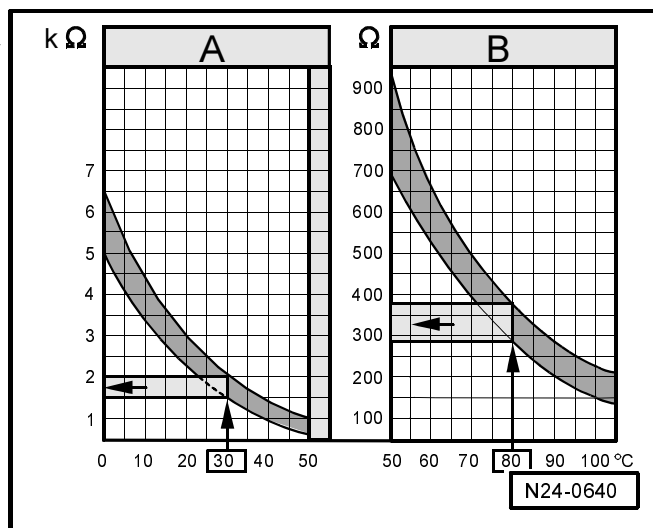
The diagram is divided into two temperature ranges:

A - 0...50 °C

B - 50...105 °C

Example:

- ♦ at a temperature of 30 °C the specified value in field A is 1.5...2.0 kΩ
- ♦ at a temperature of 80 °C the specified value in field B is approx. 290...375 Ω
- ♦ connect a multimeter between contacts 3 + 4 to measure the resistance of sender -G62-



Safety measures



Caution!

The fuel system is under pressure! Place cleaning cloths around the connection point before detaching hose connections. Reduce pressure by carefully releasing the connection point.

⇒ Safety measures, ignition system, Rep.-Gr. 28.

Rules of cleanliness

Carefully observe the following 5 rules for cleanliness when working on the fuel supply/injection system:

- ◆ Thoroughly clean the connection points and their surroundings before releasing.
- ◆ Place removed parts on a clean surface and cover. Do not use fuzzy cloths!
- ◆ Carefully cover or close opened components if the repair is not completed immediately.
- ◆ Only install clean parts: Remove spare parts from their wrapping immediately before fitting. Do not use any parts which have been stored unwrapped, e.g. on a shelf.
- ◆ When the system is open: Avoid using compressed air. Avoid moving the vehicle.

Testing lines and components with test box

Special tools, test and measuring equipment and auxiliary items required

- ◆ Test box -V.A.G 1598/31-



Note!

- ◆ *The test box -V.A.G 1598/31- is designed in such a way that it can be simultaneously connected to the wiring loom of the engine control unit and to the actual engine control unit.*
- ◆ *The advantage being that the electronic engine control remains fully operational with the test box connected (e.g. measuring signals while the engine is running).*
- ◆ *Refer to the relevant test procedures to determine whether the control unit is connected to the test box or not.*
- ◆ *For connecting measuring equipment (e.g. diode test lamp -V.A.G 1527 B-, handheld multimeter -V.A.G 1526 A - etc.) always use the adapter cable set e.g. -V.A.G 1594 A-*
- ◆ *The contact numbers of the connector of the control unit and the socket numbers of the test box are identical.*

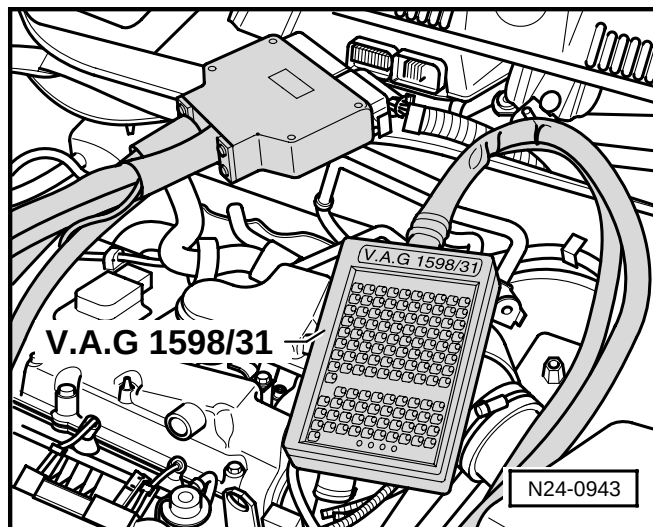
**Caution!**

To avoid damaging the electronic components, switch on the relevant measuring range before connecting the measuring cables and comply with the test conditions.

- Switch off ignition.
- Unscrew windscreen wiper arms and remove cover of plenum chamber ⇒ Body Fitting Work; Rep. Gr. 66.
- Release the connector locks and unplug the control unit connectors.
- Connect test box -V.A.G 1598/31- to connector of wiring loom. The earth clip should be connected to the test box and to battery. Whether the engine control unit remains connected to the test box or not, is described in the relevant test procedures.
- Perform test as described in the relevant repair sequences.

**Note!**

- ◆ After re-connecting the engine control unit perform the following:
- ◆ Adapt engine control unit to throttle valve control unit ⇒ Chap. 24-4.
- ◆ Interrogate and if necessary erase fault memory ⇒ Chap. 01-1, Interrogate and erase fault memory.
- ◆ Whenever the fault memory is erased, it is necessary to generate a readiness code ⇒ Chap. 01-4.



24-2 Testing components and functions

Adapting idling speed

In exceptional cases, e.g. in the event of customer complaints about droning noises, vibrations during idling it is permissible to slightly adjust the idling speed. Make sure you do not exceed or fall below the indicated speed for exhaust-emission analysis (it is quite possible the emission levels will be exceeded at the next exhaust-emission analysis).

Special tools, test and measuring equipment and auxiliary items required

- ♦ Vehicle system tester -V.A.G 1552- with cable
-V.A.G 1551/3, 3A, 3B oder 3C-

Test conditions

- Coolant temperature minimum 85 °C.
- No fault in fault memory

Test sequence

- Connect vehicle system tester -V.A.G 1552-. Switch ignition on and select address word 01 „Engine electronics“ ⇒ Chap. 01-1.
- Enter function 10 „Adaptation“ and confirm entry with key Q.

Readout on display:

▶

Vehicle system test	Q
10 - Adaptation	

Enter 01 for channel 1 and confirm entry with key Q.

▶

Adaptation
Enter channel number XX

Readout on display:

▶

Channel 1	Adaptation 125	->
720 rpm	730 rpm	A/C-Low Compr.OFF

- Enter desired speed in display field 2 with the ↑ or ↓ keys in 10/min jumps.



Note!

*The idling speed must not be adjust to above the authorised speed range. Actual value of the idling speed:
⇒ Inspection and Maintenance, Exhaust-emission Analysis..*

Confirm the entry with key **Q**.

▶

Channel 1	Adaptation	131 Q
Store changed value?		

Press **→** key.

▶

Channel 1	Adaptation	131 ->
Changed value stored		

- End output and switch off ignition.

Inspecting electronic power control (electronic throttle)

Function of the Electronic Throttle System

The position of the accelerator pedal is signalled by the engine control unit via two accelerator pedal position senders (variable resistors; located in a housing), which are connected to the accelerator pedal.

The throttle valve is activated by an electric motor (throttle valve positioner) in the throttle valve control unit, over the full speed and load range.

The electronic throttle system does not only consist of one or two components. The Electronic Throttle is a system that includes all the components, which contribute to determining, controlling and monitoring the position of the throttle valve (e.g. the accelerator pedal position sender, the throttle valve control unit, the EPC warning lamp, the engine control unit,...).

Meaning of the EPC warning lamp (fault lamp for electric power control) in the dash panel insert

„EPC“ is the abbreviation of Electronic Power Control.

Fitting location of the EPC warning lamp.

After switching on the ignition the engine control unit checks all the components that are relevant to the operation of the EPC.

Inspecting fault lamp for EPC -K132-



Note!

The EPC fault lamp -K132- is also called EPC warning lamp.

Special tools, test and measuring equipment and auxiliary items required

- ♦ Adapter cable set, e.g. -V.A.G 1594 A-
- ♦ Test box -V.A.G 1598/31-

Functional test of the warning lamp

- Switch on ignition.

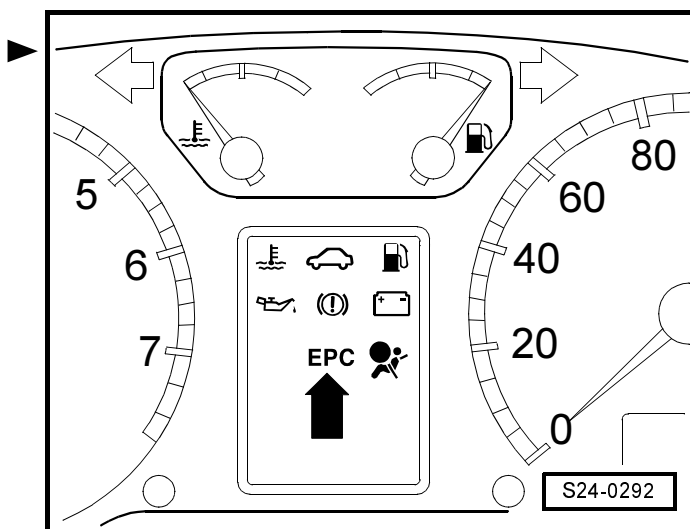
The EPC warning lamp must light up.

- Start engine and run in idle.

The EPC warning lamp must go out if no fault related to the EPC has been stored in the fault memory.

If the EPC warning lamp does not go out check the el. wiring ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

If the EPC warning lamp does not light up at all, check the dash panel insert or el. wiring ⇒ Electrical System;



Rep. Gr. 90, ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

Testing throttle valve control unit

The throttle valve housing includes the throttle valve drive - G186-, angle sender 1 for throttle valve drive -G187 -, angle sender 2 for throttle valve drive -G188-.



Note!

- ♦ If the throttle valve control unit is replaced, it is then essential to adapt this new throttle valve control unit to the engine control unit ⇒ Chap. 24-4.
- ♦ On vehicles with an automatic gearbox the gearbox control unit must also be replaced ⇒ Automatic gearbox; Rep. Gr. 01.

Special tools, test and measuring equipment and auxiliary items required

- ♦ Handheld multimeter, e.g. -V.A.G 1526 A-
- ♦ Adapter cable set, e.g. -V.A.G 1594 A-

Test conditions

- The throttle valve must neither be damaged nor soiled.

Test sequence

- Measure resistance of throttle valve drive between contacts 3 + 5. ▶

Specified value: 1...5 Ω.

If the specified value is not reached:

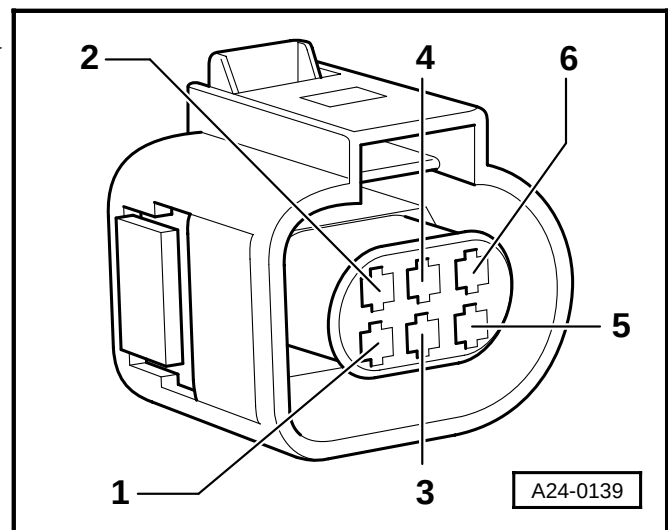
- Replace throttle valve control unit -J338-.

If the specified value is reached:

- Test voltage supply and cables to throttle valve control unit ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations. Pay special attention to the plug connections that may be loose or corroded.

If the power supply and wiring of the throttle valve control unit is O.K.:

- Replace engine control unit ⇒ Chap. 24-4.



Testing accelerator pedal position sender

Special tools, test and measuring equipment and auxiliary items required

- ♦ Handheld multimeter, e.g. -V.A.G 1526 A-
- ♦ Adapter cable set, e.g. -V.A.G 1594 A-

The two accelerator pedal position senders - G79- and -G185- are located at the accelerator pedal and pass on

the driver input to the engine control unit completely independently of each other (when accelerator is depressed). Both senders are located in a housing.

Test sequence

- Read measured value block and display group 062.

If the display does not occur as described:

- Test the voltage supply and the wiring of the accelerator pedal position sender ⇒ **24-2** page 4.

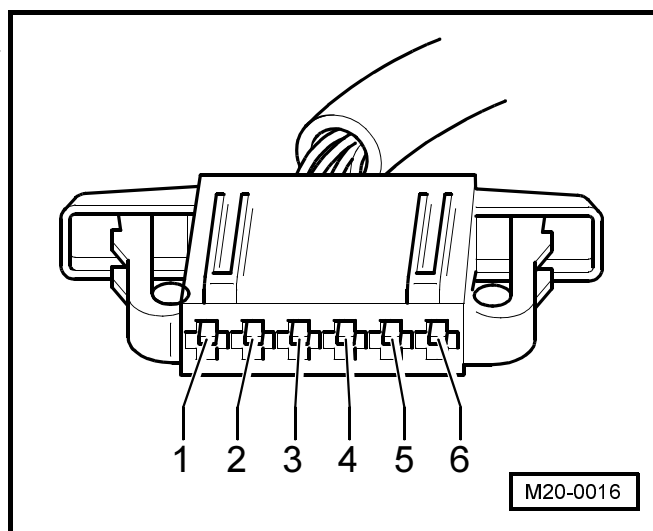
Testing the power supply of the accelerator pedal position sender

- Remove bottom part of dash panel insert: ⇒ Body Work; Rep. Gr. 70
- Disconnect the connectors of the accelerator pedal position sender.
- Switch on ignition.
- Connect the multimeter for measuring the voltages in the following manner: ➤

Contact on connector	Specification
1 + earth	approx. 5 V
1 + 5	approx. 5 V
2 + earth	approx. 5 V
2 + 3	approx. 5 V

If the specified values are not reached:

- Check the wiring from the engine control unit to the accelerator pedal position senders ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.



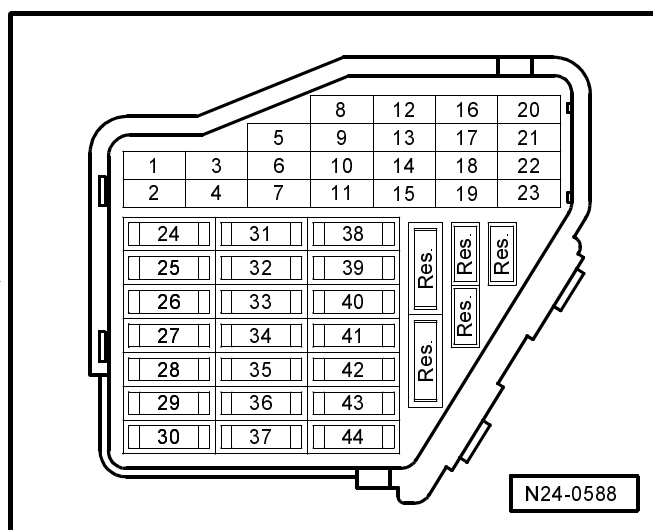
Testing voltage supply for control unit

Special tools, test and measuring equipment and auxiliary items required

- ♦ Vehicle system tester -V.A.G 1552 - with cable -V.A.G 1551/3, 3A, 3B oder 3C-
- ♦ Test box -V.A.G 1598/31-
- ♦ Handheld multimeter, e.g. -1526 A-
- ♦ Adapter cable set, e.g. -V.A.G 1594 A-

Test conditions:

- Fuses Nos. 10 and 29 for engine control unit O.K. ➤
- Battery voltage at least 11.5 V
- Alternator o.k.



Test sequence

- Read measured value block and display group 004
⇒ Chap. 01-5.

If the specified value is not reached:

- Connect test box to wiring loom to engine control unit
⇒ Chap. 24-1.

Testing voltage of terminal 30

- Connect the multimeter and measure the voltage between bushes 1 and 62 of the test box.

Specified value: minimum 11.5 V.

If the specified value is not reached:

- Inspect wiring to relay plate according to the Current Flow Diagram and repair if necessary ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

Testing voltage of terminal 15

- Connect the multimeter and measure the voltage between bushes 2 and 3 of the test box.
- Switch on ignition.

Specified value: minimum 11.5 V.

If the specified value is not reached:

- Inspect wiring to relay plate according to the Current Flow Diagram and repair if necessary ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

Procedure after voltage supply has been interrupted

If the voltage supply has been interrupted the engine control unit forgets all the learned and basic values. As in this case the control unit operates differently various driving conditions can occur while driving.

Special tools, test and measuring equipment and auxiliary items required

- ♦ Vehicle system tester -V.A.G 1552 - with cable
-V.A.G 1551/3, 3A, 3B oder 3C-

Procedure

After a voltage interruption perform the following tasks:

- Switch ignition on for at least 10 seconds.
- Switch off ignition.
- Adapt engine control unit to throttle valve control unit
⇒ Chap. 24-4.
- Test idling.

**Note!**

During the idling test the activated charcoal filter solenoid valve is disconnected and the learning process of the lambda control is initiated.

- Perform a long test drive during which the relevant values are learnt and if necessary driving behaviour shortcomings can be eliminated.

During this test drive the following conditions must be fulfilled:

- ♦ The coolant temperature should rise beyond 85 °C.
- ♦ Once this operating temperature is reached, the following operating states must be repeated several times:

Idling

Partial load

Enrichment

Trailing throttle

Under full load the engine speed must exceed 3500 rpm

Testing the fuel pressure regulator and holding pressure (pressure in system)

Special tools, test equipment and aids required

- ♦ Pressure gauge, e.g. -V.A.G 1318-
- ♦ Pressure hose with connections e.g. -V.A.G 1318/8 -
- ♦ Adapter, e.g. -V.A.G 1318/9-
- ♦ Adapter, e.g. -V.A.G 1318/17-

Test conditions

- Delivery of fuel pump O.K., testing ⇒ 1.8 l/132 kW Engine, Mechanical Components; Rep. Gr. 20
- Fuel pump relay O.K.
- Fuel filter O.K.
- Battery voltage o.k.

Test sequence

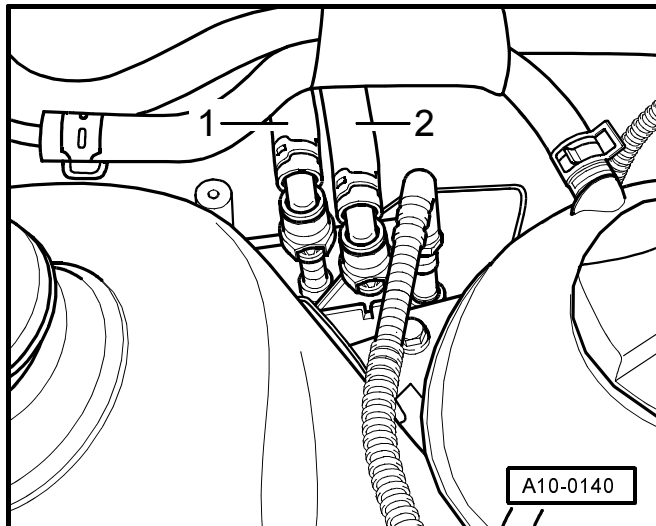
**Note!**

The fuel pressure regulator regulates the fuel pressure in line with the intake manifold pressure.

**Caution!**

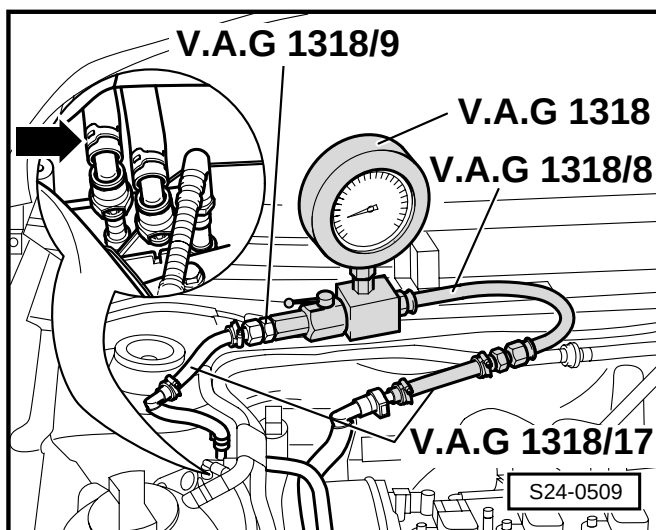
The fuel system is under pressure! Place cleaning cloths around the connection point before detaching hose connections. Reduce pressure by carefully removing the hoses.

- Disconnect the fuel-intake hose -1- from the feed line. ►



- Connect pressure gauge with the adapters to the feed line -arrow-.
- Open shut-off cock of the pressure gauge. The lever points in the direction of flow.
- Start engine and run in idle.
- Measure fuel pressure.

Specified value: approx. 0.25 MPa (2.5 bar) overpressure

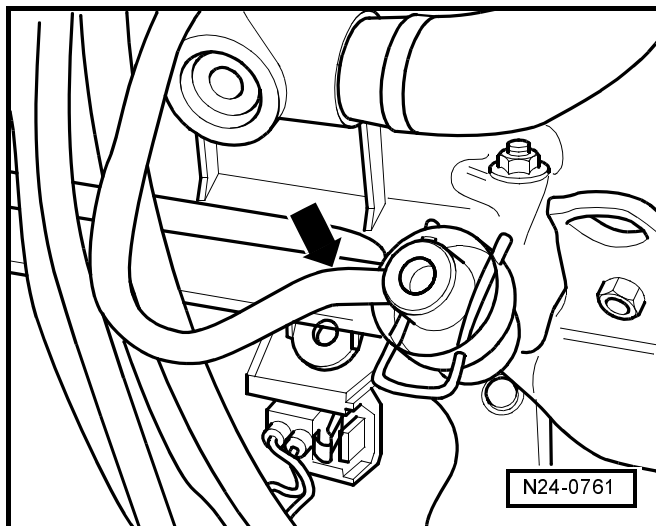


- Detach vacuum hose -arrow- from fuel pressure regulator. The fuel pressure must rise to approx. 0.3 MPa (3 bar).
- Switch off ignition.

If the specified value is not reached:

- Test for leaks and holding pressure. Observe pressure drop at gauge. After 10 minutes there must still be at least 0.20 MPa (2 bar) overpressure.

If the pressure drops below 0.20 MPa (2 bar):



- Start engine and run in idle.
- After the pressure has been built up, switch ignition off. Simultaneously connect the shut-off cock -arrow- to the pressure gauge -V.A.G 1318-.
- Observe pressure drop at gauge.

If the pressure does not drop:

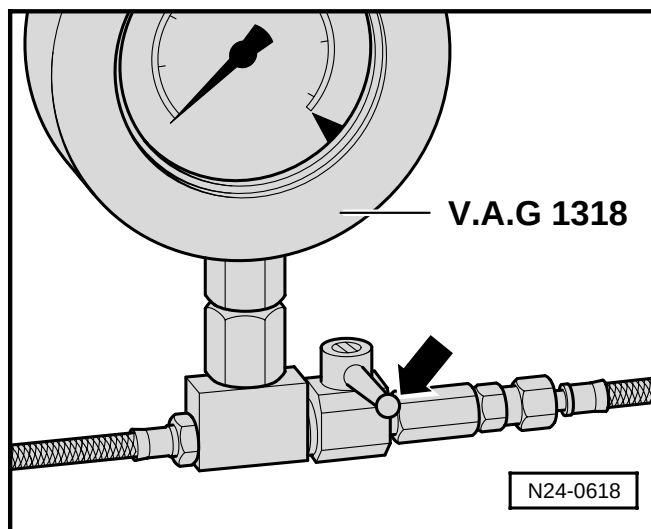
- Test non-return valve of fuel pump ⇒ 1.8 l/132 kW Engine, Mechanical Components; Rep. Gr. 20

If the pressure still does not drop:

- Inspect pressure measuring device for leaks.
- Check line connections, „O“ -rings on fuel rail and injectors for leaks.

If no leaks are found:

- Replace fuel pressure regulator.



Note!

Before removing the pressure gauge appliance reduce fuel pressure by opening the shutoff cock. While doing so grip vessel before the connection.

Inspecting the injection rate, tightness and jet formation of the injectors

Special tools, test and measuring equipment and auxiliary items required

- ♦ Vehicle system tester -V.A.G 1552 - with cable -V.A.G 1551/3, 3A, 3B oder 3C-
- ♦ Adapter cable set, e.g. -V.A.G 1594 A-
- ♦ Remote control e.g. -V.A.G 1348/3A - with adapter cable -V.A.G 1348/3-2 -
- ♦ Measuring glasses, e.g. -V.A.G 1602-

Test condition

- Fuel pressure O.K., check ⇒ **24-2** page 6

Test sequence:

- Unplug connectors at all the injectors.
- Remove the complete fuel rail.
- Detach vacuum hose from fuel pressure regulator.
- Remove fuel rail together with injectors from intake manifold and support.

Check tightness

- Connect vehicle system tester -V.A.G 1552-. Switch ignition on and select address word 01 „Engine electronics“ ⇒ Chap. 01-1.

- Initiate final control diagnosis and drive injector cyl. 1, the fuel pump must run.

Note!

This sequence is intended to ensure that the fuel pump runs when the engine is switched off. The idling speed limit switch must be in closed position as otherwise the selected injector will spray five times.

- Test the tightness of the injectors (visual inspection). With the fuel pump running per valve only 1...2 drops of fuel may escape per minute.
- If the fuel loss is greater adjust the fuel pump (end final control diagnosis) and replace defective injector.

Note!

Replace seals at the same time.

- If necessary repeat final control diagnosis.

Note!

The final control diagnosis can only be initiated again once the ignition has been briefly switched off.

Testing injection rate

- Insert injector to be tested in a measuring glass. ▶
- Connect one contact of injector to earth.
- Connect the second contact of the injector with remote control, adapter cable and auxiliary cable to pos. term. ▶
- Initiating final control diagnosis. The fuel pump must run.
- Operate remote control for 30 seconds.
- Perform the measurement on all injectors.
- Once all four injectors have been driven, position the graduated measuring glasses on an even base.

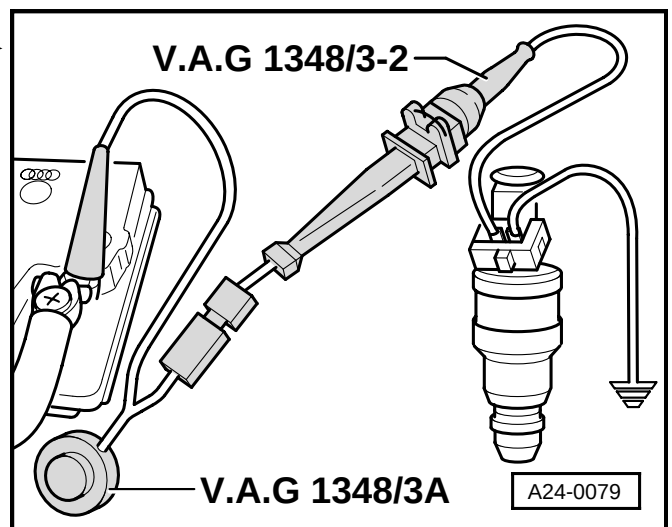
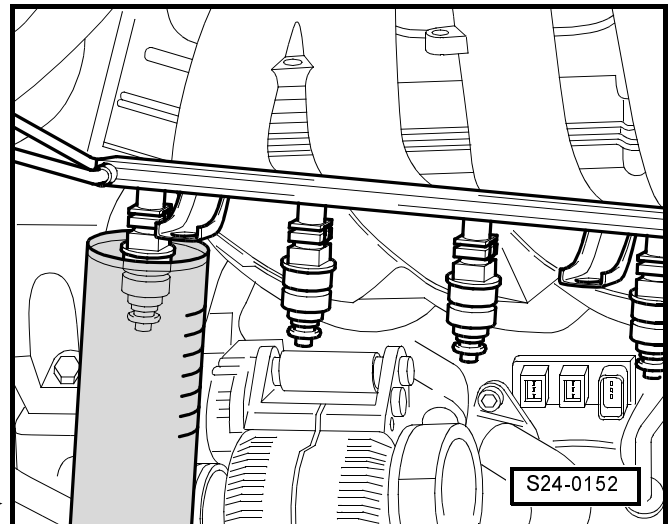
Specified value: 133...157 ml

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

Note!

When testing the injection rate also check the jet formation. The jet must be the same for all valves.

Pay attention to the following points before fitting the injectors:



- Replace O-rings on all opened connecting points (to replace the front O-ring do not remove the plastic valve head cap - draw the O-ring over the plastic cap).
- Moisten O-rings with clean engine oil
- Pay attention to correct positioning of the injectors
- Check perfect fit of the retaining clips
- Installation occurs in reverse order.

Testing the intake system for tightness (unmetered air)

Special tools, test and measuring equipment and auxiliary items required

- ♦ Vehicle system tester -V.A.G 1552 - with cable
-V.A.G 1551/3, 3A, 3B oder 3C-
- ♦ Engine leak search spray G 001 800 A1

Test sequence



Note!

- ♦ *Because of the vacuum in the intake system the leak search spray is sucked in with the unmetered air. The leak search spray reduces the ignition performance of the mixture. This results in a drop in engine speed and a change in the lambda probe value.*
- ♦ *You must comply with the safety instructions on the box.*
- Read measured value block and display group 001.
- Systematically spray parts of the intake system with engine leak search spray.

If the engine speed drops and the lambda control changes:

- End output and switch off ignition.
- Check the sprayed location of the intake system for leaks and eliminate the fault.

24-3 Checking lambda probes

Checking lambda control

Special tools, test and measuring equipment and auxiliary items required

- ◆ Vehicle system tester -V.A.G 1552 - with cable
-V.A.G 1551/3, 3A, 3B oder 3C-
- ◆ Handheld multimeter, e.g. -V.A.G 1526 A-
- ◆ Diode test lamp, e.g. -V.A.G 1527 B-
- ◆ Adapter cable set, e.g. -V.A.G 1594 A-

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

A so-called reference voltage of approx. 0.4 to 0.5 V has been programmed into the engine control unit to analyse the lambda probe signal. The control constantly fluctuates back and forward between the „slightly too lean“ and „slightly too rich“ states.

At idling speed and with a warm engine the control (on lambda probe downstream of catalytic converter) must operate at least 30 times per minute.

If the voltage change does not occur, or if it is too slow, the following faults may have occurred:

- ◆ The slots or holes in the lambda probe head are clogged up.
- ◆ The ventilation hole on the probe - near the connecting cable - is closed.
- ◆ The probe was overheated.
- ◆ The probe was damaged by leaded fuel.
- ◆ Transition resistance in the signal line.
- ◆ Probe too cold, lambda probe heater not operating.
- ◆ Lambda control off (engine control unit detected a fault in the injection system ⇒ Interrogate fault memory).
- ◆ Probe damaged by contact spray or similar (because of the thermal fluctuations and the capillary effect the contact spray is sucked into the probe via the fine hollow spaces in the electrical lines).
- ◆ Probe damaged by silicone vapours. (When using silicone sealants traces of silicone particles are sucked into the engine. These silicone particles are not combusted and damage the lambda probe).
- ◆ The probe was damaged by oil particles escaping from the crankcase housing ventilation or by engine leaks.

Testing lambda probe -G39- and lambda control upstream of catalytic converter

Special tools, test and measuring equipment and auxiliary items required

- ♦ Vehicle system tester -V.A.G 1552 - with cable -V.A.G 1551/3, 3A, 3B oder 3C-
- ♦ Handheld multimeter, e.g. -V.A.G 1526 A-
- ♦ Adapter cable set, e.g. -V.A.G 1594 A-

Test conditions

- Fuse 43 o.k.
- Battery voltage at least 11.5 V
- Fuel pump relay O.K.
- Coolant temperature minimum 85 °C

Inspect proper operation

- Check display groups 030, 032, 033 and 041 ⇒ Chap. 01-5 and ⇒ Chap. 01-6.

If the specified values are not reached:

- Test resistance of heating element between the contacts 3 + 4, voltage supply for heater and cables to -Z19- ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations



Note!

Heating element resistance approx. 2.5...10 Ω at 20 °C.

If the specified resistance is reached and the voltage supply for heater and cables to -Z19- are o.k.

- Switch on ignition.
- Use handheld multimeter to measure voltage between the contacts 1 and 5 of connector at the wiring loom. ➤

Specified value: 0.400...0.500 V.

- Switch off ignition.

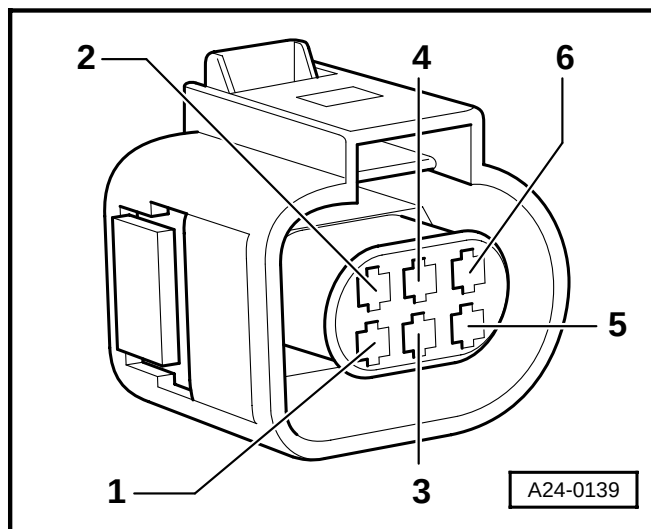
If the specified values are reached:

- Replace lambda probe -G39-.

If the specified values are not reached:

- Test cables to lambda probe -G39- ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

If the wiring is O.K., replace engine control unit ⇒ Chap. 24-4.



Testing lambda probe ageing upstream of catalytic converter

Test condition

- Coolant temperature minimum 80 °C

Inspect proper operation

- Read display group 034.

If the specified values are not reached:

- Conduct a test drive in order to eliminate any residues on the lambda probe and repeat the test.

If the specified value is again not reached:

- Replace lambda probe upstream of catalytic converter -G39-.

Testing lambda probe -G130- and lambda control downstream of catalytic converter

Special tools, test and measuring equipment and auxiliary items required

- ♦ Vehicle system tester -V.A.G 1552 - with cable -V.A.G 1551/3, 3A, 3B oder 3C-
- ♦ Handheld multimeter, e.g. -V.A.G 1526 A-
- ♦ Adapter cable set, e.g. -V.A.G 1594 A-

Test conditions

- Exhaust system between catalyst and cylinder head tight.
- Coolant temperature at least 85 °C ⇒ display group 004, display field 3 ⇒ Chap. 01-5.

Inspect proper operation

- Check display groups 030, 037 and 041 ⇒ Chap. 01-5 and ⇒ Chap. 01-6.

If the specified values are not reached:

- Test resistance of heating element between the contacts 1 + 2, voltage supply for heater and cables to -Z29- ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations



Note!

Heating element resistance approx. 1...5 Ω at 20 °C.

If the specified resistance is reached and the voltage supply for heater and cables to -Z29- are o.k.

- Connect the multimeter for voltage measurement using adapter cables to contacts 3 and 4 (plug connection to engine control unit).
- Start engine and measure basic voltage specified value: 0.400...0.500 V.
- Switch off ignition.

If the specified value is reached:

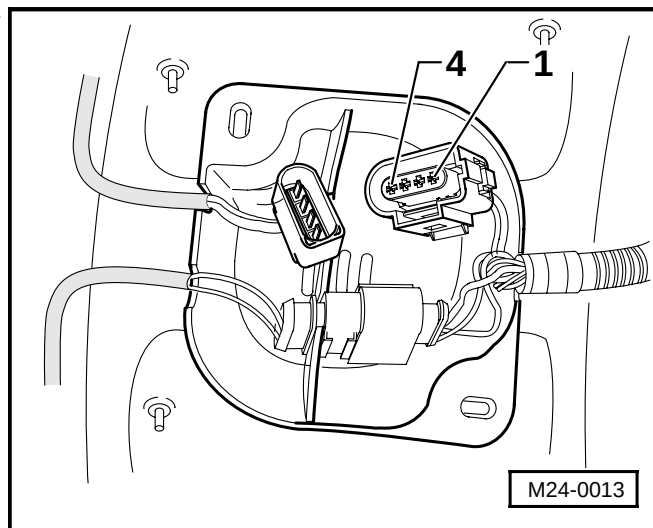
- Replace lambda probe downstream of catalytic converter -G130 -.

If the specified value is not reached:

- Test cables to lambda probe ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

If the wires are not found to be faulty:

- Replace engine control unit ⇒ Chap. 24-4.



Test exhaust emissions warning lamp -K83-

Operation

If the control unit detects a fault with a major incidence on the emission level the exhaust emissions warning lamp will light up or start flashing.

The exhaust emissions warning lamp may either flash or remain lit. In any case the fault memory must be interrogated ⇒ Chap. 01-1.

- ♦ Exhaust emissions warning lamp flashes: there is a fault on the vehicle that may damage the catalytic converter. Drive on under reduced engine power!
- ♦ Exhaust emissions warning lamp lights up: there is a fault on the vehicle that no longer guarantees low exhaust gas emissions. Interrogate fault memory of the engine control unit or of the automatic gearbox control unit.
- ♦ If there is incorrect driving behaviour, or if the customer complains and the exhaust emissions warning lamp is not lit, interrogate the fault memory, as a fault may have been stored that does not immediately cause the exhaust emission warning lamp to light up.

Functional test of the exhaust emissions warning lamp

- Switch on ignition.

The exhaust emission warning lamp must light up.

- Start engine and run in idle.

The exhaust emissions warning lamp must go out if no fault was stored in the fault memory.

**Note!**

The switching signal for the exhaust emissions warning lamp is transmitted from the engine control unit to the dash panel control unit via the CAN databus. Check data transmission between engine control unit and other control units ⇒ Electrical System; Rep. Gr. 90.

24-4 Replacing, coding and adapting the engine control unit

Replacing engine control unit

Special tools, test and measuring equipment and auxiliary items required

- ♦ Vehicle system tester -V.A.G 1552 - with cable
-V.A.G 1551/3, 3A, 3B oder 3C-



Note!

The learning values are erased when the plug is removed from the 4AV control unit, the fault memory contents are retained.

- Connect vehicle system tester. Switch ignition on and select address word 01 „Engine electronics“-V.A.G 1552 - => Chap. 01-1.
- The control unit identification appears in the display, e.g.:
- Note Part No. of control unit and coding.
- Ending output.

06A906032BJ 1.8l	R4/5VT MOTR HS	D03->
Coding 11500		WSC 06388

Removing

- Switch off ignition.
- Remove plenum chamber cover => Body Fitting Work; Rep. Gr. 66.
- Release the connector locks and unplug the control unit connectors.
- Press the engine control unit to the right and draw forwards.

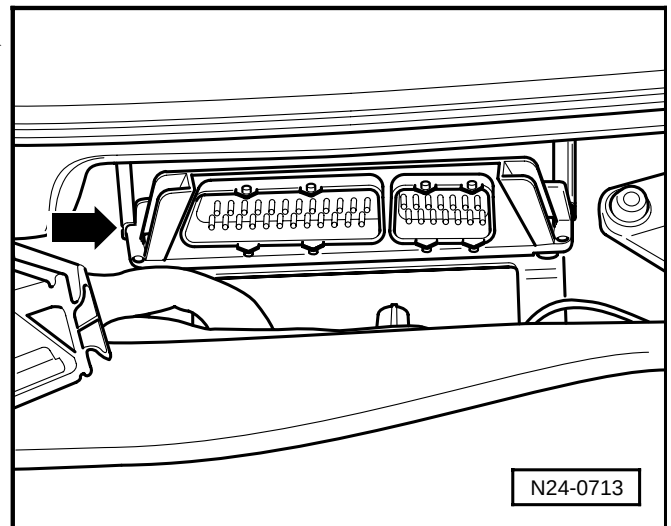
Installing

Carry out the installation in the same way in reverse order.



Note!

- ♦ *In the first learning phase during the engine basic setting a somewhat irregular idling and a slight jerking may be noticed while driving.*
- ♦ *After installing the 4AV control unit the following work steps must be performed:*
 - Interrogate fault memory, eliminate any faults and erase fault memory => Chap. 01-1.
 - Perform coding on new engine control unit => Chap. 24-4.
 - Adapt engine control unit to throttle valve control unit - J338- => Chap. 24-4.



- Adapt engine electronics control unit to electronic immobiliser ⇒ Electrical System; Rep. Gr. 96.
- Perform idling test.

On vehicles fitted with CCS:

- Activate CCS ⇒ Chap. 24-5.

For all vehicles:

- Whenever the fault memory is erased, it is necessary to generate a readiness code ⇒ Chap. 01-4.

Coding engine control unit

Special tools, test and measuring equipment and auxiliary items required

- ♦ Vehicle system tester -V.A.G 1552 - with cable
- V.A.G 1551/3, 3A, 3B oder 3C-

If the code displayed does not match the vehicle, or if the control unit has been replaced, it is then necessary to code the control unit as follows.

- Connect vehicle system tester -V.A.G 1552-. Switch ignition on and select address word 01 „Engine electronics“ ⇒ Chap. 01-1.
- Enter 07 for the function „Coding control unit“ and confirm entry with key Q.
- Readout on display:
- Enter the correct code number for this vehicle and confirm with the key Q.

Code control unit Q
Enter code number xxxxxx (0 -32000)

Denomination of control units	Equipment	Code number
06A906032BJ	Gearbox + ABS / EDL	11400
06A906032BJ	Gearbox + TCS + ABS + EDL / ESP	11500
06A906032HN	Gearbox + TCS + ABS + EDL / ESP	11500

- The read-out on vehicle system tester - V.A.G 1552- is e.g.:
- Ending output.

06A906032BJ 1.8l R4/5VT G 0001 ->
Coding 11500 WSC 12345



Note!

The entered coding is activated when the ignition is first switched on again.

Adapting the engine control unit to the throttle valve control unit

This adaptation teaches the engine control unit the various positions of the throttle valve with the ignition on and

the engine stopped. These positions are stored in the engine control unit. The acknowledgement of the throttle valve position occurs via the two throttle valve drive angle senders.

**Note!**

The engine does not start during the automatic adaptation.

Special tools, test and measuring equipment and auxiliary items required

- ♦ Vehicle system tester -V.A.G 1552 - with cable
-V.A.G 1551/3, 3A, 3B oder 3C-

Requirements:

- No fault stored in fault memory, interrogating fault memory ⇒ Chap. 01-1
- Engine not running, ignition switched on.
- Accelerator pedal not pressed.
- Coolant temperature above 5 °C, but below 95 °C
- Intake air temperature below 100 °C.
- Battery voltage at least 11.5 V.

Procedure

- Connect vehicle system tester -V.A.G 1552-. Switch ignition on and select address word 01 „Engine electronics“ ⇒ Chap. 01-1.
- Select function 04 „Initiate basic setting“ and select display group 060.

After pressing key , the throttle valve positioner will be switched.

Check the specified values for the throttle valve positioner control unit in display fields 3 and 4. ➡

System in basic setting			60	->
5.4 %	85 %	8	ADP o.k.	

Specified value display field 3: 8

Specified value display field 4: ADP runs, ADP o.k.

**Note!**

The abbreviation „ADP“ in display field 4 stands for „Adaption“, which in fact means adaptation.

**Note!**

- ♦ *If the adaptation is aborted by the control unit, this may be due to the following reasons:*
- ♦ *The throttle valve cannot be fully closed (e.g. dirty).*
- ♦ *The battery voltage is too low.*
- ♦ *The throttle valve control unit is defective or the wiring is N.O.K.*
- ♦ *The engine was started during the adaptation or the accelerator pedal was pressed.*

- ♦ *The throttle valve control unit housing is warped (check bolted connections).*
- ♦ *After the abortion the vehicle system tester displays „function unknown or cannot be performed“. When the ignition is switched on again (a few seconds) the adaptation is automatically performed again.*

— End basic setting of the engine by pressing key .

Read-out on display (function selection):



Vehicle system test
Select function XX

HELP

24-5 Testing auxiliary signals

Testing the speed signal

Special tools, test and measuring equipment and auxiliary items required

- ◆ Test box -V.A.G 1598/31-
- ◆ Diode test lamp, e.g. -V.A.G 1527 B-
- ◆ Adapter cable set, e.g. -V.A.G 1594 A-

Test conditions

- Battery voltage at least 11.5 V
- Speedometer O.K.

Test sequence

- Connect test box to wiring loom to engine control unit
⇒ Chap. 24-1.
- Connect the diode test lamp between bush 3 (pos.) and bush 54 (signal).
- Switch on ignition.
- Turn front wheel.



Note!

The right front wheel must not turn along, if necessary hold.

Diode test lamp must flash (very short flashing signal).

If the diode test lamp does not flash:

- Check wiring to speedometer or to driving speed sender ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

Testing databus (CAN bus)

- Use the relevant current flow diagrams to determine which control units have been connected to the data bus drive (CAN bus, Controller Area Network)
- Check tight fit of the plug connections of all connected control units.
- Connect vehicle system tester -V.A.G 1552- and select function 00 „Automatic test sequence“.

Before testing the communication cable check whether there are no functional faults in the connected control units.

Special tools, test and measuring equipment and auxiliary items required

- ◆ Test box -V.A.G 1598/31-
- ◆ Handheld multimeter, e.g. -V.A.G 1526 A-
- ◆ Adapter cable set, e.g. -V.A.G 1594 A-

Test conditions

- Self-diagnosis has determined a fault in the data bus.

Test sequence

- Switch off ignition.
- Unlock plug connection and remove from engine control unit.
- Connect the -V.A.G 1598/31 - to the engine control unit. Do not connect cable to the engine control unit.
- Check mean terminating resistance in the engine control unit and measure the resistance between the test box-bushes.

Bush to test box -1598/ 31-	Bush to test box -1598/ 31-
58	60

Specified value: 60...72 Ω.

If the measured value does not correspond to the specified value:

- Replace engine control unit ⇒ Chap. 24-4.

If the measured value corresponds to the specified value:

- Check data bus ⇒ Electrical System; Rep. Gr. 90.

Activating and deactivating cruise control system (CCS)

Special tools, test and measuring equipment and auxiliary items required

- ♦ Vehicle system tester -V.A.G 1552 - with cable
-V.A.G 1551/3, 3A, 3B oder 3C-

Test conditions

- There must not be any faults present in the fault memory ⇒ Chap. 01-1.

Test sequence

- Connect vehicle system tester -V.A.G 1552-. Switch ignition on and select address word 01 „Engine electronics“ ⇒ Chap. 01-1.

Read-out on display, e.g.:

If „1.8 I R4/5VT G“ is displayed, CCS is activated.

Read-out on display, e.g.:

If „1.8 I R4/5VT “ is displayed, CCS is activated.

06A906032BJ 1.8I R4/5VT G	0001 ->
Coding 11500	WSC XXXXX
06A906032BJ 1.8I R4/5VT	0001 ->
Coding 00071	WSC XXXXX

- Press  key and select function 11 „Login procedure“.

Login procedure
Enter code number XXXXX

Enter code number by referring to the table below and confirm entry with  key.

Code number	Cruise control system (CCS)
11463	Cruise control system (CCS) is activated
16167	Cruise control system (CCS) is deactivated

- Select function 06 „End output“ and switch ignition off.

After the CCS is activated, conduct a test drive as an operational check.

28 – Ignition System

28-1 Repairing ignition system

Safety measures

Observe the following points to prevent injury to persons and/or damage to the injection and ignition system:

- ♦ Ignition must be switched off before disconnecting and re-connecting cables of the fuel injection and ignition system as well as of test equipment.
- ♦ If the engine must be operated at starter speed, without the engine actually starting, e.g. during compression testing, remove plug connections from the spark plug power output stage and from the injectors. After performing the work interrogate fault memory.
- ♦ Do not carry out engine wash unless the ignition is switched off.
- ♦ Switch off the ignition before disconnecting and connecting the battery, as this may damage the 4AV control unit.



Note!

- ♦ *This section deals specifically with the components relating to the ignition system. The other components of the fuel injection and ignition system ⇒ Chap. 24-1 and following.*
- ♦ *The control unit for the injection and ignition system is equipped with self-diagnosis.*
- ♦ *Components marked with an * are checked by self-diagnosis ⇒ Chap. 01-1, interrogate fault memory.*
- ♦ *Components marked with ** can be checked by final control diagnosis ⇒ Chap. 01-1.*
- ♦ *A minimum voltage of 11.5 V is required for the perfect functioning of the electric components.*
- ♦ *Certain inspections may cause the control unit to detect and store a fault. It is therefore necessary to interrogate the fault memory after having completed all inspections and repairs, and if necessary erase ⇒ Chap. 01-1, Interrogate and erase fault memory ⇒ Chap. 01-1, Erase fault memory.*

Parts of ignition system - Summary of components

1 - 10 Nm

- ☐ only loosen or tighten with the ignition off.

2 - Earth lead

- ☐ only remove or instal with the ignition off.

3 - Connecting plug

- ☐ black, 4 pins

4 - Ignition coil

- ☐ with power output stage
- N70-, -N127-, -N291-,
-N292-
- ☐ with removable plug connection

5 - Spark plug, 20-30 Nm

- ☐ use special spark plug wrench (e.g. -3122 B-) for removing and installing
- ☐ type and change interval
⇒ Inspection and Maintenance

6 - Knock sensor 1 -G61- and 2 -G66-

- ☐ Sensor and connecting plug contacts are gold-plated

7 - Connecting plug

- ☐ black, 3 pins
- ☐ for hall sender -G40-

8 - 10 Nm

9 - Hall sender -G40-*

- ☐ inspecting ⇒ Chap. 28-1

10 - 25 Nm

11 - Washer

- ☐ conical

12 - Trim for hall sender

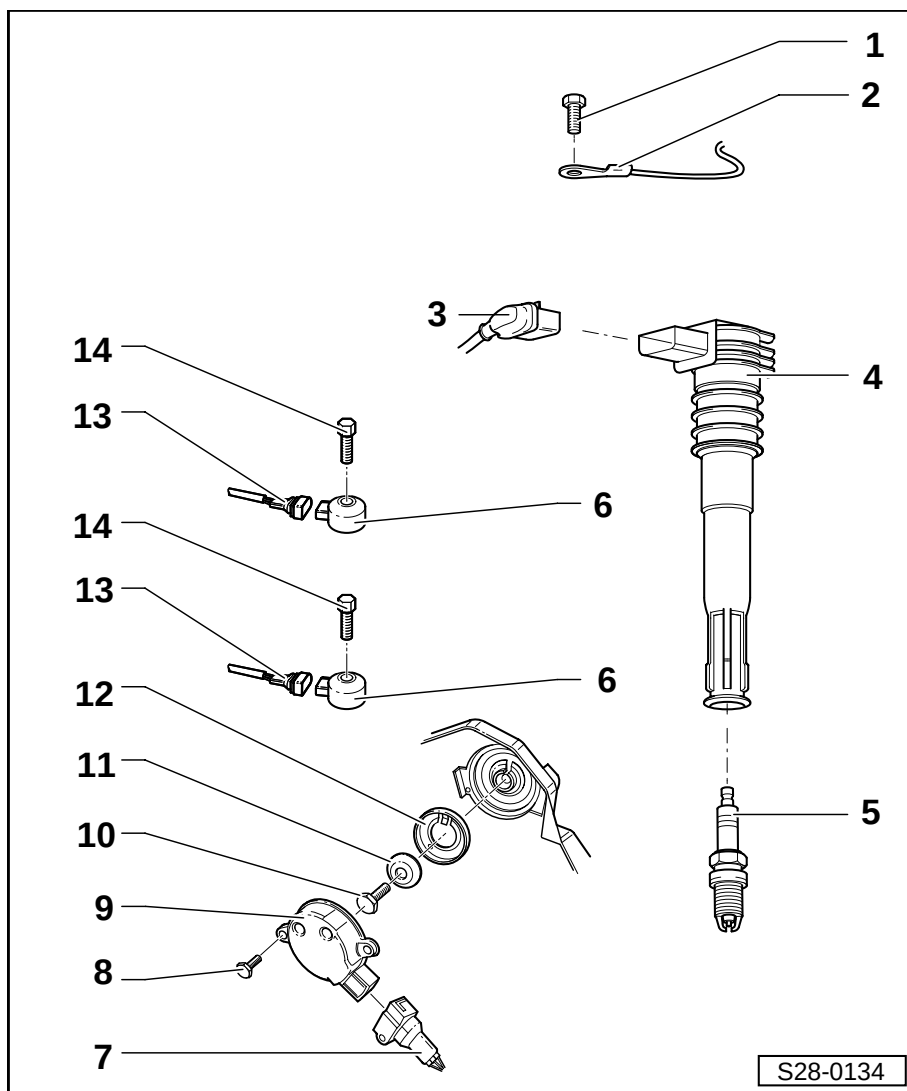
- ☐ check fitting position

13 - Connecting plug

- ☐ 2-pin
- ☐ contacts of connecting plug gilded

14 - 20 Nm

- ☐ The torque influences the knock sensor function
- ☐ Sensor and connecting plug contacts are gold-plated



Testing hall sender -G40-

Special tools, test and measuring equipment and auxiliary items required

- ♦ Diode test lamp, e.g. -V.A.G 1527 B-
- ♦ Handheld multimeter, e.g. -V.A.G 1526 A-
- ♦ Adapter cable set, e.g. -V.A.G 1594 A-

Test condition

- Battery voltage at least 11.5 V



Note!

- ♦ During normal operation the hall sender signal allows the engine control unit to determine the ignition position for cylinder 1.
- ♦ If the hall sender signal fails the cylinder assignment of the knock sensor signals is no longer possible, therefore the knock control is deactivated and the ignition angle is slightly reduced to avoid knocking effects.
- ♦ If the hall sender signal fails the engine keeps running and can also be started again because of the following reasons:
- ♦ There is no noticeable effect on the injection if there is a displacement of an engine revolution. Instead of occurring with the injector open the injection occurs „pre-engaged“ (before the injector is closed). This only has a very slight influence on the quality of the mixture formation.

- Unplug 3-pin connector -1- from hall sender -2-.
- Connect the handheld multimeter and measure voltage on contacts 1 (pos.) and 3 (earth) of the plug connection for hall sender.
- Switch on ignition.

Specified value: minimum 4.5 V.

- Switch off ignition.
- Check hall sender wiring ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

If no fault is found in the cables and the specified voltage was measured between contacts 1 + 3:

- Replace hall sender.

If no fault is found in the wiring and the specified voltage was not measured between contacts 1 + 3:

- Replace engine control unit ⇒ Chap. 24-4.

