

Workshop Manual

Octavia 1997 ➤

1.6 l/75 kW Engine, Fuel Injection and Ignition System
Edition 06.01

Engine code	AVU	BFQ							
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List of Supplements to Workshop Manual

Octavia 1997 ►

1.6 I/75 kW Engine, Fuel Injection and Ignition System

Edition 06.01

Supple- ment	Edition	Subject	Article Number
	06.01	Basic Edition	S00.5135.50.20
1	08.02	Changes for engine BFQ	S00.5135.51.20
2	10.04	Modifications in Rep. Gr. 01 24 and 28	S00.5135.52.20

Table of Contents

01 – Self-diagnosis

Self-diagnosis I	01-1	page	1
- Operation	01-1	page	1
- Technical data of self-diagnosis	01-1	page	1
- Connecting up the 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	3
- Performing actuator diagnosis	01-1	page	4
Self-diagnosis II	01-2	page	1
- Fault codes 16486 ... 16990	01-2	page	1
Self-diagnosis III	01-3	page	1
- Fault codes 17040 ... 18088	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
- Reading measured value block	01-5	page	1
- Display groups 001 up to 028	01-5	page	1
Self-diagnosis VI	01-6	page	1
- Reading measured value block - display groups 030 to 132	01-6	page	1

24 – Fuel Formation, Injection

Fuel Injection System	24-1	page	1
- Safety measures	24-1	page	1
- Rules of cleanliness	24-1	page	1
- Overview of fitting locations	24-1	page	2
- General notes on the injection system	24-1	page	4
- Removing and installing parts of the injection system	24-1	page	5
- Disassembling and assembling fuel distributor with injectors	24-1	page	7
- Disassembling and assembling top part of intake manifold	24-1	page	8
- Disassembling and assembling the air filter	24-1	page	9
- Resistances for intake air temperature sender -G42-	24-1	page	9
- Resistances for the coolant temperature sender -G62-	24-1	page	10
Testing components	24-2	page	1
- Test wiring and components with Test box -V.A.G 1598/31-	24-2	page	1
- Inspecting the injection rate, tightness and jet formation of the injectors	24-2	page	2
- Test fuel pressure regulator and holding pressure	24-2	page	4
- Testing the intake system for tightness (unmetered air)	24-2	page	5
- Testing brake vacuum pump -V192-	24-2	page	6
Inspecting functions	24-3	page	1
- Testing idling speed	24-3	page	1
- Testing the intake manifold changeover	24-3	page	2
Lambda control	24-4	page	1
- Testing lambda probe -G39- and lambda control upstream of catalytic converter	24-4	page	1

- Testing lambda probe -G130- and lambda control downstream of catalytic converter	24-4	page	2
- Test of ageing of lambda probe upstream of catalytic converter -G39-	24-4	page	3
Electronic Engine Power Control (Electronic throttle)	24-5	page	1
- Inspecting fault lamp for the EPC	24-5	page	1
- Testing throttle valve control unit -J338-	24-5	page	1
- Testing Accelerator pedal position sender	24-5	page	3
Engine control unit	24-6	page	1
- Operation	24-6	page	1
- Replacing engine control unit	24-6	page	1
- Coding engine control unit	24-6	page	2
- Adapting the 4AV control unit to the throttle valve control unit -J338-	24-6	page	4
- Adapting EGR valve	24-6	page	6
- Activating and deactivating cruise control system (CCS)	24-6	page	6
- Learning kickdown operating point	24-6	page	7
Testing auxiliary signals	24-7	page	1
- Testing signal from high pressure sender for the air conditioning system -G65-	24-7	page	1
- Testing the speed signal	24-7	page	2
- Checking the data BUS	24-7	page	3
 28 – Ignition System			
Ignition System	28-1	page	1
- General notes on the ignition system	28-1	page	1
- Safety measures	28-1	page	1
- Removing and installing ignition system	28-1	page	2
- Inspecting the camshaft position sensor -G163-	28-1	page	3

01 – Self-diagnosis

01-1 Self-diagnosis I



Note

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

Operation

The engine control unit is equipped with a fault memory. The fault memory is designed as a permanent memory.

If malfunctions occur in the monitored sensors or components, they are stored in the fault memory with indication of the fault type.

Faults which occur only temporarily (sporadically) are displayed 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 after 40 engine starts, it is automatically erased.

The stored faults can be read out with vehicle system tester -V.A.G 1552-, vehicle system tester - V.A.G 1551- or with fault read-out scan tool -V.A.G 1551- ⇒ **01-1** page 2.

After the fault(s) has(have) been removed the fault memory must be erased ⇒ **01-1** page 3.



Note

The description which follows relates only to the vehicle system tester -V.A.G 1552- using the program card 5.0 or higher.

Technical data of self-diagnosis

Equipment

Engine code letters	AVU, BFQ
Displacement	1.6 l
System denomination	SIMOS 3.3
Exhaust limits conforming to	EU4
Self-diagnosis	yes
Electronic throttle system	yes
Lambda control	2 lambda probes
Knock control	yes
Exhaust gas recirculation	yes

Interrogating control unit version

The control unit version is displayed when you connect the vehicle system tester -V.A.G 1552- and select the control unit for the engine electronics ⇒ **01-1** page 2.

Overview of the selectable functions on the Vehicle system tester -V.A.G 1552-

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

Operation	Precondition		
	Engine not running, ignition switched on	Engine idling	Normal driving
01 Interrogating control unit version	yes	yes	yes
02 Interrogating fault memory	yes ¹⁾	yes	yes
03 Actuator diagnosis	yes	no	no
04 Basic setting ²⁾	yes	yes	no
05 Erasing fault memory	yes	yes	no
06 Ending output	yes	yes	yes
07 Coding control unit	yes	no	no
08 Reading measured value block	yes	yes	yes
11 Login procedure	yes	no	no
15 Reading Readiness Code	yes	yes	yes

¹⁾ Only to be carried out with the ignition switched on and if the engine does not start (activate starter for at least 6 seconds beforehand).

²⁾ To be carried out after the following operations: Replace engine control unit, throttle valve control unit, EGR valve, or engine or disconnect battery.

Connecting up the 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-
- ♦ Diagnostic cable -V.A.G 1551/3, 3A, 3B oder 3C-

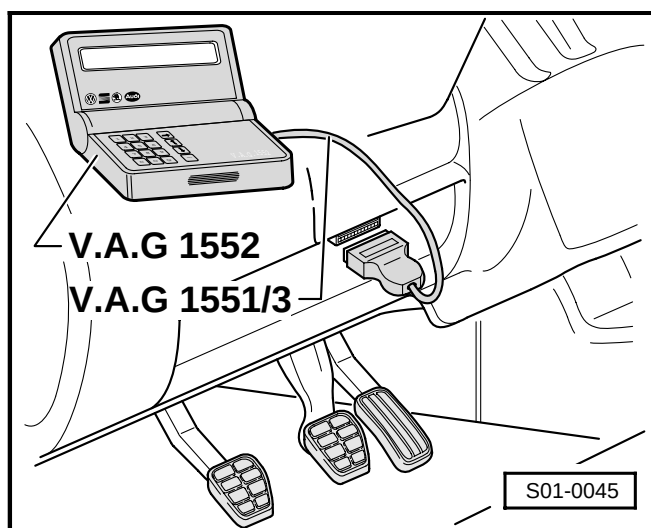
Test conditions

- Battery voltage at least 11.5 V
- Earth connection to engine and gearbox O.K.
- Fuses according to current flow diagram O.K.

Procedure

- Connect vehicle system tester - V.A.G 1552- with the corresponding diagnostic cable. ►

Once the vehicle system tester has been connected:



- Switch on ignition or start engine depending on the desired function ⇒ **01-1** page 2.

**Note**

- ♦ If the read-outs as shown in the work sequence are not displayed: ⇒ Operating instructions of the vehicle system tester.
- ♦ If „data transfer errors“ are displayed as a result of an incorrect entry, disconnect cable at vehicle system tester, plug it in again and repeat all the steps.

Readout on display:



Vehicle system test	HELP
Enter address word XX	

**Note**

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

- Select the address word **01** for „Engine electronics“ and confirm with **Q**.

The vehicle system tester -V.A.G 1552 - displays the control unit identification, e. g.:



06A906033K	SIMOS 33	1.6/2V	00HS	3553	->
Coding 00231			WSC	XXXXX	

- ♦ 06A906033K = Part No. of control unit (for current control unit version see Parts List)
- ♦ SIMOS 33 = system designation
- ♦ 1.6 I /2V= Displacement of engine and number of valves per cylinder
- ♦ 00 = number of set adaptation channels
- ♦ HS = manual gearbox
- ♦ 3553 = software number
- ♦ Coding 00231 = Coding of control unit
- ♦ WSC XXXXX = Workshop code

- **→** Press.

Readout on display:



Vehicle system test	HELP
Select function XX	

- Further procedure, see repair sequences.

Interrogating and erasing fault memory

Readout on display:



Vehicle system test	HELP
Select function XX	

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

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



X faults detected!

If one or several faults are stored:

The stored faults are displayed in sequence.

Readout on display:



Vehicle system test	HELP
Select function XX	

- Select function **05** „Erase fault memory“ and confirm with **Q**.

**Note**

The fault memory is not erased if the ignition is switched off between „Interrogating the fault memory“ and „Erasing the fault memory“.

Readout on display:



Vehicle system test
Fault memory erased!

->

- Select function 06 „End output“ and confirm entry with .
- Rectify the faults displayed by referring to the fault table ⇒ Chapters 01-2 and 01-3.
- Once the fault has been corrected perform a test drive.

**Note**

Pay attention to safety precautions for a test drive
⇒ Chapter 24-1.

During the test drive the following operating conditions must be fulfilled:

- ♦ The coolant temperature should rise beyond 80°C.
- ♦ The following operating conditions must be reached a number of times once the desired temperature has been reached:
 - Idling speed
 - partial load
 - enrichment
 - full load
 - trailing throttle
- ♦ In the case of „full load“ the engine speed should be increased beyond 3500 rpm.
- Interrogate the fault memory on the engine control unit again.

If no fault is stored:

- Select function 06 „End output“ and confirm entry with .

Performing actuator diagnosis

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

1. Fuel pump relay -J17-
2. Solenoid valve 1 for activated charcoal filter -N80-
3. Exhaust gas recirculation valve -N18-
4. Valve for variable intake manifold changeover -N156-
5. Secondary air pump relay -J299-
6. Fan for the coolant -V7- and -V35-
7. Vacuum pump for brake -V192-¹⁾

¹⁾ Only on vehicles with an automatic gearbox

**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.*
- ♦ *The actuators are tested acoustically or by contact.*
- ♦ *If final control diagnosis is to be repeated without starting the engine in-between, switch ignition off for about 20 seconds.*

Test conditions

- Fuses according to current flow diagram O.K.

Special tools, test and measuring equipment and auxiliary items required

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

Procedure

- Connect vehicle system tester -V.A.G 1552-. Switch on the ignition and select „address word“ 01 Engine control unit.
- Select function 03 „final control diagnosis“.

Readout on display:

The fuel pump relay -J17- (relay holder, relay position 4) must continue clicking until the next control element is actuated by pressing the .

Actuator diagnosis
Fuel pump relay-J17

**Note**

During the activation of the fuel pump relay, the fuel pump -J17- must also be heard to run at intervals.

If the relay does not click:

- Test wiring and plug connections to the fuel pump relay -J17- according to the current flow diagram.
-  Press.

Readout on display:

The solenoid valve must continue clicking until the next control element is actuated by pressing the .

Actuator diagnosis
Solenoid valve f.activ.charcoal filter-N80

If the solenoid valve does not click:

- Read measured value block, display group 070
⇒ Chapter 01-6, if necessary test wiring and plug connections to solenoid valve 1 for activated charcoal filter -N80- according to wiring diagram.
-  Press.

Readout on display:

Actuator diagnosis
Exhaust gas recirculation valve -N18

The valve must continue clicking until the next control element is actuated by pressing the .

If the valve does not click:

- Test wiring and plug connections to the exhaust gas recirculation valve -N18- according to the current flow diagram.

Readout on display:



Actuator diagnosis
Var. intake manifold changeover valve -N156

The valve must continue clicking until the next control element is actuated by pressing the .

If the valve does not click:

- Test intake manifold changeover ⇒ Chapter 24-3.

Readout on display:



Actuator diagnosis
Secondary air pump relay -J299

The secondary air pump relay -J299- is operated for about 10 seconds. The motor of the secondary air pump -V101- is actuated in this case by the secondary air pump relay -J299- and runs (for about 10 seconds) unless the next control element is actuated beforehand by pressing .

If the motor of the secondary air pump -V101- does not start:

- Test wiring and plug connections to the secondary air pump motor -V101- according to current flow diagram.

Readout on display:



Actuator diagnosis
Caution: Fan will be switched on

The test of the radiator fan -V7- and -V35- begins in fan stage 1. Here the fans are switched on for 5 seconds and off for 5 seconds unless the next control element is actuated beforehand by pressing .

The actuation is repeated 5 times.

After this, the fans are actuated in fan stage 2. The fans in this case are switched on for 5 seconds and off for 5 seconds unless the next control element is actuated first of all by pressing .

If the radiator fans do not operate:

- Test radiator fan -V7- and -V35- ⇒ 1.6 I/75kW Engine, Mechanical Components; Rep. Gr. 19.

Readout on display:



Actuator diagnosis
Pressure system brake servo unit

The brake vacuum pump -V192- is actuated in this case by the brake servo unit control unit -J542- and runs (for about 10 seconds) unless the next control element is actuated first of all by pressing .

If the brake vacuum pump -V192- does not run:

- Test brake vacuum pump -V192- ⇒ Chapter 24-2.

Readout on display:



Actuator diagnosis
END

- Select function 06 „End output“ and confirm entry with .

- Switch off ignition.

01-2 Self-diagnosis II

Fault codes 16486 ... 16990



Note

- ♦ The fault table is arranged according to the 5-digit fault code on the left.
- ♦ The SAE code which is displayed on the right next to the fault code (e.g.. P0107) can be ignored (at present only valid for USA).
- ♦ Explanations regarding fault types (e.g. „open circuit or short-circuit to earth“) ⇒ Operating instructions for the vehicle system tester.
- ♦ If parts are output as faulty: First check all cables and connectors to these components as well as the earth connections according to the Current Flow Diagram. Only if no fault is detected here should the part be replaced. This applies in particular if faults are shown as „sporadic“ (SP).
- ♦ If „literature“ appears in the display of the vehicle system tester -V.A.G 1552- look for the text required in the fault table under the fault code.

Readout on -V.A.G 1552-		Rectifying fault
16486 Air mass meter -G70	Signal too low	– Read measured value block, display group 002, display field 4 ⇒ Chap. 01-5.
16487 Air mass meter -G70	Signal too high	
		– Test wiring and plug connections according to current flow diagram. – Testing intake system for leaks (unmetered air) ⇒ Chap. 24-2. – Replace air filter if necessary ⇒ Chap. 24-1.
16496 Intake air temperature sender - G42	Signal too low	– Read measured value block, display group 004, display field 4 ⇒ Chap. 01-5. – Test resistances ⇒ Chapter 24-1.
16497 Intake air temperature sender - G42	Signal too high	
		– Test wiring and plug connections according to current flow diagram.
16500 Coolant temperature sender - G62	Implausible signal	– Read measured value block, display group 004, display field 3 ⇒ Chap. 01-5. – Test resistances ⇒ Chapter 24-1. – Test wiring and plug connections according to current flow diagram.
16501 Coolant temperature sender - G62	Signal too low	
16502 Coolant temperature sender - G62	Signal too high	
16514 Bank 1, probe 1	Electrical fault in the circuit	– Test lambda probe -G39- and lambda control upstream of catalytic converter ⇒ Chapter 24-4.
16515 Bank 1, probe 1	Voltage too low	
16516 Bank 1, probe 1	Voltage too high	
16517 Bank 1, probe 1	Signal too slow	
16518 Bank 1, probe 1	No activity	
16520 Bank 1, probe 2	Electrical fault in the circuit	– Test lambda probe -G130- and lambda control downstream of catalytic converter ⇒ Chapter 24-4

Readout on -V.A.G 1552-		Rectifying fault
16521 Bank 1, probe 2	Voltage too low	– Test lambda probe -G130- and lambda control downstream of catalytic converter ⇒ Chapter 24-4.
16522 Bank 1, probe 2	Voltage too high	
16524 Bank 1, probe 2	No activity	
16554 Bank 1, fuel metering system	Malfunction	– Test fuel pressure regulator and holding pressure ⇒ Chap. 24-2 – Test injection valves ⇒ Chapter 24-2 – Test fuel pump ⇒ 1.6/75 Engine, Mechanical Components; Rep. Gr. 20 – Inspect exhaust system for leaks ⇒ 1.6/75 kW Engine, Mechanical Components; Rep. Gr. 26 – Inspect secondary air system for leaks ⇒ 1.6/75 kW Engine, Mechanical Components; Rep. Gr. 26 – Inspect vacuum lines for leaks – Testing intake system for leaks (unmetered air) ⇒ Chap. 24-2.
16555 Bank 1, fuel metering system	System too lean	– Test lambda probe -G39- and lambda control upstream of catalytic converter ⇒ Chapter 24-4. – Test fuel pressure regulator and holding pressure ⇒ Chap. 24-2
16556 Bank 1, fuel metering system	System too rich	
16684 Combustion misfiring detected		– Check the resistance values of the injectors (12...17 Ω at approx. 20 °C). – Test ignition cables and spark plugs ⇒ Chap. 28-1. – Test power output stage -N122- ⇒ Chapter 28-1. – Read measured value block, display groups 014, 015 and 016 ⇒ Chap. 01-5.
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 sender (730...1000 Ω). – Test wiring and plug connections according to current flow diagram. – Replace engine speed sender -G28-.
16706 Engine speed sender -G28	No signal	
16711 Knock sensor 1 -G61	Signal too low	– Read measured value block, display groups 020, 026 and 028 ⇒ Chap. 01-5.
16712 Knock sensor 1 -G61	Signal too high	

Readout on -V.A.G 1552-		Rectifying fault
16719 Engine speed sender -G28	Malfunction	– Test resistance of sender (730...1000 Ω). – Test wiring and plug connections according to current flow diagram. – Replace engine speed sender -G28-.
16725 Camshaft pos. sensor => Sender G40 ¹⁾	Implausible signal	– Read measured value block; display group 012; check values in display fields 3 and 4 => Chapter 01-5. – Test camshaft position sensor -G163- => Chap. 28-1. – Test wiring and plug connections according to current flow diagram.
16726 Camshaft pos. sensor => Sender G40 ¹⁾	Signal too low	

¹⁾ Camshaft position sensor -G163- and camshaft pos. sensor => Sender -G40- are identical.

Readout on -V.A.G 1552-		Rectifying fault
16788 EGR system control difference	Signal too low	– Test exhaust gas recirculation valve -N18- with final control diagnosis => Chap. 01-1. – Adapt EGR valve -N18- => Chap. 24-6. – Test exhaust gas recirculation system => 1.6/75 Engine, Mechanical Components; Rep. Gr. 26
16804 Bank 1, catalytic converter system	Efficiency too low	– Generate readiness code => Chapter 01-4. – Inspect exhaust system for leaks or inspect for damage if necessary between both lambda probes => 1.6/75 Engine, Mechanical Components; Rep. Gr. 26. – Perform emission test => Inspection and Maintenance.
16825 Tank ventilation system	Flow rate incorrect	– Test solenoid valve 1 for activated charcoal filter system -N80- with the final control diagnosis => Chapter 01-1. – Inspect hoses and connection pipes from fuel tank up to the throttle valve control unit => 1.6/75 Engine - Mechanical Components; Rep. Gr. 20. – Test wiring and plug connections according to current flow diagram.
16845 Fuel gauge signal	Implausible signal	– Test fuel gauge sender -G- => Electrical System; Rep. Gr. 90. – Test CAN databus => Chap. 24-7. – Test dash panel insert => Electrical System; Rep. Gr. 90.
16885 Vehicle speed signal	Implausible signal	– Reading measured value block, display group 005, checking values in display field 3 => Chap. 01-5. – Test vehicle speed signal => Chapter 24-7. – Test CAN databus => Chap. 24-7. – Test dash panel insert => Electrical System; Rep. Gr. 90.
16890 Idling control	Speed under nominal value	– Test throttle valve control unit -J338- => Chapter 24-5. – Testing intake system for leaks (unmetered air) => Chap. 24-2. – Adapt throttle valve control unit => Chapter 24-6.
16891 Idling control	Speed above nominal value	

Readout on -V.A.G 1552-		Rectifying fault
16916 AC pressure sensor -G65	Signal too low	– Test signal from high pressure sensor for air conditioning -G65- ⇒ Chapter 24-7.
16917 AC pressure sensor -G65	Signal too high	
16935 PAS pressure/switch -F88	Implausible signal	– Read measured value block, display group 055, check readouts in display field 4 ⇒ Chapter 01-6.
16946 Voltage supply	Voltage too low	– Test voltage supply of engine control unit ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations – Test battery and alternator ⇒ Electrical System; Rep. Gr. 27
16955 Brake light switch -F	Implausible signal	– Read measured value block, display group 066 ⇒ Chapter 01-6. – Test wiring and plug connections according to current flow diagram.
16984 Databus drive	missing message	– Test CAN databus ⇒ Chap. 24-7. – Read out fault memory of all control units.
16985 Control unit defective		– Replace engine control unit ⇒ Chapter 24-6.
16988 Control unit defective		
16990 Control unit defective		

01-3 Self-diagnosis III

Fault codes 17040 ... 18088

Readout on -V.A.G 1552-		Rectifying fault
17040 Fuel consumption signal	electrical fault in the circuit	– Check the fuel consumption signal ⇒ Electrical System; Rep. Gr. 01. – Check data BUS ⇒ Chapter 24-7.
17510 Bank 1 - probe 1, heating circuit	Short circuit to positive	– Test lambda probe -G39- and lambda control upstream of catalytic converter ⇒ Chapter 24-4. – Test wiring and plug connections according to current flow diagram.
17511 Bank 1 - probe 1, heating circuit	Output too low	
17513 Bank 1 - probe 2, heating circuit	Short circuit to positive	– Test lambda probe -G130- and lambda control downstream of catalytic converter ⇒ Chapter 24-4. – Test wiring and plug connections according to current flow diagram.
17523 Bank 1 - probe 1, heating circuit	Short circuit to earth	– Test lambda probe -G39- and lambda control upstream of catalytic converter ⇒ Chapter 24-4. – Test wiring and plug connections according to current flow diagram.
17524 Bank 1 - probe 1, heating circuit	Open circuit	
17525 Bank 1 - probe 2, heating circuit	Short circuit to earth	– Test lambda probe -G130- and lambda control downstream of catalytic converter ⇒ Chapter 24-4. – Test wiring and plug connections according to current flow diagram.
17526 Bank 1 - probe 2, heating circuit	Open circuit	
17549 Load detection	implausible value	– Inspecting air intake system for tightness (unmetered air) ⇒ Chapter 24-2. – Erase the fault memory and carry out test drive.
17579 TV drive angle sender 2 -G188	Implausible signal	– Test throttle valve control unit -J338- ⇒ Chapter 24-5. – Adjust the throttle valve control unit ⇒ Chapter 24-6.
17580 TV drive angle sender 2 -G188	Signal too low	
17581 TV drive angle sender 2 -G188	Signal too high	
17584 Bank 1, lambda correction downstream of cat.	Regulating limit reached	– Test lambda probe - G39- and lambda control upstream of catalytic converter ⇒ Chapter 24-4. – Test lambda probe -G130- and lambda control downstream of catalytic converter ⇒ Chapter 24-4. – Inspect intake air system for leaks (unmetered air) ⇒ Chapter 24-2.

Readout on -V.A.G 1552-		Rectifying fault
17621 Injector cylinder 1 -N30	Short circuit to positive	– Test resistance at injector (12... 17 Ω at approx. 20 °C). – Test wiring and plug connections according to current flow diagram.
17622 Injector cylinder 2 -N31	Short circuit to positive	
17623 Injector cylinder 3 -N32	Short circuit to positive	
17624 Injector cylinder 4 -N33	Short circuit to positive	
17633 Injector cylinder 1 -N30	Short circuit to earth	– Test resistance at injector (12... 17 Ω at approx. 20° C). – Test wiring and plug connections according to current flow diagram.
17634 Injector cylinder 2 -N31	Short circuit to earth	
17635 Injector cylinder 3 -N32	Short circuit to earth	
17636 Injector cylinder 4 -N33	Short circuit to earth	
17645 Injector cylinder 1 -N30	Open circuit	– Test resistance at injector (12... 17 Ω at approx. 20° C). – Test wiring and plug connections according to current flow diagram.
17646 Injector cylinder 2 -N31	Open circuit	
17647 Injector cylinder 3 -N32	Open circuit	
17648 Injector cylinder 4 -N33	Open circuit	
17658 Fuel level	too low	– Top up the fuel tank. – Test fuel gauge sender -G- $\Rightarrow$ Electrical System; Rep. Gr. 90.
17698 Coolant temperature sender - cooler outlet -G83	Signal too high	$\Rightarrow$ 1,6 I/75 kW Engine - Mechanical Components; Rep. Gr. 19
17699 Coolant temperature sender - cooler outlet -G83	Signal too low	$\Rightarrow$ 1,6 I/75 kW Engine - Mechanical Components; Rep. Gr. 19
17700 Thermostat for map-controlled engine cooling -F265	Open circuit	$\Rightarrow$ 1,6 I/75 kW Engine - Mechanical Components; Rep. Gr. 19
17701 Thermostat for map-controlled engine cooling -F265	Short circuit to positive	$\Rightarrow$ 1,6 I/75 kW Engine - Mechanical Components; Rep. Gr. 19
17702 Thermostat for map-controlled engine cooling -F265	Short circuit to earth	$\Rightarrow$ 1,6 I/75 kW Engine - Mechanical Components; Rep. Gr. 19
17743 Engine torque monitoring 2	Regulating limit exceeded	– Inspecting air intake system for tightness (unmetered air) $\Rightarrow$ Chapter 24-2.
17744 Engine torque monitoring	Regulating limit exceeded	– Inspect accelerator pedal position sender $\Rightarrow$ Chapter 24-5.
17746 Bank1, camshaft position sensor $\Rightarrow$ sender -G163	Open circuit/Short circuit to positive	– Inspecting camshaft position sensor -G163- $\Rightarrow$ Chapter 28-1. – Test wiring and plug connections according to current flow diagram.

Readout on -V.A.G 1552-		Rectifying fault
17764 Ignition control cyl. 1	Short circuit to positive	– Test power output stage -N122- ⇒ Chapter 28-1. – Test wiring and plug connections according to current flow diagram.
17765 Ignition control cyl. 1	Short circuit to earth	
17767 Ignition control cyl. 2	Short circuit to positive	
17768 Ignition control cyl. 2	Short circuit to earth	
17794 Control unit defective		– Replace engine control unit ⇒ Chapter 24-6.
17795 Control unit defective		
17796 Control unit defective		
17805 Rotor for engine speed	Adaption limit reached	– Test resistance of sender (730...1000 Ω). – Inspect flywheel ⇒ 1.6 I/75 kW Engine, Mechanical Components; Rep. Gr. 13.
17809 Exhaust gas recirculation valve -N18	Short circuit to earth	– Test EGR valve -N18- in final control diagnosis ⇒ Chapter 01-1.
17810 Exhaust gas recirculation valve -N18	Short circuit to positive	
17811 Exhaust gas recirculation system	Control difference	
17818 Tank vent valve -N80	Short circuit to positive	– Test solenoid valve 1 for activated charcoal filter system -N80- in final control diagnosis ⇒ Chapter 01-1.
17831 Bank 1, secondary air system	Flow rate too low	– Test secondary air injection system ⇒ 1.6 I/75 kW Engine, Mechanical Components; Rep. Gr. 26. – Inspect hoses and connection pipes to and between components ⇒ 1.6 I/75 kW Engine, Mechanical Components; Rep. Gr. 26.
17832 Bank 1, secondary air system	Leak detected	
17833 Tank vent valve -N80	Short circuit to earth	– Perform actuator diagnosis ⇒ Chapter 01-1.
17834 Tank vent valve -N80	Open circuit	
17835 Actuation of brake vacuum pump	Short circuit to positive	– Perform actuator diagnosis ⇒ Chapter 01-1. – Test brake vacuum pump -V192- ⇒ Chapter 24-2.
17836 Actuation of brake vacuum pump	Short circuit to earth	
17837 Actuation of brake vacuum pump	Open circuit	
17842 Secondary air pump relay - J299	Short circuit to positive	– Perform actuator diagnosis ⇒ Chapter 01-1.
17843 Secondary air pump relay - J299	Short circuit to earth	

Readout on -V.A.G 1552-		Rectifying fault
17848 Exhaust gas recirculation valve -N18	Open circuit	– Perform actuator diagnosis ⇒ Chapter 01-1.
17850 EGR potentiometer -G212	Signal too high	– Test wiring and plug connections according to current flow diagram.
17851 EGR potentiometer -G212	Signal too low	
17909 Fuel pump relay -J17	Short circuit to earth	– Perform actuator diagnosis ⇒ Chapter 01-1.
17910 Fuel pump relay -J17	Short circuit to positive	
17911 Load signal for alternator terminal DF	Implausible signal	– Test cable to alternator ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations. – Inspecting AC generator ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.
17920 Variable intake manifold changeover valve -N156	Short circuit to positive	– Perform actuator diagnosis ⇒ Chapter 01-1. – Test wiring and plug connections according to current flow diagram.
17923 Variable intake manifold changeover valve -N156	Short circuit to earth	
17924 Variable intake manifold changeover valve -N156	Open circuit	
17925 Main relay => -J217	electrical fault in the circuit	– Check voltage supply relay -J363- ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.
17931 Crash signal from airbag CU	Implausible signal	– Interrogate fault memory of airbag control unit and erase ⇒ Chapter 01-1. – Test airbag system ⇒ Body Fitting Work; Rep. Gr. 01.
17950 TV drive angle sender -G187	Implausible signal	– Test throttle valve control unit -J338- ⇒ Chapter 24-5. – Adjust the throttle valve control unit -J338- ⇒ Chapter 24-6.
17951 TV drive angle sender -G187	Signal too low	
17952 TV drive angle sender -G187	Signal too high	
17953 Throttle valve control	Malfunction	– Test throttle valve control unit -J338- ⇒ Chapter 24-5. – Adjust the throttle valve control unit -J338- ⇒ Chapter 24-6.
17966 Throttle valve drive -G186	electrical fault in the circuit	
17967 Throttle valve control unit -J338	Incorrect basic setting	
17972 Throttle valve control unit -J338	Undervoltage on basic setting	– Test throttle valve control unit -J338- ⇒ Chapter 24-5. – Test battery, charge if necessary ⇒ Electrical System; Rep. Gr. 27.

Readout on -V.A.G 1552-		Rectifying fault
17973 Throttle valve control unit -J338	Bottom limit not reached	– Check throttle valve for damage or dirt. – Test throttle valve control unit -J338- ⇒ Chapter 24-5.
17976 Throttle valve control unit -J338	Mechanical fault	
17977 Cruise control system switch - E45	Implausible signal	– Read measured value block, display group 066 ⇒ Chapter 01-5.
17978 Engine control unit blocked ¹⁾		– Adjust the engine control unit to the electronic immobiliser ⇒ Electrical System; Rep. Gr. 96. – Test electronic immobiliser ⇒ Electrical System; Rep. Gr. 90.

¹⁾ When attempting to start with a non-adapted key a static fault is stored in the memory. If a subsequent start attempt occurs with an adapted key the fault is changed to a sporadic fault.

Readout on -V.A.G 1552-		Rectifying fault
17987 Throttle valve control unit - J338	Adaption not started	– Inspect plug assignment on the throttle valve control unit -J338- ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations. – Adjust the throttle valve control unit ⇒ Chapter 24-6. – Test throttle valve control unit -J338- ⇒ Chapter 24-5.
17997 Potentiometer for temperature selector -G267 ¹⁾	Short circuit to earth	
17998 Potentiometer for temperature selector -G267 ¹⁾	Open circuit	
18010 Voltage supply tml. 30	Voltage too low	– Check charge state of battery ⇒ Electrical System; Rep. Gr. 27. – Inspect AC generator ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations. – Remove line interruption according to Current Flow Diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.
18011 Control unit defective		– Replace engine control unit ⇒ Chapter 24-6.
18016 Steering angle signal ²⁾	Fault message from steering angle sender	– Read measured value block, display group 055, check readouts in display field 4 ⇒ Chapter 01-5.

¹⁾ These faults apply only to vehicles with heating system or manual air conditioning. If these faults are displayed on vehicles fitted with Climatronic, please check the coding of the engine control unit ⇒ Chapter 24-6.

²⁾ Fault in control unit software, what is meant is the PAS pressure switch -F88-

Readout on -V.A.G 1552-		Rectifying fault
18017 Crash disconnect activated		- Interrogate fault memory of engine control unit and erase ⇒ Chapter 01-1. - Test airbag system ⇒ Body Fitting Work; Rep. Gr. 01.
18020 Engine control unit incorrectly coded		Code engine control unit ⇒ Chapter 24-6.
18033 Databus drive	implausible message from gearbox ECU	- Interrogate fault memory of automatic gearbox control unit ⇒ Automatic Gearbox; Rep. Gr. 01. - Check coding ⇒ Chapter 24-6. - Check data BUS ⇒ Chapter 24-7.
18034 Drive databus	Missing message from gearbox CU	
18038 Accelerator pedal position sender -G79	Signal too low	Inspect accelerator pedal position sender ⇒ Chapter 24-5.
18039 Accelerator pedal position sender -G79	Signal too high	
18041 Accelerator pedal position sender -2 -G185	Signal too low	Inspect accelerator pedal position sender ⇒ Chapter 24-5.
18042 Accelerator pedal position sender -2 -G185	Signal too high	
18044 Databus drive	Missing message from airbag CU	- Check data BUS ⇒ Chapter 24-7. - Test airbag control unit ⇒ Body work; Rep. Gr. 01.
18047 1/2 for accelerator pedal position sender -G79+G185	Implausible signal	Inspect accelerator pedal position sender ⇒ Chapter 24-5.
18048 Control unit defective		Replace engine control unit ⇒ Chapter 24-6.
18056 Databus drive	defective	Check data BUS ⇒ Chapter 24-7.
18057 Databus drive	Missing message from ABS CU	- Check data BUS ⇒ Chapter 24-7. - Inspecting ABS control unit -J104- ⇒ Running Gear; Rep. Gr. 45.
18058 Databus drive	Missing message from combiinstrument	- Check data BUS ⇒ Chapter 24-7. - Test dash panel insert ⇒ Electrical System; Rep. Gr. 90.
18065 Air conditioning system inlet/outlet	Short circuit to positive	Read measured value block, display group 050 ⇒ Chapter 01-5.
18067 Radiator fan control 1	Short circuit to positive	- Perform actuator diagnosis ⇒ Chapter 01-1. - Test cables for short circuit to positive or earth ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.
18068 Radiator fan control 1	Short circuit to earth	

Readout on -V.A.G 1552-		Rectifying fault
18069 Radiator fan control 2	Short circuit to positive	– Perform actuator diagnosis ⇒ Chapter 01-1. – Test cables for short circuit to positive or earth ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.
18070 Radiator fan control 2	Short circuit to earth	
18085 Fault lamp for electrical accelerator control - K132	Short circuit to positive	– Test EPC fault lamp -K132- ⇒ Chapter 24-5.
18088 Non-resettable emergency running mode active		– Test throttle valve control unit -J338- ⇒ Chapter 24-5. – Inspect accelerator pedal position sender ⇒ Chapter 24-5.

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 the diagnosis for a system was successfully performed (e.g. diagnosis of catalytic converter), the relevant position of the numerical code is set from 1 to 0.

This diagnosis is performed at regular intervals during normal driving. If repairs have been done on a system relevant for the exhaust gas it is recommended to generate the readiness code as this guarantees that these systems operate according to the specifications. If a fault is detected during diagnosis, it is then stored in the fault memory.

The readiness code is erased if 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-
- ◆ Diagnostic cable -V.A.G 1551/3, 3A, 3B oder 3C-

Procedure

- Connect vehicle system tester -V.A.G 1552-. Switch ignition on and select „address word“ 01 Engine electronics ⇒ Chap. 01-1.
- Function **1** **5** enter „readiness code“ and confirm with **Q**.

The following readout must appear in the display after successfully completing all the checks:

Readiness code	->
00000000 - Test complete	

- Press **0**.
- Enter function **0** **6** „End output“ and confirm with **Q**.

Read-out on display:

Readiness code	->
00101101 - Test not complete	

Not all checks were performed successfully.

- Press **0**.
- Generate readiness code ⇒ **01-4** page 2.

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

X	X	X	X	X	X	X	X	Checked system
0								Exhaust gas recirculation
	0							Lambda probe heater
		0						Lambda probes
			0					Air conditioning (no diagnosis at present/always 0)
				0				Secondary air system
					0			Activated charcoal filter (tank vent system)
						0		Catalytic converter heater (no diagnosis at present/always 0)
							0	Catalytic converter

Generating readiness code

Special tools, test and measuring equipment and auxiliary items required

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

Test conditions

- Vehicle stopped.
- All electrical components such as lights and rear window heater must be switched off.
- On vehicles with an automatic gearbox the selector lever must be in position „P“ or „N“.
- The coolant temperature must be at least 80°C
⇒ display group 004, display field 3.
- The intake air temperature must be below 60 °C ⇒
display group 004, display field 4.

Procedure

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

Work step 1: Interrogating fault memory

- Enter address word „Interrogate fault memory“ and confirm with .

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

X faults detected

If a fault is stored in the memory:

- Rectify the faults by referring to the fault table
⇒ Chapter 01-2 and 01-3.

If no fault is stored:

- Press .

Work step 2: Erasing fault memory

- Enter address word **0 5** „Erase fault memory“ and confirm with **Q**.

**Note**

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

Readout on display:

► **Vehicle system test** ->
The fault memory is erased

**Note**

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

- Press **Q**.

Work step 3: Diagnosis of secondary air injection system

- Select function **0 4** „initiate basic setting“ and confirm entry with **Q**.

Readout on display:

► **Initiating basic setting**
Enter display group number XXX

- **0 7 7** for the „indicator group 077“ and confirm entry with **Q**.

Readout on display:

► **System in basic setting 77** ->
700 rpm 1.9 g/s 0.0 % Test ON

For engines with engine code BFQ

- Depress brake pedal and accelerator simultaneously.

For engines with engine code AVU

- Depress brake pedal and hold pressed.

Continued for all engines

Engine speed is increased and the readout in display field 4 switches from „Test OFF“ to „Test ON“.

- Run engine at high speed until specified value „Syst. O.K.“ appears

If the display does not occur as described:

- Interrogate fault memory ⇒ Chapter 01-1.

If the display occurs as described:

- Press **C**.

Work step 4: Diagnosis of exhaust gas recirculation system

Readout on display:

► **Initiating basic setting**
Enter display group number XXX

- **0 7 5** for the „indicator group 075“ and confirm entry with **Q**.

Readout on display:

► **System in basic setting 75** ->
700 rpm 18.4 % -2.3 % System O.K.

After initiating diagnosis of engine control unit the display in field 4 changes from „Test OFF“ to „Test ON“.

- Run engine at idling speed until „Syst. O.K.“ is displayed in display field 4.

If the display does not occur as described:

- Interrogate fault memory ⇒ Chapter 01-1.

If the display occurs as described:

- Press .

Work step 5: Catalyst diagnosis

Readout on display:

-    for the „indicator group 046“ and confirm entry with .

Readout on display:

Initiating basic setting
Enter display group number XXX

System in basic setting 46 ->
700 rpm 250,0 C 0,96 Test OFF

For engines with engine code BFQ

- Depress brake pedal and accelerator simultaneously.
- Engine speed is increased and the readout in display field 4 switches from „Test OFF“ to „Test ON“.

For engines with engine code AVU

- Set speed to 2500...4500 rpm. The readout in display field 4 changes from „Test OFF“ to „Test ON“.

Continued for all engines

- Catalytic converter temperature in display field 2 must be at least 400 °C.



Note

This may take a few minutes.

- Maintain the speed until the readout in display field 4 shows the specified value „CatB1 O.K.“.

If the display does not occur as described:

- Interrogate fault memory ⇒ Chapter 01-1.

No fault in the fault memory:

- Conduct a test drive at a constant speed.
- Pay attention to safety precautions for test drives ⇒ Chapter 24-1.
- Once again perform (test of conversion) diagnosis of catalytic converter.

In case of equal result:

- Replace catalytic converter ⇒ 1.6 I/75 kW Engine, Mechanical Components; Rep. Gr. 26.

If the display occurs as described:

- Press .

Work step 6: Diagnosis of lambda probe after catalyst (ageing test)

- **0 4 3** for the „indicator group 043“ and confirm entry with **Q**.

Readout on display:

System in basic setting 43				->
700/min	200.0	C	0.85	V
				Test OFF

For engines with engine code BFQ

- Depress brake pedal and accelerator simultaneously.

For engines with engine code AVU

- Depress brake pedal and hold pressed.

Continued for all engines

Engine speed is increased and the readout in display field 4 switches from „Test OFF“ to „Test ON“.

- Continue running engine at higher speed until the catalytic converter temperature in display field 2 shows at least 200 °C.



Note

This may take a few minutes.

- Run engine at high speed until display field 4 indicates specified value „B1-S2 O.K.“.

If the display does not occur as described:

- Interrogate fault memory ⇒ Chapter 01-1.

If the display occurs as described:

- Press **C**.

Work step 7: Diagnosis of lambda probe before catalyst (ageing test)

Readout on display:

Initiating basic setting	
Enter display group number XXX	

- **0 3 4** for the „indicator group 034“ and confirm entry with **Q**.

Readout on display:

System in basic setting 34				->
700 rpm	300.0	C	0.000	
				Test OFF

For engines with engine code BFQ

- Depress brake pedal and accelerator simultaneously.

For engines with engine code AVU

- Depress brake pedal and hold pressed.

Continued for all engines

Engine speed is increased and the readout in display field 4 switches from „Test OFF“ to „Test ON“.

- Catalytic converter temperature in display field 2 must be at least 350 °C.

**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 display does not occur as described:

- Interrogate fault memory ⇒ Chapter 01-1.

If the display occurs as described:

- Press

Work step 8: Diagnosis of activated charcoal filter system (tank vent system)

Readout on display:

- for the „indicator group 070“ and confirm entry with .

Readout on display:

After initiating diagnosis of engine control unit the display in field 4 changes from „Test OFF“ to „Test ON“.

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

If the display does not occur as described:

- Interrogate fault memory ⇒ Chapter 01-1.

If the display occurs as described:

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



Initiating basic setting
Enter display group number XXX



System in basic setting 70			->
4.3 %	10.9 %	-1.1 %	Test OFF

01-5 Self-diagnosis V

Reading measured value block

Special tools, test and measuring equipment and auxiliary items required

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

Test conditions

- Coolant temperature must be at least 80 °C.
- All electrical consumers such as e.g. rear window heater must be switched off.

Procedure

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

Readout on display:

▶

Vehicle system test
Select function XX

HELP

- Enter address word 0 8 „Read measured value block“ and confirm the entry with key Q.

Readout on display:

▶

Reading measured value block
Enter display group number XXX

- Select desired display group:

- ♦ Display groups 001 up to 028 ⇒ **01-5** page 1.
- ♦ Display groups from 030 ⇒ Chap. 01-6.

Display groups 001 up to 028

Display group 001 - Basic functions setting conditions

Engine idling

Coolant temperature 80 C

Reading measured value block 1 →				< Readout on display		
xxx rpm	xxx.x °C	xx.x %	xxxxxxxx			
1	2	3	4	< Display field	Specification	Analysis
				Setting condition for basic setting	1x111111	⇒ 01-5 page 2
				Lambda control before catalyst	-10,0...10,0 %	⇒ 01-5 page 2
				Coolant temperature	80,0...115.0 °C	⇒ 01-5 page 5
				Engine speed (idling speed)	640...900 /rpm	⇒ 01-5 page 2

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

Display -V.A.G 1552-	Possible cause of fault	Rectifying fault
less than 640 rpm	♦ Throttle valve control unit jams/defective	– Test throttle valve control unit ⇒ Chapter 24-5. – inspecting idling speed ⇒ Chapter 24-3.
greater than 900 rpm	♦ Idling not detected ♦ Large quantity of unmetered air between intake manifold and air mass meter ♦ Throttle valve control unit jams/defective	– Interrogate fault memory ⇒ Chapter 01-1. – Inspecting air intake system for tightness (unmetered air) ⇒ Chapter 24-2. – Test throttle valve control unit ⇒ Chapter 24-5. – inspecting idling speed ⇒ Chapter 24-3.

Analysis: Display group 001, display field 3 - lambda control before the catalytic converter

Display -V.A.G 1552 -	Possible cause of fault	Rectifying fault
not within tolerance	Minimum range: Mixture too rich, the lambda control leans the mixture Plus range: Mixture too lean, lambda control enriches	– wait 30 seconds until the display has stabilised
	Unmetered air	– Testing intake system for tightness ⇒ Chap. 24-2.
	Injection valve defective	– Check the resistance values of the injectors (12...17 Ω at approx. 20 °C). – Test wiring and plug connections according to current flow diagram.

Analysis: Display group 001, display field 4 - Setting conditions for basic setting

X	X	X	X	X	X	X	X	Meaning
1								No fault detected by the self-diagnostic function
	x							Disregard display
		1						AC compressor disconnected
			1					Idling detected
				1				Lambda control: o.k.
					1			Throttle valve closed
						1		Engine speed less than 2000 rpm
							1	Coolant temperature more than 80°C

Display group 002 Basic functions injection time, air mass meter**Engine idling****Coolant temperature 80 °C**

Reading measured value → block 2				< Readout on display		
xxx rpm	xxx.x %	x.x ms	x.x g/s			
1	2	3	4	< Display field	Specification	Analysis
				Drawn in air mass	2,0...4.5 g/s	⇒ 01-5 page 3
				Injection period	2,0...4.0 ms	⇒ 01-5 page 3
				Engine load	15,0...35,0 %	⇒ 01-5 page 7
				Engine speed (idling speed)	640...900 /rpm	⇒ 01-5 page 2

Analysis: Display group 002, display field 3 - injection time

Display -V.A.G 1552 -	Possible cause of fault	Rectifying fault
less than 2.0 ms	♦ high fuel volume from the activated charcoal filter system ♦ incorrect injection valve with too great flow rate fitted	– Test solenoid valve 1 for activated charcoal filter system -N80- with the final control diagnosis ⇒ Chapter 01-1. – Test injected quantity ⇒ Chapter 24-2.
greater than 4.0 ms	♦ increased engine load due to electrical consumers (air conditioning system, fog lights etc.)	– Eliminate increased load (AC, fog lights etc.).

Analysis: Display group 002, display field 4 - inducted air mass

Display -V.A.G 1552 -	Possible cause of fault	Rectifying fault
less than 2.0 g/s	♦ Large quantity of unmetered air between intake manifold and air mass meter	– Eliminate unmetered air.
greater than 4.5 g/s	♦ Gear engaged (automatic gearbox) ♦ Engine loaded by auxiliary equipment	– Move selector lever into position „P“ or „N“. – Eliminate load (AC, power steering etc.).

Display group 003 Basic functions air mass meter, throttle valve angle**Engine idling****Coolant temperature 80 °C**

Reading measured value block 3 →				< Readout on display		
xxx rpm	x.xx g/s	x.x %	xx.x ° b. TDC			
1	2	3	4	< Display field	Specification	Analysis
				Ignition angle	0,0...15,0° b. TDC	---
				Throttle valve angle	1,5...4,0 %	⇒ 01-5 page 4
				Drawn in air mass	2,0...4.5 g/s	⇒ 01-5 page 3
				Engine speed (idling speed)	640...900 /rpm	⇒ 01-5 page 2

Analysis: Display group 003, display field 3 - throttle valve angle

Display -V.A.G 1552 -	Possible cause of fault	Rectifying fault
greater than 4.0 %	♦ Engine control unit not adapted to throttle valve control unit ♦ Throttle valve potentiometer in throttle valve control unit faulty ♦ Throttle valve jams	— Adapt engine control unit to throttle valve control unit ⇒ Chapter 24-6. — Test throttle valve control unit ⇒ Chapter 24-5. — Remove fault.

Display group 004 Basic functions temperature**Engine idling****Coolant temperature 80 °C**

Reading measured value block 4 →				< Readout on display		
xxx rpm	xx.x V	xxx.x °C	xxx.x °C			
1	2	3	4	< Display field	Specification	Analysis
				Intake manifold temperature	-38,0...80,0 °C	⇒ 01-5 page 5
				Coolant temperature	80,0...115,0 °C	⇒ 01-5 page 5
				Supply voltage of the engine control unit	12,5...14,5 V	⇒ 01-5 page 5
				Engine speed (idling speed)	640...900 /rpm	⇒ 01-5 page 2

Analysis: Display group 004, display field 2 - supply voltage to the engine control unit

Display -V.A.G 1552 -	Possible cause of fault	Rectifying fault
less than 12.5 V	◆ AC generator defective, battery heavily discharged ◆ Battery 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 alternator and battery voltage ⇒ Electrical System; Rep. Gr. 27. – Increase engine speed slightly for a few minutes and switch off additional consumers. – Check the supply voltage of the engine control unit ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations. – Rectify any current drain.
greater than 14.5 V	◆ Voltage regulator on generator defective ◆ Overvoltage due to starting aid or quick charger	– Test voltage regulator, replace if necessary ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations. – Interrogate fault memory ⇒ Chapter 01-1.

Analysis: Display group 004, display field 3 - coolant temperature

Display -V.A.G 1552 -	Possible cause of fault	Rectifying fault
less than 80,0 °C	◆ Engine too cold ◆ Coolant temperature sender or cable connection to engine control unit faulty	– Conduct road test if necessary. – Test resistances ⇒ Chapter 24-1.
greater than 115,0 °C	◆ Radiator dirty ◆ Radiator fan not operational ◆ Thermostat for map-controlled engine cooling system faulty ◆ Coolant temperature sender or cable connection to engine control unit faulty	– Clean radiator. – Perform actuator diagnosis ⇒ Chapter 01-1. – Test thermostat for map-controlled engine cooling system ⇒ 1.6l/75 kW Engine, Mechanical Components; Rep. Gr. 19. – Test resistances ⇒ Chapter 24-1. – Test wiring and plug connections according to current flow diagram.
constant 30,0 or 49,5 °C	◆ Line interruption or short-circuit	– Test wiring and plug connections to coolant temperature sender -G62- according to current flow diagram.

Analysis: Display group 004, display field 4 - intake air temperature

Display -V.A.G 1552 -	Possible cause of fault	Rectifying fault
constant 9.0 or 30.0 °C	◆ Line interruption, short-circuit to positive or earth	– Test resistances ⇒ Chapter 24-1. – Test wiring and plug connections to intake air temperature sender -G42- according to current flow diagram.

Display group 005 Engine operating state**Engine idling****Coolant temperature 80 °C**

Reading measured value block 5				→ < Readout on display		
xxx rpm	xxx.x %	xxx km/h	Text			
1	2	3	4	< Display field	Specification	Analysis
				Operating condition (idling, partial load, enrichment, trailing throttle, full load)	Idling	---
				Driving speed	0 km/h	---
				Engine load	15,0...35,0 %	⇒ 01-5 page 7
				Engine speed (idling speed)	640...900 /rpm	⇒ 01-5 page 2

Display group 006 Basic functions altitude correction factor**Engine idling****Coolant temperature 80 °C**

Reading measured value block 6				→ < Readout on display		
xxx rpm	xxx %	xxx.x °C	xx.x %			
1	2	3	4	< Display field	Specification	Analysis
				Level correction factor	-50,0...10,0 %	---
				Intake manifold temperature	-38,0...80,0 °C	⇒ 01-5 page 5
				Engine load	15,0...35,0 %	⇒ 01-5 page 7
				Engine speed (idling speed)	640...900 /rpm	⇒ 01-5 page 2

Note on display field 3:

The overall temperature range is indicated as nominal value. The display value must be higher than the ambient temperature.

Note on display field 4:

Altitude	Readout
NN	+5...-10
1000 m	-5...-20
2000 m	-10...-30

Display group 010 Ignition angle**Engine idling****Coolant temperature 80 °C**

Reading measured value block 10				< Readout on display		
xxx rpm	xxx %	x.x %	xx.x ° b. TDC			
1	2	3	4	< Display field	Specification	Analysis
				Ignition angle	0,0...15,0° b. TDC	---
				Throttle valve angle (potentiometer 1 -G187-)	1,5...4,0 %	⇒ 01-5 page 7
				Engine load	15,0...35,0 %	⇒ 01-5 page 7
				Engine speed (idling speed)	640...900 /rpm	⇒ 01-5 page 2

Note on display field 3:

When accelerator fully depressed, the readout must be approx. 100 %.

Analysis: Display group 010, display field 2 - engine load

Display -V.A.G 1552 -	Possible cause of fault	Rectifying fault
less than 15.0 %	♦ lower value can only occur during trailing throttle driving ♦ Unmetered air	– Testing intake system for tightness ⇒ Chap. 24-2.
greater than 35,0 %	♦ Poor idling (engine not running on all cylinders) ♦ Electrical consumers on ♦ Steering wheel at limit stop ♦ Gear engaged (automatic gearbox) ♦ Air mass meter faulty	– Injector or spark plugs faulty. – Switch off electrical consumers. – Turn steering wheel into middle position. – Move selector lever into position „P“ or „N“. – Test wiring and plug connections to air mass meter -G70- according to current flow diagram.

Analysis: Display group 010, display field 3 - throttle valve angle

Display -V.A.G 1552 -	Possible cause of fault	Rectifying fault
greater than 4.0 %	♦ Engine control unit not adapted to throttle valve control unit ♦ Throttle valve potentiometer in throttle valve control unit faulty ♦ Throttle valve jams	– Adapt engine control unit to throttle valve control unit ⇒ Chapter 24-6. – Test throttle valve control unit ⇒ Chapter 24-5. – Remove fault.

Display group 011 Ignition angle

Engine idling

Coolant temperature 80 °C

Reading measured value block 11				< Readout on display		
xxx rpm	xxx.x °C	xxx.x °C	xx.x ° b. TDC			
1	2	3	4	< Display field	Specification	Analysis
				Ignition angle	0,0...15,0° b. TDC	---
				Intake manifold temperature	-38,0...80,0 °C	---
				Coolant temperature	80,0...115,0 °C	⇒ 01-5 page 5
				Engine speed (idling speed)	640...900 /rpm	⇒ 01-5 page 2

Display group 012 Position of camshaft relative to crankshaft

Engine idling

Coolant temperature 80 °C

Reading measured value block 12				< Readout on display		
xxx rpm	xxx.x %	xx	xx			
1	2	3	4	< Display field	Specification	Analysis
				No. of crankshaft tooth at change of camshaft slope from high - low	86...90	---
				No. of crankshaft tooth at change of camshaft slope from low - high	26...30	---
				Engine load	15,0...35,0 %	⇒ 01-5 page 7
				Engine speed (idling speed)	640...900 /rpm	⇒ 01-5 page 2

Display group 014 Ignition misfiring recognition

Driving

Coolant temperature 80 °C

Reading measured value block 14				< Readout on display		
xxxx rpm	xxx %	xxx	Text			
1	2	3	4	< Display field	Specification	Analysis
				Misfiring detection (activated, deactivated)	activated	---
				Sum of ignition misfiring	x	⇒ 01-5 page 10
				Engine load	0,0...100,0 %	---
				Engine speed (idling speed)	640...6500 /rpm	---

Note on display field 3:

What is stated is not the specification as the misfiring rate is checked continuously in the engine control unit. If the fault threshold is exceeded, the fault entries are made and the exhaust warning lamp flashes or lights up.

Display group 015 Ignition misfiring recognition cylinders 1 to 3**Driving**

Coolant temperature 80 C

Reading measured value block 15 xxxx xxx xxx Text				< Readout on display		
1	2	3	4	< Display field	Specification	Analysis
				Misfiring detection (activated, deactivated)	activated	---
				Ignition misfiring cyl. 3	x	⇒ 01-5 page 10
				Ignition misfiring cyl. 2	x	⇒ 01-5 page 10
				Ignition misfiring cyl. 1	x	⇒ 01-5 page 10

Note on display fields 1 to 3:

What is stated is not the specification as the misfiring rate is checked continuously in the engine control unit. If the fault threshold is exceeded, the fault entries are made and the exhaust warning lamp flashes or lights up.

Display group 016 Ignition misfiring recognition cylinder 4**Driving**

Coolant temperature 80 C

Reading measured value block 16 xxxx xxx xxx Text				< Readout on display		
1	2	3	4	< Display field	Specification	Analysis
				Misfiring detection (activated, deactivated)	activated	---
				no display		---
				no display		---
				Ignition misfiring cyl. 4	x	⇒ 01-5 page 10

Note on display field 1:

What is stated is not the specification as the misfiring rate is checked continuously in the engine control unit. If the fault threshold is exceeded, the fault entries are made and the exhaust warning lamp flashes or lights up.

Analysis: Display group 014, 015 and 016 - ignition misfiring

Display -V.A.G 1552 -	Possible cause of fault	Rectifying fault
counts up continuously possible misfiring fault code in fault memory	◆ Spark plug defective ◆ Spark plug connector defective ◆ Power output stage -N122- faulty ◆ Injection valve defective	– Test spark plugs and spark cables with spark plug connector ⇒ Chap. 28-1. – Test power output stage -N122- ⇒ Chapter 28-1. – Check the resistance values of the injector (12...17 Ω at approx. 20 °C). – Test wiring and plug connections to injectors according to current flow diagram.
	◆ Unmetered air ◆ Exhaust gas recirculation valve jams	– Testing intake system for tightness ⇒ Chap. 24-2. – Test exhaust gas recirculation valve -N18- with final control diagnosis ⇒ Chap. 01-1.

Display group 020 Ignition angle retardation

Driving

Coolant temperature 80 °C

Reading measured value block 20 xx.x° BTDC xx.x° BTDC xx.x° BTDC xx.x° BTDC				< Readout on display		
1	2	3	4	< Display field	Specification	Analysis
				Ignition angle relief cylinder 4 through knock control	0,0...15.0° b. TDC	⇒ 01-5 page 11
				Ignition angle relief cylinder 3 through knock control	0,0...15.0° b. TDC	⇒ 01-5 page 11
				Ignition angle relief cylinder 2 through knock control	0,0...15.0° b. TDC	⇒ 01-5 page 11
				Ignition angle relief cylinder 1 through knock control	0,0...15.0° b. TDC	⇒ 01-5 page 11

Display group 023 Knock control**Driving****Coolant temperature 80 C**

Reading measured value block 23				→ < Readout on display		
xxxx rpm	xxx.x %	xx.x° BTDC	xx.x° BTDC			
1	2	3	4	< Display field	Specification	Analysis
				Ignition angle relief cylinder 4 through knock control	0,0...15.0° b. TDC	⇒ 01-5 page 11
				Ignition angle relief cylinder 3 through knock control	0,0...15.0° b. TDC	⇒ 01-5 page 11
		Engine load			0,0...100,0 %	---
	Engine speed				640...6500 /rpm	---

Analysis: Display group 020 and 023 - ignition angle retardation

Display -V.A.G 1552 -	Possible cause of fault	Rectifying fault
all cylinders great than 15° BTDC	◆ Knock sensor defective ◆ Plug connection at knock sensor corroded ◆ Knock sensor incorrectly tightened ◆ Component parts on engine loose ◆ poor fuel quality	— Test wiring and plug connections to knock sensor -G61- according to current flow diagram. — Slacken knock sensor and tighten again to 20 Nm. — Tighten loosened attached parts. — Change grade of fuel.
one cylinder clearly deviates from the others	◆ Plug connection at knock sensor -G61- corroded ◆ Engine damage ◆ Component parts on engine loose	— Test wiring and plug connections to knock sensor -G61- according to current flow diagram. — Testing compression pressure ⇒ 1.6 I/75 kW Engine, Mechanical Components; Rep. Gr. 15 — Tighten loosened attached parts.

Display group 026 Knock sensor voltage signal**Engine idling****Coolant temperature 80 °C**

Reading measured value block 26				< Readout on display		
x.xxx V	x.xxx V	x.xxx V	x.xxx V			
1	2	3	4	< Display field	Specification	Analysis
				Knock sensor voltage signal cyl. 4	0,200...2 000 V	---
				Knock sensor voltage signal cyl. 3	0,200...2,000 V	---
				Knock sensor voltage signal cyl. 2	0,200...2,000 V	---
				Knock sensor voltage signal cyl. 1	0,200...2,000 V	---

Display group 028 Knock control**Mode basic setting 04****Driving****Coolant temperature 80 °C**

Reading measured value block 28				< Readout on display		
xxx rpm	xxx.x %	xxx.x °C	Text			
1	2	3	4	< Display field	Specification	Analysis
				Result knock control (Test ON, Test OFF, Syst. O.K., Syst. N.O.K.)	Syst. o.k.	---
				Coolant temperature	80,0...115.0 °C	⇒ 01-5 page 5
				Engine load	40...100 %	---
				Engine speed	640...6500 /rpm	---

01-6 Self-diagnosis VI

Reading measured value block - display groups 030 to 132

Display group 030 Lambda control

Engine idling

Coolant temperature 80 °C

Reading measured value block 30 xxx xxx				< Readout on display		
1	2	3	4	< Display field	Specification	Analysis
				no display		---
				no display		---
				Status lambda control downstream of catalytic converter	110	⇒ 01-6 page 1
				Status lambda control upstream of catalytic converter	111	⇒ 01-6 page 1



Note

The first position in the 3-digit numerical block fluctuates initially between 0 and 1 (lambda probe heater OFF and ON).



Note

- ♦ regarding display field 2
- ♦ The third position of the display number changes to 1 under load.

Analysis: Display group 030, display field 1 and 2 - status of lambda control

X	X	X	Meaning
1			Lambda probe heater
	1		Lambda probe operational
		1	Lambda control active

Display group 031, lambda control - lambda values upstream of catalytic converter**Engine idling****Coolant temperature 80 °C**

Reading measured value block 31 x.xxxx x.xxxx				< Readout on display		
1	2	3	4	< Display field	Specification	Analysis
				no display		---
				no display		---
				Lambda nominal value - Bank 1	0,9900...1,0100	---
				Lambda actual value - Bank 1	0,9900...1,0100	---

Display group 032, lambda control - lambda learned values**Engine idling****Coolant temperature 80 °C**

Reading measured value block 32 xx.x % xx.x %				< Readout on display		
1	2	3	4	< Display field	Specification	Analysis
				no display		---
				no display		---
				Lambda learned value at part load (multiplicative)	-10,0...10,0 %	⇒ 01-6 page 3
				Lambda learned value at idling speed (additive)	-14,0...14,0 %	⇒ 01-6 page 3

**Note**

- ♦ to the display fields 1 and 2:
- ♦ 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.
- ♦ add = additive - The effect of the fault (e.g. unmetered air) becomes increasingly less 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 effect of the fault (e.g. faulty injector) becomes greater 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.

Analysis: Display group 032, display field 1 and 2 Lambda learned values

Display -V.A.G 1552 -	Possible cause of fault	Rectifying fault
low lambda learned values	◆ Low learned values when idling at normal learned values under partial load: Oil dilution (higher fuel content in the oil) possible ◆ Injection valve leaks ◆ Fuel pressure too high ◆ Solenoid valve 1 for activated charcoal filter constantly open ◆ Air mass meter faulty ◆ Lambda probe heater faulty or lambda probe -G39- dirty	– Disappears after driving on motorway or changing oil. – Test for lack of leaks and spray pattern of injectors ⇒ Chapter 24-2 – Test fuel pressure regulator and holding pressure ⇒ Chap. 24-2. – Test solenoid valve 1 for activated charcoal filter system with the final control diagnosis ⇒ Chapter 01-1. – Test wiring and plug connections to air mass meter -G70- according to current flow diagram. – Test lambda probe -G39- and lambda control upstream of catalytic converter ⇒ Chapter 24-4.
high lambda initialisation values	◆ High learned values in idling at less high learned values in partial load: Unmetered air in intake manifold region possible ◆ Unmetered air between air mass meter and throttle valve ◆ Injection valve blocked ◆ Display field 1 and 2 high: Air mass meter faulty ◆ Fuel pressure too low ◆ Unmetered air at the exhaust manifold gasket ◆ Lambda probe heater faulty or lambda probe dirty	– Testing intake system for tightness ⇒ Chap. 24-2. – Remove fault. – Test injected quantity ⇒ Chapter 24-2. – Test wiring and plug connections to air mass meter -G70- according to current flow diagram. – Test fuel pressure regulator and holding pressure ⇒ Chap. 24-2. – Test lambda probe -G39- and lambda control upstream of catalytic converter ⇒ Chapter 24-4.

Display group 033 Lambda control - Lambda probe upstream of catalytic converter

Engine idling

Coolant temperature 80 °C

Reading measured value → block 33				< Readout on display		
xx.x %	x.xx V					
1	2	3	4	< Display field	Specification	Analysis
				no display		---
				no display		---
				Lambda probe voltage before catalyst	1,40...1,60 V	⇒ 01-6 page 4
				Lambda control before catalyst	-10,0...10,0 %	⇒ Chapter 01-5



Note

- ♦ Re display field 2:
- ♦ Voltage signal „Mixture rich“ (low level of residual oxygen) is between 0.130...1.500 V.
- ♦ Voltage signal „Mixture rich“ (high level of residual oxygen) is at approx. 1.500...4.800 V.

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

Display field: 1	Rectifying fault
constant 0.000...1.400 V or constant 1.600...3.600 V	— Testing lambda probe and lambda control upstream of catalytic converter ⇒ Chapter 24-4
constant 3,600 V	
constant 0.000 V	

Display group 034, diagnosis of lambda probe before catalytic converter (ageing test)**Mode basic setting 04****BFQ: Brake and accelerator pedal pressed simultaneously, engine running at fast idling****AVU: Brake pedal depressed, engine running at high engine speed**

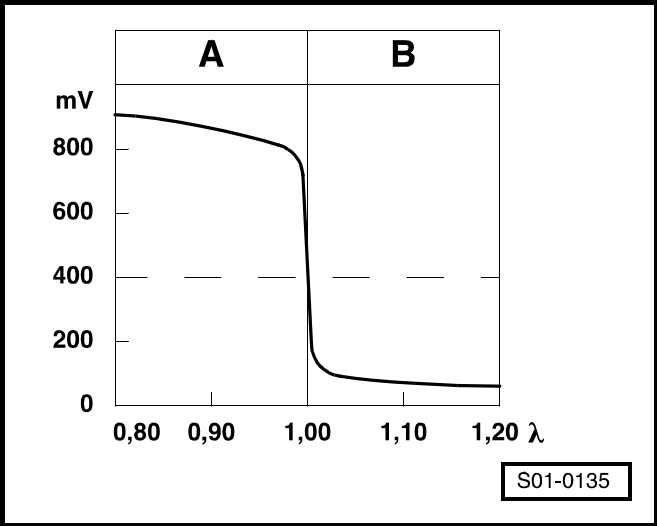
System in basic setting 34 →				< Readout on display		
xxxx rpm	xxx.x °C	x.xxx	Text			
1	2	3	4	< Display field	Specification	Analysis
				Result of test of lambda probe ageing upstream of catalytic converter (Test OFF, Test ON, B1-S1 O.K., B1-S1 not O.K.)	B1-S1 O.K.	---
				Disregard display	---	---
				Catalytic converter temperature	min. 350,0 °C	---
				Engine speed	2500...4000 rpm about 1400 rpm ¹⁾	---

¹⁾ for engines with engine code AVU**Display group 036 Operational readiness of lambda probe downstream of catalytic converter****Mode basic setting 04****Engine idling**

System in basic setting 36 →				< Readout on display		
x.xx V	Text					
1	2	3	4	< Display field	Specification	Analysis
				no display		---
				no display		---
				Test lambda probe downstream of catalytic converter (Test OFF, Test ON, B1-S2 O.K., B1 S2 n.o.k.)	B1-S2 O.K.	---
				Lambda probe voltage after catalytic converter	0,00...1,00 V	⇒ 01-6 page 6

Voltage of the 4-pin lambda probe in U in mV

- 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: Display group 036, display field 1 - Voltage of lambda probe, lambda probe downstream of catalytic converter

Display -V.A.G 1552 -	Possible cause of fault	Rectifying fault
constant 1,10 V	♦ Short circuit to positive caused by: Lambda probe, lambda probe cable, earth lead, engine control unit	— Test lambda probe -G130- and lambda control downstream of catalytic converter ⇒ Chapter 24-4.
constant between 0.40 ...0.50 V	♦ Line interruption through: Lambda probe, lambda probe cable, earth lead, engine control unit	
constant 0.00 V	♦ Short circuit to earth caused by: Lambda probe, lambda probe cable, earth lead, engine control unit	

Display group 041 Lambda probe heater

Engine idling

Coolant temperature 80 C

Reading measured value → block 41				< Readout on display		
xxxx Ω	Text	xxxx Ω	Text			
1	2	3	4	< Display field	Specification	Analysis
				Heater of lambda probe downstream of catalytic converter (Heating.aC.OFF, heating.aC.ON)	Htg.bC.ON	---
				Internal resistance of lambda probe downstream of catalytic converter	---	---
				Heater of lambda probe upstream of catalytic converter (Heating.bC.OFF/heating.bC.ON)	Htg.bC.ON	---
				Internal resistance of lambda probe upstream of catalytic converter	---	---

Display group 043, diagnosis of lambda probe after the catalytic converter (ageing test)**Mode basic setting 04****BFQ: Brake and accelerator pedal pressed simultaneously, engine running at fast idling****AVU: Brake pedal depressed, engine running at high engine speed**

System in basic setting 43 →				< Readout on display		
xxxx rpm	xxx.x °C	x.xx V	Text			
1	2	3	4	< Display field	Specification	Analysis
				Check result of ageing test of lambda probe downstream of catalytic converter (Test OFF, Test ON, B1-S2 O.K., B1-S2 N.O.K.)	B1-S2 O.K.	---
				Lambda probe voltage after catalytic converter	0,00...1,00 V	---
				Catalytic converter temperature	min. 200,0 °C	---
				Engine speed	2500...4000 rpm about 1400 rpm ¹⁾	---

¹⁾ for engines with engine code AVU**Display group 046, diagnosis of the catalytic converter efficiency****Mode basic setting 04****BFQ: Brake and accelerator pedal pressed simultaneously, engine running at fast idling****AVU: Engine runs in higher speed**

System in basic setting 46 →				< Readout on display		
xxxx rpm	xxx.x °C	x.xx	Text			
1	2	3	4	< Display field	Specification	Analysis
				Result of catalytic converter test (Test OFF, Test ON, Cat B1 O.K., Cat B1 N.O.K.)	Cat B1 O.K.	---
				Catalyst efficiency	0,50...1,00	---
				Catalytic converter temperature	min. 400,0 °C	---
				Engine speed	2500...4000 rpm 2100 ...4500 rpm ¹⁾	---

¹⁾ for engines with engine code AVU

Display group 050 Engine speed increase when AC on**Engine idling****Coolant temperature 80 °C**

Reading measured value block 50				< Readout on display		
xxx rpm	xxx rpm	Text	Text			
1	2	3	4	< Display field	Specification	Analysis
				Operating state of AC compressor	Compr. ON or compressor OFF	---
				Operating condition of air conditioning system	ON or OFF	---
				Engine speed (idling speed - specified value)	640...900 /rpm	---
				Engine speed (actual value)	640...900 /rpm	⇒ Chapter 01-5

**Note**

- ◆ *Re display field 2:*
- ◆ *What is displayed is the specified engine speed (value computed internally in control unit in line with temperature) specified by the engine control unit.*
- ◆ *Re display field 4:*
- ◆ *On vehicles not fitted with air conditioning system „Compr. OFF“ is always displayed.*

Display group 053 Engine speed increase with increased alternator load**Engine idling****Coolant temperature 80 °C**

Reading measured value block 53				< Readout on display		
xxxx rpm	xxxx rpm	xx.x V	xxx.x %			
1	2	3	4	< Display field	Specification	Analysis
				Alternator load	0,0...100,0 %	---
				Supply voltage of the engine control unit	12,5...14,5 V	⇒ Chapter 01-5
				Engine speed (idling speed - specified value)	approx. 640...900/ rpm	---
				Engine speed (actual value)	640...900 /rpm	⇒ Chapter 01-5

**Note**

- ◆ *Re display field 4:*
- ◆ *The readout is dependent on the particular electrical components which are switched on, e.g. rear window heater, blower, seat heater etc.*

Display group 054 Engine speed control**Driving****Coolant temperature 80 °C**

Reading measured value → block 54				< Readout on display		
xxx rpm	Text	xxx.x %	xxx.x %			
1	2	3	4	< Display field	Specification	Analysis
				Throttle valve angle (potentiometer 1 -G187-)	0,0...100,0 %	---
				Sender 1 for accelerator pedal position	0,0...100,0 %	---
				Operating condition (idling, partial load, enrichment, trailing throttle, full load)	---	---
				Engine speed	640...6500 /rpm	---

Display group 055 Idling speed stabilisation**Engine idling****Coolant temperature 80 °C**

Reading measured value → block 55				< Readout on display		
xxxx rpm	xx %	xx.x %	xxxxx			
1	2	3	4	< Display field	Specification	Analysis
				Operating conditions	xxxxx	⇒ 01-6 page 9
				Initialisation value idle stabilizer	-10,0...10,0 %	---
				Idling regulator	-10...20 %	---
				Engine speed (idling speed)	640...900 /rpm	⇒ Chapter 01-5

**Note**

- ♦ *Re display field 3:*
- ♦ *The display shows to what extent the idling stabilizer has „disinitialised“ from the constructively given mean value. On a new engine the value is in the positive region because of the higher friction, on a run-in engine it is in the negative region.*

Meaning of 5-digit numerical block

X	X	X	X	X	Meaning
1					PAS pressure switch ON (steering wheel at limit stop)
	x				no meaning
		1			Air conditioning switched on
			1		Gear engaged ¹⁾
				1	Air conditioning compressor on

¹⁾ Only on vehicles fitted with automatic gearbox

Display group 056 Idling speed stabilisation

Engine idling

Coolant temperature 80 °C

Reading measured value block 56				→ < Readout on display		
xxxx rpm	xxxx rpm	xx %	xxxxxx			
1	2	3	4	< Display field	Specification	Analysis
				Operating conditions	xxxxx	⇒ 01-6 page 9
				Idling regulator	-10...20 %	---
				Engine speed (idling speed - specified value)	640...900 /rpm	---
				Engine speed (actual value)	640...900 /rpm	---



Note

- ♦ Re display field 2:
- ♦ What is displayed is the specified engine speed (value computed internally in control unit in line with temperature) specified by the engine control unit.

Display group 060 the EPC system

Mode basic setting 04

Ignition on, engine stopped

System in basic setting 60				→ < Readout on display		
xx.x %	xx.x %	x	Text			
1	2	3	4	< Display field	Specification	Analysis
				Adaption status (ADP runs, ADP O.K. or ERROR)	ADP o.k.	---
				Adaption status	0...9	---
				Throttle valve angle (potentiometer 2 -G188-)	100,0...0,0 %	---
				Throttle valve angle (potentiometer 1 -G187-)	0,0...100,0 %	---



Note

- ♦ to display group 060:
- ♦ The adaptation of the throttle valve control unit occurs with the ignition switched on.
- ♦ The engine control unit is adjusted to the throttle valve control unit by selecting display group 060 under function 04 „Basic setting“. This adjustment must always be performed if a different throttle valve control unit (or completely different engine) or a different engine control unit has been fitted.
- ♦ The specifications stated in display fields 1 and 2 are not fully utilised in this process.
- ♦ During adaptation the counter in display field 3 counts up to 9.

Display group 062 Engine speed control EPC system**Ignition on, engine stopped**

Reading measured value → block 62				< Readout on display		
xx.x %	xx.x %	xx.x %	xx.x %			
1	2	3	4	< Display field	Specification	Analysis
				Sender 2 for accelerator pedal position -G185-	3,0...48,0 %	---
				Sender 1 for accelerator pedal position -G79-	6,0...96,0 %	---
				Throttle valve angle (potentiometer 2 -G188-)	97,0...3,0 %	---
				Throttle valve angle (potentiometer 1 -G187-)	3,0...97,0 %	---

**Note**

- ◆ to display group 062:
- ◆ The potentiometer on the throttle valve control unit and of the pedal value sensor are duplicated for safety reasons. The engine control unit constantly verifies the plausibility of the potentiometers.
- ◆ The value of sensor -2 for accelerator pedal position -G185- must always be half of the value of sender 1 for accelerator pedal position -G79-.
- ◆ The potentiometers of the throttle valve control unit contra-rotate. The value of both potentiometers together must always be approx. 100 %.
- ◆ The specifications stated are not fully utilised.

Display group 063 Kickdown adaptation**Only on vehicles fitted with automatic gearbox****Mode basic setting 04****Ignition on, engine stopped**

System in basic setting 63 →				< Readout on display		
xx.x %	xx.x %	Text	Text			
1	2	3	4	< Display field	Specification	Analysis
				Operating conditions (ERROR, actuated, ADP runs, ADP O.K.)	ADP o.k.	⇒ Chapter 24-6
				Kick-down switch	Kickdown	---
				Sender 2 for accelerator pedal position -G185-	---	---
				Sender 1 for accelerator pedal position -G79-	---	---

**Note**

- ◆ Re display field 4:
- ◆ If „actuated“ appears in display in the display field 4, depress the accelerator pedal fully and hold it in this position. The test is finished when „ADP O.K.“ appears in the display.

Display group 066 cruise control system (only on vehicles with cruise control system)**Engine idling**

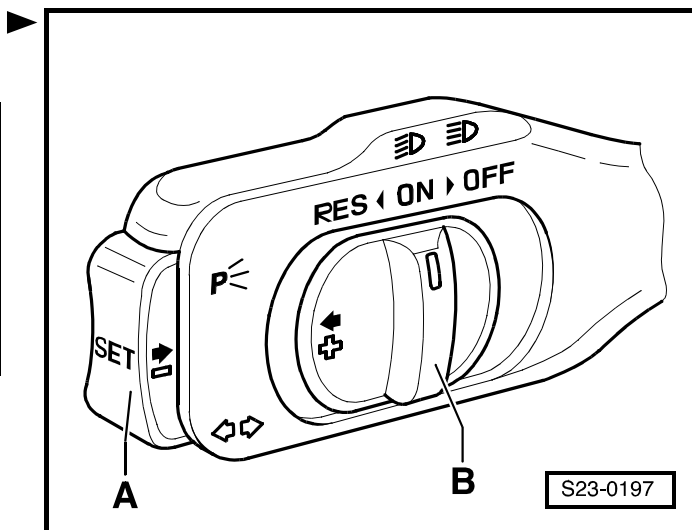
Reading measured value block 66				→ < Readout on display		
xxx km/h	xxxx	xxx km/h	xxxx	< Display field	Specification	Analysis
1	2	3	4	CCS switch position	xxxx or 0000xxxx	⇒ 01-6 page 12
				Driving speed (nominal), last value stored by the CCS	---	---
				Switch position of brake, clutch and CCS	xxxx or 0000xxxx	⇒ 01-6 page 12
				Vehicle speed (actual value)	0 km/h	---

Analysis: Display group 066, display field 2 - switch for brake, clutch and CCS

X	X	X	X	Meaning
			1	Brake pedal depressed (brake light switch)
		1		Brake pedal depressed (brake switch)
	1			Clutch depressed (if automatic gearbox fitted: brake pedal depressed)
1				CCS released

**Analysis: Display group 066, display field 4
switch position of CCS**

X	X	X	X	Meaning
1				Switch -B- to „RES“
	1			Switch -A- pressed (switch -B- to „ON“)
		0		Switch -B- to „OFF“ (not locked or locked)
			0	Switch -B- to „OFF“ (only if locked)



Display group 070 Diagnosis of activated charcoal filter system (tank vent system)**Mode basic setting 04****Engine idling****Coolant temperature minimum 60 C**

System in basic setting 70 →				< Readout on display		
xxx.x %	xx.x %	xx.x %	Text			
1	2	3	4	< Display field	Specification	Analysis
				Result of diagnosis (Test ON, Test OFF, TVV O.K., TVV N.O.K.)	TVV o.k.	---
				Idling speed controller variation during TVV diagnosis	-8,0...8,0 %	---
				Lambda controller variation during TVV diagno- sis	-10,0...7,0 %	---
				On/Off ratio of solenoid valve 1 for activated charcoal filter	0,0...100,0 %	---

**Note**

TVV means solenoid valve 1 for activated charcoal filter system. Diagnosis can only be initiated once each time the engine is started.

**Note**

- ◆ Re display field 2:
- ◆ Lambda regulation - deviation in the negative range: activated charcoal filter full.
- ◆ Lambda regulation - deviation in the positive range: activated charcoal filter empty.

Display group 074 EGR positioner adaption**Mode basic setting 04****Ignition on, engine stopped**

System in basic setting 74 →				< Readout on display		
x.x V	x.x V	xxx.x %	Text			
1	2	3	4	< Display field	Specification	Analysis
				Adaption status (ADP runs, ADP O.K. or ER- ROR)	ADP o.k.	---
				Current poti value	0,0...100,0 %	---
				Max. stop	3,0...4,8 V	---
				Zero position	0,3...1.5 V	---

**Note**

- ♦ to display group 074:
- ♦ The adaptation of the exhaust gas recirculation valve occurs with the ignition on.
- ♦ The engine control unit is adapted to the exhaust gas recirculation valve by selecting display group 074 under function 04 „Basic position“. This adaption must always be performed if another EGR valve (or completely different engine) or another engine control unit has been installed.

Display group 075 - Exhaust gas recirculation**Mode basic setting 04****Engine idling**

System in basic setting 75 →				< Readout on display		
xxxx rpm	xxx %	xxx.x %	Text			
1	2	3	4	< Display field	Specification	Analysis
				Result of the diagnosis (Test ON / Test OFF / Syst. O.K. / Syst. N.O.K.)	Syst. o.k.	---
				Valve stroke difference	-10,0...25,0 %	---
				Opening degree potentiometer value	0,0...100,0 %	---
				Engine speed (idling speed)	640...900 /rpm	⇒ Chapter 01-5

Display group 077 Diagnosis of secondary air injection system**Mode basic setting 04**

BFQ: Brake and accelerator pedal pressed simultaneously, engine running at fast idling

AVU: Brake pedal depressed, engine running at high engine speed

System in basic setting 77 →				< Readout on display		
xxxx rpm			Text			
1	2	3	4	< Display field	Specification	Analysis
				Result of the diagnosis (Test ON / Test OFF / Syst. O.K. / Syst. N.O.K., interruption)	Syst. o.k.	---
				no meaning	---	---
				no meaning	---	---
				Engine speed (idling speed)	approx. 1400 rpm	---

Display group 095 Single-stage intake manifold changeover**Engine idling****Coolant temperature 80 °C**

Reading measured value block 95				→ < Readout on display		
xxxx rpm	xx.x %	xxx.x °C	Text			
1	2	3	4	< Display field	Specification	Analysis
				Status of intake manifold changeover	ON or OFF	---
				Coolant temperature	80,0...115,0 °C	⇒ Chapter 01-5
Load					---	---
Engine speed (idling speed)					640...900 /rpm	⇒ Chapter 01-5

**Note**

- ◆ *Re display field 4:*
- ◆ *If the throttle is depressed at approx. 2000 rpm, the status must jump from OFF to ON.*

Display group 100 - readiness code**Engine idling****Coolant temperature 80 °C**

Reading measured value block 100				→ < Readout on display		
xxxxxxxx	xxx.x °C	xxx s	xxxxxxxx			
1	2	3	4	< Display field	Specification	Analysis
				Diagnosis status	---	---
				Time since engine start	---	---
Coolant temperature					80,0...115,0 °C	⇒ Chapter 01-5
Readiness code					00000000	⇒ 01-6 page 15

Meaning of the digits in the 8-digit numerical block, display field 1 - readiness code**The readiness code is only generated when all display positions are at 0.**

X	X	X	X	X	X	X	X	Checked system
0								Exhaust gas recirculation
	0							Lambda probe heater
		0						Lambda probes
			0					Air conditioning system (currently no diagnosis/always „0“)
				0				Secondary air system
					0			Activated charcoal filter (tank vent system)
						0		Catalytic converter heating (no diagnosis at present/always „0“)
							0	Catalytic converter

Display group 120 Traction control system

Driving

Reading measured value block 120				→			< Readout on display		
xxxx rpm	xxx Nm	xxx Nm	Text						
1	2	3	4	< Display field			Specification	Analysis	
				Status			TCS active / TCS n. active	---	
				Actual engine load			0...260 Nm	---	
				Nominal engine load			0...399 Nm	---	
				Engine speed			640...6500 /rpm	---	

Display group 122 Gearbox (only automatic gearbox)

Driving

Reading measured value block 122				→			< Readout on display		
xxxx rpm	xxx Nm	xxx Nm	Text						
1	2	3	4	< Display field			Specification	Analysis	
				Status			Engine ctl./ no ctl.	---	
				Actual engine load			0...260 Nm	---	
				Nominal engine load			0...399 Nm	---	
				Engine speed			640...6500 /rpm	---	

Display group 125 CAN databus - Messages

For engines with engine code BFQ

Reading measured value block 125				→			< Readout on display		
Text	Text	Text	Text						
1	2	3	4	< Display field			Specification	Analysis	
				Status of the air-conditioning system			Clima 1	---	
				Status of the dash panel insert			Combi 1	⇒ 01-6 page 17	
				Status ABS			ABS 1	⇒ 01-6 page 17	
				Status gearbox			Gearbox 1 ¹⁾	⇒ 01-6 page 17	

¹⁾ For models with an automatic gearbox

Display group 125 CAN databus - Messages

For engines with engine code AVU

Reading measured value → block 125				< Readout on display		
Text	Text	Text	Text			
1	2	3	4	< Display field	Specification	Analysis
				Status airbag	Airbag 1	---
				Status of the dash panel insert	Combi 1	⇒ 01-6 page 17
				Status gearbox	Gearbox 1 ¹⁾	⇒ 01-6 page 17
				Status ABS	ABS 1	⇒ 01-6 page 17

¹⁾ For models with an automatic gearbox

Display group 126 CAN databus - Messages

For engines with engine code BFQ

Reading measured value → block 126				< Readout on display		
Text						
1	2	3	4	< Display field	Specification	Analysis
				---	---	---
				Status airbag	Airbag 1	⇒ 01-6 page 17
				---	---	---
				---	---	---



Note

- ♦ to the display groups 125 and 126:
- ♦ Specification = 1 means: Connection to the CAN databus cables - control unit.
- ♦ Specification = 0 means: No connection to the CAN databus cables - control unit.

Analysis: Display groups 125 and 126

Display -V.A.G 1552 -	Possible cause of fault	Rectifying fault
if 0 displayed instead of 1	♦ CAN databus connection defective ♦ no CAN databus cables used - control unit ♦ CAN databus cables defective - control unit	— Perform the automatic test sequence for interrogation of all fault memories.

Display group 130 Diagnosis of mapped cooling**Engine idling****AC switched off**

Reading measured value block 130				→ < Readout on display		
xxx.x °C	xxx.x °C	xx.x %	Text			
1	2	3	4	< Display field	Specification	Analysis
				Result of the diagnosis (Test ON, Test OFF, Syst. O.K., Syst. N.O.K.)	Syst. o.k.	---
				On/off ratio of thermostat	0...100 %	---
				Coolant temperature radiator outlet	0...100 °C	---
				Coolant temperature engine outlet	80...115 °C	---

**Note**

- ♦ to the display fields 1 and 2:
- ♦ The coolant temperature at engine outlet must always be higher than at radiator outlet.

Display group 131 Diagnosis of mapped cooling**Engine idling****AC switched off**

Reading measured value block 131				→ < Readout on display		
xxx.x °C	xxx.x °C	xxx.x %	xxx.x %			
1	2	3	4	< Display field	Specification	Analysis
				On/off ratio of thermostat	0,0...100,0 %	---
				Coolant temperature radiator outlet	0,0...100,0 °C	---
				Coolant temperature at engine outlet (specified temperature)	0,0...115,0 °C	---
				Coolant temperature at engine outlet (specified tempera- ture)	80,0...115,0 °C	---

**Note**

- ♦ to the display fields 1 and 3:
- ♦ The coolant temperature at engine outlet must always be higher than at radiator outlet.

Display group 132 Diagnosis of mapped cooling**Engine idling****AC switched off**

Reading measured value block 132				→	< Readout on display		
xxx.x °C	xxx °C	xx.x V	Text				
1	2	3	4		< Display field	Specification	Analysis
					Status of coolant regulation	xxxxxx	⇒ 01-6 page 19
					Heating feed potentiometer -G267-	0,2...4.8 V ¹⁾	---
					Temperature difference engine and radiator outlet	0...110 °C	---
					Coolant temperature at radiator outlet (specified temperature)	---	---

¹⁾ on vehicles fitted with Climatronic 5.1 V

Status of coolant regulation

X	X	X	X	X	X	Checked system
1						1. Fan level active
	1					2. Fan level active
		x				Regulator variation: 0 > spec. temp., 1 < act. temp.
			1			Fan actuation active
				1		Thermostat actuation active
					1	Fault present

**Note**

- ◆ to bit 1 and 2:
- ◆ The fan stages may also be actuated by the air conditioning system.

24 – Fuel Formation, Injection

24-1 Fuel Injection System

Safety measures



Caution!

The fuel system is under pressure! Place a cloth around the connecting point before releasing hose connections or when opening the system. Then reduce the pressure by carefully removing the hose or cap.

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

- ◆ Do not touch or remove ignition leads with the engine running or at start speed.
- ◆ Ignition and plug connections must be switched off before disconnecting and re-connecting cables of the fuel injection and ignition system as well as of test equipment.
- ◆ To operate the engine at start speed without it starting (e.g. for a testing compression pressure), unplug connectors from the ignition unit and connectors from the injectors. After performing the work interrogate fault memory and erase.
- ◆ 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.

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 equipment is operated from the front passenger seat, this can result in injuries to the persons sitting on that seat in the event of an accident which involves the front passenger airbag being deployed.

Rules of cleanliness

Pay careful attention to the following rules of cleanliness when working on the fuel supply or fuel injection systems:

- ◆ 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. in tool boxes etc.).
- ♦ When the system is open: avoid working with compressed air. Avoid moving the vehicle.
- ♦ Disconnected plug connections: Protect from dirt and moisture. Plug together only if dry.

Overview of fitting locations



Note

- ♦ Components marked with an * are tested by self-diagnosis ⇒ Chap. 01-1.
- ♦ Components marked with ** are tested by final control diagnosis ⇒ Chapter 01-1.

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

- ☐ resistance: 22...30 Ω

2 - Return-flow line

- ☐ secure with spring strap clamps
- ☐ to fuel delivery unit in fuel tank

3 - Feed line

- ☐ secure with spring strap clamps
- ☐ from fuel filter

4 - Camshaft position sensor -G163-*

- ☐ for engines with engine code AVU
- ☐ under top toothed belt guard
- ☐ inspect ⇒ Chapter 28-1

5 - Variable intake manifold changeover valve -N156- */**

- ☐ inspect ⇒ Chapter 24-3

6 - Top part of intake manifold

- ☐ disassembling and assembling ⇒ **24-1** page 8

7 - Bottom part of intake manifold

8 - Connector, 81 pin

- ☐ only insert or remove plug when the ignition is switched off
- ☐ unlock before removing

9 - Engine control unit*

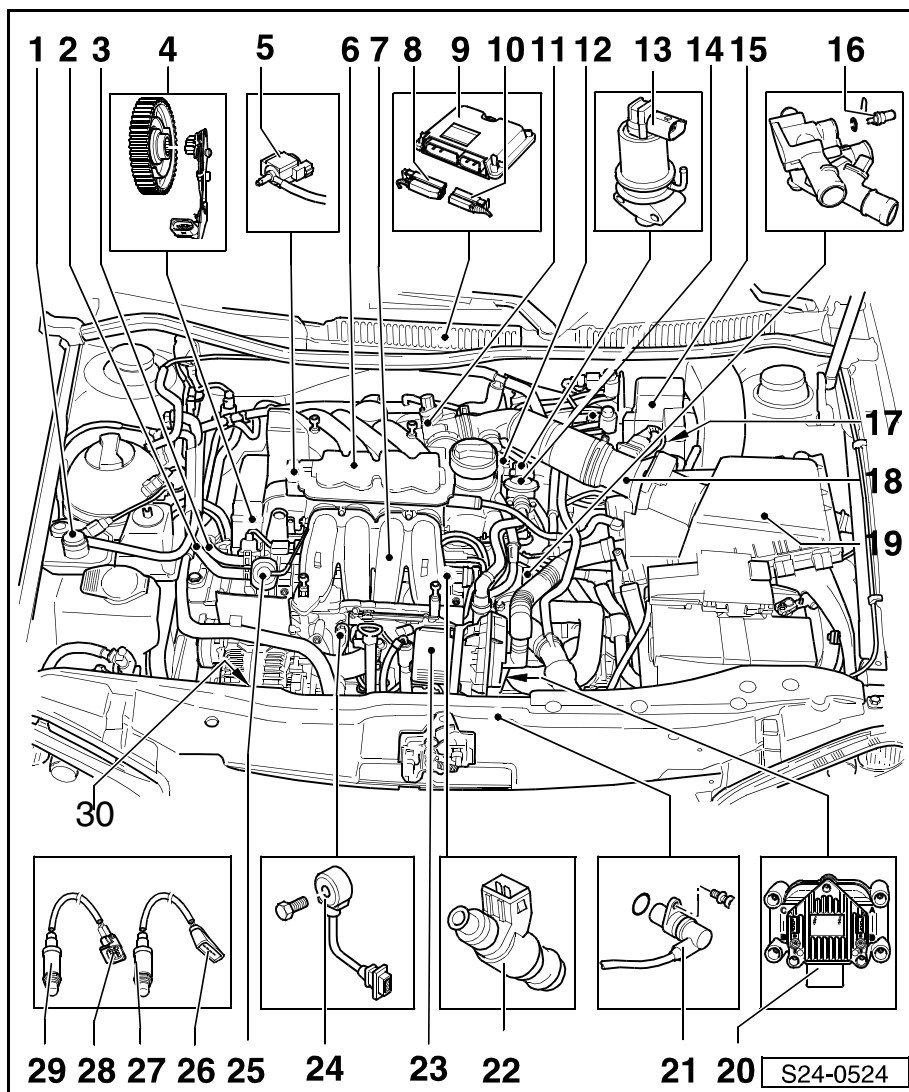
- ☐ Fitting location: in plenum chamber
- ☐ replacing ⇒ Chapter 24-6

10 - Connector, 40 pin

- ☐ only insert or remove plug when the ignition is switched off
- ☐ unlock before removing

11 - Throttle valve control unit -J338-*

- ☐ inspect ⇒ Chapter 24-5
- ☐ 6-pin connector



- ☐ contacts gold-plated
- 12 - Camshaft position sensor -G163-***
 - ☐ for engines with engine code BFQ
 - ☐ at rear of cylinder head
 - ☐ inspect ⇒ Chapter 28-1
- 13 - EGR valve -N18- */****
 - ☐ with EGR potentiometer -G212-
 - ☐ 6-pin connector
 - ☐ Adaptation ⇒ Chap. 24-6
- 14 - Combination valve**
 - ☐ Secondary air pump ⇒ 1.6 I/75 kW Engine, Mechanical Components; Rep. Gr. 26
- 15 - Protective housing for relays and fuses**
 - ☐ installation position:
 - ◆ Secondary air injection pump relay -J299- */**
 - ◆ Power supply of Simos engine control unit -J363-
 - ☐ only on vehicles fitted with automatic gearbox
 - ◆ Fuse for brake vacuum pump -V192-
 - ◆ Fuse for secondary air injection pump motor -V101-
- 16 - coolant temperature sender -G62-***
 - ☐ green
 - ☐ for engine control unit
 - ☐ with coolant temperature sender -G2-
 - ☐ resistances ⇒ **24-1** page 10
- 17 - Brake vacuum pump -V192- with brake servo unit control unit -J542- (only on vehicles fitted with automatic gearbox) */****
 - ☐ inspect ⇒ Chapter 24-2
- 18 - Air mass meter -G70- with intake air temperature sender -G42- ***
 - ☐ contacts of sender and of connector gold-plated
 - ☐ resistances for intake air temperature sender -G42- ⇒ **24-1** page 9
- 19 - Air filter**
 - ☐ disassembling and assembling ⇒ **24-1** page 9
- 20 - Power output stage -N122- with ignition coil -N, N128-**
 - ☐ with identification for ignition leads, do not switch
 - ☐ resistances ⇒ Chapter 28-1
- 21 - Engine speed sender -G28-***
 - ☐ resistance: 730...1000 Ω
- 22 - Injection valves -N30...N33-***
 - ☐ resistance: 12...17 Ω (at about 20 °C)
 - ☐ test injected quantity, leak tightness and spray pattern of injectors ⇒ Chapter 24-2.
- 23 - Secondary air injection pump motor -V101- */****
 - ☐ Secondary air system: ⇒ 1.6 I/75 kW Engine - Mechanical Components; Rep. Gr. 26
- 24 - Knock sensor I -G61-***
 - ☐ contacts of sender and of connector gold-plated
- 25 - Fuel pressure regulator**
 - ☐ inspect ⇒ Chapter 24-2
- 26 - 4-pin connector**
 - ☐ Brown
 - ☐ for lambda probe heater -Z29- and lambda probe downstream of catalytic converter -G130-
 - ☐ on underside of vehicle on right
- 27 - Lambda probe downstream of catalytic converter -G130-, 50 Nm***
 - ☐ only coat thread with hot screw paste „G 052 112 A3“; the paste must not get into the slot of the probe body.
 - ☐ Test lambda probe -G130- and lambda control downstream of catalytic converter ⇒ Chapter 24-4

28 - 6-pin connector

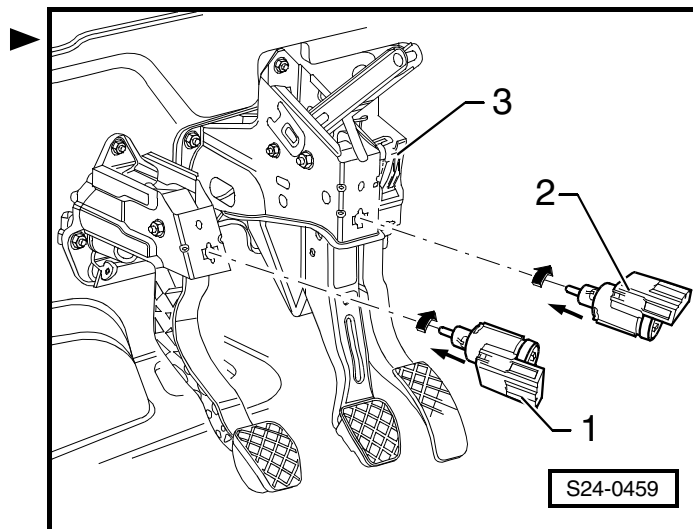
- ☐ black
- ☐ for lambda probe heater -Z19- and lambda probe upstream of catalytic converter -G39-
- ☐ on underside of vehicle on right

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

- ☐ Fitting location: in the exhaust manifold
- ☐ only coat thread with hot screw paste „G 052 112 A3“; the paste must not get into the slot of the probe body.
- ☐ Test lambda probe -G39- and lambda control upstream of catalytic converter ⇒ Chapter 24-4

30 - PAS pressure switch -F88- ***Fig. 1: Pedal assembly - installed position**

- 1 - Clutch pedal switch -F36-
- 2 - Brake light switch -F- and Brake pedal switch -F47-
- 3 - Accelerator pedal position sender -G79- and accelerator pedal position sender 2 -G185-

**General notes on the injection system**

Repairing the ignition ⇒ Rep. Gr. 28.

The engine control unit is equipped with a self-diagnosis system. Before repairs and also for fault finding, first of all interrogate the fault memory. Also check the vacuum hoses and connections (unmetered air).

A minimum voltage of 11.5 V is required for perfect functioning of the electrical components.

If after fault finding, repair or inspection of components the engine starts briefly and then stops, it is possible that the immobiliser blocks the 4AV control unit. In this case the fault memory must be interrogated and if necessary the control unit must be adapted.

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 ⇒ Chapter 01-1.

Safety measures ⇒ **24-1** page 1.

Cleanliness rules ⇒ **24-1** page 1.

Test data, spark plugs ⇒ Inspection and Maintenance.

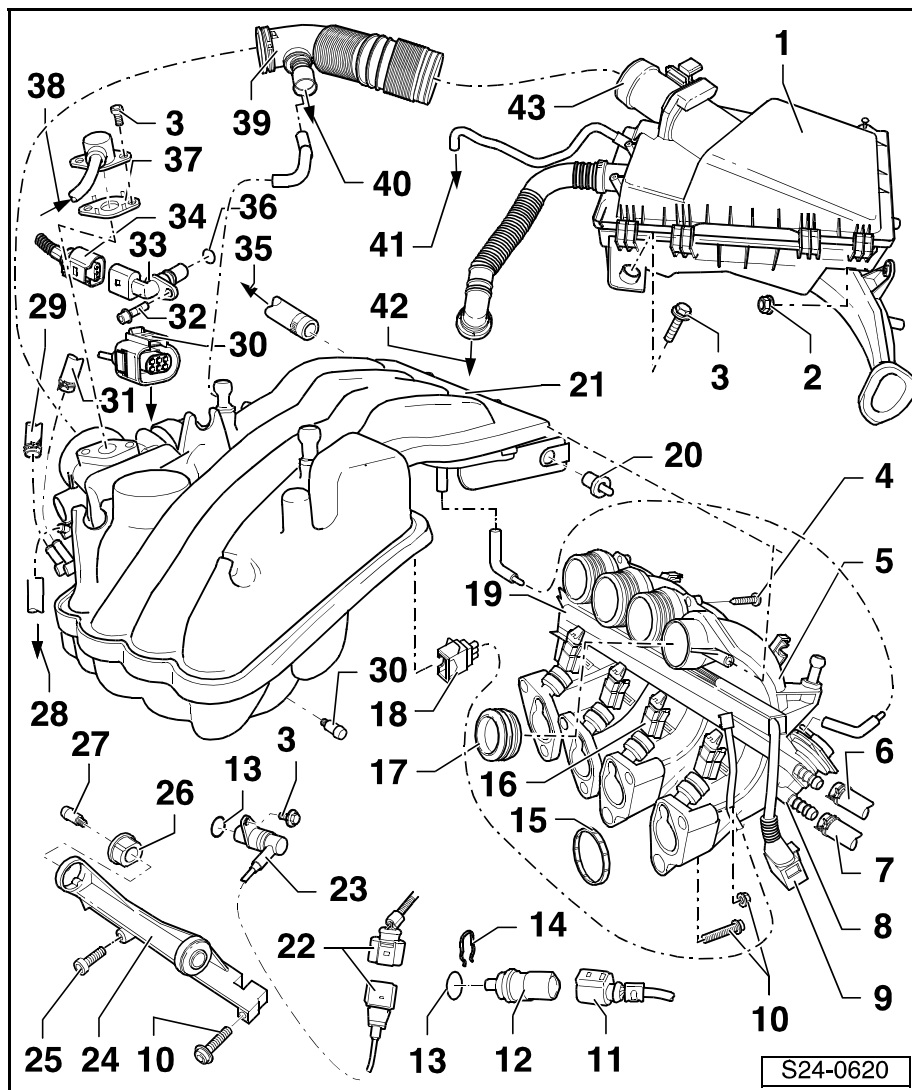
Removing and installing parts of the injection system



Note

Components marked with an * are tested by self-diagnosis ⇒ Chap. 01-1.

- 1 - Air filter
 - ☐ disassembling and assembling ⇒ **24-1** page 9
- 2 - 6 Nm
- 3 - 10 Nm
- 4 - 3 Nm
- 5 - Bottom part of intake manifold
- 6 - Feed line
 - ☐ white
 - ☐ secured with spring strap clip
 - ☐ from fuel filter ⇒ 1.6 I/75 Engine, Mechanical Components; Rep. Gr. 20
- 7 - Return-flow line
 - ☐ blue
 - ☐ secured with spring strap clip
 - ☐ to fuel delivery unit in fuel tank ⇒ 1.6 I/75 kW Engine, Mechanical Components; Rep. Gr. 20
- 8 - Fuel rail with injection valves
 - ☐ disassembling and assembling ⇒ **24-1** page 7
- 9 - 3-pin plug connection
 - ☐ for engines with engine code AVU
 - ☐ black
 - ☐ for camshaft position sensor -G163-
- 10 - 15 Nm
- 11 - Connector
 - ☐ for coolant temperature sender -G62-
 - ☐ 4-pin
 - ☐ black
 - ☐ contacts gold-plated
- 12 - coolant temperature sender -G62-*
 - ☐ green
 - ☐ with coolant temperature sender -G2-
 - ☐ resistances ⇒ **24-1** page 10
 - ☐ before removing, reduce pressure in cooling system if necessary
- 13 - O-ring
 - ☐ replace if damaged
- 14 - Retaining clip
 - ☐ check tightness
- 15 - Gasket ring
 - ☐ replace
- 16 - Connector
 - ☐ black, 2 pin



- ☐ for injection valve -N30...N33-

17 - Gasket ring**18 - Connector**

- ☐ black, 2 pin
- ☐ for variable intake manifold changeover valve -N156-

19 - Cable rail**20 - Body-bound rivet****21 - Top part of intake manifold**

- ☐ with variable intake manifold changeover
- ☐ disassembling and assembling ⇒ **24-1** page 8

22 - 3-pin plug connection

- ☐ grey
- ☐ for engine speed sender
- ☐ Fitting location: close to dipstick

23 - Engine speed sender -G28-*

- ☐ Resistance 730...1000 Ω

24 - Support

- ☐ between intake manifold and cylinder head

25 - 8 Nm

- ☐ for attaching vent connection

26 - Rubber bush**27 - 8 Nm****28 - To activated charcoal filter solenoid valve 1 -N80-**

- ☐ Activated charcoal filter ⇒ 1.6 l/75 kW Engine, Mechanical Components; Rep. Gr. 20

29 - From heater feed**30 - Connector**

- ☐ 6-pin
- ☐ contacts gold-plated
- ☐ for throttle valve control unit -J338-

31 - To T-connection and on to coolant expansion bottle**32 - 10 Nm**

- ☐ for engines with engine code BFQ

33 - Camshaft position sensor -G163-

- ☐ for engines with engine code BFQ
- ☐ inspect ⇒ Chapter 28-1

34 - Connector

- ☐ for engines with engine code BFQ
- ☐ 3-pin
- ☐ for camshaft position sensor -G163-

35 - To the brake servo unit**36 - Gasket ring**

- ☐ for engines with engine code BFQ
- ☐ replace if damaged
- ☐ before fitting moisten with clean engine oil

37 - Gasket

- ☐ replace

38 - From exhaust gas recirculation valve**39 - Air intake hose**

- ☐ with crankcase ventilation valve
- ☐ with crankcase ventilation with heating resistor (only for models with optional equipment)

40 - For housing ventilation**41 - To EGR valve -N18-**

- ☐ clean air connection to fresh air supply

42 - To secondary air pump

43 - Air mass meter -G70- with intake air temperature sender -G42- *

- ☐ contacts of sender and of connector gold-plated
- ☐ resistances for intake air temperature sender -G42- ⇒ **24-1** page 9

Disassembling and assembling fuel distributor with injectors



Note

Components marked with an * are tested by self-diagnosis ⇒ Chap. 01-1.

1 - Retaining clip

- ☐ check tightness on the injection valve and fuel distributor

2 - Fuel distributor

3 - Injection valves -N30...N33 -*

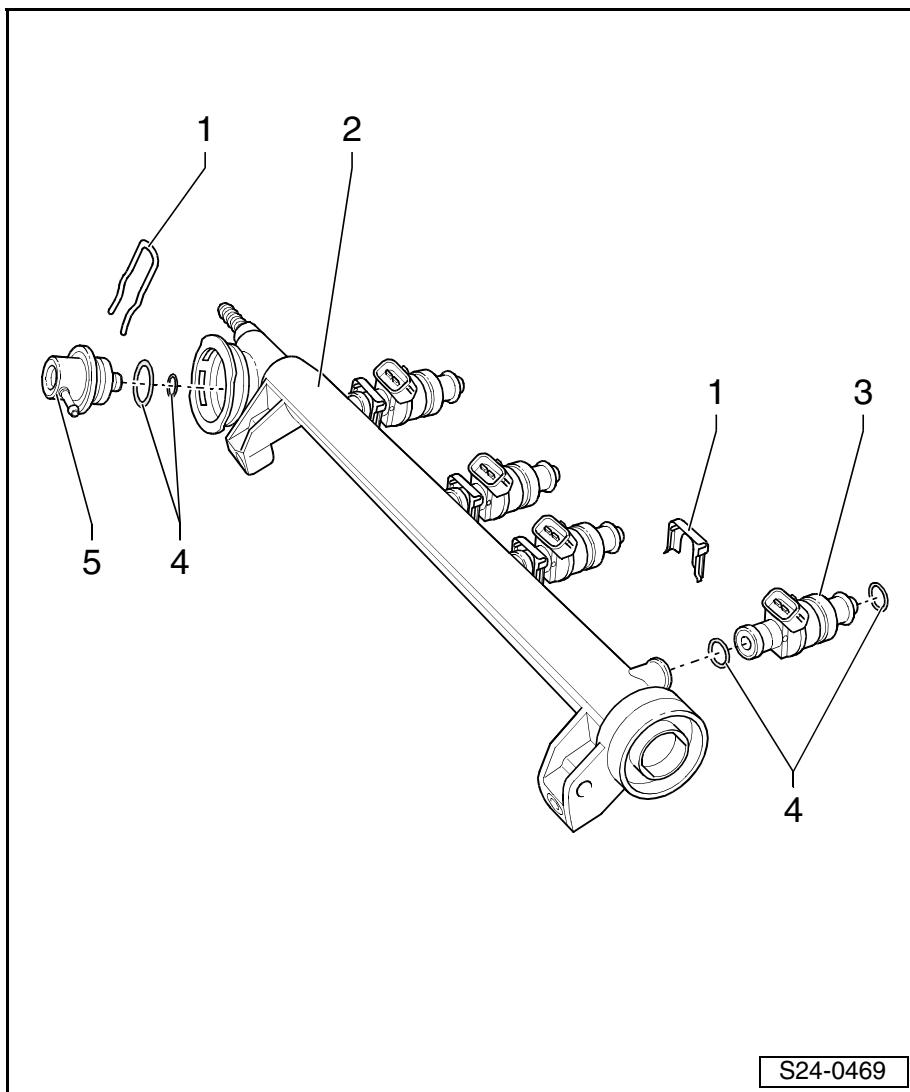
- ☐ test injected quantity, leak tightness and spray pattern of injectors ⇒ Chapter 24-2.
- ☐ resistance: 12...17 Ω (at about 20 °C)

4 - O-ring

- ☐ replace
- ☐ before fitting moisten lightly with clean engine oil

5 - Fuel pressure regulator

- ☐ inspect ⇒ Chapter 24-2



Disassembling and assembling top part of intake manifold

Note

- ◆ Components marked with an * are tested by self-diagnosis ⇒ Chap. 01-1.
- ◆ Components marked with ** are tested by final control diagnosis ⇒ Chapter 01-1.

1 - 8 Nm

2 - Throttle valve control unit -J338-*

- ☐ 6-pin connector
- ☐ contacts gold-plated
- ☐ inspect ⇒ Chapter 24-5
- ☐ if replaced adapt engine control unit ⇒ Chapter 24-6
- ☐ if replaced, adapt automatic gearbox control unit ⇒ Automatic Gearbox; Rep. Gr. 01

3 - Gasket ring

- ☐ replace

4 - Pressure relief valve

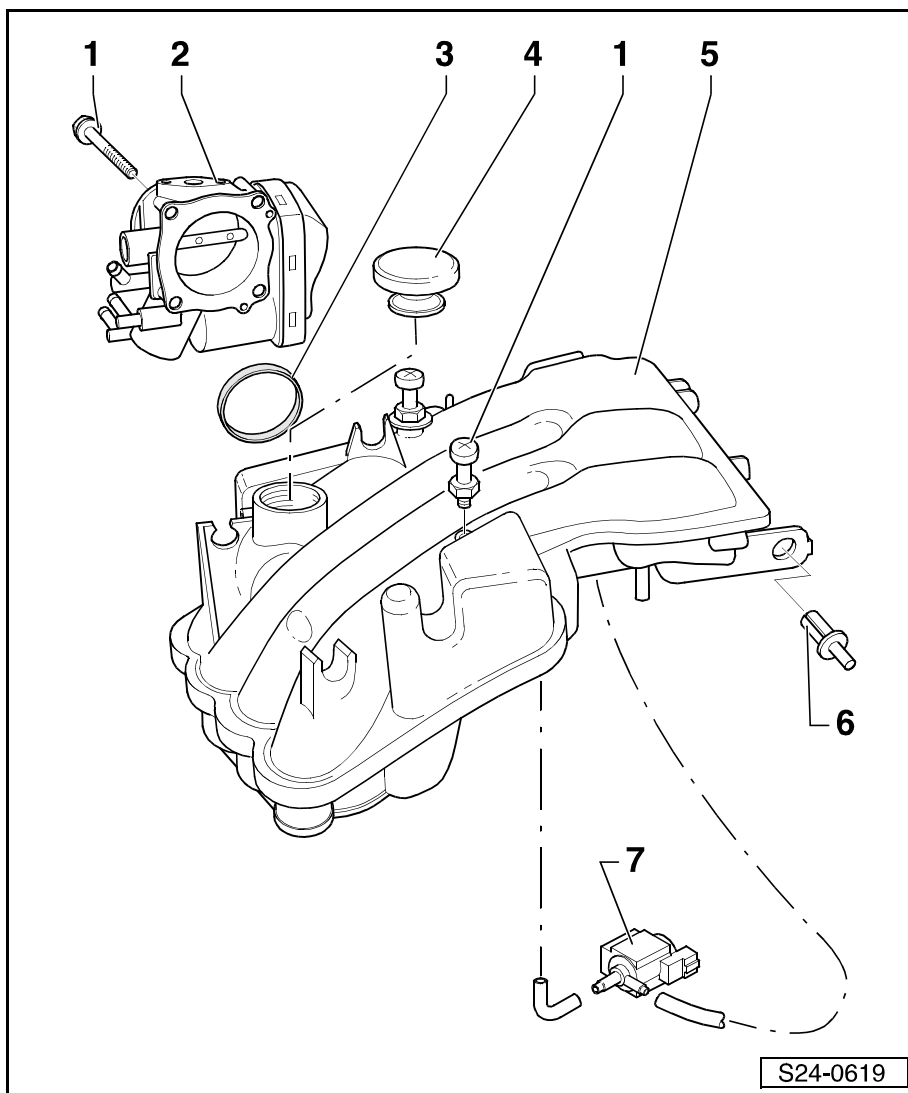
- ☐ protects intake manifold from damage if excess pressure exists

5 - Top part of intake manifold

6 - Body-bound rivet

7 - Variable intake manifold changeover valve -N156- */**

- ☐ inspect ⇒ Chapter 24-3



Disassembling and assembling the air filter



Note

Components marked with an * are tested by self-diagnosis ⇒ Chap. 01-1.

- 1 - Air mass meter -G70- with intake air temperature sender -G42- *

□ resistances for intake air temperature sender -G42-
⇒ **24-1** page 9

- 2 - Gasket ring

- 3 - 6 Nm

- 4 - Air filter top part

- 5 - Filter insert

- 6 - 10 Nm

- 7 - Air filter bottom part

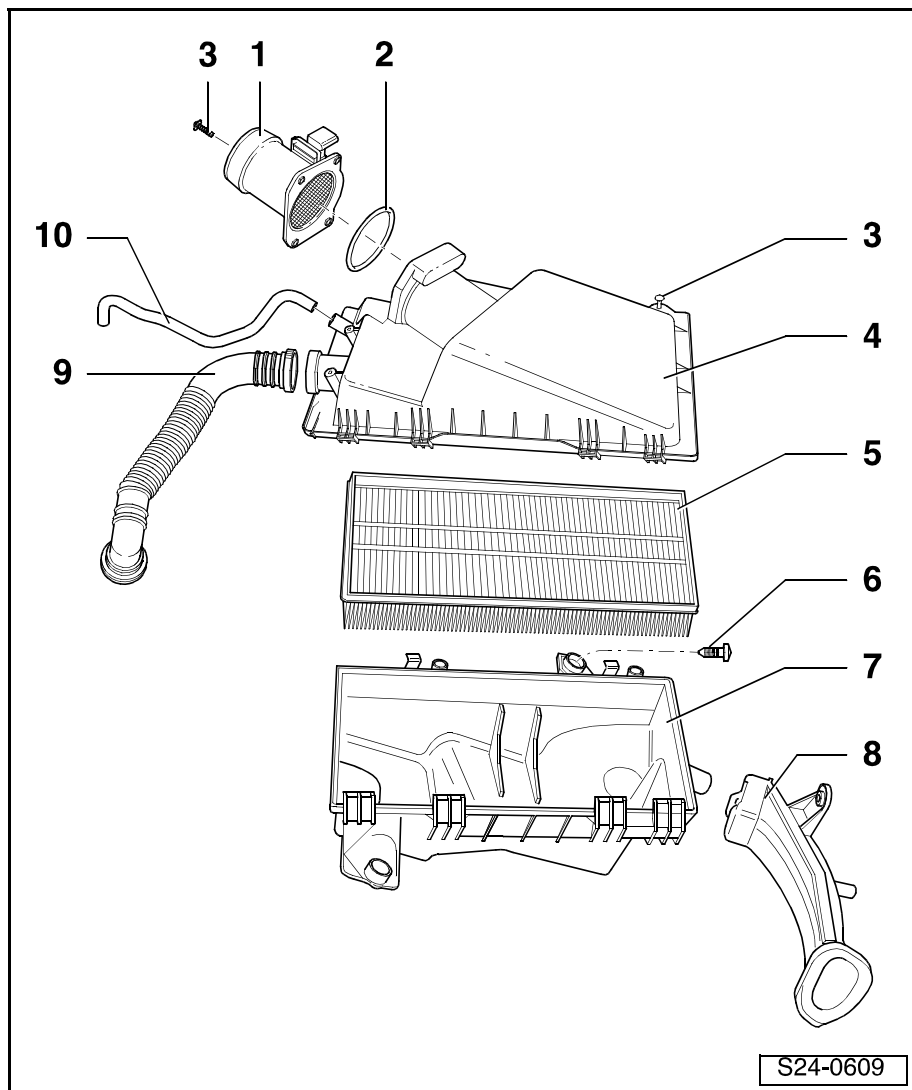
- 8 - Air deflector

- 9 - Air intake hose

□ for secondary air pump

- 10 - Ventilation hose

□ for exhaust gas recirculation valve

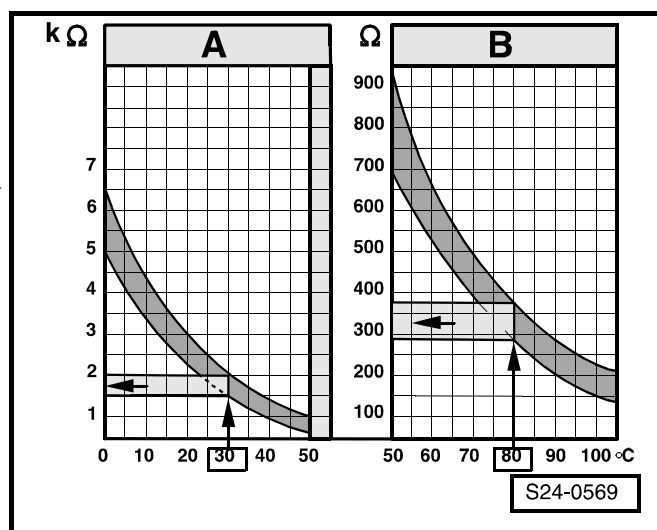


Resistances for intake air temperature sender -G42-

The nominal value in field -A- applies for temperature range 0...50 °C, nominal value in field -B- applies for temperature range 50...100 °C.

Read out examples:

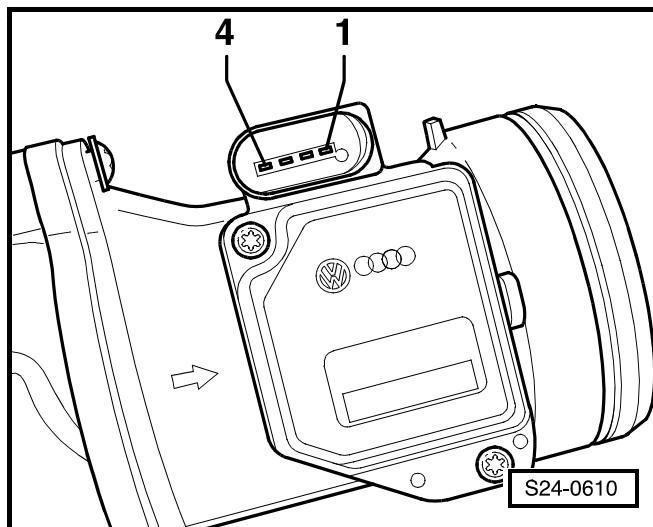
- ◆ 30 °C is within the range -A- and equals a resistance of 1.5...2.0 kΩ.
- ◆ 80 °C is in range -B- and corresponds to a resistance of 275...375 Ω.



- Check resistance values of the intake manifold temperature sender -G42- between contacts 2 + 4. ►

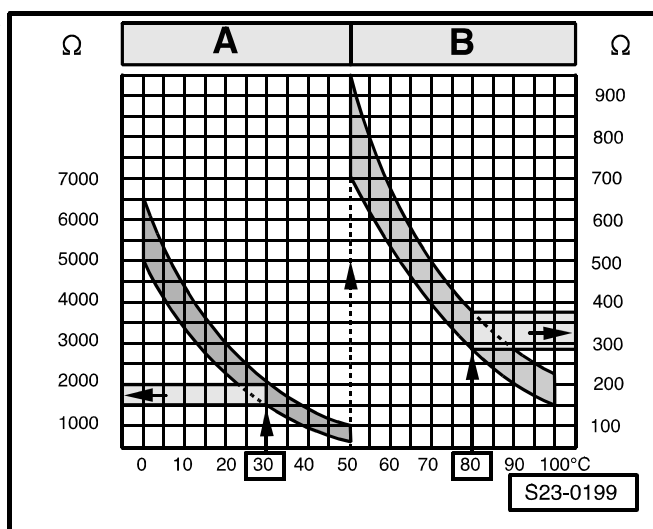
Resistances for the coolant temperature sender -G62-

The nominal value in field -A- applies for temperature range 0...50 °C, nominal value in field -B- applies for temperature range 50...100 °C.

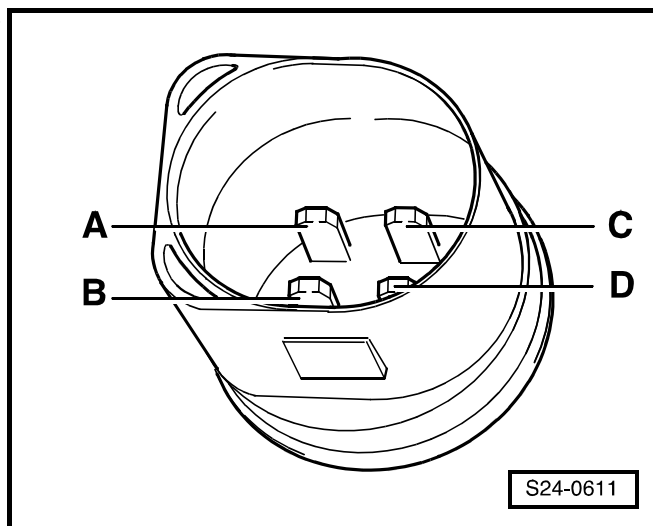


Read out examples: ►

- ♦ 30 °C is within the range -A- and equals a resistance of 1500...2000 kΩ.
- ♦ 80 °C is in range -B- and corresponds to a resistance of 275...375 Ω.



- Test the resistance of the coolant temperature sender -G62- between contacts C (signal) and D (earth). ►



24-2 Testing components

Test wiring and components with Test box -V.A.G 1598/31-

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).

Whether the control unit is additionally connected to the test box or not, is indicated in the particular test procedure.

Always use the measuring tool set

-V.A.G 1594 A, B oder C- to connect the measuring tools (e.g. handheld multimeter -V.A.G 1715- etc.).

The contact numbers of the connector of the control unit and the socket numbers of the test box -V.A.G 1598/31- are identical.

Special tools, test and measuring equipment and auxiliary items required

- ♦ Test box -V.A.G 1598/31-



WARNING!

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

- Remove wiper arm ⇒ Electrical System; Rep. Gr. 92.
- Remove the cooling water tank cover ⇒ Body Work; Rep. Gr. 66.
- Release the connector catches and unplug the control unit connectors.
- Connect test box -V.A.G 1598/31- to both connectors of the wiring loom. Earth clip should be connected to the test box and to battery negative.

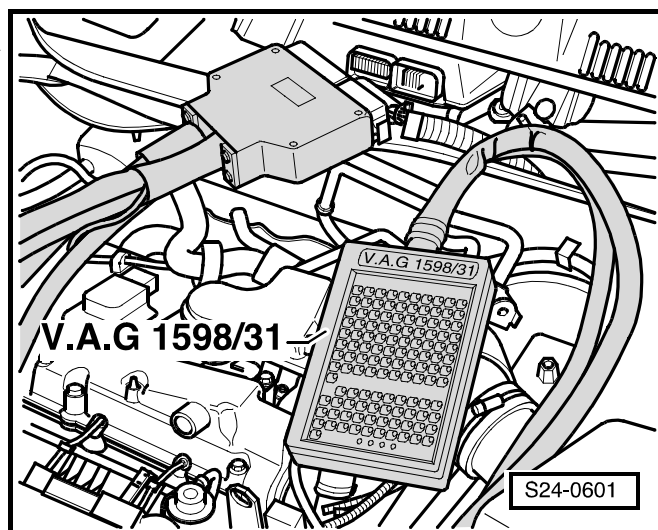
Whether the control unit is additionally connected to the test box or not, is indicated in the particular test procedure.

- Perform test as described in the relevant repair sequences.



Note

It is therefore necessary to interrogate the fault memory after reconnecting the engine control unit, and if necessary erase ⇒ Chapter 01-1.



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

Special tools, test and measuring equipment and auxiliary items required

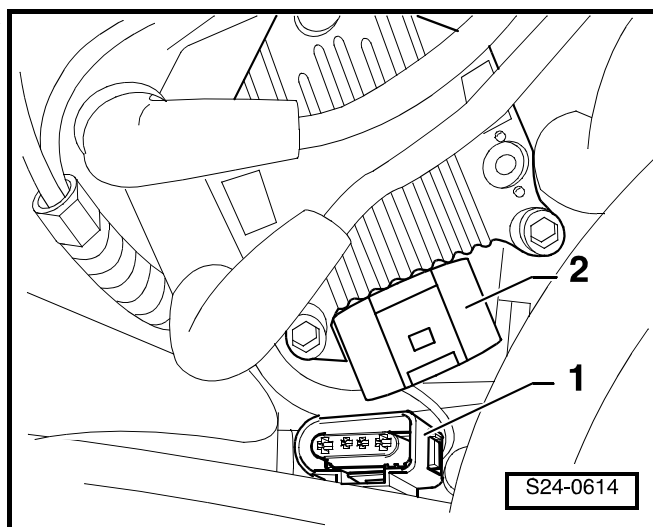
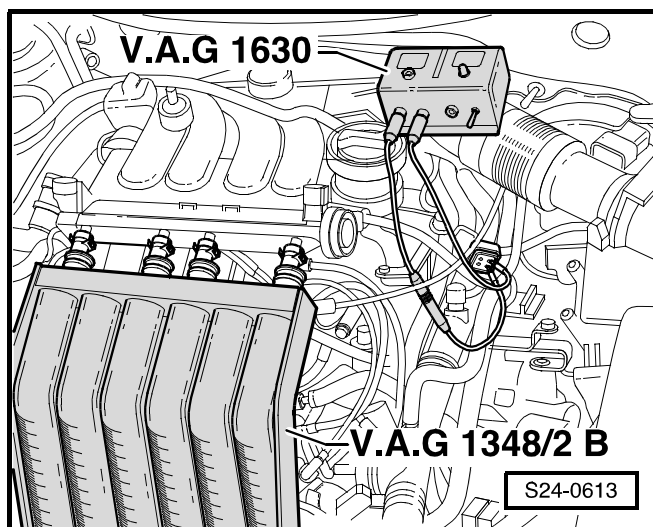
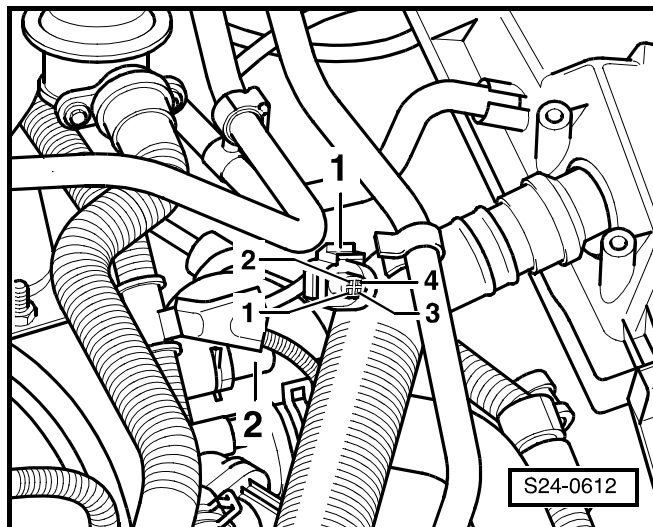
- ♦ Hand multimeter (e.g. -V.A.G 1348/2B-)
- ♦ Digital potentiometer (e.g. -V.A.G 1630-)

Test condition

- Fuel pump relay o.k., testing ⇒ Chap. 01-1.

Testing jet formation and tightness

- Remove the upper part of the intake manifold ⇒ Chapter 24-1.
- Remove the fuel rail together with the installed injectors ⇒ Chapter 24-1. The fuel hoses remain connected.
- Unplug the 4-pin connector -1- from the coolant temperature sender -G62- -2-. ►
- Set digital potentiometer -V.A.G 1630- side A to 15 kΩ ► and connect to the unplugged connector contact 3 and 4 using auxiliary cables.
- Unplug the 4-pin connector -1- from the power output stage -N122- -2-. ►



- Hold the injectors in the measuring glasses.
- Operate starter (2nd person required). The injectors must spray in a pulsing action in line with firing order.
- Switch ignition off and inspect injectors for leaks. No more than 2 drops/min may trickle out.

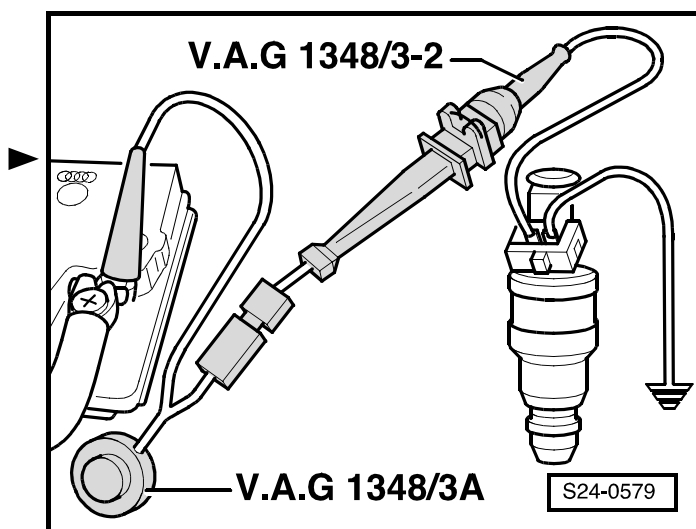
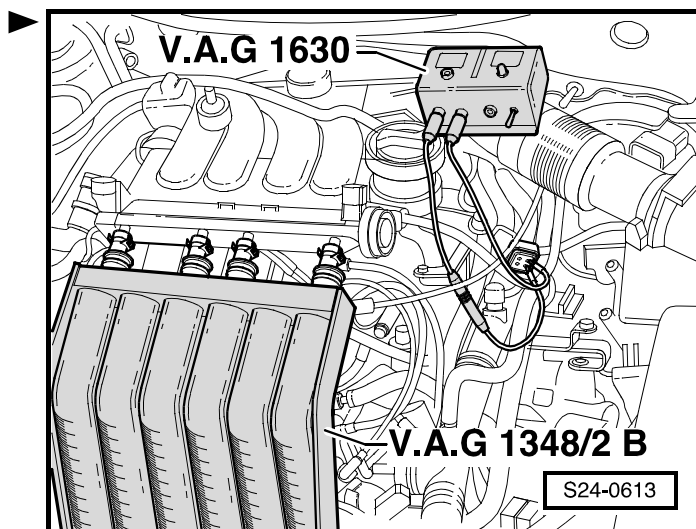
**Note**

- ◆ Always fit new seals.
- ◆ If injectors are replaced, erase the learned values and re-adapt engine control unit ⇒ Chapter 24-6.

Testing injection rate**Note**

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

- Insert injector to be tested in a measuring glass.
- Connect one contact of injector to the battery earth.
- Connect the second contact of the injector to the remote control.
- Connect terminal to battery positive (+).



- Connect battery positive (+) and fuse socket No. 28 with adapter cable and adapter -V.A.G 1348/3-2-.

The fuel delivery unit must start running.

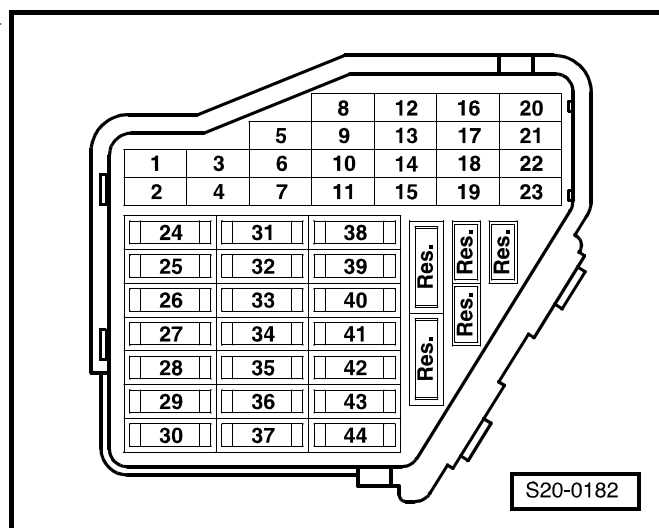
- Actuate the remote control for 30 seconds.
- Perform the measurement on all injectors.
- Once all four injectors have been driven, position the graduated measuring glasses on an even base.

Nominal value per injection valve: 87...95 ml.

- If the measured value of one or more injectors is outside the tolerance value, disconnect the fuel pump and replace the defective injector (or defective injectors) ⇒ Chapter 24-1.

The injectors are installed in the reverse order. Pay attention to the following:

- ◆ Replace the O-rings and all the injectors and moisten lightly with clean engine oil.
- ◆ Insert injectors vertically and into the correct position in the fuel rail and secure with retaining clips.
- ◆ Fit fuel distributor with the secured injection valves onto the cylinder head and screw up at the same time ⇒ Chapter 24-1.



Test fuel pressure regulator and holding pressure

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

Special tools, test and measuring equipment and auxiliary items required

- ◆ Pressure gauge appliancee.g. -V.A.G 1318-
- ◆ Adapter -V.A.G 1318/9-
- ◆ Adapter -V.A.G 1318/17-

Test sequence

- Remove fuse no. 28 (fuel delivery unit) from the fuse holder.

WARNING!

The fuel system is under pressure! Before opening the system lay cleaning cloths around the connection point. Reduce pressure by carefully releasing the connection point.

- Disconnect the connection of the fuel supply hose -1- (black or black marking) and catch fuel leaking out with cloth.
- Connect up the pressure gauge appliance -V.A.G 1318- with adapter -V.A.G 1318/9- and -V.A.G 1318/17- to the feed line the hose to the fuel rail.
- Open shut-off cock of the pressure measuring device. Lever points in direction of flow.
- Plug fuse no. 28 (fuel delivery unit) into the fuse holder.
- Start engine and run in idle.
- Measure fuel pressure.

Specified value: approx. 0.25 MPa (2.5 bar)

- Detach vacuum hose -1- from fuel pressure regulator -2-. Fuel pressure must rise to approx. 0.3 MPa (3.0 bar).

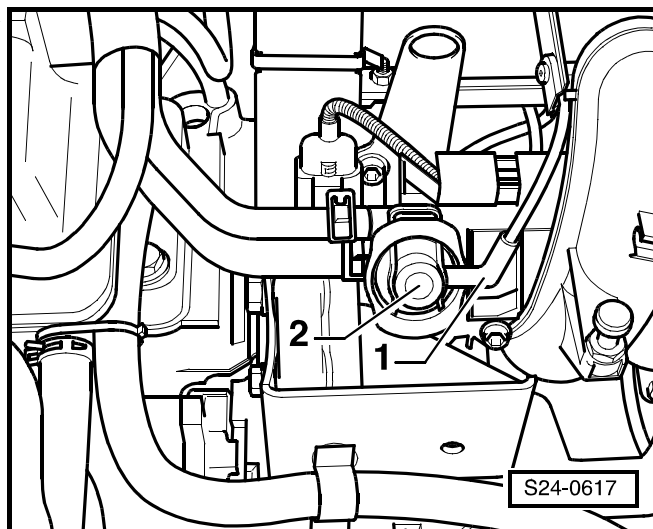
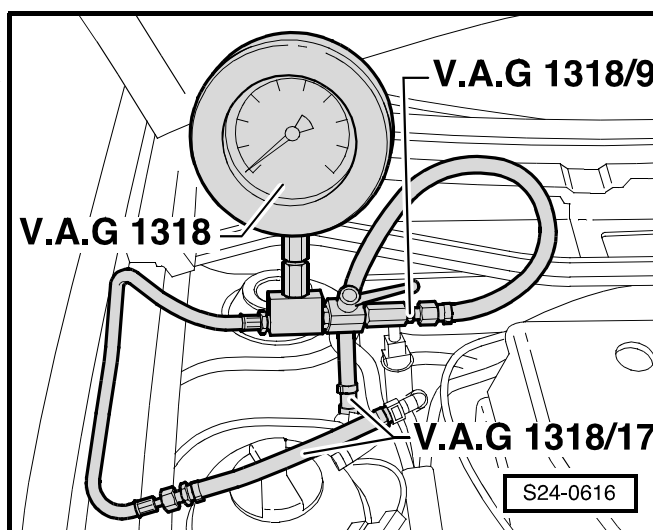
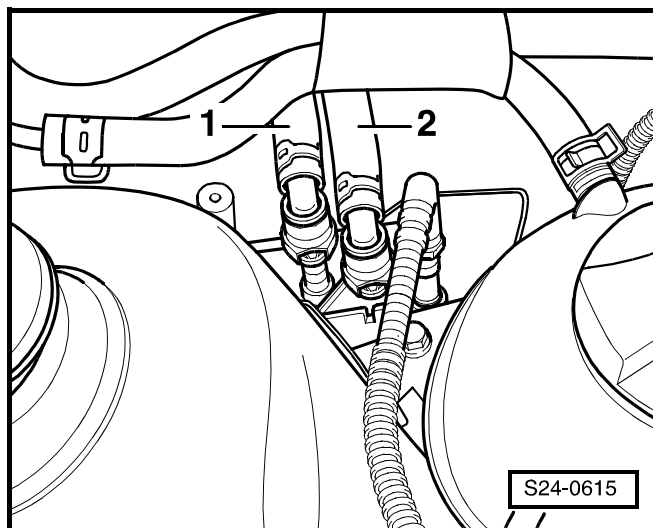
If the specified value is not reached:

- Test flow rate of fuel delivery unit ⇒ 1.6 I/75 kW Engine, Mechanical Components; Rep. Gr. 20.

If the specified value is reached:

- Switch off ignition.
- Test for leaks and holding pressure. Observe pressure drop at gauge. A pressure of at least 0.2 MPa (2.0 bar) must be indicated on the gauge after 10 minutes.

If the holding pressure drops below 0.2 MPa (2.0 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 appliance .
- Observe pressure drop at gauge.

If the pressure does not drop:

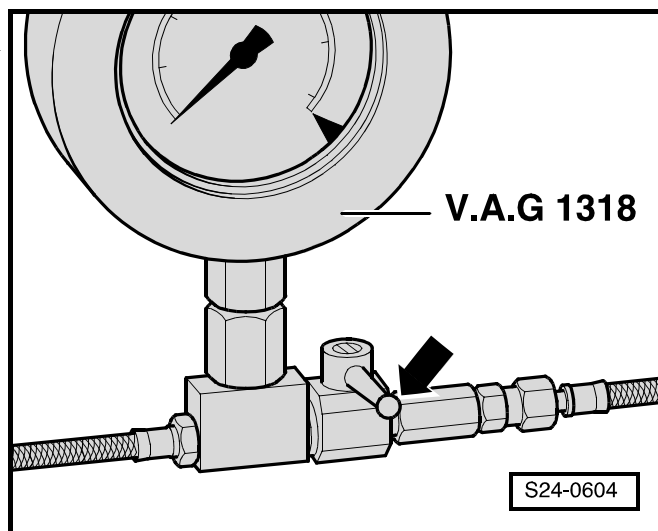
- Test non-return valve of fuel delivery unit ⇒ 1.6 I/75 kW Engine, Mechanical Components; Rep. Gr. 20

If the pressure again drops:

- Inspect pressure measuring device for leaks.
- Inspect connections, O-rings on the fuel rail and injectors for leaks.

If no leaks are found:

- Replace the fuel pressure regulator.



Note

Before removing the pressure measuring device, place the cloth around the line connection and remove the fuse no. 28 (fuel delivery unit) from the fuse holder.

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-
- ♦ Diagnostic cable -V.A.G 1551/3, 3A, 3B, oder 3C-
- ♦ Engine leak search spray -G 001 800 A1-

Test condition

- Coolant temperature must be at least 80 °C.

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 control value.
- ♦ You must comply with the safety instructions on the box.
- Connect vehicle system tester -V.A.G 1552-. Start engine and select the address word 01 „Engine electronics“ ⇒ Chapter 01-1.
- Enter function 08 „read measured value block“ and select display group 001.

Readout on display:

Reading	measured value	block	1	->
700/min	85.0 C	1.5 %	10111111	

- Observe engine speed in display field 1 and readout for lambda control upstream of catalytic converter in display field 3.
- Systematically spray parts of the intake system with engine leak search spray.

If the engine speed drops or if the displayed lambda control value changes:

- Press ☐.
- Enter for the function „End output“ and confirm with .
- Switch off ignition.
- Check the sprayed location of the intake system for leaks and if necessary eliminate the fault.

Testing brake vacuum pump -V192-

The brake servo assistance system on vehicles fitted with automatic gearbox improves provision of the vacuum required.

The brake vacuum pump -V192- and the brake servo assistance control unit -J542- form a single unit.

Special tools, test and measuring equipment and auxiliary items required

- ◆ Vehicle system tester -V.A.G 1552-
- ◆ Diagnostic cable -V.A.G 1551/3, 3A, 3B oder 3C-
- ◆ Hand multimeter (e.g. -V.A.G 1715-)
- ◆ Diode test lamp (e.g. -V.A.G 1527B-)
- ◆ Adapter cable set (e.g. -V.A.G 1594 A, B oder C-)
- ◆ Test box -V.A.G 1598/31-

Check for proper operation

- Initiate final control diagnosis and select vacuum pump for brakes -V192- ⇒ Chapter 01-1.

If the pump does not run:

- Test actuation ⇒ **24-2** page 6, voltage supply ⇒ **24-2** page 7 and cables ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

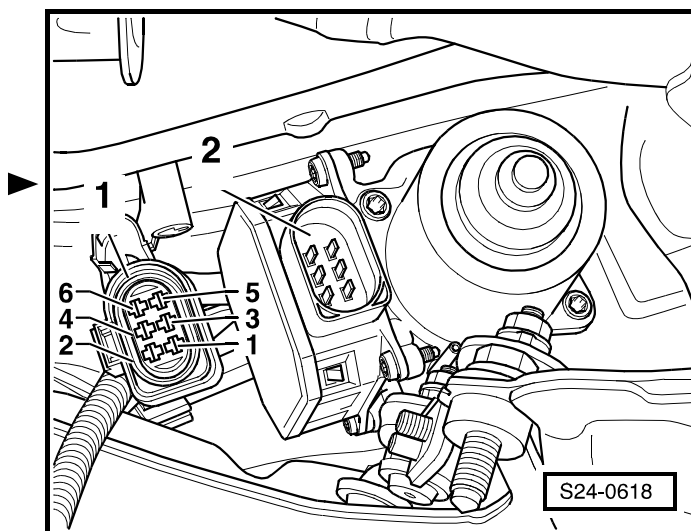
Test control

- Unplug plug -1- from the vacuum pump -2-.
- Connect diode test lamp to contacts 1 and 2 of the plug -1-.
- Switch on the ignition and initiate an actuator diagnosis.

The LED must flash.

The LED flashes:

- Proceed with the final control diagnosis up to the end.



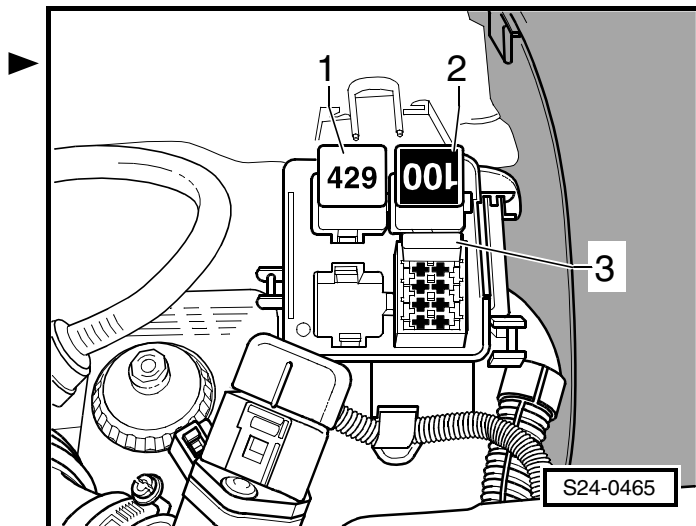
- Switch off ignition.
- Check fuse -3- for the vacuum pump.

If fuse is o.k.:

- Check voltage supply.

The LED does not flash:

- Test wiring.



Check supply voltage

- Connect multimeter for voltage measurement (terminal 30) to contacts 1 and 5.

Specified value: approx. battery voltage

- Connect multimeter for voltage measurement (terminal 15) to contacts 1 and 3.

- Switch on ignition.

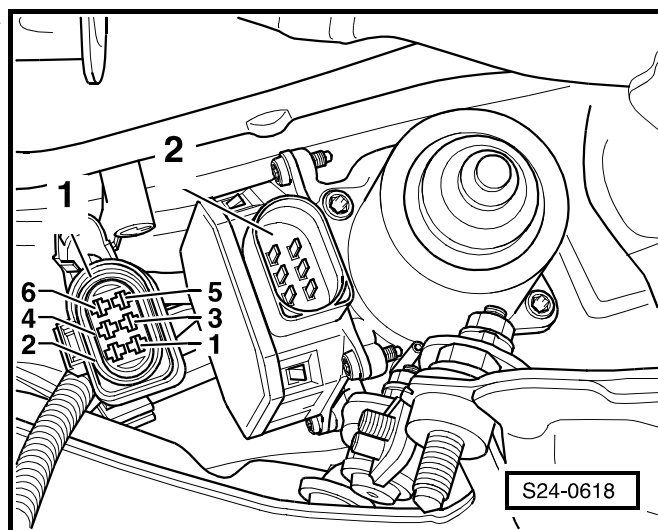
Specified value: approx. battery voltage

If the specified values are reached:

- Replace brake vacuum pump -V192- ⇒ Chassis; Rep. Gr. 47.

If the specified values are not reached:

- Test wiring ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.



24-3 Inspecting functions

Testing idling speed



Note

- ◆ *The idling speed cannot be adjusted.*
- ◆ *The idling speed is checked during the basic setting of the engine.*
- ◆ *During the basic setting the activated charcoal filter system solenoid valve -N80- is closed and the air conditioning compressor is deactivated.*

Special tools, test and measuring equipment and auxiliary items required

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

Test conditions

- Exhaust system shut
- Coolant temperature must be at least 80 °C
- Electrical consumers must be disconnected (the radiator cooling fan must be off during this test)

Test sequence

- Connect vehicle system tester -V.A.G 1552-. Start engine and select address word 01 „Engine electronics“ ⇒ Chapter 01-1.
- Interrogate fault memory ⇒ Chapter 01-1. There must not be any fault stored, rectify any faults present, erase fault memory, switch off engine and start again, conduct test drive and as a check once again interrogate fault memory.
- Allow engine to run.
- Enter function 04 „basic setting“ and select display group number number 056.

Readout on display:

System in basic setting		56	->
700/min	710/min	3 %	00000

- Check whether the actual engine speed shown in display field 1 (actual speed) is within the permissible tolerance range of display field 2 (nominal speed).

Tolerance: ±10 rpm



Note

- ◆ *The speed in display field 1 (actual speed) is indeed the actual engine speed.*
- ◆ *The speed in display field 2 (nominal speed) is the theoretical speed calculated by the engine control unit.*
- ◆ *In idle the engine control unit always attempts to adapt the (actual) speed to the specified speed (nominal).*

- ♦ *This means that engine speed when idling (actual) should always be approximately the same as the engine speed (specified).*
- ♦ *Display fields 3 and 4 serve as information and are not relevant for the inspection of the idling speed.*

If the specified value is reached:

-  Press.

Readout on display:



Vehicle system test
Select function XX

HELP

If the specified value is not reached:

- Interrogate fault memory again ⇒ Chapter 01-1.

If the idling speed is too high or too low and if there is no fault in the fault memory, perform the following inspections marked with points:

- ♦ Inspect unmetered air in the intake system ⇒ Chapter 24-2.
- ♦ Test throttle valve control unit ⇒ Chapter 24-5.
- ♦ Test activated charcoal filter system solenoid valve -N80- in final control diagnosis ⇒ Chapter 01-1.
- ♦ Adjust the throttle valve control unit ⇒ Chapter 24-6.
- ♦ Check operating states of engine: Read measured value block, display group 005 ⇒ Chapter 01-5.
- ♦ Perform adaptation of the valve for recycling of exhaust gases ⇒ Chapter 24-6.

Testing the intake manifold changeover

The test should only be carried out if there is a problem with poor torque, i.e. if insufficient elasticity or poor pulling power exists.

Test condition

- The coolant temperature must be at least 80 °C.

Special tools, test and measuring equipment and auxiliary items required

- ♦ Vacuum tester -V.A.G 1368-
- ♦ Hand vacuum pump with accessories (e.g. -V.A.G 1390-)
- ♦ Vehicle system tester -V.A.G 1552-
- ♦ Diagnostic cable -V.A.G 1551/3, 3A, 3B oder 3C-
- ♦ Hand multimeter (e.g. -V.A.G 1715 -)
- ♦ Adapter cable set (e.g. -V.A.G 1594 A- or -V.A.G 1594 C -)

Test sequence

- If final control diagnosis has already been performed and no fault was found when the variable intake manifold changeover valve -N156- was actuated, continue the check as follows:

- Connect vehicle system tester -V.A.G 1552-. Start engine and select address word 01 „Engine electronics“ ⇒ Chapter 01-1.
- Enter function 08 „read measured value block“ and select display group number 095.
- Readout on display:
- Push the accelerator pedal down sharply to the stop.
- If the accelerator is depressed at an engine speed of greater than 3000 rpm, the status of the intake manifold changeover in display field 4 must change.

Reading	measured value	block	95	->
670 rpm	20.3 %	96.0 °C	off	

If the readout in display field 4 changes briefly from „off“ to „on“ but there is still a problem of poor torque:

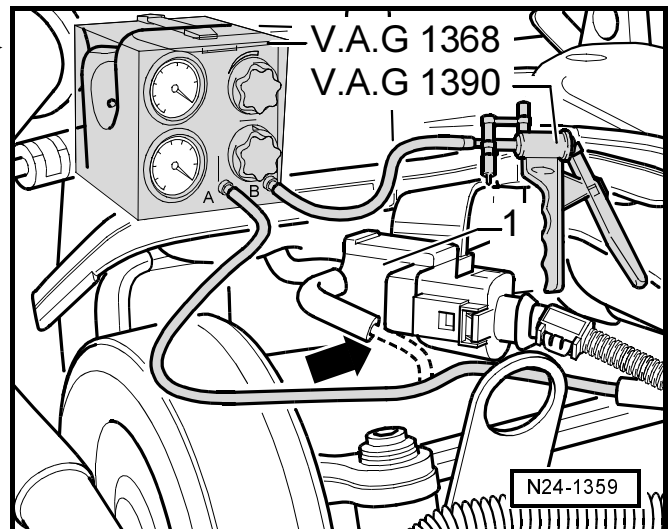
- Inspect vacuum lines to see that they are connected properly.
- Inspect the vacuum system for leaks.
- Inspect the positioning element of the variable intake manifold changeover for leaks as follows:



Note

The positioning element of the variable intake manifold changeover is integrated in the intake manifold and is therefore not visible from the outside.

- Detach the vacuum hose to the variable intake manifold changeover positioning element -arrow- at the variable intake manifold changeover valve -1-.
- Check this vacuum hose for porosity and for correct installation.
- Connect hand vacuum pump -V.A.G 1390- to vacuum tester -V.A.G 1368- (connection B).
- Connect vacuum hose to positioning element for variable intake manifold changeover to vacuum tester (connection A).
- Move vacuum tester into position A/B.
- Operate -V.A.G 1390- several times. Build up a vacuum to a maximum of 0.05 MPa (0.5 bars).



The vacuum must not drop.

If the vacuum drops:

- Replace the inlet manifold ⇒ Chapter 24-1.

If no fault is found:

- Check the change-over mechanics on the intake manifold flap for ease of movement.
- Remove the intake manifold to be able to inspect it ⇒ Chapter 24-1.

If a fault is found:

- Replace the inlet manifold.

24-4 Lambda control

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 control unit.

Further information can be found in the self-study programmes:

- SSP45 - Engine 1.6/75kW
- SSP39 - Euro-On-Board-Diagnosis for Otto engines

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-
- ◆ Diagnostic cable -V.A.G 1551/3, 3A, 3B oder 3C-
- ◆ Test box -V.A.G 1598/31-
- ◆ Hand multimeter (e.g. -V.A.G 1715-)
- ◆ Adapter cable set (e.g. -V.A.G 1594 A- or -V.A.G 1594 C -)

Test conditions

- Check that the fuel pump relay is OK ⇒ Chapter 01-1
- Fuse 43 OK
- Coolant temperature must be at least 80 °C
- Exhaust system between catalyst and cylinder head tight

Test sequence

Check the function of the lambda probe -G39- and of the lambda control upstream of the catalytic converter using the function „Read measured value block“, display group numbers 030, 031, 032, 033 and 041⇒ Chapter 01-6.

If the specified values are not reached:

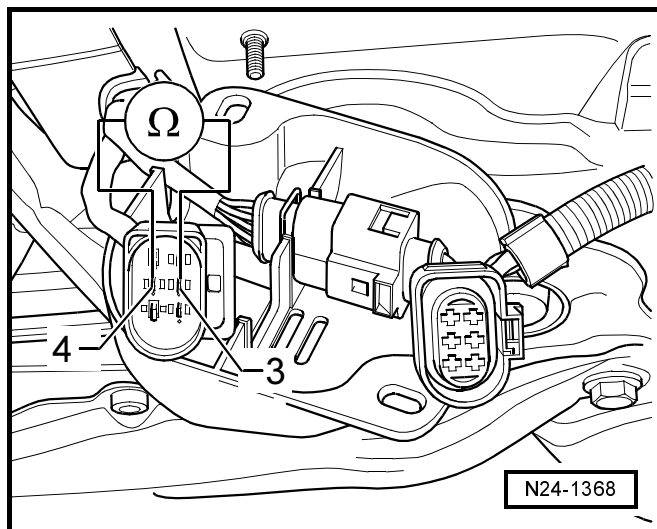
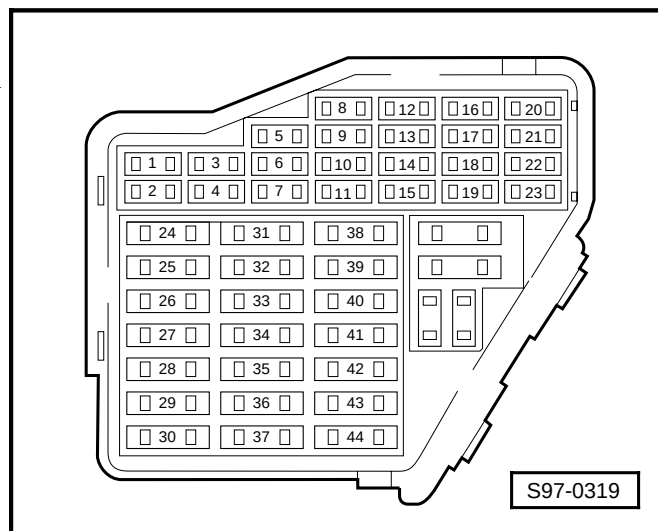
- Switch off ignition.
- Disconnect the 6-pin plug connector from the lambda probe -G39-.
- Use handheld multimeter to measure the resistance between contacts 3 and 4 of the plug.



Note

At ambient temperature (approx. 20 °C) the heating element resistance is of approx. 1 to 5 Ω. The resistance increases considerably even if the temperature rises only slightly.

Replace the lambda probe - G39- if an open circuit is detected.



- Check the supply voltage or lines to the lambda probe heating -Z19- according to the current diagram.

If the resistance and the supply voltage are OK:

- Connect the hand-held multimeter for voltage measurement to contacts 1 + 5 of the plug. ►
- Start engine and measure supply voltage.

◆ Specified value: 0.40...0.50 V

- Switch off ignition.

If the specified value is reached:

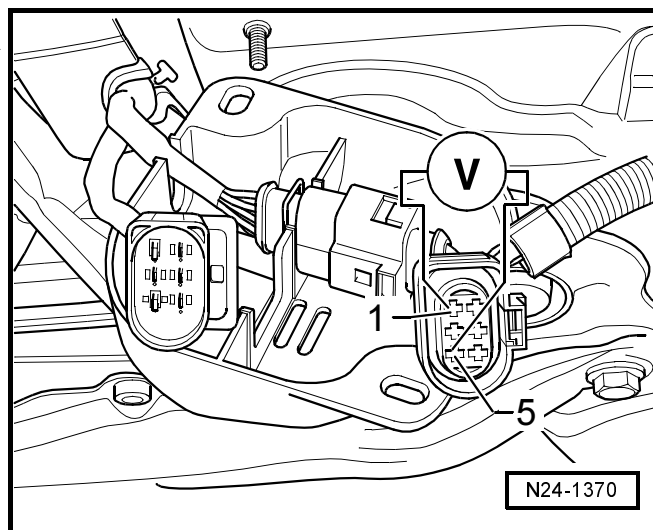
- Replace the lambda probe -G39- ⇒ 1.6 I/75 kW Engine, Mechanical Components; Rep. Gr. 26.

If the specified value is not reached:

- Test wiring and plug connections according to current flow diagram.

If no fault was found:

- Replace engine control unit ⇒ Chapter 24-6.



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-
- ◆ Diagnostic cable -V.A.G 1551/3, 3A, 3B oder 3C-
- ◆ Test box -V.A.G 1598/31-
- ◆ Hand multimeter (e.g. -V.A.G 1715-)
- ◆ Adapter cable set (e.g. -V.A.G 1594 A- or -V.A.G 1594 C -)

Test conditions

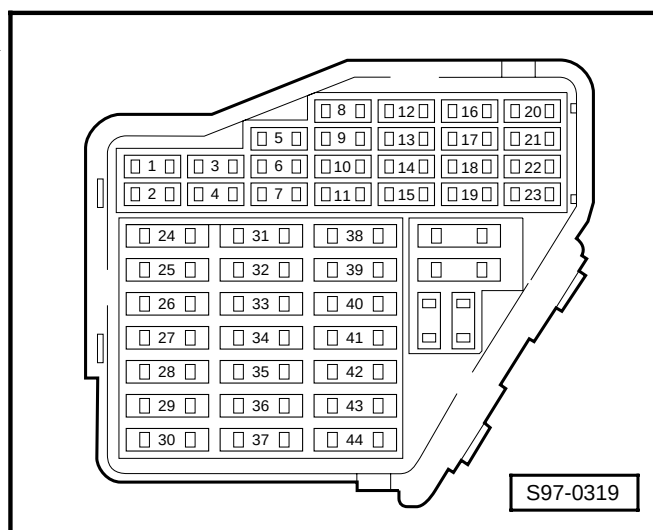
- Check that the fuel pump relay is OK ⇒ Chapter 01-1
- Fuse 43 OK ►
- Coolant temperature must be at least 80 °C
- Exhaust system between catalyst and cylinder head tight

Test sequence

Check the function of the lambda probe -G130 - and of the lambda control downstream of the catalytic converter using the function „Read measured value block, display groups 030, 036 and 041“ ⇒ Chapter 01-6.

If the specified values are not reached:

- Switch off ignition.



- Disconnect the 4-pin plug connector from the lambda probe -G130-.
- Use handheld multimeter to measure the resistance between contacts 1 and 2 of the plug. ►

**Note**

At ambient temperature (approx. 20 °C) the heating element resistance is of approx. 1 to 5 Ω . The resistance increases considerably even if the temperature rises only slightly.

If there is an interruption, replace the lambda probe after catalyst -G130-.

- Check the supply voltage or lines to the lambda probe heating downstream of the catalytic converter -Z19- according to the current diagram.

If the resistance and the supply voltage are OK:

- Connect the hand-held multimeter for voltage measurement to contacts 3 + 4 of the plug -2-. ►
- Start engine and measure supply voltage.
- ♦ Specified value: 0.40...0.50 V
- Switch off ignition.

If the specified value is reached:

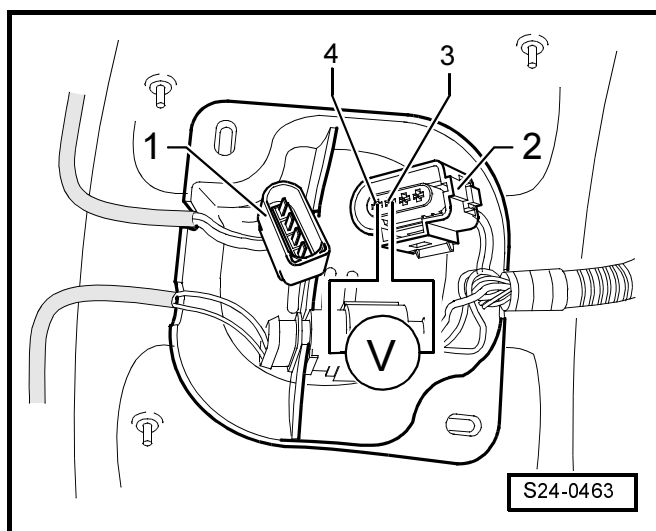
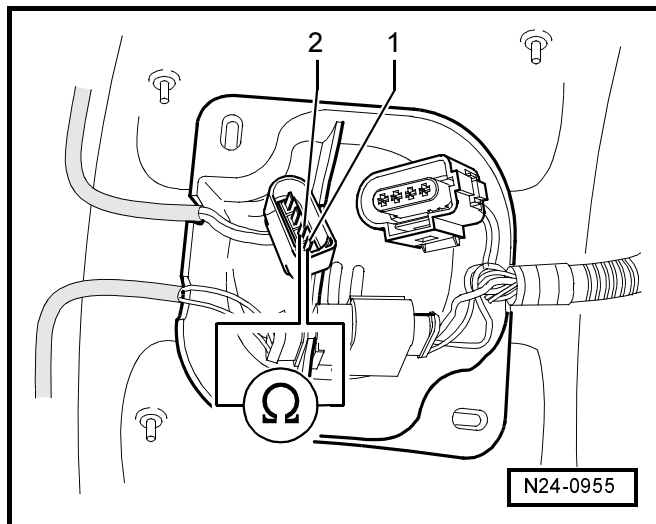
- Replace the lambda probe downstream of the catalytic converter -G130- ⇒ 1.6 I/75 kW Engine, Mechanical Components; Rep. Gr. 26.

If the specified value is not reached:

- Test wiring and plug connections according to current flow diagram.

If no fault was found:

- Replace engine control unit ⇒ Chapter 24-6.



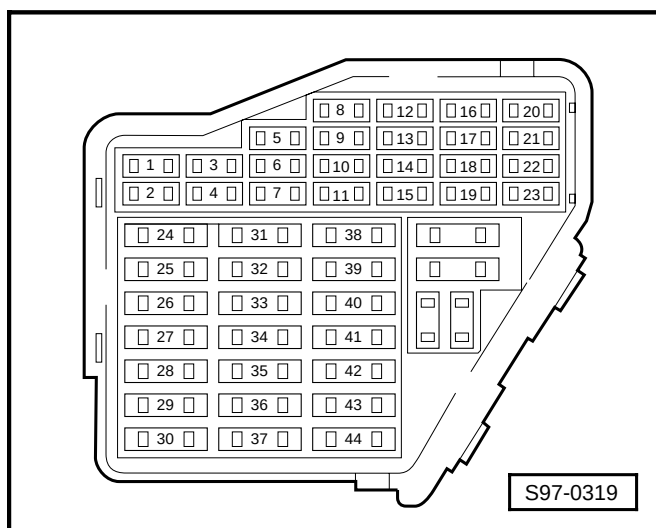
Test of ageing of lambda probe upstream of catalytic converter -G39-

Special tools, test and measuring equipment and auxiliary items required

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

Test conditions

- Fuel pump relay O.K., inspecting ⇒ Chap. 01-1
- Fuse 43 OK
- Coolant temperature must be at least 80 °C
- Exhaust system between catalyst and cylinder head tight



Check for proper operation

- Connect vehicle system tester -V.A.G 1552-. Start engine and select address word 01 „Engine electronics“
⇒ Chapter 01-1.
- Enter function 04 „Basic setting“ and select display group 034.
- Actuate brake pedal and hold it pressed down.

The engine control unit raises the engine speed to approx. 1400 rpm.

- Maintain this high engine speed until the display readout in display field 4 switches from „Test OFF“ to „Test ON“. Catalytic converter temperature in display field 2 must be at least 350 °C.

Readout on display:



System in basic setting	34	->
1400 rpm	360.0 °C	3.501 Test OFF



Note

This may take a few minutes.

- Continue to run engine at high speed until display field 4 indicates specified value „B1-S1 OK“.

If „B1-S1 not OK“ is shown in display field 4:

- Conduct a test drive in order to eliminate any residues on the lambda probe and repeat the test.
- Pay attention to safety precautions for a test drive
⇒ Chapter 24-1.

If the nominal values are again not reached:

- Replace lambda probe upstream of the catalyst -G39-.

24-5 Electronic Engine Power Control (Electronic throttle)

Inspecting fault lamp for the EPC

- Switch on ignition.

The electronic power control fault lamp -K132- must light up. ►

If the electronic power control fault lamp -K132- does not light up when the ignition is switched on.

- Inspect the dash panel insert and the electronic power control fault lamp -K132- ⇒ Electrical System; Rep. Gr. 90.
- Start engine and run in idle.

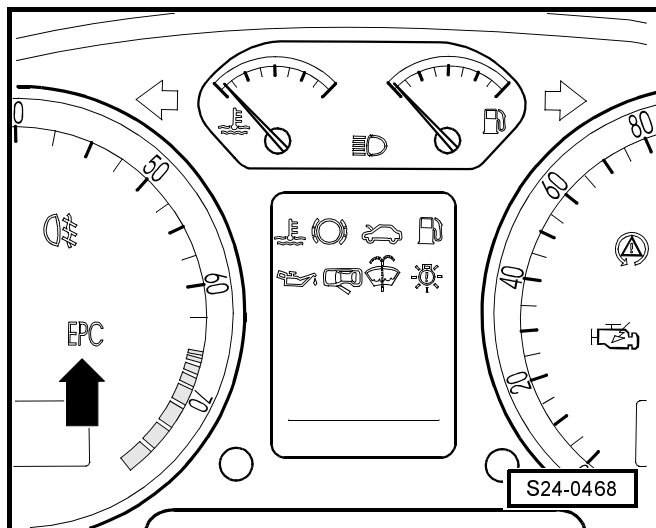
The electronic power control fault lamp -K132- must go out after a few seconds.

If the electronic power control fault lamp -K132- does not go out.

- Interrogate the fault memory of the engine control unit ⇒ Chapter 01-1 and if necessary eliminate the detected faults.
- Erase fault memory ⇒ Chapter 01-1.

If no fault is stored:

- Test data bus cables ⇒ Chapter 24-7.



Testing throttle valve control unit -J338-

The housing of the throttle valve control unit -J338- contains the following components:

- ♦ Throttle valve drive -G186-. This is an electric motor driven by the engine control unit. This electric motor opens the throttle valve against a spring force.
- ♦ Angle sender 1 for the throttle valve drive -G187-
- ♦ Angle sender 2 for the throttle valve drive -G188-



Note

- ♦ *The housing of the throttle valve control unit -J338- must not be opened.*
- ♦ *The angle senders are designed as potentiometers (variable resistors). They indicate the position of the throttle valve to the engine control unit fully independently from one another.*
- ♦ *The potentiometers cannot be mechanically adjusted. The settings are carried out when initiating the basic setting (function 04) using the vehicle system tester -V.A.G 1552-.*

Special tools, test and measuring equipment and auxiliary items required

- ♦ Vehicle system tester -V.A.G 1552-
- ♦ Diagnostic cable -V.A.G 1551/3, 3A, 3B oder 3C-
- ♦ Hand multimeter (e.g. -V.A.G 1715 -)
- ♦ Adapter cable set (e.g. -V.A.G 1594 A- or -V.A.G 1594 C -)
- ♦ Test box -V.A.G 1598/31-

Test conditions

- The throttle valve must neither be damaged nor soiled
- Coolant temperature must be at least 80 °C

Test sequence

- The functional test of the throttle valve control unit -J338- can be undertaken using the function „Read measured value block“, display group number 062 ⇒ Chapter 01-6.

If the specified values are not reached:

- Switch off ignition.
- Unplug plug of the throttle valve control unit -J338-.
- Measure the resistance of the throttle valve drive on the throttle valve control unit -J338- between contacts 3 + 5.

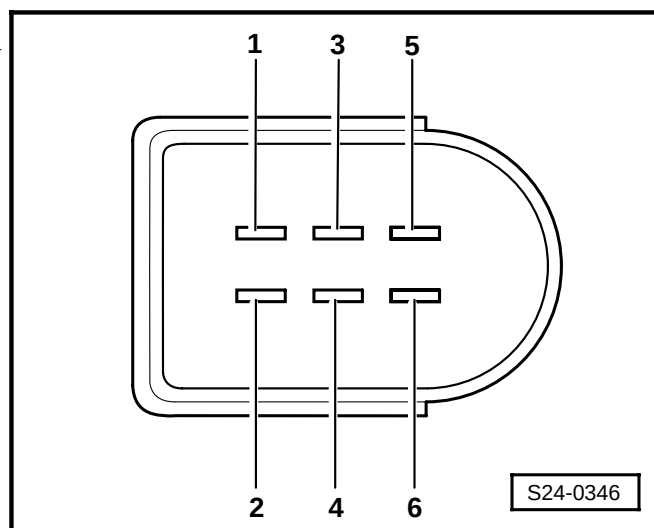
Specified value: 1...5 Ω

If the specified value is not reached:

- Replace the throttle valve control unit -J338-.

If the specified value is reached:

- Test voltage supply of throttle valve control unit ⇒ **24-5** page 2 and cables to engine control unit ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

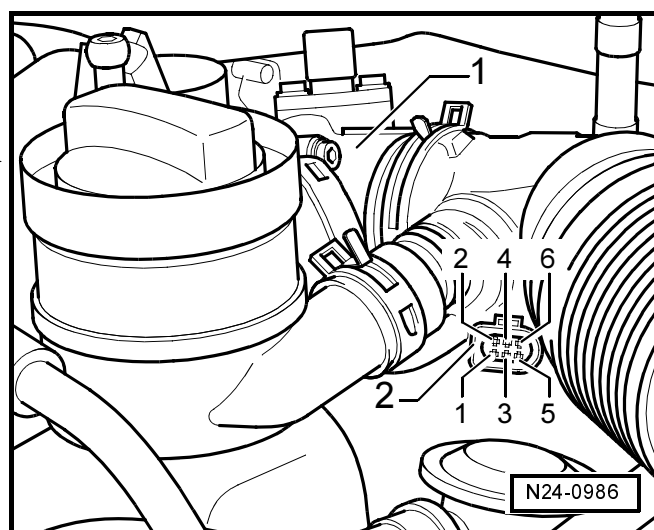


Testing the voltage supply to the throttle valve control unit -J338-

- Unplug plug of the throttle valve control unit -J338-.
- Switch on ignition.
- Connect up the hand multimeter and measure the voltage as follows:

6-pin plug on wiring loom, contact	Specification
2 + earth	min. 4.5 V
2 + 6	min. 4.5 V

If the specified values are not reached:



- Check the cables from the engine control unit to the throttle valve control unit -J338- ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

If no fault was found:

- Replace engine control unit ⇒ Chapter 24-6.

Testing Accelerator pedal position sender

The two accelerator pedal position senders -G79- and -G185- are located on 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.

Special tools, test and measuring equipment and auxiliary items required

- ♦ Vehicle system tester -V.A.G 1552-
- ♦ Diagnostic cable -V.A.G 1551/3, 3A, 3B oder 3C-
- ♦ Hand multimeter (e.g. -V.A.G 1715-)
- ♦ Adapter cable set (e.g. -V.A.G 1594 A- or -V.A.G 1594 C -)
- ♦ Test box -V.A.G 1598/31-

Check for proper operation

- The functional test of the accelerator pedal position sender can be undertaken using the function „Read measured value block“, display group number 062 ⇒ Chapter 01-6.

If the specified values are not reached:

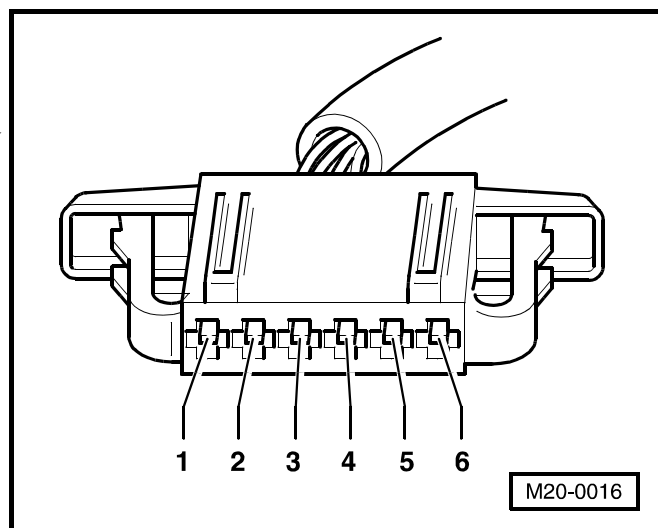
- Test the voltage supply ⇒ **24-5** page 3 and wiring of the accelerator pedal position sender.

Testing the power supply of the Accelerator pedal position sender

- Remove lower part of the dash panel insert on the driver's side ⇒ Body work; Rep. Gr. 70.
- Disconnect the connectors of the accelerator pedal position sender.
- Switch on ignition.
- Connect up the hand multimeter and measure the voltage as follows:

6-pin plug on wiring loom, contact	Specification
1 + earth	min. 4.5 V
1 + 5	min. 4.5 V
2 + earth	min. 4.5 V
2 + 3	min. 4.5 V

If the specified values are not reached:



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

If the cable is not found to be faulty:

- Replace engine control unit ⇒ Chapter 24-6.

24-6 Engine control unit

Operation

After analysing the input signals the engine control unit controls the

- ◆ injection,
- ◆ Lambda control
- ◆ Ignition,
- ◆ Tank ventilation,
- ◆ Cruise control system,
- ◆ Electronic power control
- ◆ Self-diagnosis.

Replacing engine control unit

Special tools, test and measuring equipment and auxiliary items required

- ◆ Vehicle system tester -V.A.G 1552-
- ◆ Diagnostic cable -V.A.G 1551/3- or -V.A.G 1551/3A- or -V.A.G 1551/3B- or -V.A.G 1551/3C-

Procedure

- Connect vehicle system tester -V.A.G 1552-. Switch on the ignition and select the engine control unit with „Address word“ 01 ⇒ Chap. 01-1.

The vehicle system tester -V.A.G 1552- displays the control unit identification, e. g.:

06A906033K	SIMOS 33 1.6/2V 00HS 3553 ->
Coding 00231	WSC XXXXX

- Take down the control unit identification.
- Select function 06 „End output“ and confirm entry with .

Removing

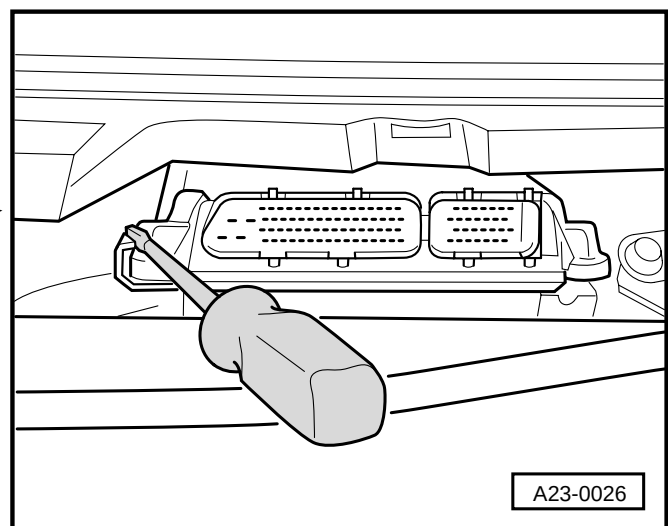
- Switch off the ignition.
- Remove the windscreen wiper arms and take off the cover of the plenum chamber ⇒ Body Fitting Work; Rep. Gr. 66.



Note!

When taking off, detach hose for spray nozzles.

- Use a screwdriver to push the detent catch of the fixture to the side and pull the engine control unit forward.
- Release the plug locks and unplug the control unit connectors.



A23-0026

Installing

Installation occurs in reverse order.

After installing the engine control unit, it is necessary to carry out the following steps:

- Code the engine control unit ⇒ **24-6** page 2.
- Adapt the engine control unit to the immobilizer control unit ⇒ Electrical System; Rep. Gr. 96.
- Perform adaptation of the throttle valve control unit -J338- ⇒ **24-6** page 4.
- Generate readiness code ⇒ Chap. 01-4.
- For vehicles with cruise control system: Activate the cruise control ⇒ **24-6** page 6.
- On vehicles fitted with automatic gearbox: Learn kick-down operating point ⇒ **24-6** page 7.
- Adapt EGR valve ⇒ **24-6** page 6.
- Interrogate the fault memory of the new engine control unit and if necessary erase the fault memory ⇒ Chap. 01-1.
- Perform a test drive.



Note!

Comply with the applicable safety instructions for test drives ⇒ Chap. 24-1.

During the test drive the following operating conditions must be fulfilled:

- ♦ The coolant temperature should rise beyond 80°C.
- ♦ Once the temperature has been reached the following operating conditions must be reached a number of times:
 - Idling speed
 - partial load
 - enrichment
 - full load
 - trailing throttle
- ♦ At „full load“ engine speed must be increased to more than 3500 rpm.
- Subsequently interrogate the fault memory of the engine control unit again.

Coding engine control unit

If the specific vehicle coding is not displayed or if the control unit was replaced, the control unit must be coded as follows.

Special tools, test and measuring equipment and auxiliary items required

- ♦ Vehicle system tester -V.A.G 1552-
- ♦ Diagnostic cable -V.A.G 1551/3- or -V.A.G 1551/3A- or -V.A.G 1551/3B- or -V.A.G 1551/3C-

Adapting the 4AV control unit to the throttle valve control unit -J338-

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 control unit. The acknowledgement of the throttle valve position occurs via the two throttle valve drive angle senders.

Always perform an adaptation if the throttle valve control unit -J338- or the engine control unit is removed and installed or if it is replaced or if the voltage supply of the engine control unit is interrupted.

The learning process (adaptation) is performed

- ♦ by initiating basic setting (function 04) display group 060 with the ignition on,
- ♦ automatically, when the ignition is switched on for at least 6 seconds without activating the starter and accelerator pedal and the engine control unit detects an „initialisation need“ (this does not show however whether the adaptation was successful or not). An initialisation need is detected if the stored angle sender voltage values do not correspond with the actually measured voltage values in a given tolerance range.



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-
- ♦ Diagnostic cable -V.A.G 1551/3- or -V.A.G 1551/3A- or -V.A.G 1551/3B- or -V.A.G 1551/3C-

Test conditions

- No fault in fault memory, interrogating fault memory
⇒ Chap. 01-1
- All electrical consumers such as lights and rear window heater must be switched off
- The throttle valve must be in idling position
- Accelerator pedal not pressed
- Coolant temperature above 5 °C, but below 100 °C
- Intake air temperature below 100 °C
- Battery voltage at least 11.5 V
- For vehicles with cruise control system:

Check whether the function is activated ⇒ Chap. 01-1. If „G“ does not appear in the control unit identification, the cruise control system should be activated ⇒ **24-6** page 6.

Procedure

- Connect vehicle system tester -V.A.G 1552-. Switch on the ignition and select the engine control unit with „Address word“ 01 ⇒ Chap. 01-1.
- Select function 04 „Basic setting“ and display group number 060.

After pressing , the throttle valve positioner is switched dead.

In this condition the throttle valve is drawn into emergency operation position by a mechanical spring located in the throttle valve control unit -J338-. The values generated by the two angle senders in this emergency position are stored by the engine control unit.

Subsequently the throttle valve is opened at a given value. If this value is reached, the throttle valve positioner is again switched dead. Now the mechanical spring must close the throttle valve within a given period in the previously initialised emergency position (spring test).

The throttle valve is subsequently closed by the throttle valve positioner: the values sent by the angle sender to the throttle valve control unit -J338- are stored in the engine control unit.

If the engine control unit switches the throttle valve positioner dead during driving operation, this is indicated by an increased, saw-toothed idling speed. The engine accelerates with a considerable delay.

Readout on display:

System in basic setting			60
10.5 %	89.0 %	8	ADP. running

- Check the nominal value for the throttle valve control unit -J338- in display field 4.

Readout on display:

System in basic setting			60
10.5 %	89.0 %	0	ADP. o.k.

Specified value display field 4:

ADP. runs
ADP. o.k.



Note!

The abbreviation „ADP“ in display field 4 stands for „Adaption“.

If the adaption is aborted by the control unit, this may be due to the following reasons:

- ♦ The throttle valve cannot be fully closed (e.g. dirt).
- ♦ The battery voltage is too low.
- ♦ The engine is started during the adaptation or the accelerator pedal is pressed.
- ♦ Warping of the throttle valve housing (check screwed connection).
- ♦ After the abortion the 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 the basic setting of the engine by pressing .

Readout on display:



Vehicle system test
Select function XX

HELP

Adapting EGR valve

Special tools, test and measuring equipment and auxiliary items required

- ♦ Vehicle system tester -V.A.G 1552-
- ♦ Diagnostic cable -V.A.G 1551/3- or -V.A.G 1551/3A- or -V.A.G 1551/3B- or -V.A.G 1551/3C-

Test conditions

- No fault in fault memory, interrogating fault memory
⇒ Chap. 01-1
- Battery voltage at least 11.5 V
- The throttle valve must be in idling position

Procedure

- Connect vehicle system tester -V.A.G 1552-. Switch on the ignition and select the engine control unit with „Address word“ 01 ⇒ Chap. 01-1.
- Select function 04 „Basic setting“ and display group number 074.

After pressing , adaption is performed automatically.

Readout on display:



System in basic setting			74	->
0.8 V	3.9 V	0.0 %	ADP.runs	

- Check the specification for adaption in display field 4.
Specified value: ADP.o.k.
- Terminate the basic setting of the engine by pressing .

Activating and deactivating cruise control system (CCS)

Special tools, test and measuring equipment and auxiliary items required

- ♦ Vehicle system tester -V.A.G 1552-
- ♦ Diagnostic cable -V.A.G 1551/3- or -V.A.G 1551/3A- or -V.A.G 1551/3B- or -V.A.G 1551/3C-

Test condition

- No fault in fault memory, interrogating fault memory
⇒ Chap. 01-1

Procedure

- Connect vehicle system tester -V.A.G 1552-. Switch on the ignition and select the engine control unit with „Address word“ 01 ⇒ Chap. 01-1.

Readout on display:



06A906033K SIMOS 33 1.6/2V G00HS 3553 ->	
Coding 00231	WSC XXXXX

If „G00HS“ is displayed the cruise control system is activated.

Readout on display:

06A906033K SIMOS 33 1.6/2V 00HS 3553 ->
Coding 00231 WSC XXXXX

If „00HS“ is displayed the cruise control system is not activated.

– Press .

Readout on display:

Vehicle system test HELP
Select function XX

– Press  twice for the function „Login procedure“ and confirm with .

Readout on display:

Login procedure
Enter code number XXXXX

– Enter code number according to the following table.

11463	Cruise control system activated
16167	Cruise control system deactivated

– Confirm entry with .

– Press  and  for the function „End output“ and confirm with .

After activating the cruise control system perform a test drive as a functional test.

Learning kickdown operating point

After the engine control unit or the accelerator pedal has been replaced, it is necessary to re-learn the kickdown operating point on vehicles fitted with automatic gearbox.

Special tools, test and measuring equipment and auxiliary items required

- ♦ Vehicle system tester -V.A.G 1552-
- ♦ Diagnostic cable -V.A.G 1551/3- or -V.A.G 1551/3A- or -V.A.G 1551/3B- or -V.A.G 1551/3C-

Test condition

- Ignition switched on, engine switched off

Procedure

- Connect vehicle system tester -V.A.G 1552-. Switch on the ignition and select the engine control unit with „Address word“ 01 ⇒ Chap. 01-1.
- Select function 04 „Basic setting“ and display group number 063.

Readout on display:

System in basic setting 63 ->
14.5% 87.8% Kickdown operate;

- Pay attention to the readout in display fields 3 and 4:

Display: Operate kickdown

- Depress accelerator pedal beyond the kickdown pressure point as far as the stop.

- Hold the accelerator pedal at stop for at least 2 seconds.
- Pay attention to the readout in display fields 3 and 4:
Specified value: Kickdown ADP.runs
then
Specified value: Kickdown ADP.o.k.

If the following readout appears in display fields 3 and 4:
„Kickdown ERROR“

- End basic setting by pressing .
- Select function 06 „End output“ and confirm entry with .
- Test accelerator pedal position senders ⇒ Chap. 24-5.
- Interrogate fault memory, correct fault if applicable and then erase the fault memory ⇒ Chap 01-1.

24-7 Testing auxiliary signals

Testing signal from high pressure sender for the air conditioning system -G65-

Special tools, test and measuring equipment and auxiliary items required

- ◆ Vehicle system tester -V.A.G 1552-
- ◆ Diagnostic cable -V.A.G 1551/3, 3A, 3B oder 3C-
- ◆ Hand multimeter (e.g. -V.A.G 1715-)
- ◆ Adapter cable set (e.g. -V.A.G 1594 A- or -V.A.G 1594 C -)
- ◆ Test box -V.A.G 1598/31-

Test conditions

- The function of the air conditioning system must be OK
- The air conditioning system must be switched off
- There must be no fault stored in the fault memory
⇒ Chapter 01-1.
- The vehicle must be at room temperature (above +15 °C).

Test sequence

Load signal from high pressure sender for the air conditioning system -G65-:

In order to more accurately control idling speed, the engine control unit is supplied with a PWM (pulse width modulated) signal from the air conditioning system.

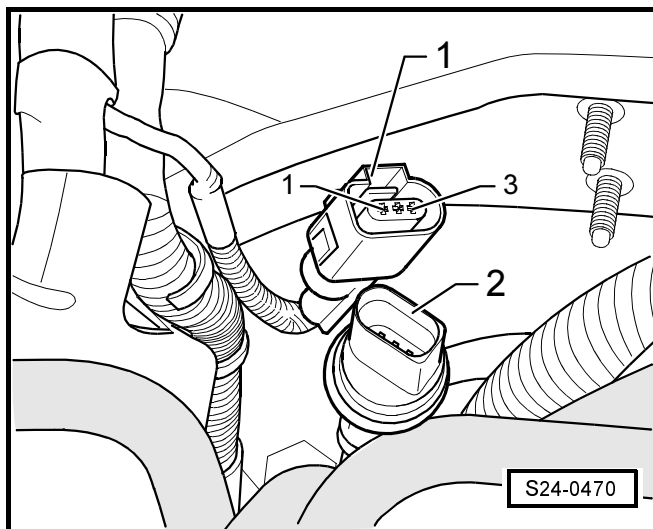
- Connect vehicle system tester -V.A.G 1552-. Start engine and select address word 01 „Engine electronics“
⇒ Chapter 01-1.
- Enter function 08 „read measured value block“ and select display group number 057.
- Readout on display:
- Note the contents of indicator 4. This must show 0...2 %.
- Switch on the air conditioning system.
- Set the lowest temperature and highest blower level.
- The readout in the display field must change to 15...60 %.

If the readout does not change or stays at a constant 24%:

-  Press.
- Select function 06 „End output“ and confirm entry with .
- Switch off ignition.

Reading	measured value	block	57	->
800 rpm	800 rpm	Compr.OFF		1%

- Unplug 4-pin connector (-1-) from high pressure sender -N152- (-2-).



- Connect the multimeter for voltage measurement with the auxiliary cables to contact 2 (positive) + 3 (earth) of connector -1- for the high pressure sender.

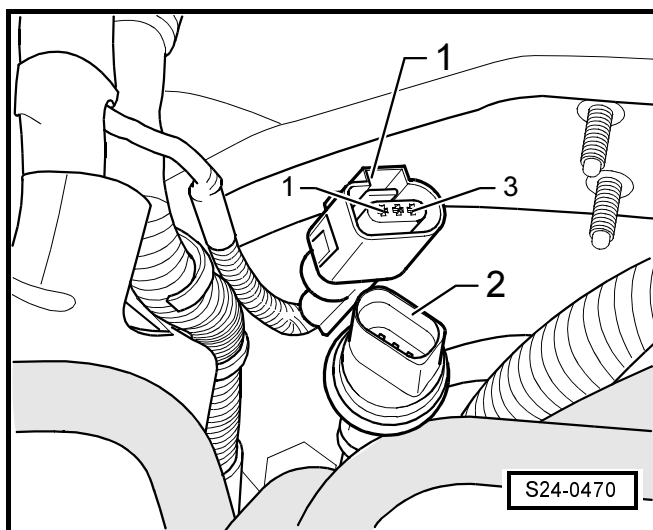
- Switch on ignition.

Specified value: at least 11.5 V

- Switch off ignition.

If the specified value is not reached:

- Test cable connections for short circuit according to the current diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.



Testing the speed signal

The speed signal is generated by the speedometer sender -G22- and is produced in the dash panel insert.

The processed signal passes to contact 9 of the engine control unit and is used for idling speed stabilisation and for damping load change jolts during gearshifts.

Special tools, test and measuring equipment and auxiliary items required

- ♦ Hand multimeter (e.g. -V.A.G 1715-)
- ♦ Diode test lamp (e.g. -V.A.G 1527 B-)
- ♦ Adapter cable set (e.g. -V.A.G 1594 A- or -V.A.G 1594 C -)
- ♦ Test box -V.A.G 1598/31-
- ♦ Current flow diagram

Test condition

- Operation and indication of speedometer is OK,
⇒ Electrical System; Rep. Gr. 90

Test sequence

- Connect the test box -V.A.G 1598/31 - to the wiring loom of the engine control unit ⇒ Chapter 24-2. The engine control unit is not connected.

- Raise vehicle until the front left wheel is clear of the ground.
- Connect the diode test lamp between bush 3 (positive) and bush 9 (speed signal) of the test box - V.A.G 1598/31-.
- Switch on ignition.
- Turn the left side front wheel by hand.

The diode test lamp must flash (very short flashing signal).

If the diode test lamp does not flash:

- Test wiring and plug connections to speed measuring sender -G22- according to current flow diagram.

Checking the data BUS

Special tools, test and measuring equipment and auxiliary items required

- ◆ Hand multimeter (e.g. -V.A.G 1715-)
- ◆ Adapter cable set (e.g. -V.A.G 1594 A- or -V.A.G 1594 C -)
- ◆ Test box -V.A.G 1598/31-

Test conditions

- A fault in the data bus lines was detected by the engine control unit.
- Coding of all control units OK.

Test sequence

- Switch off ignition.
- Unlock connector at engine control unit and unplug.
- Connect the test box -V.A.G 1598/31- to the engine control unit ⇒ Chapter 24-2. The wiring loom of the control unit is not connected during this test.
- Test the central terminating resistor in the engine control unit.
- Measure resistance between test box sockets 39 + 40.

Specified value: 60...72 Ω

If the resistance is not within the specified range:

- Replace engine control unit ⇒ Chapter 24-6.

If the resistance is within the specified range:

- Eliminate the fault in the data BUS cables or in the other data BUS control units ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

28 – Ignition System

28-1 Ignition System

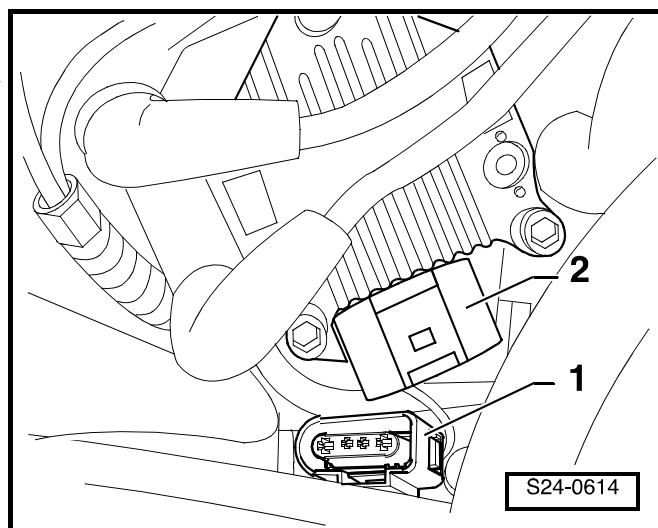
General notes on the ignition system

- ◆ The engine control unit is equipped with a self-diagnosis system.
- ◆ A minimum voltage of 11.5 V is required for perfect functioning of the electrical 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 delete.
- ◆ If after fault finding, repair or inspection of components the engine starts briefly and then stops, it is possible that the immobiliser blocks the 4AV control unit. In this case the fault memory must be interrogated and if necessary the control unit must be adapted.

Safety measures

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

- ◆ Do not touch or remove ignition leads with the engine running or at start speed.
 - ◆ Disconnect and connect wires of the injection and preheating system and measuring device wires when the ignition is switched off.
 - ◆ To operate the engine at start speed without it starting (e.g. for a testing compression pressure), unplug connectors from the ignition unit and connectors from the injectors. After performing the work interrogate fault memory and erase.
 - ◆ 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.
 - ◆ If the engine must be operated at start speed without the engine starting:
- Unplug 4-pin connector -1- from ignition transformer -2-.



Removing and installing ignition system

1 - Ignition lead

- ☐ 4...8 kΩ
- ☐ with shielded plug and spark-plug
- ☐ Use extractor -T10112- to unplug spark plug connector.

2 - Ignition transformer -N, N128-

- ☐ with identification for ignition leads:
A = Cylinder 1
B = Cylinder 2
C = Cylinder 3
D = Cylinder 4
- ☐ with power output stage -N122-
- ☐ resistances ⇒ **28-1** page 3

3 - 10 Nm

4 - Connector

- ☐ 4-pin

5 - Knock sensor -G61-

- ☐ contacts of sender and of connector gold-plated

6 - 3-pin plug connection

- ☐ contacts gold-plated
- ☐ black

7 - 20 Nm

- ☐ The tightening torque influences the knock sensor function

8 - Spark plug, 20...30 Nm

- ☐ type and electrode gap ⇒ Inspection and Maintenance
- ☐ use spark plug wrench, (e.g. -3122 B-) for removing and installing

9 - Connector

- ☐ for engines with engine code AVU
- ☐ for the camshaft position sensor -G163-
- ☐ contacts of sender and of connector gold-plated
- ☐ 3-pin

10 - Bracket

- ☐ for engines with engine code AVU
- ☐ for camshaft position sensor -G163-

11 - Camshaft position sensor -G163-

- ☐ for engines with engine code AVU
- ☐ check ⇒ **28-1** page 3

12 - Camshaft sprocket

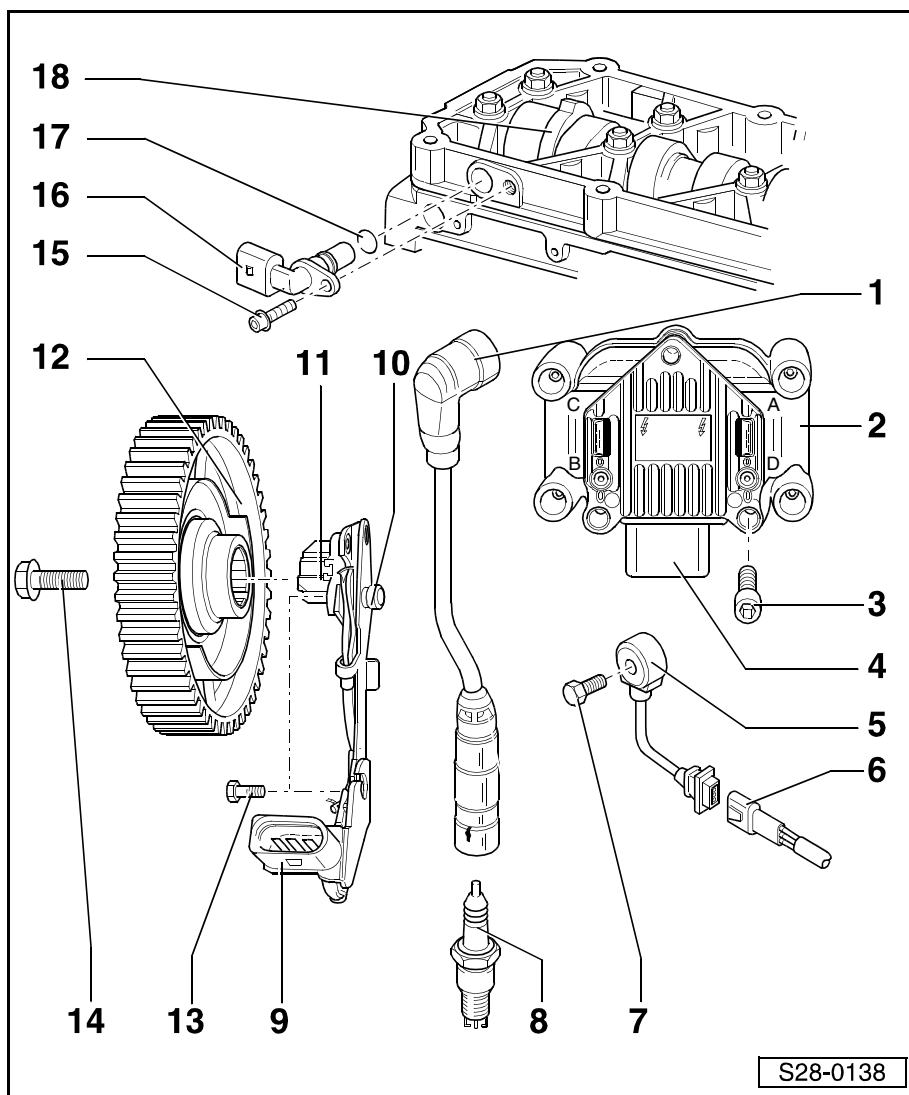
- ☐ for engines with engine code letters AVU with trim for hall sender
- ☐ removing and installing ⇒ 1.6 I/75 kW Engine, Mechanical Components; Rep. Gr. 15

13 - 10 Nm

- ☐ for engines with engine code AVU

14 - 100 Nm

- ☐ to release and tighten use counterholder -3415-



15 - 10 Nm

- ☐ for engines with engine code BFQ

16 - Camshaft position sensor -G163-

- ☐ for engines with engine code BFQ
- ☐ check ⇒ **28-1** page 3

17 - Gasket ring

- ☐ for engines with engine code BFQ
- ☐ replace if damaged
- ☐ before fitting moisten with clean engine oil

18 - Rotor

- ☐ for engines with engine code BFQ
- ☐ on the camshaft

Resistances of ignition coils

What is tested is the resistance between contacts 2 + 3 and 1 + 4. ►

Specified value: 4.0...6.0 k Ω (at approx. 20 °C)

Inspecting the camshaft position sensor -G163-

The camshaft position sensor -G163- indicates the ignition position for cylinder 1.

If it fails the knock control is deactivated and the ignition angle is slightly reduced as a cylinder assignment is no longer possible.

Without sensor signal the engine runs on and can be started again:

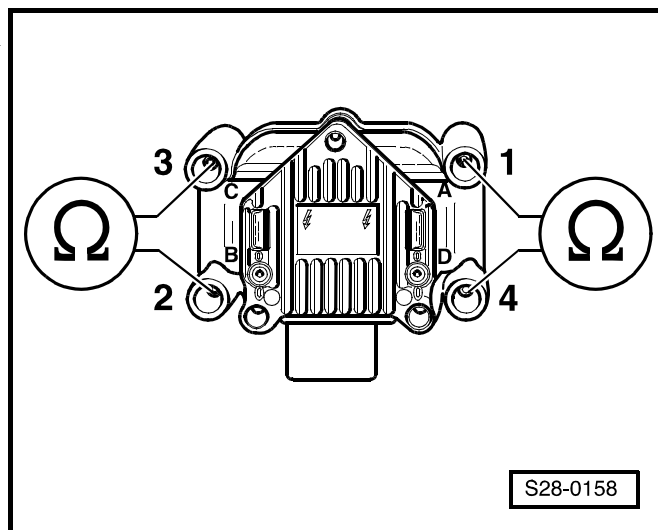
- ◆ In the event of a fault detection the engine control unit generates an ignition spark per cylinder for each crankshaft rotation.
- ◆ There is no noticeable effect on the injection if there is a displacement of an engine revolution. Instead of occurring with the injection valve open the injection occurs "pre-engaged" (before the closed injection valve). This only has a very slight influence on the quality of the mixture formation.

**Note**

- ◆ The camshaft position sensor -G163- is identical to the Hall sender -G40-.
- ◆ The correct setting of the timing can be checked in measured value block 012 ⇒ Chapter 01-5.

Special tools, test and measuring equipment and auxiliary items required

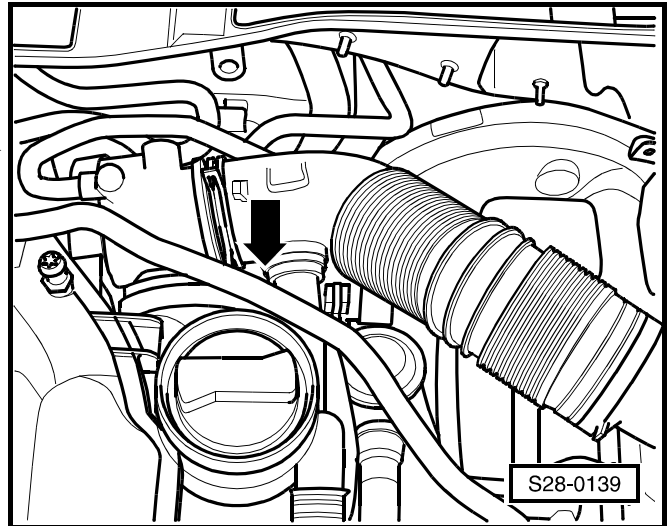
- ◆ Hand multimeter (e.g. -V.A.G 1715-)
- ◆ Adapter cable set (e.g. -V.A.G 1594 A, B oder C-)
- ◆ Test box -V.A.G 1598/31-



Test sequence

- Unplug the plug on the camshaft position sensor -G163- -arrow-.

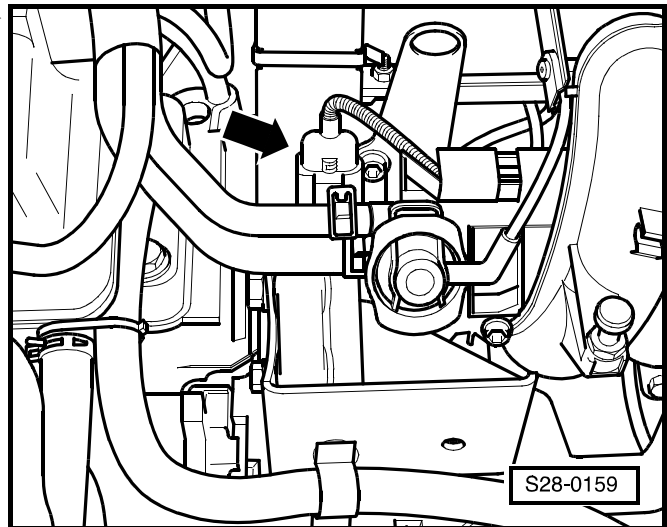
For engines with engine code BFQ



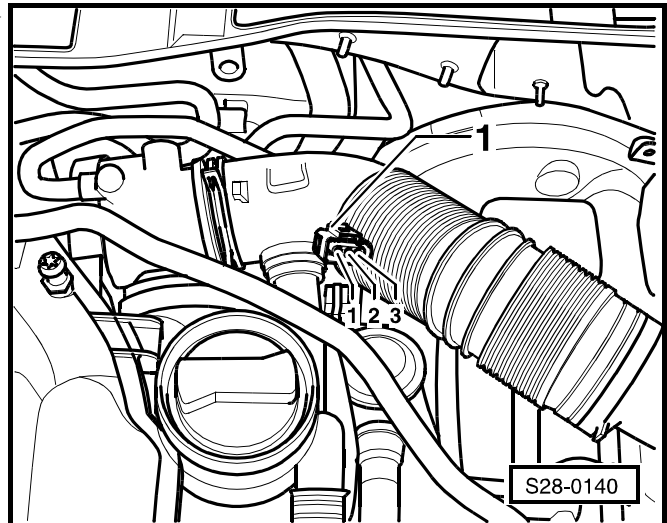
For engines with engine code AVU

Continued for all engines

- Switch on ignition.
- Connect up hand multimeter and measure the voltage as follows:



For engines with engine code BFQ



For engines with engine code AVU

3-pin plug -1- on wiring loom, contact	Specification
1 + 3	min. 4,5 V

If the specified value is not reached:

- Test wiring ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations

