

Workshop Manual OCTAVIA 1997 ➤

**1.9 l/96 kW (TDI) Engine, Fuel Injection and Glow
Plug System**
Edition 04.03

Engine code	ASZ								
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List of Supplements to Workshop Manual

OCTAVIA 1997 ➤

1.9 l/96 kW (TDI) Engine, Fuel Injection and Glow Plug System

Edition 04.03

Supplement	Edition	Subject	Article Number
	04.03	Basic Edition	S00.5143.50.20
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Table of Contents

01 – Self-diagnosis

Self-diagnosis I	01-1	page	1
- Properties of the self-diagnosis	01-1	page	1
- Technical data of self-diagnosis	01-1	page	1
- Connecting vehicle system tester -V.A.G 1552- and selecting the control unit for engine electronics	01-1	page	2
- Interrogating and erasing fault memory	01-1	page	3
- Actuator diagnosis	01-1	page	5
Self-diagnosis II	01-2	page	1
- Fault table	01-2	page	1
Self-diagnosis III	01-3	page	1
- Readiness code	01-3	page	1
- Reading readiness code	01-3	page	1
- Generating readiness code	01-3	page	2
Self-diagnosis IV	01-4	page	1
- Reading measured value block	01-4	page	1
- Display groups 001 to 022, engine idling	01-4	page	1
- Display groups 004 through 011 at full load	01-4	page	10
- Display group 125 - CAN databus	01-4	page	12

23 – Fuel Formation, Injection

Diesel Direct Injection System	23-1	page	1
- Safety instructions	23-1	page	1
- Rules of cleanliness	23-1	page	1
- Overview of fitting locations	23-1	page	2
- Disassembling and assembling intake manifold	23-1	page	5
- Disassembling and assembling the air filter	23-1	page	6
Disassembling and assembling the unit injector	23-2	page	1
- Summary of components	23-2	page	1
- Removing and installing O-rings for unit injector	23-2	page	2
- Removing and installing the unit injector	23-2	page	3
Testing components	23-3	page	1
- Testing lines and components with test box -V.A.G 1598/31-	23-3	page	1
- Testing unit injector valve	23-3	page	1
Testing exhaust gas recirculation	23-4	page	1
- Connection diagram for vacuum hoses	23-4	page	1
- Testing exhaust gas recirculation	23-4	page	1
Engine control unit	23-5	page	1
- Testing voltage supply for engine control unit	23-5	page	1
- Replacing diesel direct injection system control unit -J248-	23-5	page	2
- Coding diesel direct injection system control unit -J248-	23-5	page	3
- Activating and deactivating cruise control system (CCS)	23-5	page	4
Testing auxiliary signals	23-6	page	1
- Testing databus (CAN bus)	23-6	page	1
- Testing the speed signal	23-6	page	2

28 – Glow Plug System

Testing preheating system	28-1	page	1
- Check for proper operation	28-1	page	1
- Checking glow plugs	28-1	page	2

01 – Self-diagnosis

01-1 Self-diagnosis I

Properties of the self-diagnosis

The control unit for the diesel direct injection system 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. Fault table ⇒ Chap. 01-2.

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 50 engine starts, it is automatically erased.

If faults are detected that are likely to influence the driving behaviour, the glow period warning lamp -K29- flashes.

The stored faults can be read out with the vehicle system tester -V.A.G 1552-, -V.A.G 1551- or -VAS 5051- ⇒ **01-1** page 2.

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



Note

The following description only relates to vehicle system tester -V.A.G 1552- using the current program card. When not using the current program card or when using the fault read-out scan tool -V.A.G 1551- with integrated printer or using the vehicle diagnosis, measurement and information system -VAS 5051- a minor deviation in the display is possible.

Technical data of self-diagnosis

Interrogating control unit version

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

Available functions when using the vehicle system tester -V.A.G 1552-

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

Operation	Condition		
	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	yes	no
04 Perform basic setting	no	yes	no
05 Erasing fault memory	yes	yes	yes
06 Ending output	yes	yes	yes
07 Coding control unit	yes	no	no
08 Reading measured value block	yes	yes	yes
11 Login procedure	yes	no	no

¹⁾ Only perform with the ignition on, if the engine does not start.

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

Special tools, test and measuring equipment and auxiliary items required

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

Test conditions

- Battery voltage at least 11.5 volts
- Earth connection to engine and gearbox O.K.
- Fuses must be OK in compliance with the current flow diagram.

Procedure

- Connect vehicle system tester -V.A.G 1552- with appropriate cable. ►

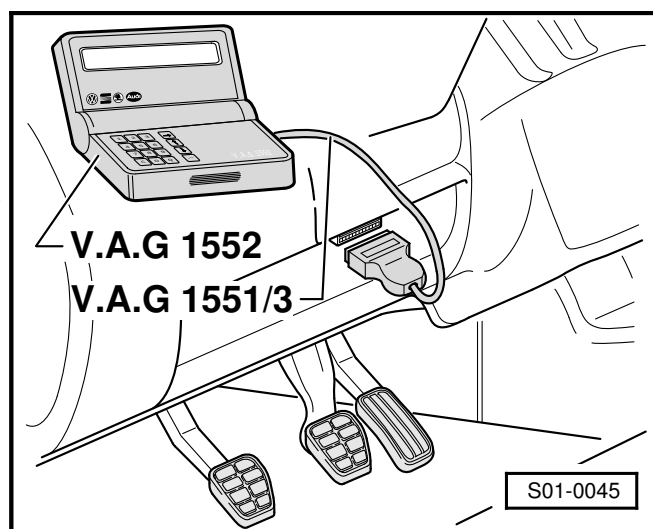
Once the vehicle system tester has been connected:

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



Note

- ♦ If „data transfer errors“ are displayed as a result of an incorrect entry, disconnect cable at vehicle system tester, connect it in again and repeat all the steps.
- ♦ If one of the following messages appears in the display, test the diagnostic cable ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations or ⇒ Operating Instructions of vehicle system tester. ►



Vehicle system test **HELP**
The control unit does not respond

- Operate the vehicle system tester by referring to the read-out on the display:

Readout on display:

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

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

- ♦ 038906019HJ = Part No. of the control unit (for current control unit version see spare parts catalogue)
- ♦ 1.9 ltr. = engine displacement
- ♦ R4 = engine version (4 cyl. in-line engine)
- ♦ EDC = Injection system (Electronic Diesel Control)
- ♦ CC = Cruise control system activated (only on models with CCS)
- ♦ 000 = Control unit ID
- ♦ MG = Manual gearbox
- ♦ 1576 = Data status (Software version of the control unit)
- ♦ Coding 00002 = Coding variant of the control unit
- ♦ WSC XXXXX = Workshop identification



Note

- ♦ If the control unit version displayed does not correspond to the vehicle, replace the control unit
⇒ Chapter 23-5.
- ♦ Incorrect coding of the engine control unit results in:
- ♦ Handling problems (jerky gear change, load change jolts etc.)
- ♦ Increase in fuel consumption
- ♦ Increase in pollution
- ♦ Storage of non-existent faults in fault memory

Interrogating and erasing fault memory

Special tools, test and measuring equipment and auxiliary items required

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

Interrogating fault memory

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

▶ Vehicle system test HELP
Fault in communication set-up

▶ Vehicle system test HELP
K cable does not connect to earth

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

▶ Vehicle system test HELP
Enter address word XX

038906019HJ 1.9l R4 EDC G000SG 1576 ->
Coding 00002 WSC XXXXX

Only if the engine does not start:

- Switch on ignition.
- Enter function 02 „Interrogate fault memory“ and confirm entry with the  key.

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

X faults detected!

If no fault is stored:

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

If one or several faults are stored:

- Press .

Readout on display, e.g.: ➤

Fault number: 16685 P0301 044 ->

- Press .

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

Cylinder 1 ->
Combustion misfiring detected

- Press .

The stored faults are displayed in sequence.

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

Note

When carrying out testing and removal and installation operations faults such as connector unplugged or CAN bus faults, may also be detected by other control units. This is why, when the work is concluded, that it is necessary to interrogate and erase the fault memory on all control units. For this you must proceed as follows:

- Enter function 00 for „Automatic test sequence“ and confirm with .

The Vehicle system tester -V.A.G 1552- sends all the known address words one after the other.

Erasing fault memory

Test conditions

- Fault eliminated
- Fault memory interrogated ⇒ **01-1** page 3

Note

After fault elimination the fault memory must again be interrogated and subsequently erased.

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

Readout on display: ➤

Vehicle system test ->
Fault memory was erased

**Note**

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

- Enter function 06 „End output“ and confirm entry with .
- Perform a test drive. Then, once again interrogate the fault memory. No fault must be displayed.

Actuator diagnosis

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

- 1 - Exhaust gas recirculation valve -N18-
- 2 - AC compressor engagement
- 3 - Solenoid valve for charge pressure control -N75-
- 4 - Changeover valve for intake manifold flap -N239-
- 5 - Glow period warning lamp -K29-
- 6 - Radiator fan control
- 7 - Glow plug relay -J52-
- 8 - Low heat output relay -J359-
- 9 - High heat output relay -J360-
- 10 - Fault lamp

**Note**

- ♦ *Actuation of the individual control elements is limited to 30 seconds.*
- ♦ *If final control diagnosis is to be repeated without starting the engine in-between, switch ignition off for about 20 seconds.*

Special tools, test and measuring equipment and auxiliary items required

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

Test conditions

- Fuses must be OK in compliance with the current flow diagram.

Procedure

- Connect vehicle system tester -V.A.G 1552-. Start engine and select address word 01 „Engine electronics“ ⇒ **01-1** page 2.
- Enter function 03 „Final control diagnosis“.

Readout on display:

The valve must click.



Actuator diagnosis ->
Exhaust gas recirculation valve -N18



Note

The clicking of the valve cannot be heard because of the engine noise and can therefore only be checked.

If the valve does not click:

- Testing Exhaust gas recirculation valve -N18 -
⇒ Chap. 23-1.
- Press .

Readout on display:

This test step is also activated on vehicles without AC system.

Disregard display.

- Press .

Readout on display:

The valve must click.



Actuator diagnosis ->
AC compressor engagement



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



Note

The clicking of the valve cannot be heard because of the engine noise and can therefore only be checked.

If the valve does not click:

- Test charge pressure control solenoid valve -N75 -
⇒ Chap. 23-1.
- Press .

Readout on display:

The engine must stop.

If the engine does not stop:

- Switch off ignition.
- Inspecting Intake manifold flap change-over valve -N239- ⇒ Chap. 23-1.
- Continue final control diagnosis with the engine off and the ignition switched on.
- Press .

Readout on display:

The warning light for glow period must flash.

If the warning light does not flash:

- Testing Glow period warning lamp - K29 - ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.
- Press .

Readout on display:



Actuator diagnosis ->
Intake manif.flap change-over valve-N239



Actuator diagnosis ->
Glow period warning lamp -K29



Actuator diagnosis ->
Radiator fan control

The radiator fan must start running at 30 second intervals and stop.

If the fan does not run:

- Testing radiator fan and radiator fan control unit -J293- ⇒ Current Flow Diagrams, Fault Finding Electrics and Fitting Locations.

- Press .

Readout on display:

The relay must click.

It is also possible to observe the relay switching on and off by the interior light becoming brighter and darker (caused by the high power consumption of glow plugs).

If the relay does not click:

- Test glow plug relay -J52- ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

- Press .

Readout on display:

The relay must click.

If the relay does not click:

- Test low heat output relay -J359- ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

- Press .

Readout on display:

The relay must click.

If the relay does not click:

- Test high heat output relay -J360 - ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

- Press .

Readout on display:

The fault lamp must flash.

If the fault lamp does not flash:

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

- Press .

Readout on display:

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

▶

Actuator diagnosis Glow plug relay -J52	->
--	----

▶

Actuator diagnosis Low heat output relay -J359	->
---	----

▶

Actuator diagnosis High heat output relay -J360	->
--	----

▶

Actuator diagnosis Fault lamp	->
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▶

Vehicle system test Select function XX	HELP
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01-2 Self-diagnosis II

Fault table



Note

- ◆ The fault table is ordered 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 of all test all leads and plug connections to these components, as well as the earth connections according to 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 „Info in 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
16485 Air mass meter -G70	Implausible signal	– Test air mass meter -G70 - ⇒ Chap. 01-4, display group 003
16684 Combustion misfiring detected		– Test compression ⇒ 1.9 /74 kW (TDI) Engine, Mechanical Components; Rep. Gr. 15.
16685 Cyl. 1 combustion misfirings detected		– Check unit injector ⇒ Chap. 23-3
16686 Cyl. 2 combustion misfirings detected		
16687 Cyl. 3 combustion misfirings detected		
16688 Cyl. 4 combustion misfirings detected		
16705 Engine speed sender - G28	Implausible signal	– Inspecting Engine speed sender -G28- ⇒ Chap. 23-1
16706 Engine speed sender - G28	No signal	– Inspecting Engine speed sender -G28- ⇒ Chap. 23-1 – Check wiring according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations – Replace diesel direct injection system control unit -J248- ⇒ Chap. 23-5
16725 Camshaft pos. sensor ⇒ Sender -G40	Implausible signal	– Test camshaft position sensor -G40- ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations – Remove open circuit in wiring or short circuit according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations – Test position of camshaft and sensor rotor ⇒ 1.9/74 kW (TDI) Engine, Mechanical Components; Rep. Gr. 15.
16885 Vehicle speed signal	Implausible signal	– Test vehicle speed signal ⇒ Chapter 23-6

Readout on -V.A.G 1552-		Rectifying fault
16944 Voltage supply	Implausible signal	– Test cables to diesel direct injection system control unit - J248- according to the current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
16946 Voltage supply	Voltage too low	
16947 Voltage supply	Voltage too high	
16955 Brake light switch -F	Implausible signal	– Test brake light switch - F- and brake pedal switch -F47- ⇒ Chap. 01-4, display group 006
16989 Control unit defective		– Replace diesel direct injection system control unit -J248 - ⇒ Chap. 23-5
17552 Air mass meter -G70	Open circuit or short circuit to earth	– Test air mass meter -G70- ⇒ Chap. 01-4, display group 003 – Check wiring according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations – Replace diesel direct injection system control unit -J248- ⇒ Chap. 23-5
17553 Air mass meter -G70	Short circuit to positive	
17554 Air mass meter -G70	Voltage supply	
17563 Intake manifold pressure sender -G71	Short circuit to positive	– Test intake manifold pressure sender -G71- ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations – Check wiring according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations – Replace diesel direct injection system control unit - J248 - ⇒ Chap. 23-5 – Test charge pressure ⇒ Chap. 01-4, display group 010
17564 Intake manifold pressure sender -G71	Open circuit or short circuit to earth	
17565 Intake manifold pressure sender -G71	Voltage supply	
17568 Intake manifold temperature sender -G72	Short circuit to earth	– Test intake manifold temperature sender -G72- ⇒ Chap. 01-4, display group 007 – Check wiring according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations – Replace diesel direct injection system control unit -J248 - ⇒ Chap. 23-5
17569 Intake manifold temperature sender -G72	Open circuit/ Short circuit to positive	
17570 Fuel temperature sender -G81	Short circuit to earth	– Test fuel temperature sender -G81- ⇒ Chap. 01-4, display group 007 – Check wiring according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations – Replace diesel direct injection system control unit - J248 - ⇒ Chap. 23-5
17571 Fuel temperature sender -G81	Open circuit/ Short circuit to positive	
17663 Coolant temperature sender -G62	Open circuit/ Short circuit to positive	– Test coolant temperature sender -G62- ⇒ Chap. 01-4, display group 007 – Check wiring according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations – Replace diesel direct injection system control unit - J248- ⇒ Chap. 23-5
17664 Coolant temperature sender -G62	Short circuit to earth	
17668 Unit injector solenoid valve cyl. 1 -N240	Implausible signal	– Check unit injector ⇒ Chap. 23-3
17669 Unit injector solenoid valve cyl. 1 -N240	Regulating limit exceeded	

Readout on -V.A.G 1552-		Rectifying fault
17670 Unit injector solenoid valve cyl. 1 -N240	Regulating limit not reached	– Check unit injector ⇒ Chap. 23-3 – Test fuel supply ⇒ 1.9 ltr./74 kW (TDI) Engine, Mechanical Components; Rep. Gr. 20
17671 Unit injector solenoid valve cyl. 2 -N241	Implausible signal	– Check unit injector ⇒ Chap. 23-3
17672 Unit injector solenoid valve cyl. 2 -N241	Regulating limit exceeded	
17673 Unit injector solenoid valve cyl. 2 -N241	Regulating limit not reached	– Check unit injector ⇒ Chap. 23-3 – Test fuel supply ⇒ 1.9 ltr./74 kW (TDI) Engine, Mechanical Components; Rep. Gr. 20
17674 Unit injector solenoid valve cyl. 3 -N242	Implausible signal	– Check unit injector ⇒ Chap. 23-3
17675 Unit injector solenoid valve cyl. 3 -N242	Regulating limit exceeded	
17676 Unit injector solenoid valve cyl. 3 -N242	Regulating limit not reached	– Check unit injector ⇒ Chap. 23-3 – Test fuel supply ⇒ 1.9 ltr./74 kW (TDI) Engine, Mechanical Components; Rep. Gr. 20
17677 Unit injector solenoid valve cyl. 4 -N243	Implausible signal	– Check unit injector ⇒ Chap. 23-3
17678 Unit injector solenoid valve cyl. 4 -N243	Regulating limit exceeded	
17679 Unit injector solenoid valve cyl. 4 -N243	Regulating limit not reached	– Check unit injector ⇒ Chap. 23-3 – Test fuel supply ⇒ 1.9 ltr./74 kW (TDI) Engine, Mechanical Components; Rep. Gr. 20
17795 Control unit defective		– Replace diesel direct injection system control unit -J248 - ⇒ Chap. 23-5
17810 Exhaust gas recirculation valve -N18	Short circuit to positive	– Test exhaust gas recirculation valve -N18- with final control diagnosis ⇒ Chap. 01-1 – Inspecting exhaust gas recirculation ⇒ Chap. 23-4
17849 Exhaust gas recirculation valve -N18	Open circuit or short circuit to earth	
17910 Fuel pump relay -J17	Short circuit to positive	– Testing fuel pump relay -J17- ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
17911 Load signal for alternator terminal DF	Implausible signal	– Test generator ⇒ Electrical System; Rep. Gr. 27 – Reading measured value block, display group 016 ⇒ Chap. 01-4
17931 Crash signal from airbag CU	Implausible signal	– Perform airbag system self-diagnosis ⇒ Body Work; Rep. Gr. 01
17948 Vehicle speed signal	Signal too high	– Test vehicle speed signal ⇒ Chapter 23-6 – Test CAN databus lines ⇒ Chapter 23-6 – Test dash panel insert ⇒ Electrical System; Rep. Gr. 90

Readout on -V.A.G 1552-		Rectifying fault
17954 Charge pressure control solenoid valve - N75	Short circuit to positive	– Test charge pressure control solenoid valve -N75- with final control diagnosis ⇒ Chap. 01-1
17957 Charge pressure control solenoid valve - N75	Open circuit or short circuit to earth	
17958 Charge pressure	Control difference	– Test charge pressure control solenoid valve - N75- with final control diagnosis ⇒ Chap. 01-1 – Test charge pressure control ⇒ 1.9 l/96 kW (TDI) Engine, Mechanical Components; Rep. Gr. 21
17964 Charge pressure control	Regulating limit not reached	
17965 Charge pressure control	Regulating limit exceeded	
17977 Cruise control system switch -E45	Implausible signal	– Analyse measured value block, display groups 006 and 022 ⇒ Chap. 01-4 – Read out fault memory of the electrical system control unit ⇒ Electrical System; Rep. Gr. 90
17978 Engine control unit blocked ¹⁾		– Adapt diesel direct injection system control unit - J248- to electronic immobiliser ⇒ Electrical System; Rep. Gr. 96 – Test immobiliser ⇒ Electrical System; Rep. Gr. 96
18008 Voltage supply terminal 15	Voltage too low	– Test voltage supply for diesel direct injection system control unit -J248- ⇒ Chap. 23-5
18009 Voltage supply relay terminal 30 -J317 ²⁾	Implausible signal	– Test diesel direct injection system relay -J322- ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
18017 Crash disconnect activated		– Read out fault memory of airbag control unit ⇒ Body Work; Rep. Gr. 01 – Replace airbag control unit ⇒ Body Work; Rep. Gr. 69
18020 Engine control unit	Incorrectly coded	– Code diesel direct injection system control unit -J248- ⇒ Chap. 23-5
18024 Glow period warning lamp -K29	Short circuit to positive	– Test glow period warning lamp -K29- with final control diagnosis ⇒ Chap. 01-1
18025 Glow period warning lamp -K29	Open circuit/ Short circuit to positive	
18026 Glow plug relay -J52	Short circuit to positive	– Test glow plug relay -J52 - with final control diagnosis ⇒ Chap. 01-1
18027 Glow plug relay -J52	Short circuit to earth	
18034 Data BUS drive	Missing message from gearbox CU	– Test CAN databus lines ⇒ Chapter 23-6
18039 Accelerator pedal position sender -G79	Signal too high	– Test accelerator pedal position sender -G79- ⇒ Chap. 01-4, display group 002
18040 Accelerator pedal position sender -G79	Voltage supply	

Readout on -V.A.G 1552-		Rectifying fault
18043 Data BUS drive	Missing message from air conditioning system CU	– Test CAN databus lines ⇒ Chapter 23-6 – Read out air conditioning system control unit fault memory ⇒ Heating, Air conditioning; Rep. Gr. 87
18044 Data BUS drive	Missing message from airbag CU	– Test CAN databus lines ⇒ Chapter 23-6 – Read out fault memory of airbag CU ⇒ Body Work; Rep. Gr. 01
18045 Data BUS drive	missing message from electron. CU	– Test CAN databus lines ⇒ Chapter 23-6 – Read out fault memory of electrical system control unit ⇒ Electrical System; Rep. Gr. 90
18047 1/2 for accelerator pedal position sender - G79+G185	Implausible signal	– Test accelerator pedal position sender -G79- ⇒ Chap. 01-4, display group 002 – Replace diesel direct injection system control unit -J248 - ⇒ Chap. 23-5
18048 Control unit defective		– Replace diesel direct injection system control unit -J248 - ⇒ Chap. 23-5
18056 Data BUS drive	defective	– Test CAN databus lines ⇒ Chapter 23-6 – Read out fault memory of engine CU ⇒ Chapter 01-1
18057 Data BUS drive	Missing message from ABS CU	– Test CAN databus lines ⇒ Chapter 23-6 – Read out fault memory of ABS control unit ⇒ Chassis; Rep. Gr. 45
18058 Data BUS drive	Missing message from combiinstrument	– Test CAN databus lines ⇒ Chapter 23-6 – Read out fault memory of dash panel insert ⇒ Electrical System; Rep. Gr. 90
18062 Read out fault memory of combiinstrument		– Perform self-diagnosis of the dash panel insert ⇒ Electrical System; Rep. Gr. 90
18065 Air conditioning system inlet/outlet	Short circuit to positive	– Test AC compressor control with final control diagnosis ⇒ Chap. 01-1
18067 Radiator fan control 1		– Test radiator fan control with final control diagnosis ⇒ Chap. 01-1
18071 Actuation of unit injector solenoid valve	Short circuit to positive	– Check unit injector ⇒ Chap. 23-3
18072 Actuation of unit injector solenoid valve	Electrical fault in the circuit	
18073 Actuation of unit injector solenoid valve	Mechanical fault	– Replacing unit injector ⇒ Chap. 23-2

Readout on -V.A.G 1552-		Rectifying fault
18074 Unit injector solenoid valve cyl. 1 -N240	Electrical fault in the circuit	– Check unit injector ⇒ Chap. 23-3
18075 Unit injector solenoid valve cyl. 2 -N241		
18076 Unit injector solenoid valve cyl. 3 -N242		
18077 Unit injector solenoid valve cyl. 4 -N243		
18080 Radiator fan control 1	Open circuit or short circuit to earth	– Test radiator fan control with final control diagnosis ⇒ Chap. 01-1
18090 Data BUS drive	implausible message from ABS CU	– Test CAN databus lines ⇒ Chapter 23-6 – Read out fault memory of ABS control unit ⇒ Chassis; Rep. Gr. 45
18097 Data BUS drive	Implausible message from electron. CU	– Test CAN databus lines ⇒ Chapter 23-6 – Read out fault memory of electrical system control unit ⇒ Electrical System; Rep. Gr. 90
19456 Glow period warning lamp -K29-	Fault message from combiinstrument	– Test CAN databus lines ⇒ Chapter 23-6
19458 Kick-down switch -F8-	Implausible signal	– Test accelerator pedal position sender -G79- ⇒ Chap. 01-4, display group 002
19459 Low heat output relay -J359	Short circuit to positive	– Test low heat output relay -J359- with final control diagnosis ⇒ Chap. 01-1
19461 High heat output relay -J360		– Test high heat output relay -J360- with final control diagnosis ⇒ Chap. 01-1
19463 Camshaft pos. sensor ⇒ Sender -G40	No signal	– Test camshaft position sensor -G40- ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations – Test position of camshaft and sensor rotor ⇒ 1.9/74 kW (TDI) Engine, Mechanical Components; Rep. Gr. 15.
19464 Camshaft pos. sensor ⇒ Sender -G40	Signal outside tolerance	– Test camshaft position sensor -G40- ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations – Remove open circuit in wiring or short circuit according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations – Test position of camshaft and sensor rotor ⇒ 1.9/74 kW (TDI) Engine, Mechanical Components; Rep. Gr. 15.

Readout on -V.A.G 1552-		Rectifying fault
19560 Intake manifold flap change-over valve - N239	Short circuit to positive	– Test intake manifold flap changeover valve -N239- with final control diagnosis ⇒ Chap. 01-1
19561 Intake manifold flap change-over valve - N239	Open circuit or short circuit to earth	
19586 Exhaust gas recirculation system	Regulating limit not reached	– Testing Exhaust gas recirculation valve -N18- ⇒ Chap. 23-1 – Inspecting exhaust gas recirculation ⇒ Chap. 23-4
19587 Exhaust gas recirculation system	Regulating limit exceeded	

- 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.
- ²⁾ Relay for voltage supply terminal 30 -J317- is identical with relay for diesel direct injection system -J322-.

01-3 Self-diagnosis III

Readiness code

Reading readiness code

Operation

The readiness codes are two eight-digit numerical codes which indicate the status of the emission-relevant diagnoses.

If the diagnosis for a system was successfully performed (e.g. exhaust gas recirculation system), 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 the systems operate according to the specifications. If a fault is detected during the diagnosis it is entered in the fault memory.

Readiness code is erased, i.e. all relevant points will be set to 1, through deletion of the fault memory.

Generation of readiness code refers to the activation of the diagnostic functions such as diagnosis of fuel supply, diagnosis of other systems etc.

Procedure

Special tools, test and measuring equipment and auxiliary items required

- ◆ Vehicle system tester -V.A.G 1552- with cable
-V.A.G 1551/3, 3A, 3B oder 3C-
- Connect vehicle system tester -V.A.G 1552- and enter address word 01 „Engine electronics“ ⇒ Chap. 01-1.
- Select function 08 „Read measured value block“ and display group number 017.

Readout on display:

Reading measured value block 17 ->
00000000 00000110 10000000 00000000

Meaning of 8-digit numerical block for readiness code in display field 2								Meaning
1	2	3	4	5	6	7	8	0 Ignore
						1		Ignore
					1			Ignore
				0				Ignore
			0					Ignore
		0						Diagnosis of other systems
	0							Diagnosis of fuel system
0								Ignore

Meaning of 8-digit numerical block for readiness code in display field 4								
1	2	3	4	5	6	7	8	Meaning
							0	Ignore
						0		Ignore
					0			Ignore
				0				Ignore
			0					Ignore
		0						Ignore
	0							Ignore
0								Diagnosis of exhaust gas recirculation system

- If the specified values are not reached, generate readiness code ⇒ **01-3** page 2.
- Press  key.
- Select function 06 „End output“ and switch ignition off.

Generating readiness code

Special tools, test and measuring equipment and auxiliary items required

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

Test conditions

- All electrical consumers such as lights and rear window heater switched off
- Intake air temperature must be below 60°C ⇒ display group 007, display field 3
- Coolant temperature at least 83°C ⇒ display group 007, display block 4

Procedure

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



Note

Certain work steps have to be carried out twice, in order to achieve the readiness code.

Work step 1: Interrogating fault memory

- Enter function   „Interrogate fault memory“ and confirm entry 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.

If no fault is stored:

- Press .

Work step 2: Erasing fault memory

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



Note

Readiness code is 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 .

Work step 3: Switch off ignition

- Wait at least 5 seconds with ignition switched off.



Note

This point is important, because for certain diagnoses the castor of the control unit must be ended. Otherwise the readiness code cannot be generated.

Work step 4: Switch on ignition

- Wait at least 10 seconds with ignition switched on.

Charge pressure sender is adapted to atmospheric pressure sender.

Work step 5: 1. Test of fuel system and other systems

- Start engine.
- Select function   „Read measured value block“ and display group 001.
- Increase engine speed for 5 seconds to 2500 rpm and then run engine at idling speed.

Readout on display:

Reading measured value block 1 ->
2500 rpm 4.6 mg/s 2 0°C 94.2 °C

Work step 6: 1. Test of exhaust gas recirculation

- Increase engine speed to 1600 rpm up to 1700 rpm and maintain it for at least 10 seconds in this range.

Readout on display:

In this speed range, the exhaust gas recirculation is active and the control difference is checked. (Condition for generation of readiness code for exhaust gas recirculation).



Reading	measured value	block	1	->
1650 rpm	4.1 mg/s	4	0°C	93.2 °C

Work step 7: Switch off ignition

- Wait at least 5 seconds with ignition switched off.

Work step 8: Switch on ignition

- Wait at least 10 seconds with ignition switched on.

Work step 9: 2. Test of fuel system and other systems

- Start engine.
- Select function **0 8** „Read measured value block“ and display group 001.
- Increase engine speed for 5 seconds to 2500 rpm and then run engine at idling speed.

Readout on display:



Reading	measured value	block	1	->
2500 rpm	4.6 mg/s	2	0°C	94.2 °C

Work step 10: 2. Test of exhaust gas recirculation

- Increase engine speed to 1600 rpm up to 1700 rpm and maintain it for at least 10 seconds in this range.

Readout on display:



Reading	measured value	block	1	->
1650 rpm	4.1 mg/s	4	0°C	93.2 °C

- Press **C**.
- Enter **0 1 7** for display group 017 and read readiness code.

Readout on display:



Reading	measured value	block	17	->
00000000	00000110	10000000	00000000	

Specification in display field 2: 00000110

Specification in display field 4: 00000000

- Press **→**.
- If the specified values are not reached, repeat procedure for generating readiness code ⇒ **01-3** page 2.

Work step 11: Interrogating fault memory

- Enter function **0 2** „Interrogate fault memory“ and confirm entry with **Q**.

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 generate readiness code again
⇒ **01-3** page 2.

If no fault is stored:

– Press .

Readiness code was successfully generated, if no fault is stored after repeating the test procedure in the fault memory of the engine control unit and if the following appears in the channel 017.

Reading	measured	value	block	17	->
00000000	00000110	10000000	00000000		

01-4 Self-diagnosis IV

Reading measured value block

Special tools, test and measuring equipment and auxiliary items required

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

Test conditions

- Coolant temperature must be at least 75°C.
- All electrical consumers, e.g. lights and rear window heater, must be switched off.
- If vehicle is equipped with air conditioning, this must be switched off.

Procedure

- 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 confirm entry with .
- Enter display group ⇒ **01-4** page 1.

Display groups 001 to 022, engine idling

Display group 001 in idle (engine warm, coolant temperature not below 75°C)

Reading measured value block 1 →				< Readout on display		
xxx rpm	xx.x mg/s	x.xx °KW	xxx.x °C			
1	2	3	4	< Display field	Specification	Analysis
				Coolant temperature	75.0...110.0°C	---
				Fuel delivery duration (set value)	3...8 °KW	---
				Injection rate	3.0...9.0 mg/s	⇒ 01-4 page 1
				Engine speed	800...950 rpm	---

Analysis: Display group 001, display field 2 - Injection rate

Readout on -V.A.G 1552-	Rectifying fault
below 3.0 mg/s	– Check unit injector ⇒ Chap. 23-3.
above 9.0 mg/s	– Warm up engine by running at high revs and repeat test. – Check unit injector ⇒ Chap. 23-3.

Display group 002 in idle (engine warm, coolant temperature not below 75°C)

Reading measured value block 2 →				< Readout on display		
xxx rpm	xxx.x %	x x x	xxx.x °C			
1	2	3	4	< Display field	Specification	Analysis
				Coolant temperature	75.0...110.0°C	---
				Operating position	0 1 0	⇒ 01-4 page 2
				Accelerator pedal position	0.0 %	⇒ 01-4 page 2
				Engine speed	800...950 rpm	---

Analysis: Display group 002, display field 2 - Accelerator pedal position

Readout on -V.A.G 1552-	Rectifying fault
1...100,0%	— Test accelerator pedal position sender -G79- ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

Analysis: Display group 002, display field 3 - Operating position

Meaning, if display positions = 1			
X	X	X	Operating position
		1	Air conditioning switched on
	1		Idling switch closed (accelerator pedal not pressed)
1			Ignore

Display group 003 in idle (engine warm, coolant temperature not below 75°C)

Reading measured value block 3 →				< Readout on display		
xxx rpm	xxx mg/s	xxx mg/s	xxx %			
1	2	3	4	< Display field	Specification	Analysis
				On/off ratio (actuation) of exhaust gas recirculation valve	40...75%	---
				drawn in air mass (actual value)	210...350 mg/s	⇒ 01-4 page 3
				drawn in air mass (nominal value)	230...310 mg/s	⇒ 01-4 page 3
				Engine speed	800...950 rpm	---

Analysis: Display group 003, display field 2 - inducted air mass (set value)

Readout on -V.A.G 1552-	Rectifying fault
above 310 mg/s	— Warm up engine by running at high revs and repeat test.

Analysis: Display group 003, display field 3 - inducted air mass (actual value)

Readout on -V.A.G 1552-	Rectifying fault
below 210 mg/s	— Test exhaust gas recirculation ⇒ Chap. 23-4. — Test intake system for leaks.
above 350 mg/s	— Warm up engine by running at high revs and repeat test. — Engine idles for too long, briefly blip throttle. — Test air mass meter -G70- ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

Display group 004 in idle (engine warm, coolant temperature not below 75°C)

Reading measured value block 4 →				< Readout on display		
xxx rpm	xx.x ° b. TDC	xx.x °KW	xx.x °KW			
1	2	3	4	< Display field	Specification	Analysis
				Synchronizing angle	-3...+3 °KW	⇒ 01-4 page 3
				Fuel delivery duration (set value)	3,0...8.0 °KW	---
				Commencement of injection (set value)	4° BTDC...2° ATDC	⇒ 01-4 page 3
				Engine speed	800...950 rpm	---

Analysis: Display group 004, display field 2 - commencement of injection (set value)

Readout on -V.A.G 1552-	Rectifying fault
less than 4° BTDC	— Engine too cold, warm up engine by running at high revs and repeat test.

Analysis: Display group 004, display field 4 - Synchronizing angle

Readout on -V.A.G 1552-	Rectifying fault
above 3 °KW or under -3 °KW	— Test camshaft position sensor -G40- ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations. — Check position of camshaft and sensor rotor ⇒ 1.9/74 (TDI) Engine, Mechanical Components; Rep. Gr. 15.

Display group 006 in idle (engine warm, coolant temperature not below 75°C)

Reading measured value block 6 →				< Readout on display		
xxx km/h	xxx	xx.x %	xxx			
1	2	3	4	< Display field	Specification	Analysis
				Operating condition of the cruise control system	xxx	⇒ 01-4 page 4
				Accelerator pedal position	0 %	⇒ 01-4 page 2
				Status of the brake and clutch pedal switch	000	⇒ 01-4 page 4
Vehicle speed					0 km/h	---

Analysis: Display group 006, display field 2 - Status of brake and clutch pedal switch

Meaning, if display positions = 1			
X	X	X	Operating position
		1	Brake light switch -F- closed (brake pedal operated)
	1		Brake pedal switch -F47- opened (brake pedal operated)
1			Clutch pedal switch -F36- opened (clutch pedal operated)

Analysis: Display group 006, display field 4 - Operating condition of cruise control system

Dis- play	Operating position
0	Vehicle with cruise control system, cruise control system switched off
1	Vehicle with cruise control system, cruise control system switched on
255	Vehicle without cruise control system, or cruise control system function in engine control unit not activated

Display group 007 with ignition switched on (engine cool and standing)

Reading measured value block 7 →				< Readout on display		
xxx.x °C	xxx %	xxx.x °C	xxx.x °C	< Display field	Specification	Analysis
1	2	3	4	Coolant temperature	approx. ambient temperature ¹⁾	⇒ 01-4 page 5
				Intake manifold temperature	approx. ambient temperature ¹⁾	⇒ 01-4 page 5
		Status of the fuel cooling			0%	---
	Fuel temperature				approx. ambient temperature ¹⁾	⇒ 01-4 page 5

¹⁾ It is not possible to give a nominal value indication for temperatures. Once the engine has cooled down the temperatures of the fuel, intake manifold and coolant must approximately correspond with the ambient temperature. If there is a marked value difference check the relevant sender.

Analysis: Display group 007, display field 1 - Fuel temperature

Readout on -V.A.G 1552-	Rectifying fault
40.5°C	— Inspecting Fuel temperature sender -G81- ⇒ Chap. 23-1.

Analysis: Display group 007, display field 3 - Intake manifold temperature

Readout on -V.A.G 1552-	Rectifying fault
approx. 135.9°C	— Inspecting Intake manifold temperature sender -G72 - ⇒ Chap. 23-1.

Analysis: Display group 007, display field 4 - Coolant temperature

Readout on -V.A.G 1552-	Rectifying fault
-5.4°C	— Inspecting coolant temperature sender -G62- ⇒ Chap. 23-1. In the event of a fault the fuel temperature is displayed instead.

Display group 010 in idle (engine warm, coolant temperature not below 75°C)

Read measured value block 10 →				< Readout on display		
xxx rpm	xxxx mbar	xxxx mbar	xxx %	< Display field	Specification	Analysis
1	2	3	4	Accelerator pedal position	0,0%	⇒ 01-4 page 2
				Charge pressure (actual value)	900...1150 mbar	---
				Atmospheric pressure	900...1100 mbar	---
				drawn in air mass (actual value)	210...370 mg/s	⇒ 01-4 page 3

Display group 011 in idle (engine warm, coolant temperature not below 75°C)

Read measured value block 11 →				< Readout on display		
xxx rpm	xxxx mbar	xxxx mbar	xxx %	< Display field	Specification	Analysis
1	2	3	4	On/off ratio (actuation) of solenoid valve for charge pressure control -N75-	20...50 %	---
				Charge pressure (actual value)	900...1150 mbar	---
				Charge pressure (specified value)	900...1100 mbar	---
				Engine speed	800...950 rpm	---

Display group 013 in idle (engine warm, coolant temperature not below 75°C)

Reading measured value block 13 →				< Readout on display		
x.xx mg/s	x.xx mg/s	x.xx mg/s	x.xx mg/s	< Display field	Specification	Analysis
1	2	3	4	Smooth running control - injected quantity cylinder 4	-2.80...+2.80 mg/s	⇒ 01-4 page 7
				Smooth running control - injected quantity cylinder 3	-2.80...+2.80 mg/s	⇒ 01-4 page 7
				Smooth running control - injected quantity cylinder 2	-2.80...+2.80 mg/s	⇒ 01-4 page 7
				Smooth running control - injected quantity cylinder 1	-2.80...+2.80 mg/s	⇒ 01-4 page 7

Analysis: Display group 013, display field 1 to 4 - idle smooth running control

- ♦ The injection system has an idle smoothness regulator. It is possible to detect differences in performance between individual cylinders (part tolerances, injector flow, compression etc.) and to compensate for these by selectively metering the quantity injected in the idling speed range.
- ♦ Differences are detected in the idling speed range on the basis of the signal supplied by the engine speed sender which supplies four signals to the control unit for each crankshaft revolution. If the signals have the same rhythm, the cylinder have the same output. If a cylinder has a lower output, the crankshaft will need more time for the next half crankshaft rotation. As opposed to this a high output cylinder will accelerate the crankshaft to such an extent that it will need less time.
- ♦ Once the control unit has identified a deviation, the relevant cylinder will immediately be supplied with a greater or smaller injection rate until the engine again runs „smoothly“.
- ♦ +... mg/s: The relevant cylinder has less output and is therefore supplied with more fuel.
- ♦ -... mg/s: The relevant cylinder has more output and is therefore supplied with less fuel.

Display group 016 in idle

Reading measured value block 16				→ < Readout on display		
xxx %	xxxxxxxx	xx	xx.x V	< Display field	Specification	Analysis
1	2	3	4	Supply voltage of the engine control unit	13.5...14.5 V	⇒ 01-4 page 8
				Heating element control	xx	⇒ 01-4 page 8
				Auxiliary heating	1x000001	⇒ 01-4 page 7
				Generator capacity	5...95%	---

Analysis: Display group 016, display field 2 - Auxiliary heating

Meaning, if display positions = 1								
X	X	X	X	X	X	X	X	Additional heating deactivated, because:
							1	Coolant temperature greater than 70...75°C or intake air temperature greater than +5°C
						1		Generator defective
					1			Battery voltage below 9 V
				1				Engine speed less than 800 rpm
			1					Engine start within the last 10 seconds

Meaning, if display positions = 1								
X	X	X	X	X	X	X	X	Additional heating deactivated, because:
		1						Coolant temperature sender -G62 - or Intake manifold temperature sender -G72 - defective
	1							Ignore
1								Ignore

Analysis: Display group 016, display field 3 - Control of the heating elements

Meaning, if display positions = 1		
X	X	Operating position
	1	Low heat output relay -J359- switched on
1		High heat output relay -J360- switched on

Analysis: Display group 016, display field 4 - supply voltage of engine control unit

Readout on -V.A.G 1552-	Rectifying fault
less than 13.5 V	– Test generator and battery voltage, charge battery ⇒ Electrical System; Rep. Gr. 27. – Increase engine speed slightly for a few minutes and switch off additional consumers. – Test supply voltage of engine control unit ⇒ Chap. 23-5. – Rectify any current drain.
greater than 14.5 V	– Test voltage regulator, replace if necessary ⇒ Electrical System; Rep. Gr. 27. – Remove start aid cable or quick charger.

Display group 018 in idle

Reading measured value block 18 →				< Readout on display		
xx	xx	xx	xx	< Display field	Specification	Analysis
1	2	3	4	Unit injector solenoid valve cyl. 4	0	⇒ 01-4 page 9
				Unit injector solenoid valve cyl. 3	0	⇒ 01-4 page 9
				Unit injector solenoid valve cyl. 2	0	⇒ 01-4 page 9
				Unit injector solenoid valve cyl. 1	0	⇒ 01-4 page 9

Analysis: Display group 018, display field 1 through 4 - Display of the condition of the unit injectors

Readout on -V.A.G 1552-	Rectifying fault
If number instead of zero	— Test unit injector ⇒ Chap. 23-3. — Test fuel supply ⇒ 1.9 ltr./74 kW (TDI) Engine, Mechanical Components; Rep. Gr. 20.

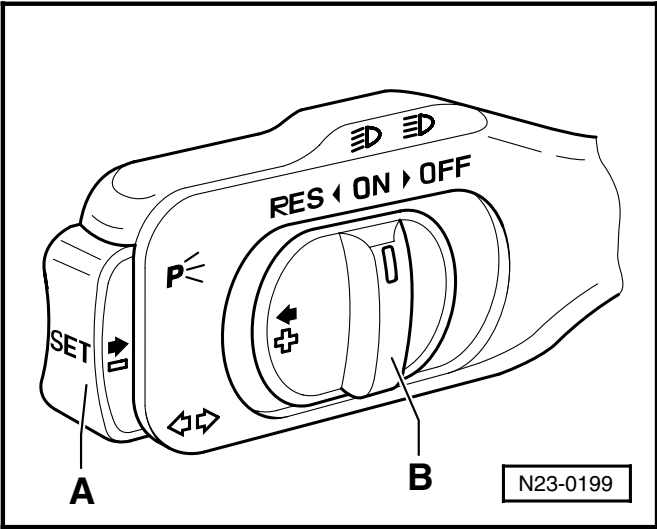
Display group 022, engine idling

Reading measured value block 22				→ < Readout on display		
x	xxxxxx	x	x	< Display field	Specification	Analysis
1	2	3	4	Operating state of air conditioning	0	—
				Operating state of charge pressure control	0	—
				Operating state of cruise control	xxxxxx	⇒ 01-4 page 10
				Operating condition of the cruise control system	x	⇒ 01-4 page 9

Analysis: Display group 022, display field 1 - operating state of cruise control system

Operating condition of the cruise control system	
0	Vehicle without CCS, or CCS function in engine control unit not activated
1	Vehicle with CCS - CCS switched off
9	Vehicle with CCS - CCS switched on

Analysis: Display group 022, display field 2 - operating state of cruise control system ➤



Cruise control	Display field 2
Switch B on „ON“	000011
Switch B on „RES“	001011
Switch A operated	000111
Switch B to „OFF“ before operating point	000001
Switch B to „OFF“ locks	000000
Brake pedal depressed	010011
Clutch pedal depressed	100011

Display groups 004 through 011 at full load

-  **Note**
- ♦ Accelerate vehicle at full throttle before inspecting.
 - ♦ The measured values must be read off or printed out once an engine speed of 3000 rpm is reached (2nd person required).
 - ♦ Pay attention to safety precautions for test drives
⇒ Chapter 23-1.

Display group 004 under full load (test drive in 2nd gear coolant temperature not below 75°C)

Reading measured value block 4 →				< Readout on display		
xxx rpm	xx.x ° b. TDC	xx.x °KW	x.xx °KW			
1	2	3	4	< Display field	Specification	Analysis
				Synchronizing angle	-3...+3 KW	---
				Fuel delivery duration (set value)	16...28 °KW	---
				Commencement of injection (set value)	13° BTDC...21° BTDC	---
Engine speed					2800...3200 rpm	---

Display group 008 under full load (test drive in 2nd gear coolant temperature not below 75°C)

Reading measured value block 8				→	< Readout on display		
xxx rpm	xx.x mg/s	xx.x mg/s	xx.x mg/s				
1	2	3	4	< Display field	Specification	Analysis	
				Injection rate limit based on drawn in air mass (smoke prevention)	47.0...60.0 mg/s	⇒ 01-4 page 11	
				Injection rate limit based on engine speed (torque limit)	47.0...51.0 mg/s	⇒ 01-4 page 11	
				Injection rate (driver's instruction)	65.0...70.0 mg/s	⇒ 01-4 page 11	
				Engine speed			

Analysis: Display group 008, display field 2 - Injection rate (driver's instruction)

Readout on -V.A.G 1552-	Rectifying fault
below 65.0 mg/s	— Repeat test at full throttle. — Test accelerator pedal position sender -G79- ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

Analysis: Display group 008, display field 3 - Injection rate limit over engine speed

Readout on -V.A.G 1552-	Rectifying fault
below 47.0 mg/s	— Read off set value at 3000 rpm.

Analysis: Display group 008, display field 4 - Injection rate limit (smoke prevention)

Readout on -V.A.G 1552-	Rectifying fault
below 47.0 mg/s	— Test air mass meter -G70- ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations. — Test exhaust gas recirculation ⇒ Chap. 23-4.

Display group 011 under full load (test drive in 2nd gear coolant temperature not below 75°C)

Read measured value block 11 →				< Readout on display		
xxx rpm	xxxx mbar	xxxx mbar	xxx %			
1	2	3	4	< Display field	Specification	Analysis
				On/off ratio (actuation) of solenoid valve for charge pressure control -N75-	35...80%	⇒ 01-4 page 12
				Charge pressure (actual value)	2100...2600 mbar	⇒ 01-4 page 12
				Charge pressure (specified value)	2200...2400 mbar	---
				Engine speed	2800...3200 rpm	---

Analysis: Display group 011, display field 3 - Charge pressure (actual value)

Readout on -V.A.G 1552-	Possible cause of fault	Rectifying fault
below 1850 mbar	♦ Charge pressure control defective ♦ Leaking intake manifold ♦ Damaged turbocharger	– Inspecting charge pressure control ⇒ 1.9/74 TDI Engine, Mechanics; Rep. Gr. 21.

Analysis: Display group 011, display field 4 - On/off ratio (actuation) of solenoid valve for charge pressure control -N75-

Readout on -V.A.G 1552-	Possible cause of fault	Rectifying fault
below 35 %	♦ Charge pressure control defective	– Inspecting charge pressure control ⇒ 1.9/74 TDI Engine, Mechanics; Rep. Gr. 21.
above 80%	♦ Charge pressure is not controlled	

Display group 125 - CAN databus

Display group 125 with ignition switched on

Reading measured value block 125 →				< Readout on display		
	ABS 1	Combi 1	Airbag 1			
1	2	3	4	< Display field	Specification	Analysis
				Airbag control unit	Airbag 1	⇒ 01-4 page 13
				Dash panel insert CU	Combi 1	⇒ 01-4 page 13
				ABS control unit	ABS 1	⇒ 01-4 page 13
				not assigned	---	---

Analysis: Display group 125, display field 2, 3 or 4

Readout on -V.A.G 1552-	Rectifying fault
ABS 0 Combi 0 Airbag 0	— Test CAN databus ⇒ Chap. 23-6.

23 – Fuel Formation, Injection

23-1 Diesel Direct Injection System

Safety instructions

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

- ♦ Disconnect and connect wires of the injection and preheating system and measuring device wires when the ignition is switched off.
- ♦ When the battery is disconnected and reconnected, carry out additional operations ⇒ Electrical System; Rep. Gr. 27.

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.
- ♦ Also make sure no diesel fuel runs onto the coolant hoses. If this is the case clean the hoses immediately. Immediately replace contaminated hoses.

Overview of fitting locations

Components A to F are not shown on the overview figure.

A - Diesel direct injection system relay -J322-

- ☐ on relay carrier ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations

B - Glow plug relay -J52-

- ☐ on relay carrier ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations

C - Fuel pump relay -J17-

- ☐ on relay carrier ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations

D - Sender for accelerator pedal position -G79-

- ☐ in footwell on the accelerator pedal ⇒ Fig. 1 in **23-1** page 3

E - Brake light switch -F- and Brake pedal switch -F47-

- ☐ in footwell on the brake pedal ⇒ Fig. 1 in **23-1** page 3

F - Clutch pedal switch -F36-

- ☐ in footwell on the clutch pedal ⇒ Fig. 1 in **23-1** page 3

1 - Mechanical exhaust gas recirculation valve

- ☐ with an intake manifold flap

2 - Diesel direct injection system control unit -J248-

3 - Exhaust gas recirculation valve -N18-

- ☐ Specified resistance: 14...20 Ω

4 - Changeover valve for intake manifold flap -N239-

5 - Solenoid valve for charge pressure control -N75-

- ☐ Specified resistance: 14...20 Ω

6 - Low heat output relay -J359-

7 - High heat output relay -J360-

8 - Air mass meter -G70-

9 - Control unit for the fan for coolant -J293-

- ☐ for vehicles with an air conditioning system

10 - Sender for the coolant temperature -G62-

- ☐ Specified resistance ⇒ Fig. 2 in **23-1** page 3

11 - Connector

- ☐ for unit injector (-N240-...-N243-)

12 - Engine speed sender -G28-

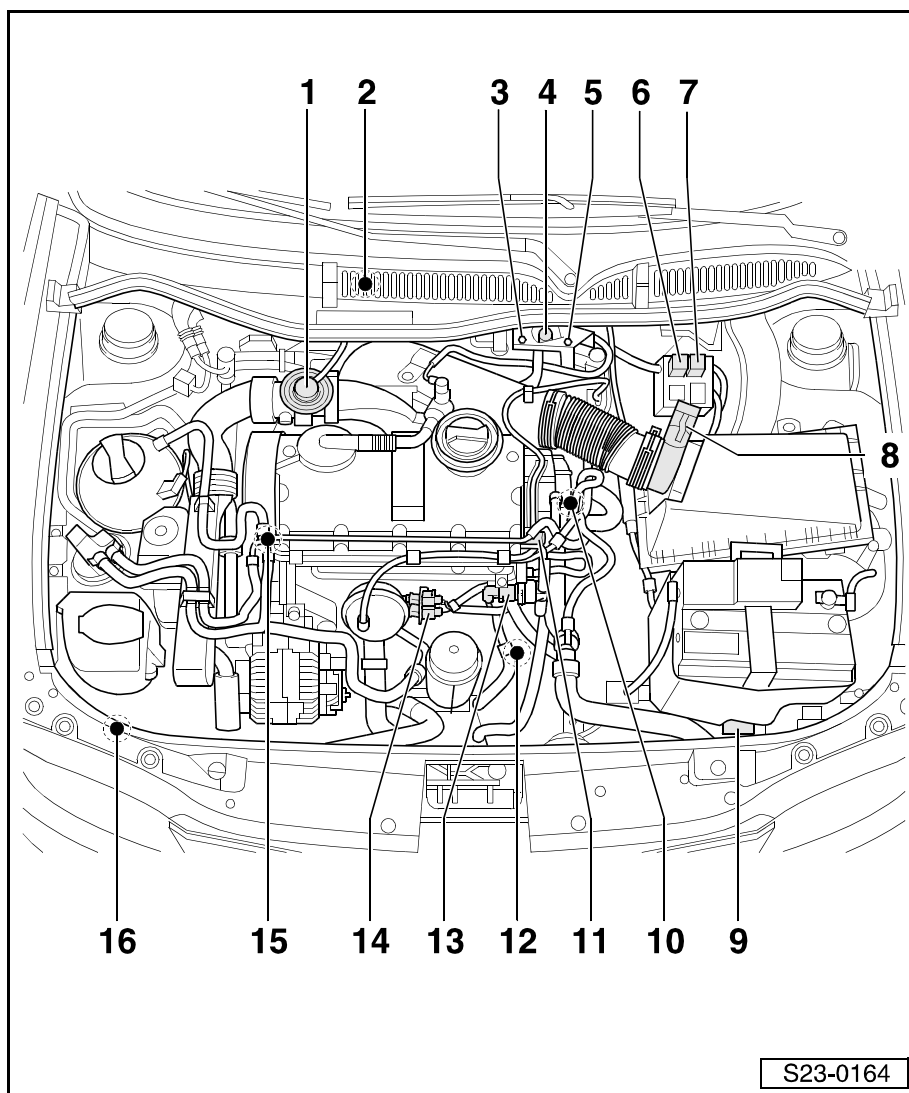
- ☐ specified resistance between contacts 1 and 2: 450...550 Ω

13 - Fuel temperature sender -G81-

- ☐ Specified resistance ⇒ Fig. 3 in **23-1** page 4

14 - Connector

- ☐ grey for engine speed sender -G28-



- ❑ black for camshaft position sensor -G40-

15 - Camshaft position sensor -G40-

16 - Intake manifold pressure sender -G71- with intake manifold temperature sender -G72-

- ❑ specified resistance for intake manifold temperature sender -G72- ⇒ Fig. 2 in **23-1** page 3

Fig. 1: Components in footwell

- 1 - Clutch pedal switch -F36-
- 2 - Brake light switch -F- and Brake pedal switch -F47-
- 3 - Sender for accelerator pedal position -G79-

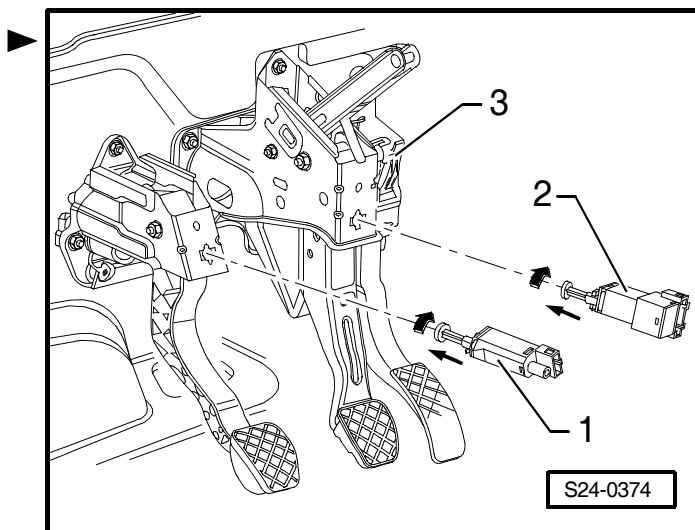


Fig. 2: Resistance of coolant temperature sender -G62- and of intake manifold temperature sender -G72-

The specification in field -A- applies to the temperature range 0 to 50 °C, specification in field -B- applies to the temperature range 50 to 100°C.

Read out examples:

- ◆ The specification for a temperature of 30°C is 1500 to 2000 Ω
- ◆ The specification for a temperature of 80°C is 275 to 375 Ω

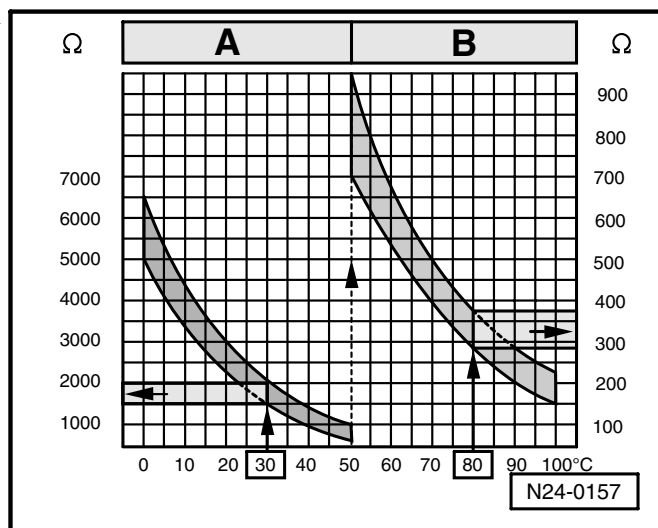
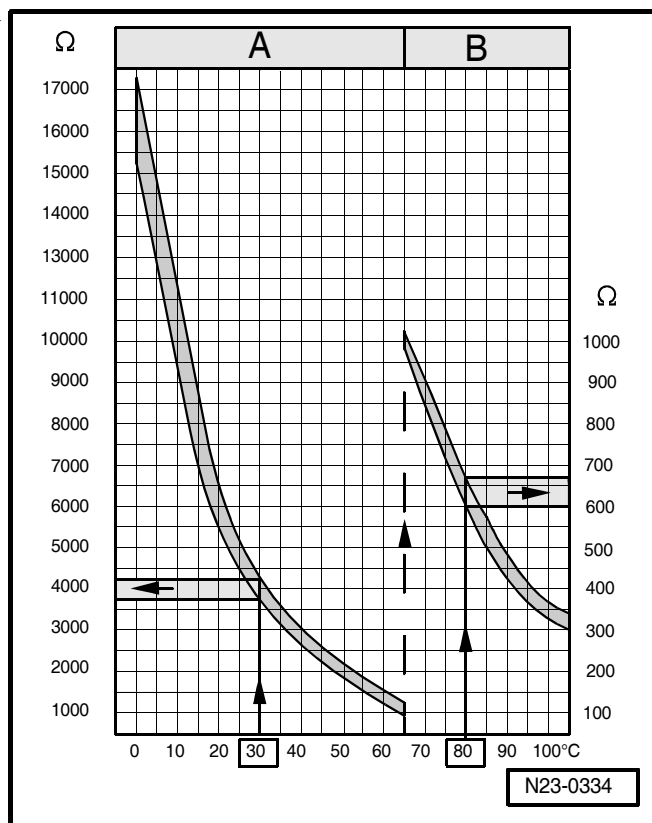


Fig. 3: Resistance of fuel temperature sender -G81- ►

The specification in field -A- applies to the temperature range 0 to 65°C, specification in field -B- applies to the temperature range 65 to 100°C.

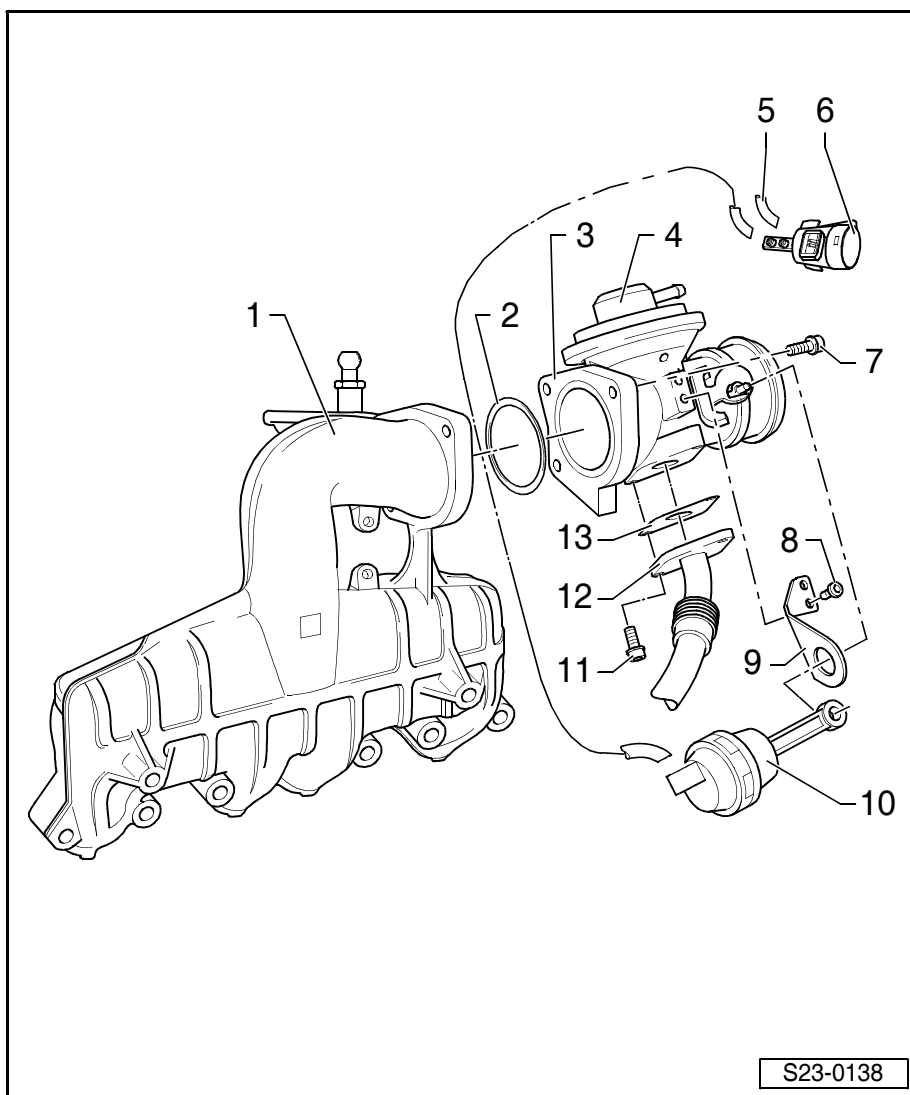
Read out examples:

- ♦ The specification for a temperature of 30°C is 3790 to 4270 Ω
- ♦ The specification for a temperature of 80°C is 600 to 660 Ω



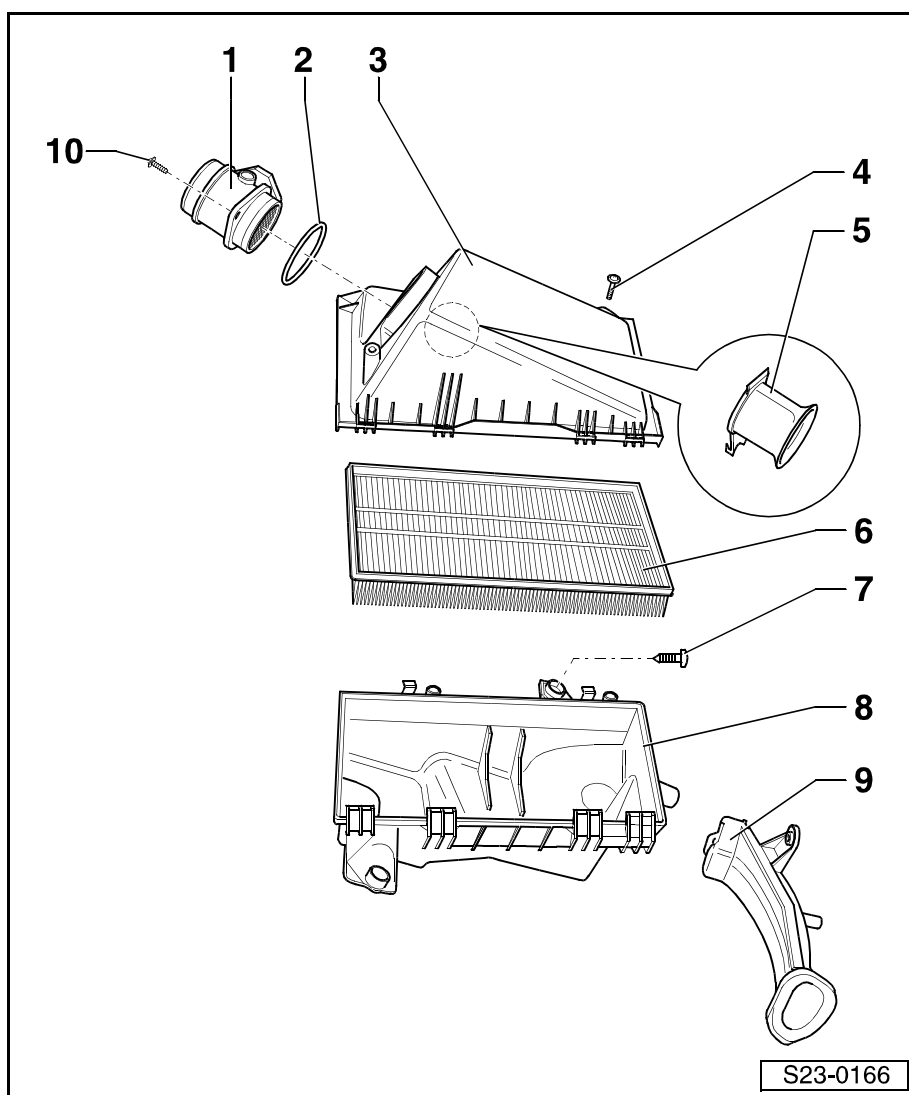
Disassembling and assembling intake manifold

- 1 - Intake manifold
- 2 - O-ring
 - ☐ replace
- 3 - Inlet connection
 - ☐ with exhaust gas recirculation valve and intake manifold flap
- 4 - Mechanical exhaust gas recirculation valve
- 5 - Vacuum hose
 - ☐ from vacuum pump
- 6 - Changeover valve for intake manifold flap -N239-
 - ☐ Specified resistance: 25...45 Ω
- 7 - 10 Nm
- 8 - 10 Nm
- 9 - Bracket
- 10 - Vacuum setting element
- 11 - 25 Nm
- 12 - Exhaust return pipe
 - ☐ to exhaust pipe
- 13 - Gasket
 - ☐ replace



Disassembling and assembling the air filter

- 1 - Air mass meter -G70-
- 2 - Gasket ring
- 3 - Air filter top part
- 4 - 6 Nm
- 5 - Air deflector
 - in air filter top part
- 6 - Filter insert
- 7 - 10 Nm
- 8 - Air filter bottom part
- 9 - Air deflector
- 10 - 6 Nm

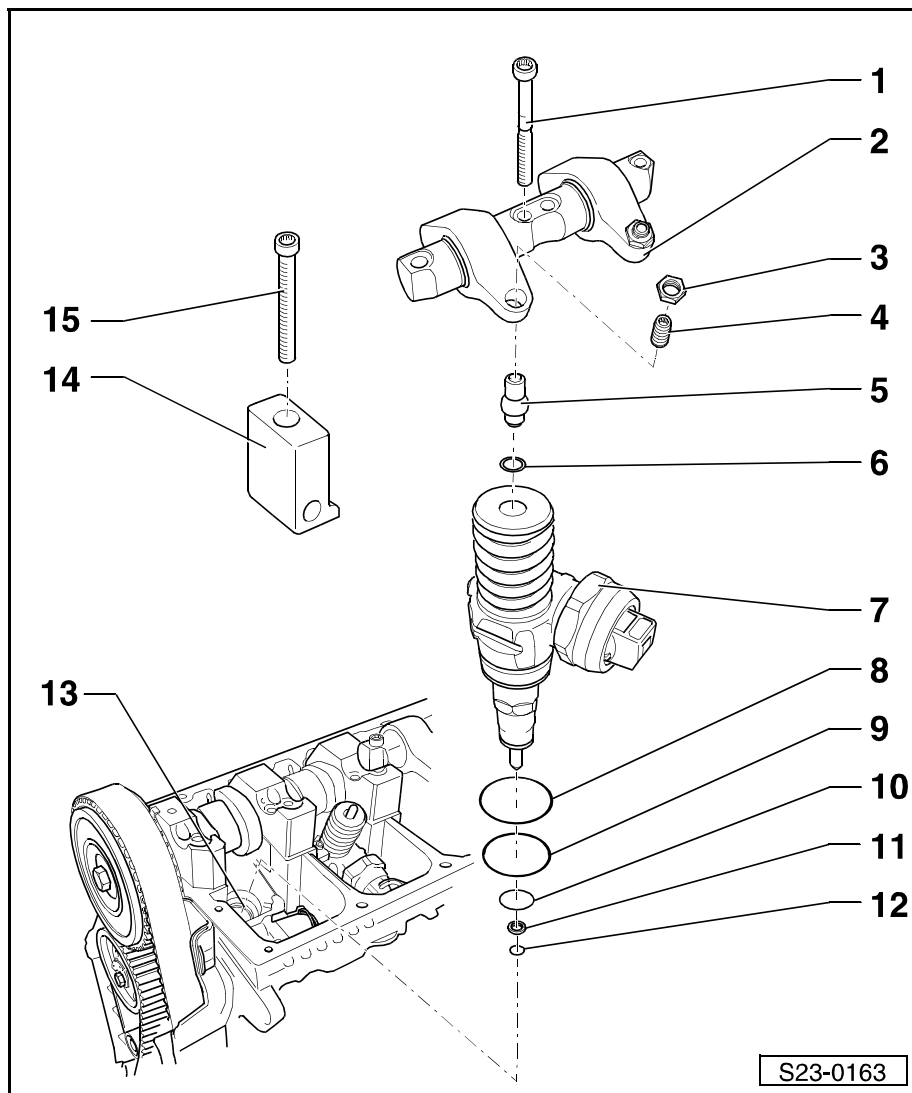


23-2 Disassembling and assembling the unit injector

Summary of components

- ♦ Observe the rules for cleanliness ⇒ Chap. 23-1
- ♦ Always replace gaskets and O-rings

- 1 - 20 Nm + torque a further $\frac{1}{4}$ turn (90°)**
 - ☐ replace
- 2 - Valve-lever shaft**
 - ☐ with valve lever
- 3 - Lock nut, 30 Nm**
- 4 - Adjusting screw**
 - ☐ replace when installing a new unit injector and where wear marks are visible
 - ☐ Grease the contact surfaces of the unit injector to ball pins using -G 000 100-
- 5 - Bolt**
- 6 - O-ring**
 - ☐ replace
- 7 - Unit injector**
 - ☐ Check ball pins for wear marks and replace if necessary
 - ☐ Grease the contact surface to the adjusting screw using -G 000 100-
 - ☐ removing and installing ⇒ **23-2** page 3
 - ☐ pay attention to different version
- 8 - O-ring**
 - ☐ replace ⇒ **23-2** page 2
- 9 - O-ring**
 - ☐ replace ⇒ **23-2** page 2
- 10 - O-ring**
 - ☐ replace ⇒ **23-2** page 2
- 11 - Heat-protection seal**
 - ☐ replace
- 12 - Circlip**
- 13 - Cylinder head**
- 14 - Clamping pad**
- 15 - 12 Nm + torque a further $\frac{3}{4}$ turn (270 °)**
 - ☐ replace



Removing and installing O-rings for unit injector

Special tools, test and measuring equipment and auxiliary items required

- ◆ Assembly sleeves -T10056-

Removing

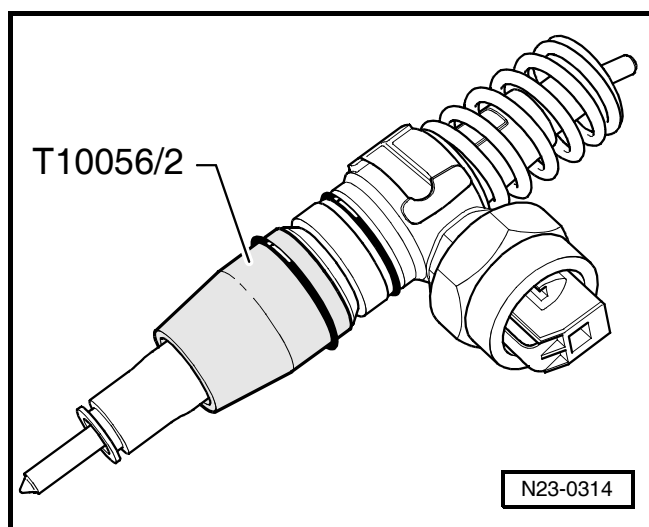
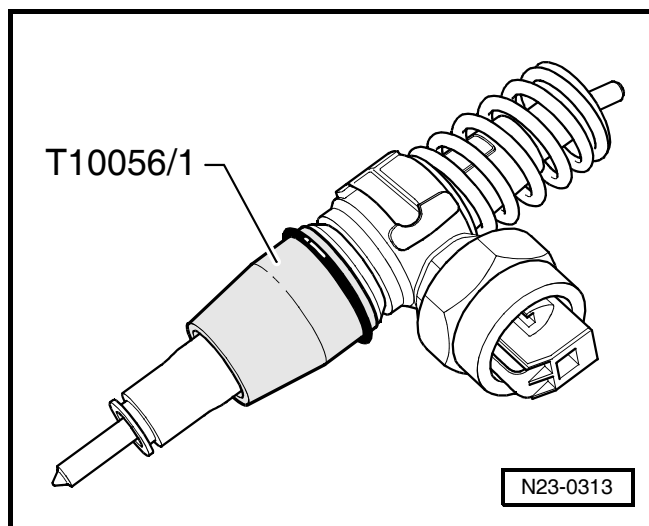
- Lever off the O-rings from the unit injector with extreme care.
- Make sure that no burr arises at the base of the O-rings.

Installing



Note

- ◆ Always use the assembly sleeves to install the O-rings. If they are not used there is a risk that the O-rings may become damaged.
- ◆ Observe the correct allocation of the O-rings to the channels: the ring thickness reduces in the direction of the injection nozzle.
- ◆ Avoid rolling the O-rings when sliding them on. The O-rings must not be turned inwards on the seat of the unit injector.
- Remove the heat-protection seal along with the circlip.
- Clean the seating surfaces for the O-rings in the unit injector with great care.
- Insert the assembly sleeve -T10056/1 - on the unit injector up to the stop. ►
- Carefully slide the upper, thicker O-ring onto the assembly sleeve and in the seat of the unit injector.
- Remove assembly sleeve.
- Insert the assembly sleeve -T10056/2 - on the unit injector up to the stop. ►
- Carefully slide the middle, thinner O-ring onto the assembly sleeve and in the seat of the unit injector.
- Remove assembly sleeve.



- Insert the assembly sleeve -T10056/3 - on the unit injector up to the stop. ►
- Carefully slide the lower O-ring onto the assembly sleeve and in the seat of the unit injector.
- Remove assembly sleeve.
- Slide on a new heat-protection seal together with the circlip.

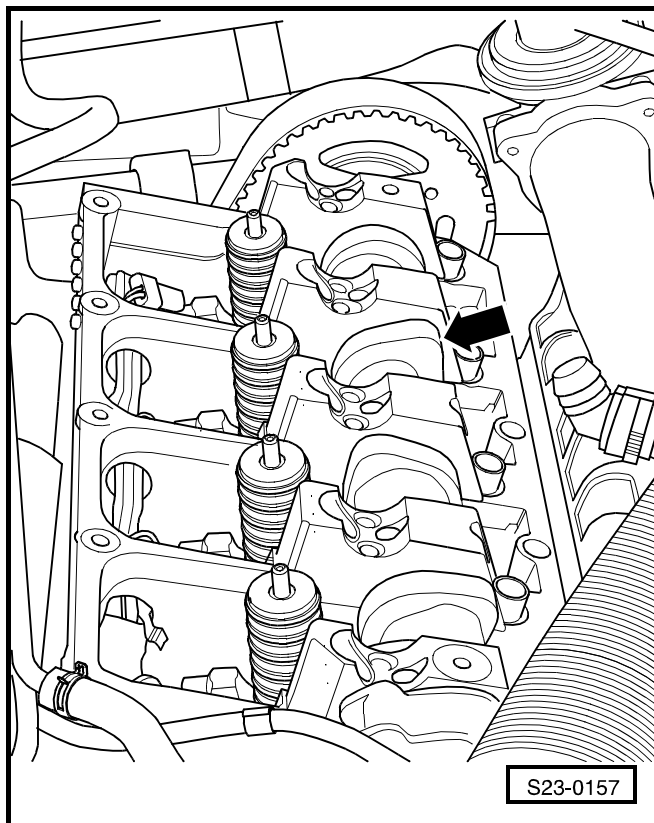
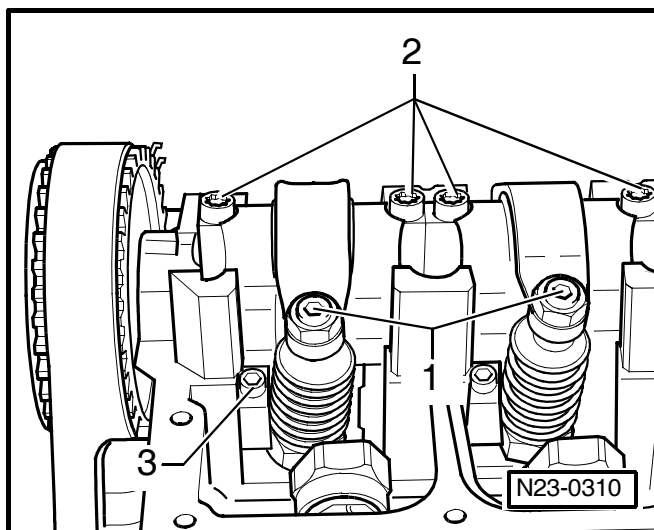
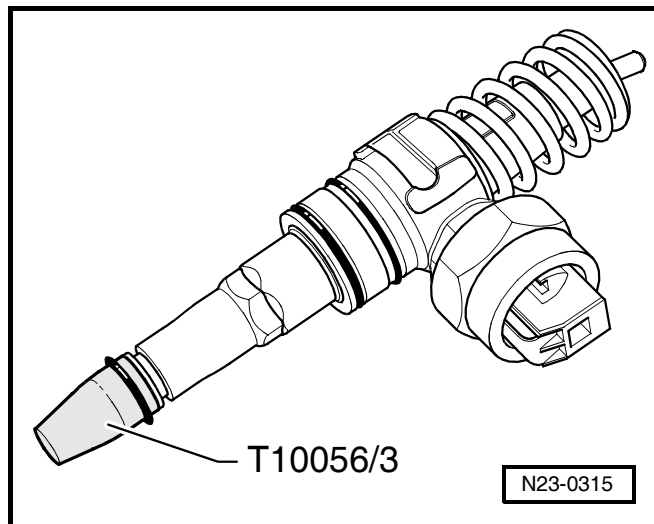
Removing and installing the unit injector

Special tools, test and measuring equipment and auxiliary items required

- ◆ Extractor -T10055-
- ◆ Dial gauge -MP 3-447-
- ◆ Dial gauge

Removing

- Remove upper timing belt cover and cylinder head cover ⇒ 1.9 l/74 kW TDI engine, mechanics; Rep. Gr. 15.
- Turn the crankshaft until the cam pair of the relevant unit injector to be removed points uniformly upwards. ►
- Release the counternuts of the adjusting screws -1- and unscrew the adjusting screws until the relevant valve lever rests against the tappet spring of the unit injector.
- Screw out fixing screws -2- for the valve-lever shaft from the outside to the inside and remove the valve-lever shaft.
- Set the camshaft in such a way that the cam for Cylinder 2 points in -direction of arrow-. All clamping pads can be removed in this position. ►
- Separate plug connection from the unit injector. Support the opposite side of the connector with your finger in order to avoid twisting the connector.
- Screw out fixing screw -3- of the clamping pad and remove the pad in the direction towards the camshaft.



- Insert the extractor -T10055- instead of the clamping pad in the slot of the unit injector. ►
- Remove the unit injector through movements of the sleeve at the nut up to the stop in -direction of arrow-.

i Note

Do not interchange the unit injectors, if necessary mark the assignment to each cylinder.

Installing

i Note

- ♦ Pay attention to different versions of the unit injector, adjusting screw and bolt. A mixed lining is permissible when replacing the unit injector.
- ♦ The associated adjusting screws in the valve-lever should be replaced when a new unit injector is being installed.
- ♦ For any work procedure involving an adjustment of the unit injector it is necessary to clean the adjusting screw in the valve lever and also the ball pin of the unit injector and to check them for traces of wear. If there is any wear replace the ball pin and the adjusting screw.
- ♦ Grease the contact surfaces between the ball pin and the adjusting screw using -G 000 100-.
- ♦ New unit injectors are supplied with O-rings and heat-protection seal.
- Before installing the unit injector check the correct position of the three O-rings, heat-protection seal and the circlip.

i Note

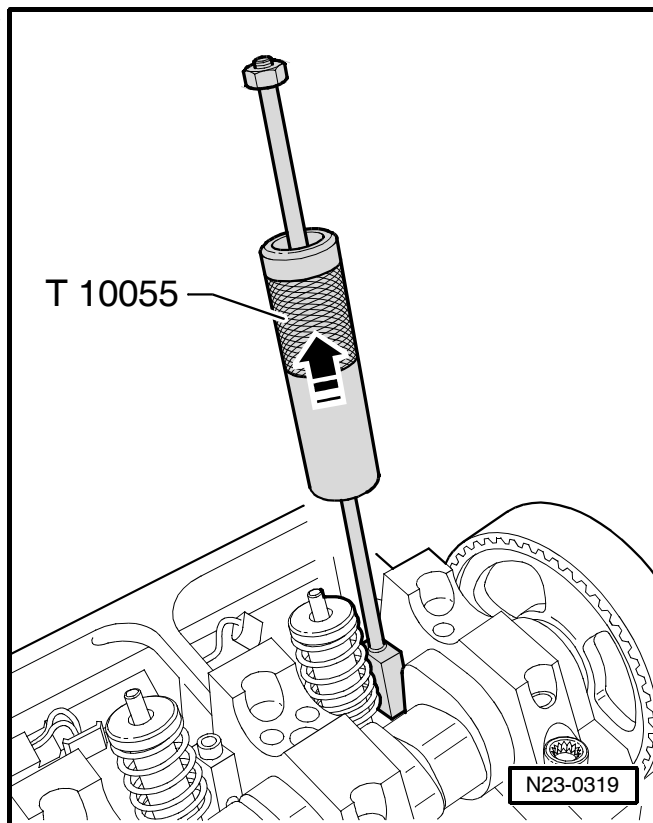
The O-rings must not be twisted.

- Oil the O-rings and place the unit injector with the greatest of care into the cylinder head.
- Slide the unit injector into the cylinder head seat up to the stop by exerting a uniform pressure.
- Place the clamping pad in the side slot of the unit injector.

i Note

If the unit injector is not perpendicular to the clamping pad the fixing screw may loosen and cause damage to the unit injector or cylinder head.

- Align the unit injector as follows:
- Screw the new fixing screw in the clamping pad until the unit injector can still easily be turned.
- Set the unit injector at a right angle to the bearing shell of the camshaft.



- Using a caliper gauge, check dimension -a- from the outer side of the cylinder head to the round surface of the unit injector.

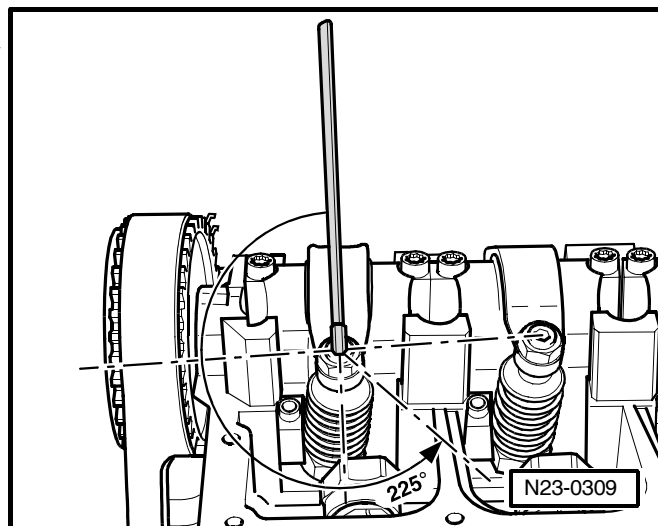
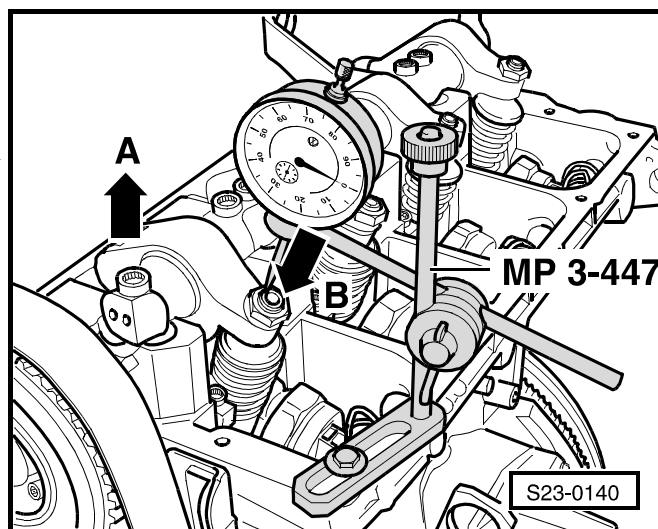
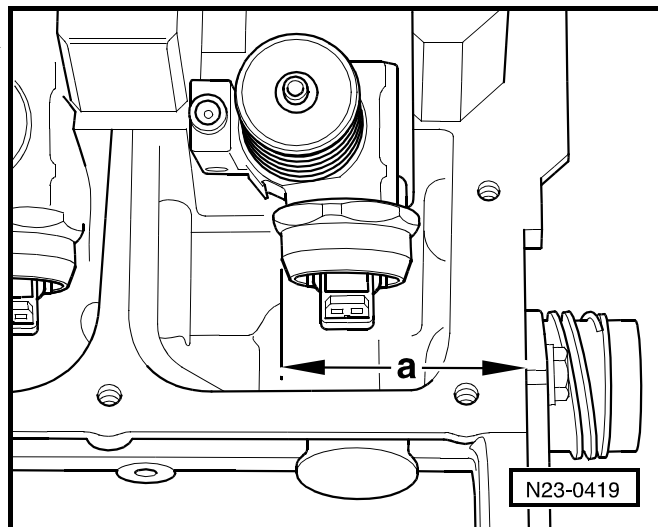
**Note**

It is possible to install the unit injector with the new solenoid valve nut when taking into account the dimension -a-.

Removing and installing the unit injector with the new solenoid valve nut

Cylinder	Dimension -a-
1	333.0 ± 0.8 mm
2	245.0 ± 0.8 mm
3	153.6 ± 0.8 mm
4	65.6 ± 0.8 mm

- Adjust the unit injector as required, tighten the fixing screw using a torque of 12 Nm and then turn through a further 270° ($3/4$ of a turn). Tightening may occur in successive stages.
- Mount valve-lever shaft and tighten up the new fixing screws as follows.
- First tighten the inside screws then the two outside screws by hand. In the same sequence tighten to 20 Nm and turn a further 90° ($1/4$ turn).
- Place the dial gauge on the adjusting screw of the unit injector.
- Turn the crankshaft in the running direction of the engine until the roller of the valve lever is on the drive cam tip.
 - Roller side -arrow A- is on the highest point.
 - Dial gauge -arrow B- is on the lowest point.
- Remove the dial gauge.
- Turn the adjusting screw in the valve lever until one feels a significant resistance (the unit injector is against the stop).
- Turn the adjusting screw in the opposite direction from the stop by about 225°
- Hold the adjusting screw in this position and tighten up the lock nut using a torque of 30 Nm
- Place connector onto the unit injector and install the cylinder head cover and the upper timing belt cover.



23-3 Testing components

Testing lines and components with test box -V.A.G 1598/31-

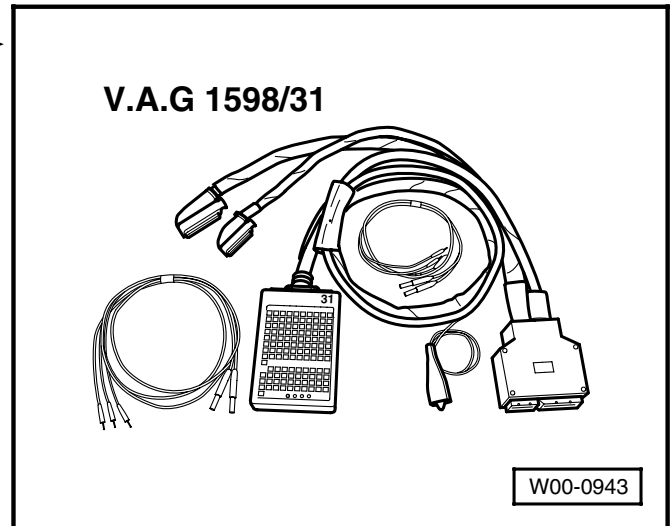
Special tools, test and measuring equipment and auxiliary items required

- ◆ Test box -V.A.G 1598/31-



Note

- ◆ The test box -V.A.G 1598/31- is designed in such a way that it can be simultaneously connected to the wiring loom of the engine control unit and to the actual engine control unit.
- ◆ The advantage being that the electronic engine control remains fully operational with the test box connected (e.g. measuring signals while the engine is running).
- ◆ Whether the control unit is additionally connected to the test box or not, is indicated in the particular test procedure.
- ◆ For connecting measuring equipment (e.g. handheld multimeter -V.A.G 1526 A- etc.) always use the adapter cable set e.g. - V.A.G 1594 C-
- ◆ 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.



Caution!

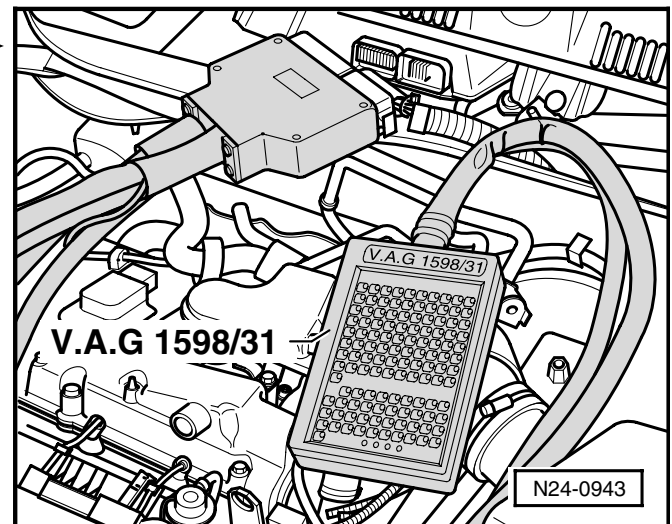
To avoid damaging the electronic components, switch on the relevant measuring range before connecting the measuring cables and comply with the test conditions.

- Switch off ignition.
- Remove the cooling water tank cover ⇒ Body work; Repair Group 66.
- Release the connector catches and unplug the control unit connectors at the engine control unit.
- Connect test box -V.A.G 1598/31- to both connectors of the wiring loom. Clamp the earth clip to the battery.

Testing unit injector valve

Special tools, test and measuring equipment and auxiliary items required

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



Test sequence

- Connect vehicle system tester -V.A.G 1552-. Start engine (idling) and select address word 01 „Engine electronics“ ⇒ Chap. 01-1.
- Select function 08 „Read measured value block“ and display group number 018.

Readout on display:

Display field 1 = Cyl. 1; 2 = cyl. 2; 3 = cyl. 3; 4 = cyl. 4

If the control is operating properly, a „0“ must appear in all display fields.

If another number is displayed instead of zero:

- Enter function 06 „End output“ and confirm entry with .
- Switch off ignition.
- Remove engine cover.
- Separate plug connection -1/2- for unit injector at cylinder head. ►
- Connect handheld multimeter for resistance measurement between the contacts of connector -2-:

Cylinder	Contact
1	7 + 5
2	7 + 3
3	7 + 2
4	7 + 6

Specified value: approx. 0.5 Ω

- Also test the cables for short circuiting with each other.

Specified value: $\infty \Omega$

If the specified value is reached:

- Test cables to diesel direct injection system control unit -J248-:
- Connect test box -V.A.G 1598/31 - to wiring loom to engine control unit ⇒ **23-3** page 1.
- Test cable connections for open circuit and for short circuit ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

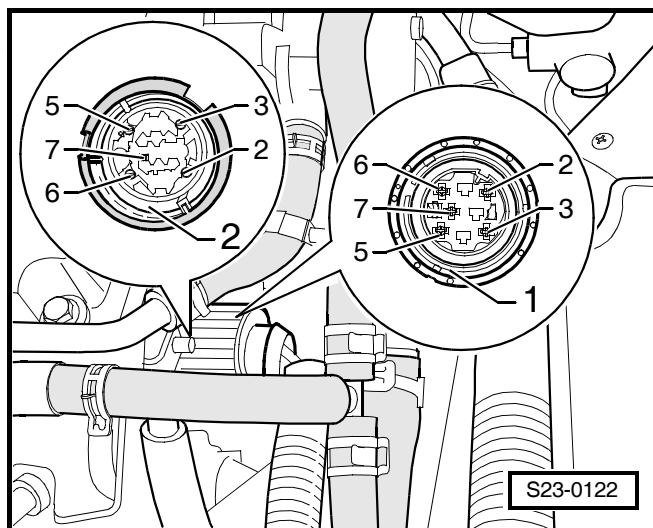
If the lines are not found to be faulty:

- Replace diesel direct injection system control unit - J248- ⇒ Chapter 23-5.

If the specified values are not reached:

- Remove upper timing belt cover and cylinder head cover ⇒ 1.9 I/74 kW (TDI) Engine, Mechanical components; Rep. Gr. 15.

Reading measured value block 18
->



- Use a screwdriver to carefully lever the connectors off all 4 unit injectors. Support the opposite side of the connector with your finger in order to avoid twisting the connector.
- Test resistance of valve of unit injector between contacts at valves for unit injector.

Specified value: approx. 0.5Ω

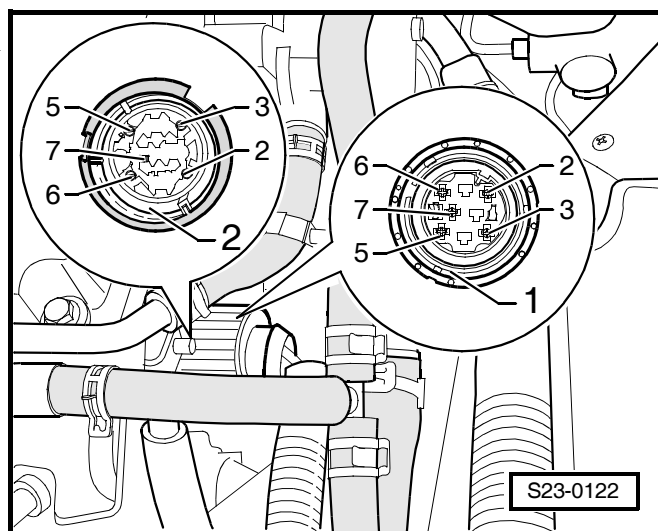
If the specified value is not reached:

- Replace faulty unit injector.

If the specified value is reached:

- Test cables between the plug connection of unit injector and all 4 connectors for open circuit and for short circuit.

Plug connection at unit injector	Plug connection -2- for unit injector; contact
Cylinder 1: Contact 2 (grey)	5
Cylinder 2: Contact 2 (red)	3
Cylinder 3: Contact 2 (yellow)	2
Cylinder 4: Contact 2 (white)	6
All cylinders contact 1 (brown)	7



- If necessary eliminate wire interruption or short-circuit.

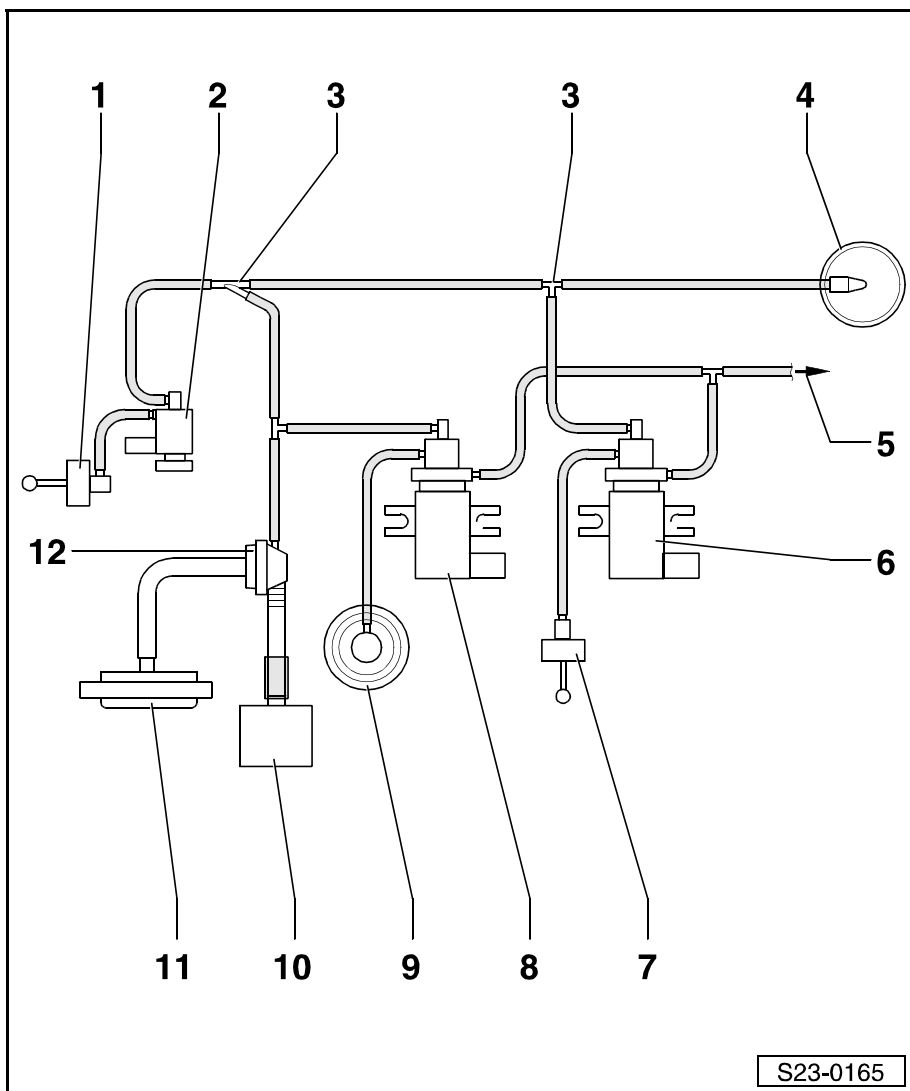
If the lines are not found to be faulty:

- Replace diesel direct injection system control unit
- J248- ⇒ Chapter 23-5.

23-4 Testing exhaust gas recirculation

Connection diagram for vacuum hoses

- 1 - Vacuum unit
 - ☐ for intake manifold flap
- 2 - Changeover valve for intake manifold flap -N239-
 - ☐ Specified resistance: 25...45 Ω
- 3 - Distributor part
- 4 - Vacuum reservoir
- 5 - To air filter
- 6 - Solenoid valve for charge pressure control -N75-
 - ☐ Specified resistance: 14...20 Ω
- 7 - Vacuum setting element
 - ☐ for charge pressure control
 - ☐ part of turbocharger, cannot be replaced separately
- 8 - Exhaust gas recirculation solenoid valve -N18-
 - ☐ Specified resistance: 14...20 Ω
- 9 - Mechanical exhaust gas recirculation valve
- 10 - Tandem pump
- 11 - Brake servo unit
- 12 - Distributor part
 - ☐ with non-return valve for brake servo unit



Testing exhaust gas recirculation

Special tools, test and measuring equipment and auxiliary items required

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

Test sequence

The exhaust gas recirculation function is checked in function 04 (basic setting). As a result of this procedure the exhaust gas recirculation valve is pulsed every 10 seconds, so that the extreme values for the exhaust gas recirculation (air mass meter) can be read off in measured value block 003 in display field 3.

- 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 number 003.

i Note

After selecting display group 003 and confirming with **[Q]**, the idling speed is increased by the engine control unit in display field 1 to 1380...1420 rpm.

Readout on display:



System in basic setting 3			->
1400 rpm	EGR not active	500 mg/H	20 %

The display in display field 2 must switch between EGR not active and EGR active every 10 seconds.

The following readouts must fluctuate in display fields 3 and 4:

i Note

If a constant value of 439 mg/H and higher is shown in display field 3, test the air mass meter.

EGR not active:

Specification in display field 3: 440...600 mg/H
specified value in display field 4: 18...22 %

EGR active:

Specification in display field 3: 160...340 mg/H
specified value in display field 4: 63...67 %

If the specified values are not reached:

- Test mechanical exhaust gas recirculation valve
⇒ 1.9 l/74 kW (TDI) Engine, Mechanical Components; Rep. Gr. 26.
- Inspect the connection diagram for the vacuum hoses
⇒ **23-4** page 1.
- Test exhaust gas recirculation valve -N18- ⇒ Chap. 01-1.

23-5 Engine control unit

Testing voltage supply for engine control unit

Special tools, test and measuring equipment and auxiliary items required

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

Test conditions

- Fuses o.k.
- Battery voltage at least 11.5 volts
- Generator o.k.

Test sequence

- Connect vehicle system tester -V.A.G 1552-. Switch ignition on and select address word 01 „Engine electronics“ ⇒ Chap. 01-1.
- Select function 08 „Read measured value block“ and display group 012.

Readout on display:



Reading	measured value	block	12	->
11111111	0.00	12.5 V	28.5 °C	

- Read off value indicated in display field 3.

Specified value: approx. battery voltage (constant)

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

If the value displayed fluctuates or if the battery voltage is not reached:

- Switch off ignition.
- Connect test box -V.A.G 1598/31- to the wiring loom of the engine control unit ⇒ Chap. 23-3.
- Connect handheld multimeter as follows:

Test box - V.A.G 1598/31-, bush	Specification
1.2 + 4.5	approx. 0 V
37 + 4.5	approx. 0 V

- Switch on ignition.
- Measure once again the voltage between the bushes.

Test box - V.A.G 1598/ 31-, bush	Specification
1.2 + 4.5	approx. battery voltage
37 + 4.5	approx. battery voltage

If the specified values are not reached:

- Test diesel direct injection system relay - J322-.

Replacing diesel direct injection system control unit -J248-

Special tools, test and measuring equipment and auxiliary items required

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

Procedure

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

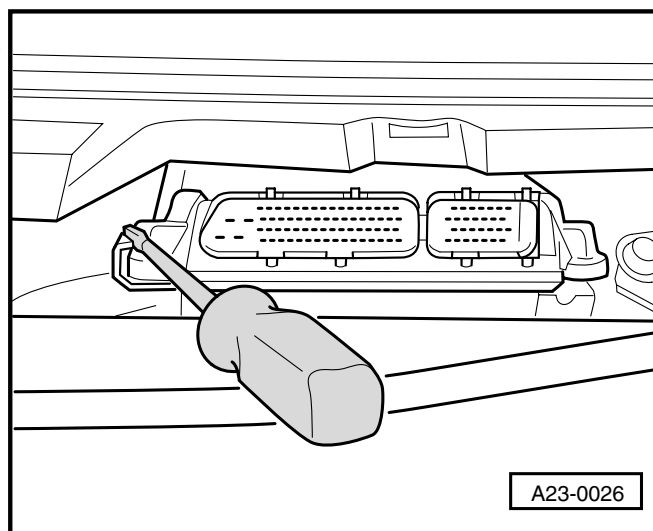
The vehicle system tester -V.A.G 1552 - displays the control unit identification, e. g.:

038906019HJ 1.9l R4 EDC G000SG 1576 ->
Coding 00002 WSC XXXXX

- Note Part No. of control unit and coding.
- Enter function 06 „End output“ and confirm entry with .
- Switch off ignition.
- Remove the cooling water tank cover ⇒ Body Work; Rep. Gr. 66.
- Release the connector catches and unplug the connectors of the diesel direct injection control unit - J248-.
- Use a screwdriver to push the catch of the fixture to the side and pull out the engine control unit forward.
- Insert new engine control unit.

After installing the diesel direct injection system control unit -J248-, it is then necessary to carry out the following steps:

- Perform coding of diesel direct injection system control unit -J248- ⇒ **23-5** page 3.
- Adapt new diesel direct injection system control unit -J248- to immobiliser control unit ⇒ Electrical System; Rep. Gr. 96.
- On vehicles fitted with CCS: Activate CCS ⇒ **23-5** page 4.
- Interrogate fault memory of new engine control unit and erase fault memory, rectify any faults present ⇒ Chap. 01-1.



For vehicles from 08.03

- Generate readiness code ⇒ Chapter 01-3.

For all vehicles

- Perform a test drive.



Note

Pay attention to safety precautions during the test drive
⇒ Chap. 23-1.

- Once again interrogate the fault memory of the diesel direct injection system control unit - J248-.

Coding diesel direct injection system control unit -J248-

If the code displayed does not match the vehicle or if the diesel direct injection system control unit -J248- has been replaced, it is then necessary to code the control unit as follows.

Special tools, test and measuring equipment and auxiliary items required

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

Procedure

- Connect vehicle system tester -V.A.G 1552-. Switch ignition on and select address word 01 „Engine electronics“ ⇒ Chap. 01-1.
- Enter function 07 „Code control unit“.

Readout on display:

Coding control unit
Enter code number xxxxxx (0 -32767)

- Enter code number by referring to table of codes and confirm entry with .

Table of codes:

Control unit identification	Variant	Code number
038 906 019 HJ	Gearbox	00002
038 906 019 KJ		

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

038906019HJ 1.9l R4 EDC G000SG 1567 ->
Coding 00002 WSC XXXXX

- Enter function 06 „End output“ and confirm entry with .
- Switch ignition off and on again.



Note

The entered coding is activated by switching the ignition on and off again.

Activating and deactivating cruise control system (CCS)

Special tools, test and measuring equipment and auxiliary items required

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

Test condition

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

Procedure

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

Readout on display, e.g.:



```
038906019HJ 1.9l R4 EDC G000SG 1576 ->
Coding 00002 WSC XXXXX
```

If „G000SG“ is displayed, the cruise control system is active

Readout on display:



```
038906019HJ 1.9l R4 EDC 000SG 1576 ->
Coding 00002 WSC XXXXX
```

If „000SG“ is displayed, the cruise control system is not active

- Press .

- Select function 11 „login procedure“.

Readout on display:



```
Login procedure
Enter code number XXXXX
```

- Enter code number as specified in table.

Code number	Cruise control system (CCS)
11463	Activate CCS
16167	Deactivate CCS

- Confirm the entry with .
- Enter function 06 „End output“ and confirm entry with .

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

23-6 Testing auxiliary signals

Testing databus (CAN bus)

Operation

Two data BUS circuits with a different priority are integrated in the electrical system of the vehicle:

- ◆ Drive CAN databus
- ◆ Convenience CAN databus

Information regarding which control unit is connected to the drive CAN databus, and which is connected to the convenience CAN databus ⇒ Electrical System; Rep. Gr. 90.

These control units are interlinked over a databus line (CAN_High and CAN_Low) and exchange information (messages). Both the engine control unit and the other control units detect missing information at the data BUS as faults.

For further information ⇒ Self-study Programme No. 24; CAN databus.

Special tools, test and measuring equipment and auxiliary items required

- ◆ Hand multimeter (e.g. -V.A.G 1526 A-)
- ◆ Adapter cable set (e.g. -V.A.G 1594 C-)
- ◆ Test box -V.A.G 1598/31-

Test conditions

- A fault of the diesel direct injection system control unit - J248- was detected in the line. For example fault code 18055, 18057 or 18097.
- Coding of all control units o.k.

Test sequence

- Switch off ignition.
- Remove the cooling water tank cover ⇒ Body work; Rep. Gr. 66.
- Unlock connectors of diesel direct injection system control unit -J248- and unplug.
- Connect test box -V.A.G 1598/31 - to diesel direct injection system control unit - J248-. Wiring loom to control unit is not connected for this step ⇒ Chap. 23-3.
- Test the central terminating resistor in the diesel direct injection system control unit -J248-.
- Measure resistance between test box sockets 6 + 7.
Specified value: 60...72 Ω

If the resistance is not within the specified range:

- Replace diesel direct injection system control unit
- J248- ⇒ Chapter 23-5.

If the resistance is within the specified range:

- Rectify fault in the CAN databus lines, or in the CAN databus lines of other control units ⇒ Electrical System; Rep. Gr. 90.

Testing the speed signal

Speed signal is generated by the speedometer sender -G22- and is produced in the dash panel insert. The produced signal enters at contact 20 of the engine control unit.

Special tools, test and measuring equipment and auxiliary items required

- ♦ Diode test lamp (e.g. -V.A.G 1527 B-)
- ♦ Adapter cable set (e.g. -V.A.G 1594 C-)
- ♦ Test box -V.A.G 1598/31-

Test condition

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

Test sequence

- Connect test box -V.A.G 1598/31 - to the wiring loom of the engine control unit ⇒ Chapter 23-3.
- Connect diode test lamp between sockets 4/5 + 20 of test box -V.A.G 1598/31-.
- Switch on ignition.
- Raise vehicle until the front left wheel is clear of the ground.
- Rotate front left wheel by hand and observe the diode test lamp.

Diode test lamp must flash.

If it does not flash:

- Test the following cable connections for open circuit and for short circuit to earth and to positive:

Test box - V.A.G 1598/31-, bush	Dash panel insert, contact
20	⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations

- If necessary eliminate wire interruption or short-circuit.

28 – Glow Plug System

28-1 Testing preheating system

Check for proper operation

Special tools, test and measuring equipment and aids required

- ♦ Hand multimeter (e.g. -V.A.G 1526 A-)
- ♦ Current flow diagram

Test conditions

- Battery voltage at least 11.5 volts
- Diesel direct injection system control unit -J248- O.K.
- Fuses in fuse holder on battery are O.K.

Test sequence

- Switch off ignition.
- Remove engine cover.

To do so remove the front and rear engine cover upwards with a sudden motion.

- Disconnect plug -1- from Coolant temperature sender (-G62-) -2-.



Note

By disconnecting the plug from the coolant temperature sender, engine condition „cold“ is simulated and when the ignition is switched on a corresponding preheating process is performed.

- Remove glow plug connectors from the glow plugs.
- Connect Hand multimeter for voltage measurement to a glow plug connector and engine mass.
- Switch on ignition. The approx. battery voltage must be displayed for approximately 20 seconds.

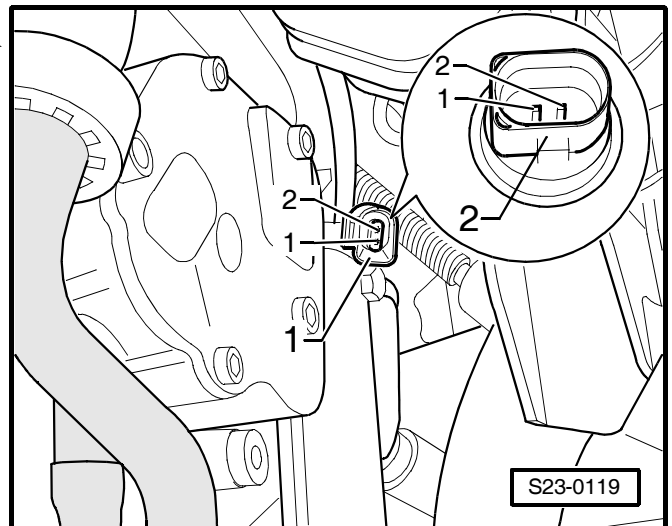
If no voltage is present:

- If necessary eliminate wire interruption or short-circuit.
⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

During the simulated preheating process the glow period warning lamp -K29- must light up.

If the warning lamp does not light up:

- Testing Glow period warning lamp - K29- ⇒ Current Flow Diagrams, Fault Finding Electrics and Fitting Locations.



Checking glow plugs

Special tools, test and measuring equipment and aids required

- ♦ Diode test lamp (e.g. -V.A.G 1527 B-)
- ♦ Flexible-head wrench for glow plugs (e.g. -3220-)

Test condition

- Battery voltage at least 11.5 volts

Test sequence

- Switch off ignition.
- Remove engine cover.

To do so remove the front and rear engine cover upwards with a sudden motion.

- Remove glow plug connectors from the glow plugs.
- Connect the wire of the diode test lamp to battery positive (+).
- Apply test prod of the diode test lamp to each glow plug in turn. ►

If the diode lights up: Glow plug is O.K.

If the diode does not light up:

- Replace glow plug.
- If necessary remove and install glow plugs with flexible-head wrench (e.g. -3220-).

Tightening torque: 15 Nm

