Workshop Manual
FABIA 2000 ➢

1.9/74 TDI Engine, Fuel Injection Edition 11.00									
Engine code	**ATD**								

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List of Supplements to Workshop Manual

FABIA 2000 ➢

1.9/74 TDI Engine, Fuel Injection

Edition 11.00

Supple-ment	Edition	Subject	Article Number
	11.00	Basic Edition	S00.5314.00.20
1	12.00	Modifications in Sub-assembly 23-2	S00.5314.01.20
2	01.02	Modifications for vehicles 11.01 ➢	S00.5314.02.20
3	12.03	Modifications in Rep. Gr. 01 and 23	S00.5314.03.20

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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.

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 temporary 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 vehicle system tester -V.A.G 1552-, with the fault read-out scan tool -V.A.G 1551- or with vehicle diagnosis, measurement and informations system -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 5.0. 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 conditions under which the desired functions can be selected 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	yes	no
04	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 according to current flow diagram O.K.

Procedure

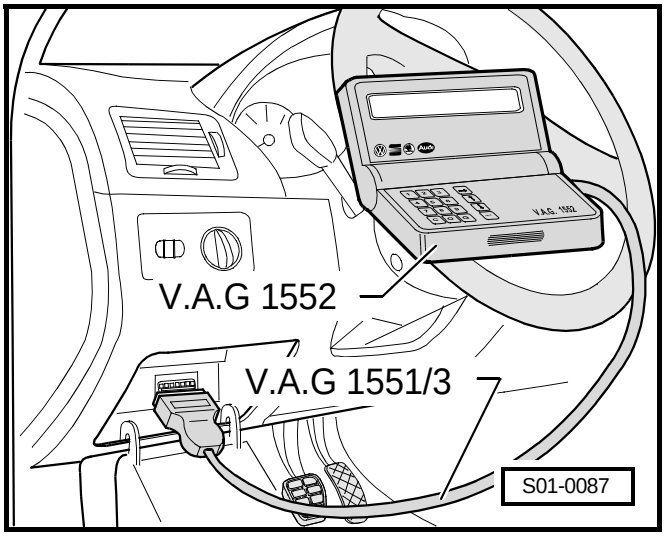
The diagnostic connection is located on the left next to the storage compartment on the driver's side.

– Unclip cover and remove downward.

– Connect vehicle system tester -V.A.G 1552- with diagnostic cable -V.A.G 1551/3-.

Once the vehicle system tester has been connected:

– Ignition must be switched on or engine must be started depending on the function desired ⇒ **01-1** page 1.



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, carry out fault finding as specified in the fault finding program diagnostic cable. ⇒ Current flow diagrams, fault finding electrical system, fitting locations or ⇒ operating instructions of the vehicle system tester.*

► `Vehicle system test HELP`
`The control unit does not respond`

► `Vehicle system test HELP`
`Fault in communication set-up`

► `Vehicle system test HELP`
`K cable does not connect to earth`

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

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

Readout on display:

► `Vehicle system test HELP`
`Enter address word XX`

– 0 Enter 1 for the „address word“ 01 and confirm with Q.

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

► `038906019AF 1.9l R4 EDC G000SG 1056 ->`
`Coding 00002 WSC XXXXX`

- 038906019AF = 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
- GB = gearbox; AG = automatic gearbox[1)]
- 1056 = Data status (Software version of the control unit)
- Coding 00002 = Coding variant of the 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

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-

1) Not available at present

Interrogating fault memory

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

Only if the engine does not start:

– Switch on ignition.

– 0 Enter 2 for the function „Interrogate fault memory“ and confirm with Q.

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

```
X faults detected!
```

If no fault is stored:

– Select function 06 „End output“ and confirm with Q.

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.: ►

```
Cyl.1                                   ->
Combustion misfiring detected
```

– Press →.

The stored faults are displayed in sequence.

– Select function 06 „End output“ and confirm with Q.

– 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 twice 0 for address word „Automatic test sequence“ and confirm entry with Q.

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 4

Note

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

– 0 Enter 5 for the function „Erase fault memory“ and confirm with Q.

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.

– Select function 06 „End output“ and confirm with Q.

– Perform a test drive. Then, again interrogate the fault memory. No fault must be displayed.

Performing 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. Glow plug relay -J52-
7. Low heat output relay -J359-
8. High heat output relay -J360-
9. Fault lamp

Note

- *The control of the individual actuators is limited to 30 s, however this can be extended by pressing ↑ and ↓ on vehicle system tester -V.A.G 1552-.*
- *If the actuator diagnosis must be repeated without the engine being started in the meantime, switch off ignition for about 20 seconds.*

Special tools, test and measuring equipment and auxiliary items required

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

Procedure

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

– Select function 03 „final control diagnosis“.

Readout on display:

```
Actuator diagnosis                     ->
Exhaust gas recirculation valve -N18
```

The valve must click.

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. 23-4

– Press (→).

Readout on display:

```
Actuator diagnosis                    ->
AC compressor engagement
```

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

– Disregard display.

– Press (→).

Readout on display:

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

The valve must click.

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:

– Inspecting charge pressure control solenoid valve -N75 - ⇒ Rep. Gr. 21; inspecting charge pressure control

– Press (→).

Readout on display:

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

The engine must stop.

If the engine does not stop:

– Switch off ignition.

– Inspecting Intake manifold flap change-over valve -N239- ⇒ Chap. 23-3.

– Continue final control diagnosis with the engine off and the ignition switched on.

– Press (→).

Readout on display:

```
Actuator diagnosis                    ->
Glow period warning lamp -K29
```

The warning light for glow period must flash.

If the warning light for glow period does not flash:

– Test glow period warning light -K29 - ⇒ Electrical System; Rep. Gr. 90

– Press (→).

Readout on display:

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

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:

– Testing Glow plug relay -J52- ⇒ Current Flow Diagrams, Fault Finding Electrics, Fitting Locations.
– Press (→).

Readout on display:

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

The relay must click.

If the relay does not click:

– Testing Low heat output relay -J359- ⇒ Current Flow Diagrams, Fault Finding Electrics, Fitting Locations.
– Press (→).

Readout on display:

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

The relay must click.

If the relay does not click:

– Testing High heat output relay -J360 - ⇒ Current Flow Diagrams, Fault Finding Electrics, Fitting Locations.
– Press (→).

Readout on display:

```
Actuator diagnosis                    ->
Fault lamp
```

The fault lamp must flash.

If the fault lamp does not flash:

– Test fault lamp ⇒ Current Flow Diagrams, Electrical Fault Finding, Fitting Locations.
– Press (→).

Readout on display:

```
Vehicle system test                  HELP
Select function XX
```

– Select function 06 „End output“ and confirm with (Q).

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 on fault types (e.g. „interruption/short-circuit to earth“) ⇒ Operating instructions of 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. Replace component only if these tests do not reveal any fault. This applies in particular if the fault is shown as „sporadically occurred“ (SP).*
- *If „19561/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-		Possible cause of fault	Possible effects	Rectifying fault
16485 Air mass meter -G70	Implausible signal	♦ Air mass meter -G70- supplies implausible signal caused by loose contact or corrosion due to humidity in the connector ♦ Air mass meter -G70- defective	♦ reduced performance ♦ Black smoke	– Inspecting air mass meter -G70- ⇒ Chap. 23-3
16684 Combustion misfiring detected		♦ no compression pressure ♦ there is no combustion in one or more cylinders	♦ reduced performance ♦ irregular engine running ♦ Increased emission levels	– Inspecting compression pressure ⇒ 1.9/74 TDI Engine, Mechanics; Rep. Gr. 15
16685 Cyl. 1 combustion misfirings detected		♦ no compression pressure ♦ no combustion in cylinder 1		
16686 Cyl. 2 combustion misfirings detected		♦ no compression pressure ♦ no combustion in cylinder 2		
16687 Cyl. 3 combustion misfirings detected		♦ no compression pressure ♦ no combustion in cylinder 3		
16688 Cyl. 4 combustion misfirings detected		♦ no compression pressure ♦ no combustion in cylinder 4		

Readout on -V.A.G 1552-		Possible cause of fault	Possible effects	Rectifying fault
16705 Engine speed sender -G28	Implausible signal	♦ Engine speed sender - G28- supplies implausible signal caused by loose contact or corrosion due to humidity in the connector ♦ Distance between engine speed sender/flywheel too great ♦ Metallic swarf on sender - G28- or sender -G28- loose	♦ Engine does not start ♦ Engine stalls ♦ Glow period warning lamp -K29- flashes ♦ No display on rev counter	– Inspecting Engine speed sender -G28- ⇒ Chap. 23-3
16706 Engine speed sender -G28	No signal	♦ Engine speed sender -G28- defective ♦ Line interruption or short-circuit ♦ Metallic swarf on sender - G28- or sender -G28- loose ♦ Signal input in Diesel direct injection system control unit -J248- defective (control unit defective)		– Inspecting Engine speed sender -G28- ⇒ Chap. 23-3 – Replace diesel direct injection system control unit -J248- ⇒ Chap. 23-5
16725 Camshaft pos. sensor => Sender -G40	Implausible signal	♦ Voltage supply or earth distribution to -G40- defective ♦ -G40- defective ♦ Line interruption or short-circuit to earth or to positive in the signal line between -G40- and diesel direct injection system control unit -J248- ♦ -G40- loose or incorrectly fitted	♦ Engine does not reach maximum speed ♦ Poor performance ♦ Starting problems ♦ reduced engine performance	– Inspecting camshaft pos. sensor -G40- ⇒ Chapter 23-3. – Remove open circuit in wiring or short circuit according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations. – Inspect position of camshaft and rotor ⇒ 1.9/74 TDI Engine, Mechanics; Rep. Gr. 15.
16885 Vehicle speed signal	Implausible signal	♦ Speedometer sender -G22- defective ♦ Line interruption or short-circuit between Speedometer sender -G22- and dash panel insert ♦ Line interruption or short-circuit between dash panel insert and Diesel direct injection system control unit -J248- ♦ Dash panel insert defective	♦ Speed display NOK ♦ Speedometer not operational ♦ Vehicle jerks when shifting gears ♦ Malfunction on systems using the speed signal	– Test vehicle speed signal ⇒ Chapter 23-6

Readout on -V.A.G 1552-		Possible cause of fault	Possible effects	Rectifying fault
16944 Voltage supply	Implausible signal	♦ Control unit was fitted on with the ignition switched on	♦ Engine does not start ♦ Engine stoppage	– 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 – Inspect AC generator – Replace diesel direct injection system control unit -J248- ⇒ Chap. 23-5
16946 Voltage supply	Voltage too low	♦ Line interruption or short-circuit		
16947 Voltage supply	Voltage too high	♦ Damaged control unit		
16955 Brake light switch -F	Implausible signal	♦ Brake light switch -F- defective ♦ CC system brake pedal switch -F47- defective ♦ Line interruption	♦ Poor vehicle handling ♦ Brake light not operational ♦ Glow period warning lamp -K29- flashes	– Inspect Brake light switch -F- and CC system brake pedal switch -F47- ⇒ Chap. 23-6
16989 Control unit defective		♦ Diesel direct injection system control unit -J248- internally defective	♦ Incorrect driving behaviour when engine is stopped ♦ Glow period warning lamp -K29- flashes	– Replace diesel direct injection system control unit -J248- ⇒ Chap. 23-5
17552 Air mass meter -G70	Open circuit/Short-circuit to earth	♦ Open circuit or short-circuit to earth between air mass meter -G70- and diesel direct injection system control unit -J248- ♦ -G70- defective ♦ Signal input in Diesel direct injection system control unit -J248- defective (control unit defective)	♦ Black smoke ♦ reduced performance ♦ Exhaust gas recirculation switches off	– Inspecting air mass meter -G70- ⇒ Chap. 23-3 – Replace diesel direct injection system control unit -J248- ⇒ Chap. 23-5
17553 Air mass meter -G70	Short circuit to positive	♦ Short-circuit to positive in the wiring between air mass meter -G70- and Diesel direct injection system control unit -J248- ♦ -G70- defective ♦ Signal input in Diesel direct injection system control unit -J248- defective (control unit defective)		
17554 Air mass meter -G70	Supply voltage	♦ Line interruption ♦ Line has short-circuit to earth ♦ -G70- defective ♦ Diesel direct injection system control unit -J248- defective		

Readout on -V.A.G 1552-		Possible cause of fault	Possible effects	Rectifying fault
17563 Intake manifold pressure sender -G71	Short circuit to positive	♦ Short-circuit to positive in the wiring between Intake manifold pressure sender -G71- and Diesel direct injection system control unit -J248- ♦ -G71- defective ♦ Signal input in Diesel direct injection system control unit -J248- defective (control unit defective)	♦ Increased emission levels ♦ reduced performance ♦ Charge pressure control switches off	– Inspecting Intake manifold pressure sender -G71- ⇒ Chap. 23-3 – Replace diesel direct injection system control unit -J248- ⇒ Chap. 23-5
17564 Intake manifold pressure sender -G71	Open circuit/Short-circuit to earth	♦ Open circuit or short-circuit to earth between air mass meter -G70- and diesel direct injection system control unit -J248- ♦ -G71- defective ♦ Signal input in Diesel direct injection system control unit -J248- defective (control unit defective)		
17565 Intake manifold pressure sender -G71	Supply voltage	♦ Line interruption ♦ Line has short-circuit to earth ♦ -G71- defective ♦ Diesel direct injection system control unit -J248- defective		
17568 Intake manifold temp. sender -G72	Short circuit to earth	♦ Short-circuit to positive in the wiring between Intake manifold temperature sender -G72- and Diesel direct injection system control unit -J248- ♦ -G72- defective ♦ Signal input in Diesel direct injection system control unit -J248- defective (control unit defective)	♦ Diesel direct injection system control unit - J248- operates with bakkup temperature 134,9 °C	– Test intake manifold temperature sender -G72- ⇒ Chap. 23-3 – Replace diesel direct injection system control unit -J248- ⇒ Chap. 23-5
17569 Intake manifold temp. sender -G72	Open circuit/Short circuit to positive	♦ Short-circuit to positive in the wiring between Intake manifold temperature sender -G72- and Diesel direct injection system control unit -J248- ♦ -G72- defective ♦ Earth distribution to -G72- defective ♦ Signal input in Diesel direct injection system control unit -J248- defective (control unit defective)		

Readout on -V.A.G 1552-		Possible cause of fault	Possible effects	Rectifying fault
17570 Fuel temperature sender -G81	Short circuit to earth	♦ Short-circuit to positive in the wiring between Fuel temperature sender -G81- and Diesel direct injection system control unit -J248- ♦ -G81- defective ♦ Signal input in Diesel direct injection system control unit -J248- defective (control unit defective)	♦ Poor performance ♦ Increased emission levels ♦ Diesel direct injection system control unit - J248- operates with bakkup temperature 40 °C	– Inspecting Fuel temperature sender -G81- ⇒ Chap. 23-3 – Replace diesel direct injection system control unit -J248- ⇒ Chap. 23-5
17571 Fuel temperature sender -G81	Open circuit/Short circuit to positive	♦ Short-circuit to positive in the wiring between Fuel temperature sender -G81- and Diesel direct injection system control unit -J248- ♦ -G81- defective ♦ Signal input in Diesel direct injection system control unit -J248- defective (control unit defective)		
17663 Coolant temperature sender -G62	Open circuit/Short circuit to positive	♦ Short-circuit to positive in the wiring between Coolant temperature sender -G62- and Diesel direct injection system control unit -J248 - ♦ -G62- defective ♦ Signal input in Diesel direct injection system control unit -J248- defective (control unit defective)	♦ Black smoke when starting ♦ preheating always occurs for approx. 20 seconds	– Inspecting coolant temperature sender -G62- ⇒ Chap. 23-3 – Replace diesel direct injection system control unit -J248- ⇒ Chap. 23-5
17664 Coolant temperature sender -G62	Short circuit to earth	♦ Short-circuit to earth in the wiring between Coolant temperature sender -G62- and Diesel direct injection system control unit -J248 - ♦ -G62- defective ♦ Signal input in Diesel direct injection system control unit -J248- defective (control unit defective)		

Readout on -V.A.G 1552-		Possible cause of fault	Possible effects	Rectifying fault
17668 Unit injector solenoid valve cyl. 1 -N240	Implausible signal	♦ Unit injector solenoid valve cannot be regulated ♦ Unit injector solenoid valve cyl. 1 -N242 - defective	♦ Poor vehicle handling ♦ reduced performance ♦ Increased emission levels ♦ irregular engine running	– Test unit injector ⇒ Chap. 23-3
17669 Unit injector solenoid valve cyl. 1 -N240	Regulating limit exceeded	♦ Regulating times too great ♦ Transition impedances in the connectors between Unit injector solenoid valve cylinder 1 -N240- and Diesel direct injection system control unit -J248 -		
17670 Unit injector solenoid valve cyl. 1 -N240	Regulating limit not reached	♦ Regulating times too small ♦ Fuel shortage ♦ Air in fuel system		– Test unit injector ⇒ Chap. 23-3 – Inspecting fuel supply ⇒ 1.9/74 TDI Engine, Mechanics; Rep. Gr. 20
17671 Unit injector solenoid valve cyl. 2 -N241	Implausible signal	♦ Unit injector solenoid valve cannot be regulated ♦ Unit injector solenoid valve cyl. 2 -N241- defective		– Test unit injector ⇒ Chap. 23-3
17672 Unit injector solenoid valve cyl. 2 -N241	Regulating limit exceeded	♦ Regulating times too great ♦ Transition impedances in the connectors between Unit injector solenoid valve cylinder 2 -N241- and Diesel direct injection system control unit -J248 -		
17673 Unit injector solenoid valve cyl. 2 -N241	Regulating limit not reached	♦ Regulating times too small ♦ Fuel shortage ♦ Air in fuel system		– Test unit injector ⇒ Chap. 23-3 – Inspecting fuel supply ⇒ 1.9/74 TDI Engine, Mechanics; Rep. Gr. 20

Readout on -V.A.G 1552-		Possible cause of fault	Possible effects	Rectifying fault
17674 Unit injector solenoid valve cyl. 3 -N242	Implausible signal	♦ Unit injector solenoid valve cannot be regulated ♦ Unit injector solenoid valve cyl. 3 -N242 - defective	♦ Poor vehicle handling ♦ reduced performance ♦ Increased emission levels ♦ irregular engine running	– Test unit injector ⇒ Chap. 23-3
17675 Unit injector solenoid valve cyl. 3 -N242	Regulating limit exceeded	♦ Regulating times too great ♦ Transition impedances in the connectors between Unit injector solenoid valve cylinder 3 -N242- and Diesel direct injection system control unit -J248 -		
17676 Unit injector solenoid valve cyl. 3 -N242	Regulating limit not reached	♦ Regulating times too small ♦ Fuel shortage ♦ Air in fuel system		– Test unit injector ⇒ Chap. 23-3 – Inspecting fuel supply ⇒ 1.9/74 TDI Engine, Mechanics; Rep. Gr. 20
17677 Unit injector solenoid valve cyl. 4 -N243	Implausible signal	♦ Unit injector solenoid valve cannot be regulated ♦ Unit injector solenoid valve cyl. 4 defective -N243-		– Test unit injector ⇒ Chap. 23-3
17678 Unit injector solenoid valve cyl. 4 -N243	Regulating limit exceeded	♦ Regulating times too great ♦ Transition impedances in the connectors between Unit injector solenoid valve cylinder 4 -N243- and Diesel direct injection system control unit -J248 -		
17679 Unit injector solenoid valve cyl. 4 -N243	Regulating limit not reached	♦ Regulating times too small ♦ Fuel shortage ♦ Air in fuel system		– Test unit injector ⇒ Chap. 23-3 – Inspecting fuel supply ⇒ 1.9/74 TDI Engine, Mechanics; Rep. Gr. 20
17795 Control unit defective		♦ Diesel direct injection system control unit -J248- internally defective	♦ Incorrect driving behaviour when engine is stopped ♦ Glow period warning lamp -K29- flashes	– Replace diesel direct injection system control unit -J248- ⇒ Chap. 23-5
17810 Exhaust gas recirculation valve -N18	Short circuit to positive	♦ Short-circuit to positive in the wiring between Exhaust gas recirculation valve -N18- and Diesel direct injection system control unit -J248 - ♦ -N18- defective	♦ no exhaust gas recirculation	– Testing Exhaust gas recirculation valve -N18- ⇒ Chap. 23-4 – Inspecting exhaust gas recirculation ⇒ Chap. 23-4
17849 Exhaust gas recirculation valve -N18	Open circuit/Short-circuit to earth	♦ Interruption or short-circuit to earth in the wiring between Exhaust gas recirculation valve -N18 - and Diesel direct injection system control unit -J248- ♦ -N18- defective	♦ no exhaust gas recirculation ♦ Poor performance ♦ Black smoke	

Readout on -V.A.G 1552-		Possible cause of fault	Possible effects	Rectifying fault
17910 Fuel pump relay -J17	Short circuit to positive	♦ -J17- defective ♦ Short circuit to positive	♦ Engine does not start	– Testing fuel pump relay -J17- ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
17911 Load signal for alternator terminal DF	Implausible signal	♦ Voltage regulator on AC generator defective ♦ AC generator defective ♦ Wiring between AC generator and Diesel direct injection system control unit -J248- defective	♦ PTC heating not operational	– Check AC generator ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations, ⇒ Electrical System; Rep. Gr. 27; AC generator – Reading measured value block, display group 016 ⇒ Chap. 01-3
17931 Crash signal from airbag CU	Implausible signal	♦ Fault in the airbag system	♦ Warning light for an airbag comes on	– Perform self-diagnosis for airbag system ⇒ Body Work; Rep. Gr. 01
17948 Vehicle speed signal	Signal too high	♦ Speedometer sender -G22- defective ♦ Line interruption or short-circuit between Speedometer sender -G22- and dash panel insert ♦ Data BUS drive defective ♦ Dash panel insert defective	♦ Speed display NOK ♦ Speedometer not operational ♦ Vehicle jerks when shifting gears ♦ Malfunction on systems using the speed signal	– Test vehicle speed signal ⇒ Chapter 23-6 – Testing data BUS ⇒ Electrical system; Rep. Gr. 90; – Inspecting dash panel insert ⇒ Electrical System; Rep. Gr. 90; dash panel insert self-diagnosis

Readout on -V.A.G 1552-		Possible cause of fault	Possible effects	Rectifying fault
17954 Charge pressure control solenoid valve - N75	Short circuit to positive	♦ Short-circuit to positive in the wiring between Charge pressure control solenoid valve -N75- and Diesel direct injection system control unit -J248 -	♦ Poor performance ♦ Glow period warning lamp -K29- flashes ♦ Charge pressure too low	– Test charge pressure control solenoid valve -N75- with final control diagnosis ⇒ Chap. 01-1 – Inspecting charge pressure control ⇒ 1.9/74 TDI Engine, Mechanics; Rep. Gr. 21
17957 Charge pressure control solenoid valve - N75	Open circuit/Short-circuit to earth	♦ Open circuit in the wiring between Charge pressure control solenoid valve -N75- and Diesel direct injection system control unit -J248- ♦ Short circuit to earth	♦ Poor performance ♦ Glow period warning lamp -K29- flashes ♦ Charge pressure too low ♦ Charge pressure too high	
17958 Charge pressure	Control difference	♦ Fault in charge pressure control ♦ -N75 defective	♦ Poor vehicle handling ♦ Poor performance	
17964 Charge pressure control	Regulating limit not reached	♦ Charge pressure control solenoid valve -N75- defective or blocked ♦ Leaks between turbocharger and engine (charge-air routing) ♦ Turbocharger defective	♦ Poor performance	
17965 Charge pressure control	Regulating limit exceeded	♦ Charge pressure control solenoid valve -N75- defective or blocked ♦ Leaks between turbocharger and engine (charge-air routing) ♦ Turbocharger defective		
17977 Cruise control system switch - E45	Implausible signal	♦ CC system switch -E45- defective ♦ Wiring from CC system switch -E45- to vehicle voltage control unit -J519- defective	♦ Speedometer not operational	– Analyse measured value block, display group number 006 ⇒ Chap. 01-3 – Read out fault memory of the vehicle voltage control unit ⇒ Electrical System; Rep. Gr. 90; self-diagnosis of the vehicle voltage control unit

Readout on -V.A.G 1552-		Possible cause of fault	Possible effects	Rectifying fault
17978 Engine control unit blocked[1)]		♦ Start attempt with unauthorised ignition key ♦ Manipulation attempt ♦ wrong coding in Diesel direct injection system control unit -J248- ♦ fault in the immobilizer system ♦ Dash panel insert defective [2)] ♦ Diesel direct injection system control unit -J248- not adapted to the immobilizer	♦ Engine starts and stops immediately ♦ Glow period warning lamp -K29- flashes	– 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 tml. 15	Voltage too low	♦ No voltage when ignition is switched on (Terminal 15)	♦ Incorrect driving behaviour when engine is stopped	– Test diesel direct injection system control unit -J248- ⇒ Chap. 23-5
18009 Terminal 30 - voltage supply relay -J317 [3)]	Implausible signal	♦ Diesel direct injection system relay -J322 - jams or defective ♦ Wiring to -J322- defective		– Inspecting Diesel direct injection system relay -J322- ⇒ Chap. 23-3
18017 Crash disconnect activated		♦ Crash disconnect activated by Airbag control unit (e.g. after an accident) ♦ Airbag control unit defective	♦ Engine does not start	– Read fault memory Airbag control unit ⇒ Body Work; Rep. Gr. 01 – Replacing Airbag control unit ⇒ Body Work; Rep. Gr. 01
18020 Engine control unit	Incorrectly coded	♦ incorrect coding		– Code diesel direct injection system control unit -J248- ⇒ Chap. 23-5
18024 Glow period warning lamp -K29	Short circuit to positive	♦ Short circuit to positive	♦ Glow period warning lamp not operational	– Test glow period warning lamp -K29- with final control diagnosis ⇒ Chap. 01-1
18025 Glow period warning lamp -K29	Open circuit/Short-circuit to earth	♦ Line interruption ♦ Bulb defective ♦ Short circuit to earth	♦ Glow period warning lamp not operational ♦ Glow period warning lamp lights up and remains lit	
18026 Glow plug relay -J52	Short circuit to positive	♦ Short-circuit to positive in the wiring between Glow plug relay -J52- and Diesel direct injection system control unit -J248- ♦ -J52- defective	♦ no preheating ♦ poor cold start behaviour ♦ Glow period warning lamp -K29- flashes	– Inspecting Glow plug relay -J52- ⇒ Chap. 01-1
18027 Glow plug relay -J52	Short circuit to earth	♦ Short-circuit to earth in the wiring between Glow plug relay -J52- and Diesel direct injection system control unit -J248- ♦ -J52- defective		

Readout on -V.A.G 1552-		Possible cause of fault	Possible effects	Rectifying fault
18034 Databus drive	Missing message from gearbox CU	♦ Datalines faulty	♦ Poor vehicle handling	– Test databus cables ⇒ Chapter 23-6
18039 Accelerator pedal position sender -G79	Signal too high	♦ Accelerator pedal position sender -G79- defective	♦ increased idling speed ♦ Glow period warning lamp -K29- flashes	– Inspecting accelerator pedal position sender -G79- ⇒ Chap. 23-3
18040 Accelerator pedal position sender -G79	Supply voltage	♦ Supply voltage too great or too small ♦ Interruption or short-circuit to earth or positive in the wiring between Accelerator pedal position sender -G79- and Diesel direct injection system control unit -J248 -		
18043 Databus drive	missing message from AC CU	♦ Fault in databus wiring ♦ wrong or defective AC CU	♦ Air conditioning system deactivated ♦ PTC heating not operational	– Check data bus ⇒ Chapter 23-6 – Interrogate fault memory of the airbag control unit ⇒ Body Work; Rep. Gr. 01
18044 Databus drive	Missing message from airbag CU	♦ Fault in databus wiring ♦ wrong or defective airbag CU	♦ Crash disconnect not operational	
18045 Databus drive	missing message form electron. CU	♦ Fault in databus wiring ♦ Wrong or faulty vehicle voltage control unit -J519-		– Check data bus ⇒ Chapter 23-6 – Interrogate fault memory of electrical system control unit ⇒ Electrical System; Rep. Gr. 90
18047 1/2 for accelerator pedal position sender -G79+G185	Implausible signal	♦ Interruption or short-circuit to earth or positive in the wiring between Accelerator pedal position sender -G79- and Diesel direct injection system control unit -J248 - ♦ -G79- defective ♦ Signal input in Diesel direct injection system control unit -J248- defective (control unit defective)	♦ increased idling speed ♦ Glow period warning lamp -K29- flashes	– Inspecting accelerator pedal position sender -G79- ⇒ Chap. 23-3 – Replace diesel direct injection system control unit -J248- ⇒ Chap. 23-5
18048 Control unit defective		♦ Diesel direct injection system control unit -J248- internally defective	♦ Incorrect driving behaviour when engine is stopped ♦ Glow period warning lamp -K29- flashes	– Replace diesel direct injection system control unit -J248- ⇒ Chap. 23-5

Readout on -V.A.G 1552-		Possible cause of fault	Possible effects	Rectifying fault
18056 Databus drive	defective	♦ Fault in databus wiring ♦ Data BUS drive defective	♦ Poor vehicle handling	– Check data bus ⇒ Chapter 23-6 – Read-out fault memory of the control units in the data BUS drive
18057 Databus drive	Missing message from ABS CU	♦ Fault in databus wiring ♦ wrong or defective ABS CU		– Check data bus ⇒ Chapter 23-6 – Interrogate the fault memory of the ABS control unit ⇒ Chassis; Rep. Gr. 45
18058 Databus drive	Missing message from combi-instrument	♦ Fault in databus wiring ♦ wrong or defective dash panel insert	♦ Glow period warning lamp -K29- not operational	– Check data bus ⇒ Chapter 23-6 – Interrogate fault memory of dash panel insert ⇒ Electrical System; Rep. Gr. 90
18062 Read out fault memory content of combiinstrument		♦ Oil level/temperature sender defective	♦ Oil level warning lamp -K38- lights up	– Perform self-diagnosis of the dash panel insert ⇒ Electrical System - Self-diagnosis; Rep. Gr. 01
18065 Air conditioning system inlet/outlet	Short circuit to positive	♦ Short circuit in the wiring	♦ reduced vehicle acceleration, when the air conditioning system is on	– Test AC compressor control with final control diagnosis ⇒ Chap. 23-6
18067 Radiator fan control 1	Short circuit to positive	♦ Short circuit in the wiring	♦ no radiator fan control	– Test radiator fan control with final control diagnosis ⇒ Chap. 23-6
18071 Actuation of unit injector solenoid valve	Short circuit to positive	♦ Short-circuit to positive in the wiring between unit injector solenoid valve and Diesel direct injection system control unit -J248-	♦ Engine stalls (for permanent fault) ♦ Engine misfiring (for sporadic fault)	– Test unit injector ⇒ Chap. 23-3
18072 Actuation of unit injector solenoid valve	Electrical fault in the circuit	♦ Open circuit or short-circuit to earth in the wiring between unit injector solenoid valve and Diesel direct injection system control unit -J248-		
18073 Actuation of unit injector solenoid valve	Mechanical fault	♦ Unit injector mechanically defective	♦ Engine misfiring ♦ Engine stalls	– Replace unit injector ⇒ Chap. 23-2

Readout on -V.A.G 1552-		Possible cause of fault	Possible effects	Rectifying fault
18074 Unit injector solenoid valve cyl. 1 -N240	Electrical fault in the circuit	♦ Open circuit or short-circuit to earth in the wiring between Unit injector solenoid valve cyl. 1 -N240- and Diesel direct injection system control unit -J248-	♦ Poor vehicle handling ♦ reduced performance ♦ Increased emission levels ♦ irregular engine running	– Test unit injector ⇒ Chap. 23-3
18075 Unit injector solenoid valve cyl. 2 -N241	Electrical fault in the circuit	♦ Open circuit or short-circuit to earth in the wiring between Unit injector solenoid valve cyl. 2 -N18 - and Diesel direct injection system control unit - J248-		
18076 Unit injector solenoid valve cyl. 3 -N242	Electrical fault in the circuit	♦ Open circuit or short-circuit to earth in the wiring between Unit injector solenoid valve cyl. 3 -N18 - and Diesel direct injection system control unit - J248-		
18077 Unit injector solenoid valve cyl. 4 -N243	Electrical fault in the circuit	♦ Open circuit or short-circuit to earth in the wiring between Unit injector solenoid valve cyl. 4 -N18 - and Diesel direct injection system control unit - J248-		
18080 Actuation of radiator fan 1	♦ Open circuit/ Short-circuit to earth	♦ Line interruption ♦ Relay defective ♦ Short circuit to earth	♦ Radiator fan not operational ♦ Radiator fan keeps on running	– Test radiator fan control with final control diagnosis ⇒ Chap. 01-1
18090 Databus drive	implausible message from ABS CU	♦ Fault in databus wiring ♦ wrong or defective ABS CU	♦ Poor vehicle handling	– Check data bus ⇒ Chapter 23-6 – Interrogate the fault memory of the ABS control unit ⇒ Chassis; Rep. Gr. 45
18097 Databus drive	Implausible message from electron. CU	♦ Fault in databus wiring ♦ Wrong or faulty vehicle voltage control unit -J519-		– Check data bus ⇒ Chapter 23-6 – Interrogate fault memory of electrical system control unit ⇒ Electrical System; Rep. Gr. 90
19456 Glow period warning lamp -K29-	Fault message from combiinstrument	♦ Fault in databus wiring to dash panel insert		– Check data bus ⇒ Chapter 23-6
19458 Kick-down switch -F8-	Implausible signal	♦ Accelerator pedal position sender -G79- defective	♦ Shifting points for automatic gearbox N.O.K.	– Inspecting accelerator pedal position sender -G79- ⇒ Chap. 23-3

Readout on -V.A.G 1552-		Possible cause of fault	Possible effects	Rectifying fault
19459 Low heat output relay -J359	Short circuit to positive	♦ Short-circuit to positive in the wiring between Low heat output relay -J359- and Diesel direct injection system control unit -J248- ♦ -J359- defective	♦ PTC heating not operational	– Inspecting Low heat output relay -J359 - ⇒ Chap. 01-1
19461 High heat output relay -J360	Short circuit to positive	♦ Short-circuit to positive in the wiring between High heat output relay -J360- and Diesel direct injection system control unit -J248 - ♦ -J360- defective		– Inspecting High heat output relay -J360 - ⇒ Chap. 01-1
19463 Camshaft pos. sensor => Sender -G40	No signal	♦ Voltage supply or earth distribution to -G40- defective ♦ -G40- defective ♦ Line interruption or short-circuit to earth or to positive in the signal line between sender -G40- and diesel direct injection system control unit -J248- ♦ -G40- loose or incorrectly fitted	♦ Engine does not reach maximum speed ♦ Starting problems ♦ reduced engine performance	– Inspecting camshaft pos. sensor -G40- ⇒ Chapter 23-3. – Remove open circuit in wiring or short circuit according to current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations. – Inspect position of camshaft and rotor ⇒ 1.9/74 TDI Engine, Mechanics; Rep. Gr. 15.
19464 Camshaft pos. sensor => Sender -G40	Signal outside tolerance	♦ Voltage supply or earth distribution to -G40- defective ♦ -G40- defective ♦ Line interruption or short-circuit to earth or to positive in the signal line between sender -G40- and diesel direct injection system control unit -J248- ♦ -G40- loose or incorrectly fitted	♦ Engine does not reach maximum speed ♦ Poor performance ♦ Starting problems ♦ reduced engine performance	
19560 Intake manifold flap change-over valve -N239	Short circuit to positive	♦ Short-circuit to positive in the wiring between Intake manifold flap change-over valve -N239- and Diesel direct injection system control unit -J248 - ♦ -N239- defective	♦ no exhaust gas recirculation ♦ Intake manifold flap fully open	♦ Inspecting Intake manifold flap change-over valve -N239- ⇒ Chap. 23-3.
19561 Intake manifold flap change-over valve -N239	Open circuit/Short-circuit to earth	♦ Interruption or short-circuit to earth in the wiring between Intake manifold flap change-over valve -N239- and Diesel direct injection system control unit -J248- ♦ -N239- defective		
19586 Exhaust gas recirculation system	Regulating limit not reached	♦ Fault in charge pressure control	♦ Poor vehicle handling ♦ Poor performance ♦ Increased emission levels	– Testing Exhaust gas recirculation valve -N18- ⇒ Chap. 23-4 – 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 adpated key the fault is changed to a sporadic fault.
2) The immobilizer control unit is a component part of the dash panel insert and therefore must not be replaced individually.
3) 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 8-digit numerical codes which indicate the status of the emission-relevant diagnoses.

If the diagnosis for a system is successfully performed (e.g. exhaust gas recirculation system), the relevant position of the readiness code switches 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 through deletion of the fault memory, that is all relevant points will be set to 1.

Generation of the readiness code means to activate 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

1	2	3	4	5	6	7	8	Meaning
							0	Ignore
						1		Ignore
					1			Ignore
				0				Ignore
			0					Ignore
		0						Diagnosis of other systems
	0							Diagnosis of fuel supply
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, e.g. lights and rear window heater switched off.
- Intake air temperature must be below 60°C ⇒ display group number 007, display field 3
- Coolant temperature at least 83°C ⇒ display group number 007, display block 4

Procedure

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

Note

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

Work step 1: Interrogating fault memory

– Enter function (0) (2) „Interrogate fault memory“ and confirm 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.

If no fault is stored:

– Press →.

Work step 2: Erasing fault memory

– Enter function 0 5 „Erase fault memory“ and confirm with Q.

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

– Min. Wait 5 seconds with ignition OFF.

Note

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

Work step 4: Switch on ignition

– Min. Wait 10 seconds with ignition ON.

Charge pressure sender is adapted with atmospheric charge pressure sender.

Work step 5: 1. Testing fuel supply and other systems

– Start engine.

– Function 0 8 „Read measured value block“ and then select display group number 001.

– For 5 seconds increase the engine speed to 2500 rpm and then run engine at idling speed.

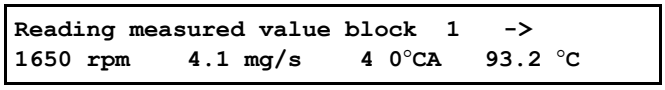
Readout on display:

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

Work step 6: 1. Testing 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 readiness code to generate exhaust gas recirculation).

Work step 7: Switch off ignition

– Min. Wait 5 seconds with ignition OFF.

Work step 8: Switch on ignition

– Min. Wait 10 seconds with ignition ON.

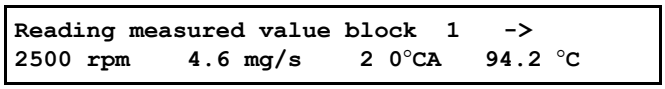
Work step 9: 2. Testing fuel supply and other systems

– Start engine.

– Function 0 8 „Read measured value block“ and then select display group number 001.

– For 5 seconds increase the engine speed to 2500 rpm and then run engine at idling speed.

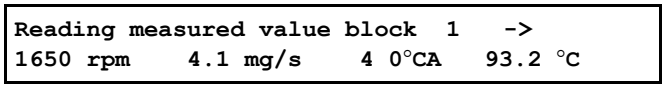
Readout on display:



Work step 10: 2. Testing 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:



– Press C.

– Enter 0 1 7 for display group number 017 and read readiness code.

Readout on display:

Specification in display field 2: 00000110

Specification in display field 4: 00000000

– Press →.

– If the specified values are not reached, once again 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 with Q.

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

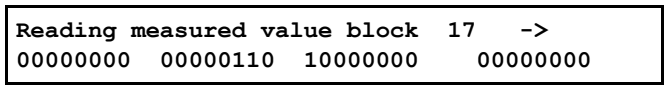
If a fault is stored in the memory:

– Rectify the faults by referring to the fault table ⇒ Chapter 01-2 and again generate readiness code ⇒ **01-3** page 2.

If no fault is stored:

– Press (→).

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



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 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 the address word 01 „Engine electronics“ ⇒ Chapter 01-1.

– 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 80 °C)

Read 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	80,0…110.0 °C	---
			Fuel delivery duration (set value)		4...7 °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

Display -V.A.G 1552-	Possible cause of fault	Rectifying fault
below 3.0 mg/s	♦ Unit injector defective	– Replace unit injector ⇒ Chap. 23-2
above 9.0 mg/s	♦ Engine too cold	– Warm up engine by running at high revs and repeat test.
	♦ Unit injector defective	– Replace unit injector ⇒ Chap. 23-2

Display group 002 in idle (engine warm, coolant temperature not below 80 °C)

Read 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	80,0…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

Display -V.A.G 1552-	Possible cause of fault	Rectifying fault
1…100,0 %	♦ Accelerator pedal position sender -G79- defective ♦ Line interruption to sender -G79-	– Inspecting Accelerator pedal position sender -G79- ⇒ 1.9/74 TDI Engine, Mechanics; Rep. Gr. 20

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

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

Display group 003 in idle (engine warm, coolant temperature not below 80 °C)

Read measured value block 3 →				< Readout on display		
xxx rpm	xxx mg/s	xxx mg/s	xxx %			
1	2	3	4	< Display field	Specification	Analysis
				Mark space ratio from exhaust gas recirculation valve -N18-	30…80 %	---
				drawn in air mass (actual)	210...370 mg/s	⇒ **01-4** page 3
				drawn in air mass (nominal)	230...350 mg/s	⇒ **01-4** page 3
				Engine speed	800…950 rpm	---

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

Display -V.A.G 1552-	Possible cause of fault	Rectifying fault
above 350 mg/s	♦ Engine too cold	– Warm up engine by running at high revs and repeat test

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

Display -V.A.G 1552-	Possible cause of fault	Rectifying fault
below 210 mg/s	♦ too much exhaust gas recirculation	– Test exhaust gas recirculation ⇒ Chap. 23-4.
	♦ Unmetered air	– Test intake system for tightness
above 370 mg/s	♦ Engine too cold	– Warm up engine by running at high revs and repeat test
	♦ too little exhaust gas recirculation	– Engine has been running in idle too long, briefly accelerate
	♦ Air mass meter -G70- defective	– Inspecting air mass meter -G70- ⇒ Chap. 23-3

Display group 004 in idle (engine warm, coolant temperature not below 80 °C)

Read measured value block 4 →

xxx rpm	xx.x ° b. TDC	xx.x °KW	xx.x °KW
1	2	3	4

< Readout on display

< Display field	Specification	Analysis
Synchronizing angle	-3…+3 °KW	⇒ **01-4** page 4
Fuel delivery duration (set value)	4,0…7.0 °KW	---
Commencement of injection (set value)	3,0…6.0 ° b. TDC	⇒ **01-4** page 3
Engine speed	800…950 rpm	---

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

Display -V.A.G 1552-	Possible cause of fault	Rectifying fault
below 3.0 ° b. TDC	♦ Engine too cold	– Warm up engine by running at high revs and repeat test

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

Display -V.A.G 1552-	Possible cause of fault	Rectifying fault
above +3 °KW or under -3 °KW	♦ Hall sender -G40- defective	– Test camshaft position sensor -G40- ⇒ Chap. 23-3.
	♦ Sender incorrectly fitted	
	♦ Line interruption or short-circuit to earth	
	♦ Hub with rotor twisted on camshaft, loose	– Inspect position of camshaft and rotor ⇒ 1.9/74 TDI Engine, Mechanics; Rep. Gr. 15.

Display group 006 in idle (engine warm, coolant temperature not below 80 °C)

Read measured value block 6 →

xxx km/h | x x x | xx.x % | xxx

1	2	3	4	< Display field	Specification	Analysis
				Operating condition of the cruise control system	xxx	⇒ **01-4** page 5
				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

Display	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 in engine control unit not activated

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

Read measured value block 7 →

xxx.x °C	xxx %	xxx.x °C	xxx.x °C
1	2	3	4

< Readout on display

< Display field	Specification	Analysis
Coolant temperature	approx. ambient temperature [1]	⇒ **01-4** page 6
Intake manifold temperature	approx. ambient temperature [1]	⇒ **01-4** page 5
Status of the fuel cooling	off: 0% on: 100%	---
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

Display -V.A.G 1552-	Possible cause of fault	Rectifying fault
-5.4 °C	♦ Short-circuit or Fuel temperature sender -G81- defective	– Inspecting Fuel temperature sender -G81- ⇒ Chap. 23-3

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

Display -V.A.G 1552-	Possible cause of fault	Rectifying fault
approx. 134.9 °C	♦ Short-circuit or Intake manifold sender -G72- defective	– Test intake manifold temperature sender -G72- ⇒ Chap. 23-3

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

Display -V.A.G 1552-	Possible cause of fault	Rectifying fault
great deviation from ambient temperature	♦ Short-circuit or Coolant temperature sender -G62- defective	– Inspecting coolant temperature sender -G62- ⇒ Chap. 23-3 In the event of a fault the fuel temperature is displayed instead.

Display group 010 in idle (engine warm, coolant temperature not below 80 °C)

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

Display group 011 in idle (engine warm, coolant temperature not below 80 °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 of solenoid valve for charge pressure control -N75-	25...80 %	---
				Charge pressure (actual)	900...1150 mbar	---
				Charge pressure (nominal)	900...1100 mbar	---
				Engine speed	800…950 rpm	---

Display group 013 in idle (engine warm, coolant temperature not below 80 °C)

Read measured value block 13 →				< Readout on display		
x.xx mg/s	x.xx mg/s	x.xx mg/s	x.xx mg/s			
1	2	3	4	< Display field	Specification	Analysis
				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 through 4 - Idle smoothness regulator

- 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

Read measured value block 16 →				< Readout on display		
xxx %	xxxxxxxx	xx	xx.x V			
1	2	3	4	< Display field	Specification	Analysis
				Supply voltage of the engine control unit	13,5…14.5 V	⇒ **01-4** page 9
			Heating element control		xx	⇒ **01-4** page 8
		Auxiliary heating			1x000001	⇒ **01-4** page 8
	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 above 70 °C…80 °C or intake air temperature above +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
		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- on
1		High heat output relay -J360- on

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

Display -V.A.G 1552-	Possible cause of fault	Rectifying fault
below 13.5 V	♦ Generator defective, battery heavily discharged	– Inspect generator and battery voltage, charge battery ⇒ Electrical System; Rep. Gr. 27
	♦ Battery heavily loaded just after start by a high charge current or by auxiliary equipment	– Increase engine speed slightly for a few minutes and switch off additional consumers
	♦ Transition resistance in the power supply or earth connection for engine control unit	– Test supply voltage of engine control unit ⇒ Chapter 23-5
	♦ Current consumption with ignition off	– Eliminate current consumption
above 14.5 V	♦ Voltage regulator on generator defective	– Check voltage regulator, if necessary replace ⇒ Electrical System; Rep. Gr. 27
	♦ Overvoltage due to starting aid or quick charger	– Remove start aid cable or quick charger

Display group 018 in idle

Read 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 fields 1 through 4 - Display of the conditon of the unit injector

Display -V.A.G 1552-	Possible cause of fault	Rectifying fault
If number instead of zero	♦ Unit injector solenoid valve defective ♦ Line interruption	– Test unit injector ⇒ Chap. 23-3
	♦ Air in fuel system ♦ Fuel shortage	– Inspecting fuel supply ⇒ 1.9/74 TDI Engine, Mechanics; Rep. Gr. 20

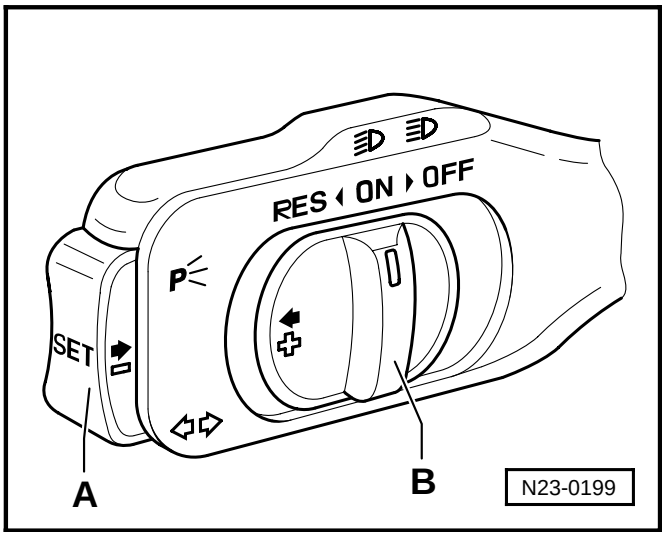
Display group 022, engine idling

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

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 in engine control unit not activated
1	Vehicles with activated CCS, switch in position „OFF“
9	Vehicles with activated CCS, switch in position „ON“

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



Cruise control system	Display field 2
Switch B on „ON“	000011
Switch B on „RES“	001011
Switch A operated	000111
Switch B on „OFF“ before the activation point	000001
Switch B to „OFF“ locked	000000

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).*
- *Comply with the applicable safety instructions for the test drive ⇒ Chap. 23-1.*

Display group 004 under full load (test drive in 3rd gear, coolant temperature not below 80 °C)

Read 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	---	---
				Fuel delivery duration (set value)	18…27 °KW	---
				Commencement of injection (set value)	13…22 ° b. TDC	---
				Engine speed	2800…3200 rpm	---

Display group 008 under full load (test drive in 3rd gear, coolant temperature not below 80 °C)

Read 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)	42,0…46.0 mg/s	⇒ **01-4** page 12
				Injection rate limit based on engine speed (torque limit)	40,0…44.0 mg/s	⇒ **01-4** page 12
				Injection rate (driver's instruction)	46,0…51.0 mg/s	⇒ **01-4** page 11
				Engine speed	2800…3200 rpm	---

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

Display -V.A.G 1552-	Possible cause of fault	Rectifying fault
below 46.0 mg/s	♦ Accelerator pedal was not fully pressed down	– repeat test at full throttle
	♦ Accelerator pedal position sender -G79- defective	– Inspecting Accelerator pedal position sender -G79- ⇒ 1.9/74 TDI Engine, Mechanics; Rep. Gr. 20

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

Display -V.A.G 1552-	Possible cause of fault	Rectifying fault
below 40.0 mg/s	♦ Speed too high or too low	– Read off set value at 3000 rpm

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

Display -V.A.G 1552-	Possible cause of fault	Rectifying fault
below 42.0 mg/s	♦ Air mass drawn in too small	– Inspecting air mass meter -G70- ⇒ Chap. 23-3 – Inspecting exhaust gas recirculation ⇒ Chap. 23-4
	♦ Exhaust gas recirculation too high	– Inspecting exhaust gas recirculation ⇒ Chap. 23-4

Display group 011 under full load (engine warm, coolant temperature not below 80 °C)

Read measured value block 11 →

xxx rpm	xxxx mbar	xxxx mbar	xxx %	< Display field	Specification	Analysis
1	2	3	4	On/off ratio of solenoid valve for charge pressure control -N75-	45...80%	⇒ **01-4** page 13
				Charge pressure (actual)	1850...2250 mbar	⇒ **01-4** page 12
				Charge pressure (nominal)	1900...2100 mbar	---
				Engine speed	2800...3200 rpm	---

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

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

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

Display -V.A.G 1552-	Possible cause of fault	Rectifying fault
below 45 %	♦ Charge pressure control defective	– Inspecting charge pressure control ⇒ 1.9/ 74 TDI Engine, Mechanics; Rep. Gr. 21
above 80 %	♦ Charge pressure is not controlled	– Inspecting charge pressure control ⇒ 1.9/ 74 TDI Engine, Mechanics; Rep. Gr. 21

Display group 125 Data BUS

Display group 125 with ignition on

Read 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	Combi 1	⇒ **01-4** page 13
				ABS control unit	ABS 1	⇒ **01-4** page 13
				not assigned	---	---

Analysis: Display group 125

Display -V.A.G 1552-	Possible cause of fault	Rectifying fault
ABS 0 Combi 0 Airbag 0	♦ one or several control units without communication with data BUS cables	– Check data bus ⇒ Chapter 23-6

23 – Fuel Formation, Injection

23-1 Diesel Direct Injection System

Safety measures

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

- Disconnect and connect wires of the injection and pre-heating system and measuring device wires when the ignition is switched off.
- Check concerning the code of the radio set before disconnecting the battery.
- Always switch off the ignition before disconnecting and re-connecting the battery. Otherwise the engine control unit may be damaged.

Note

When the battery is disconnected and reconnected, carry out rework ⇒ 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.

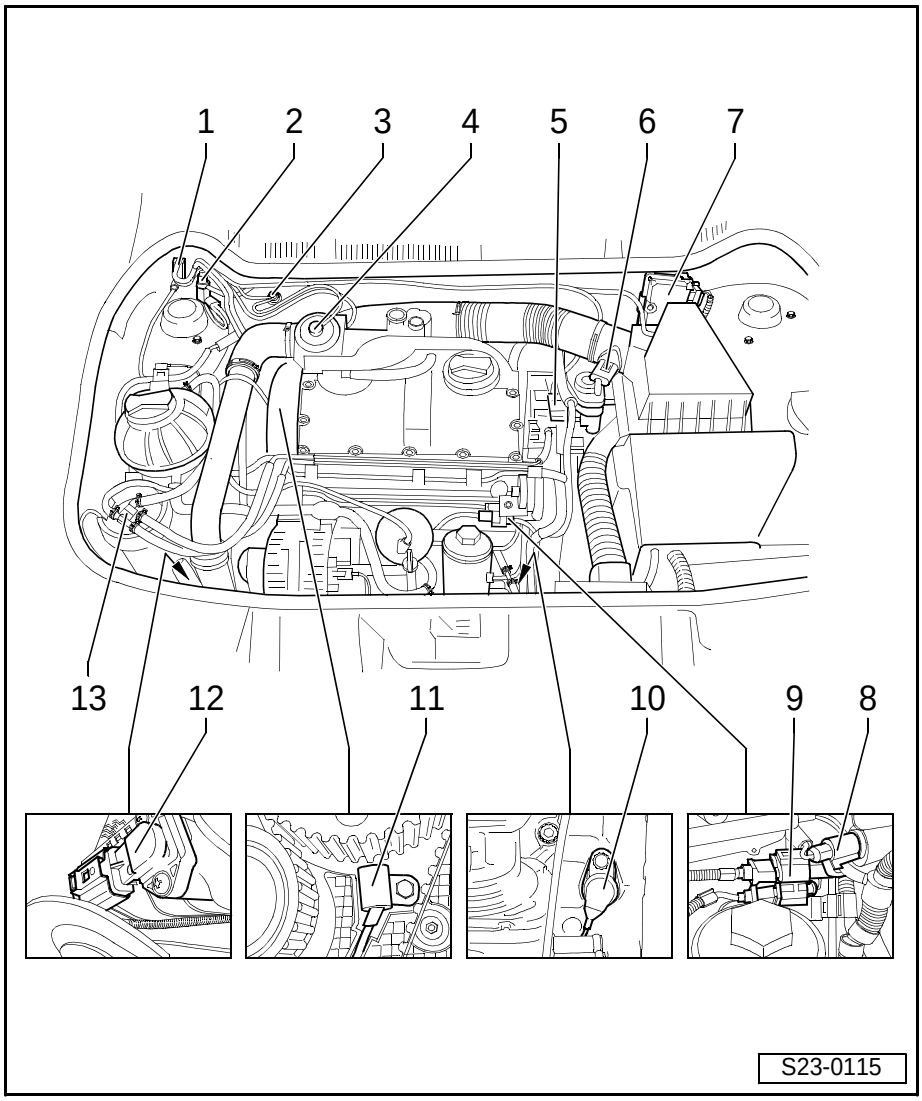
Rules of cleanliness

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. Replace immediately any hoses which have suffered damage.

Installed positions - overview for vehicles ➤ 11.01

Components A through H are not represented in the overview figure.



A - Diesel direct injection system relay -J322-
- ❑ on relay carrier ⇒ Fig. 2 in **23-1** page 4

B - Glow plug relay -J52-
- ❑ on relay carrier ⇒ Fig. 2 in **23-1** page 4

C - Low heat output relay -J359-
- ❑ on relay carrier ⇒ Fig. 2 in **23-1** page 4

D - High heat output relay -J360-
- ❑ on relay carrier ⇒ Fig. 2 in **23-1** page 4

E - Fuel pump relay -J17-
- ❑ on relay carrier ⇒ Fig. 2 in **23-1** page 4

F - Sender for accelerator pedal position -G79-
- ❑ in footwell on the accelerator pedal ⇒ Fig. 1 in **23-1** page 4

G - Brake light switch -F- and Brake pedal switch -F47-
- ❑ in footwell on the brake pedal ⇒ Fig. 1 in **23-1** page 4

H - Clutch pedal switch -F36-
- ❑ in footwell at clutch pedal ⇒ Fig. 1 in **23-1** page 4

1 - Changeover valve for intake manifold flap -N239-

2 - Solenoid valve for charge pressure control -N75-

3 - Exhaust gas recirculation valve -N18-

4 - Mechanical exhaust gas recirculation valve

5 - Sender for the coolant temperature -G62-

6 - Air mass meter -G70-

7 - Diesel direct injection system control unit -J248-

8 - Fuel temperature sender -G81-
- ❑ Specified resistance ⇒ Fig. 3 in **23-1** page 4

9 - Plug connection
- ❑ 3-pin, grey
- ❑ for engine speed sender -G28-
- ❑ 3-pin, black
- ❑ for the camshaft position sensor -G40-

10 - Engine speed sender -G28-

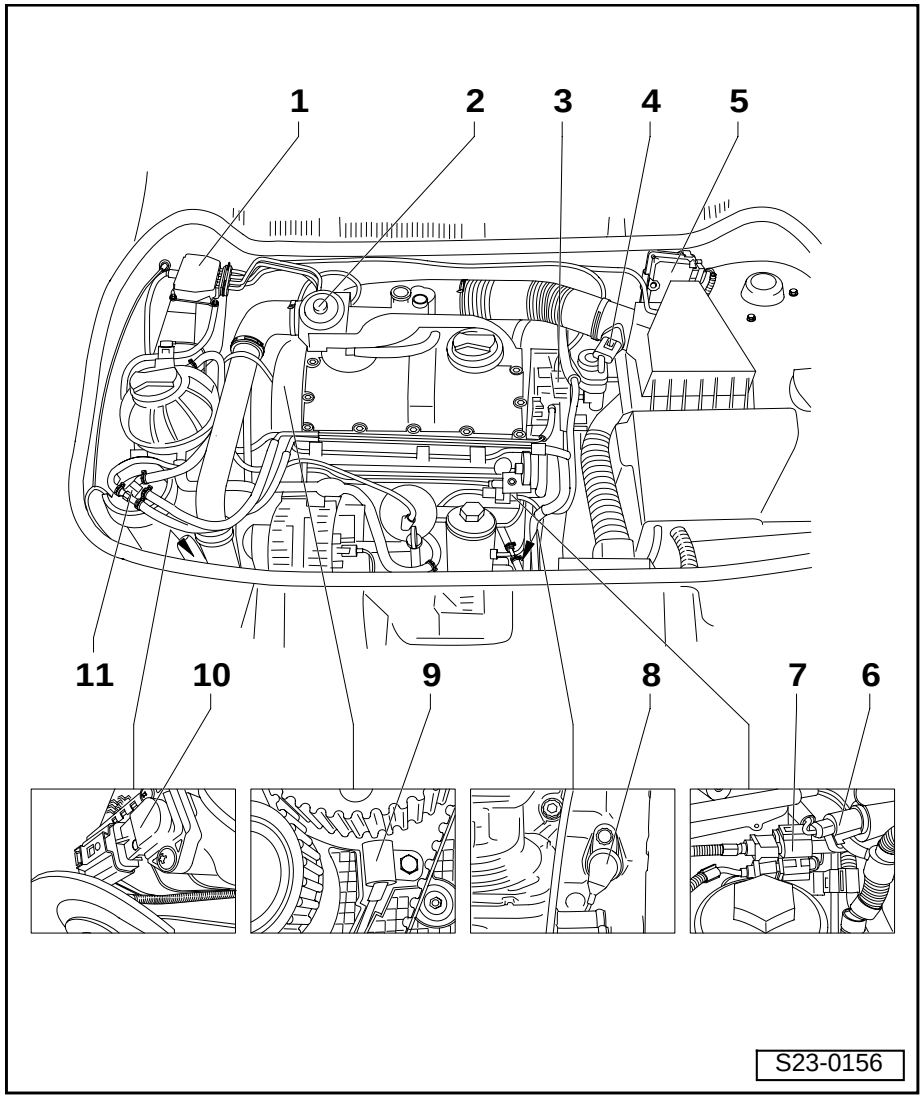
11 - Camshaft position sensor -G40-

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

13 - Fuel filter
- ❑ repairing ⇒ 1.9/74 TDI Engine, Mechanics; Rep. Gr. 20

Installed positions - overview for vehicles 11.01 ➢

Components A through H are not represented in the overview figure.



A - Diesel direct injection system relay -J322-
- ❑ on relay carrier ⇒ Fig. 2 in **23-1** page 4

B - Glow plug relay -J52-
- ❑ on relay carrier ⇒ Fig. 2 in **23-1** page 4

C - Low heat output relay -J359-
- ❑ on relay carrier ⇒ Fig. 2 in **23-1** page 4

D - High heat output relay -J360-
- ❑ on relay carrier ⇒ Fig. 2 in **23-1** page 4

E - Fuel pump relay -J17-
- ❑ on relay carrier ⇒ Fig. 2 in **23-1** page 4

F - Sender for accelerator pedal position -G79-
- ❑ in footwell on the accelerator pedal ⇒ Fig. 1 in **23-1** page 4

G - Brake light switch -F- and Brake pedal switch -F47-
- ❑ in footwell on the brake pedal ⇒ Fig. 1 in **23-1** page 4

H - Clutch pedal switch -F36-
- ❑ in footwell at clutch pedal ⇒ Fig. 1 in **23-1** page 4

1 - Valve block
- ❑ Component parts of the valve block are:
- ❑ Changeover valve for intake manifold flap -N239-
- ❑ Exhaust gas recirculation valve -N18-
- ❑ Solenoid valve for charge pressure control -N75-

2 - Mechanical exhaust gas recirculation valve

3 - Sender for the coolant temperature -G62-

4 - Air mass meter -G70-

5 - Diesel direct injection system control unit -J248-

6 - Fuel temperature sender -G81-
- ❑ Specified resistance ⇒ Fig. 3 in **23-1** page 4

7 - Plug connection
- ❑ 3-pin, grey
- ❑ for engine speed sender -G28-
- ❑ 3-pin, black
- ❑ for the camshaft position sensor -G40-

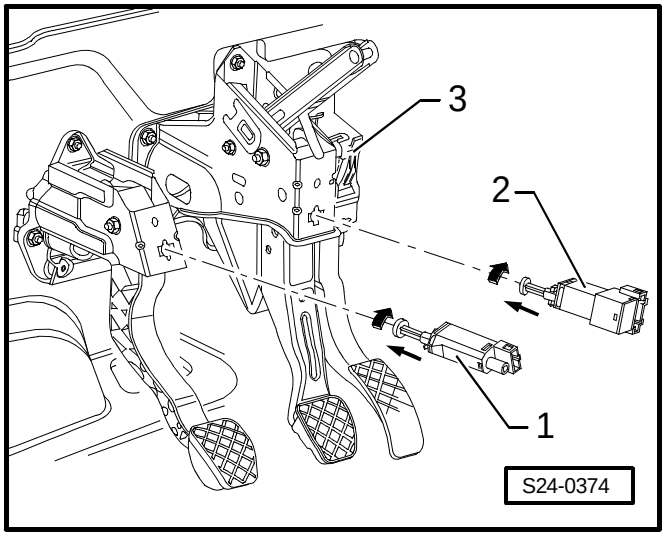
8 - Engine speed sender -G28-

9 - Camshaft position sensor -G40-

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

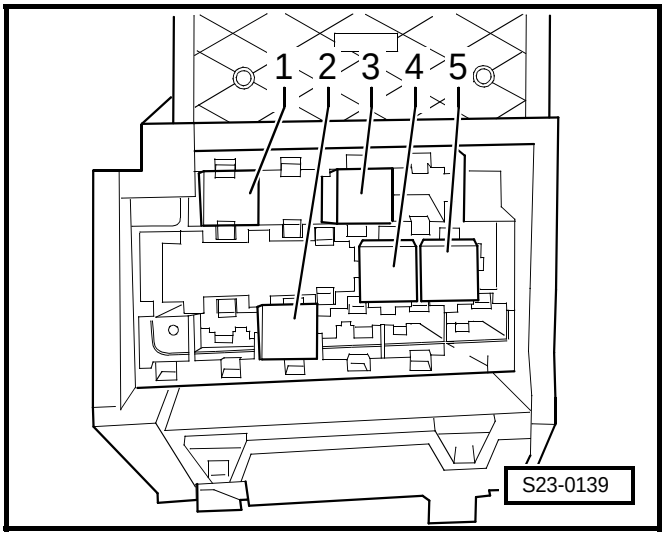
11 - Fuel filter
- ❑ repairing ⇒ 1.9/74 TDI Engine, Mechanics; Rep. Gr. 20

Fig. 1: Components in footwell



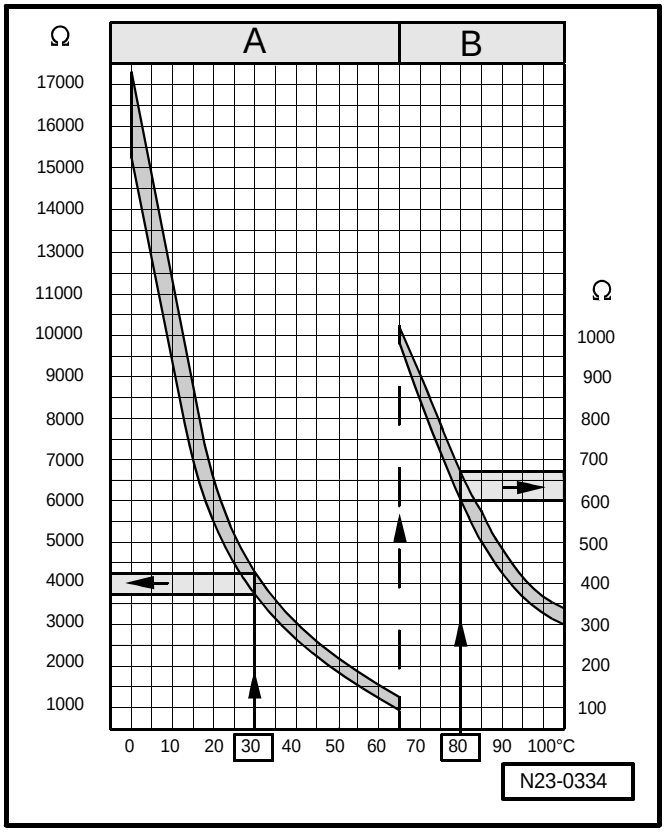
1 - Clutch pedal switch -F36-
2 - Brake light switch -F- and Brake pedal switch -F47-
3 - Sender for accelerator pedal position -G79-

Fig. 2: Relay carrier



1 - Fuel pump relay -J17-
2 - Diesel direct injection system relay -J322-
3 - Glow plug relay -J52-
4 - Low heat output relay -J359-
5 - High heat output relay -J360-

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



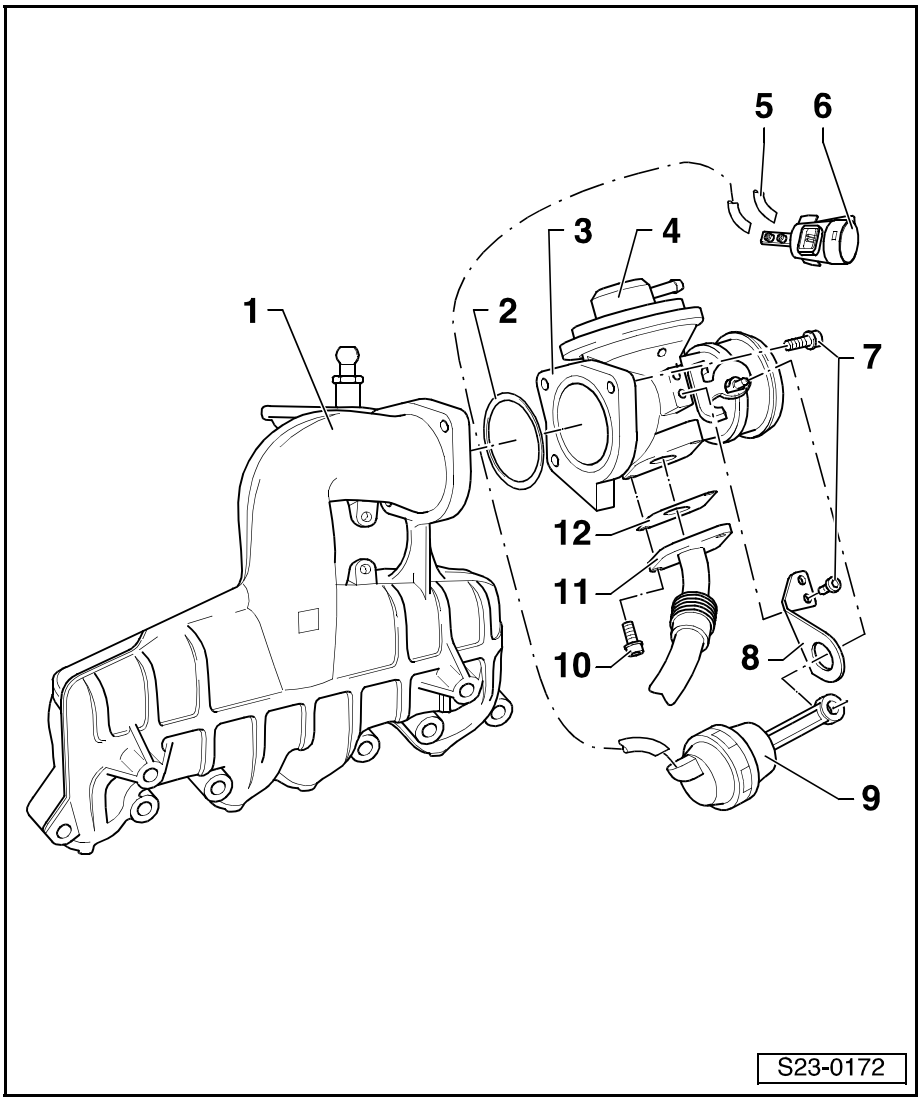
The specification in field -A- applies to the temperature range 0 to 65°C, specification in field -B- applies to the temperature range 65 to 100°C.

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

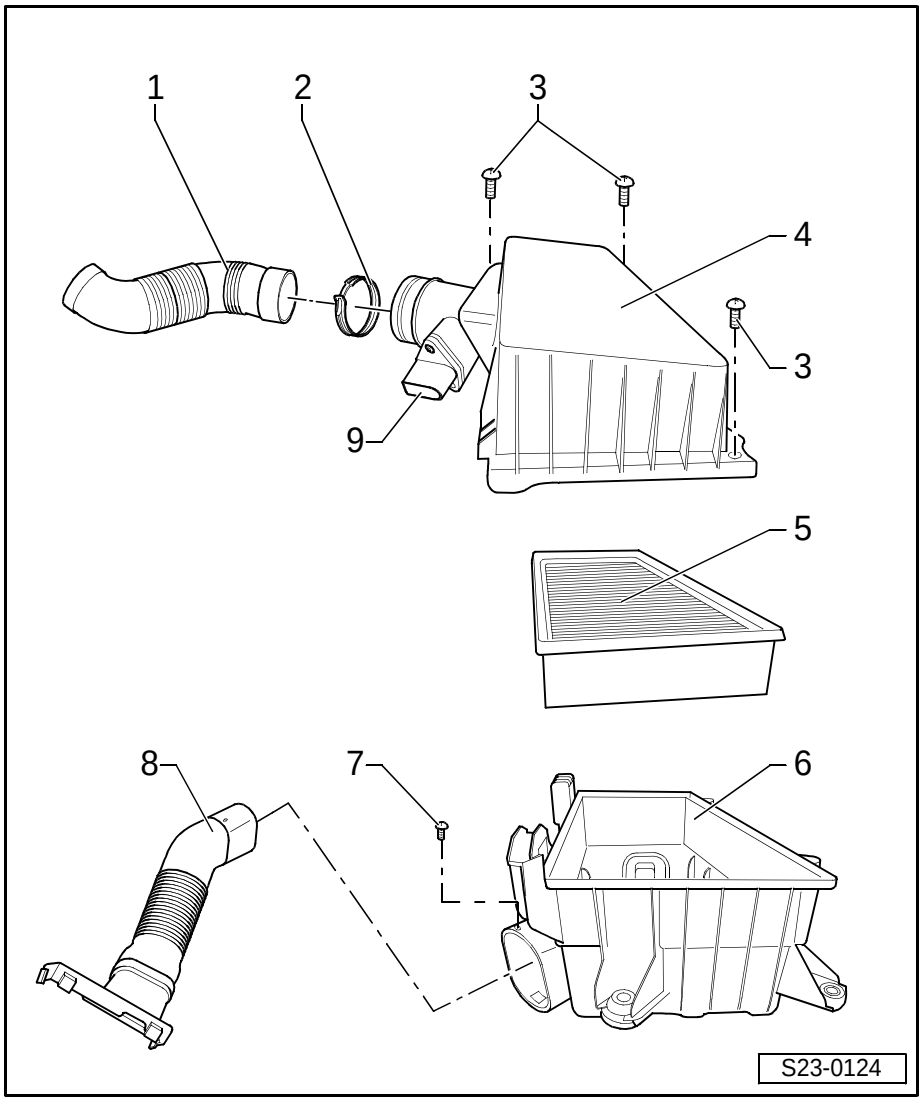
Disassembling and assembling intake manifold

- **1 - Intake manifold**
- **2 - O-ring**
  - ❑ replace
- **3 - Induction pipe**
  - ❑ 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-**
  - ❑ for vehicles 11.01 ➢ component of the valve block
  - ❑ inspect ⇒ Chapter 23-3
- **7 - 10 Nm**
- **8 - Bracket**
- **9 - Vacuum setting element**
- **10 - 25 Nm**
- **11 - Exhaust return pipe**
  - ❑ to exhaust pipe
- **12 - Gasket**
  - ❑ replace



Disassembling and assembling the air filter

- **1 - Air guide hose**
  - ❑ To intake manifold
  - ❑ Check fitting position
- **2 - Spring strap clip**
- **3 - 2 Nm**
- **4 - Cover - upper part of the air filter**
- **5 - Filter insert**
- **6 - Cover - lower part of the air filter**
- **7 - 2 Nm**
- **8 - Air deflector**
  - ❑ to the lock carrier
- **9 - Air mass meter -G70-**
  - ❑ inspect ⇒ Chapter 23-3



Removing and installing air filter

Removing

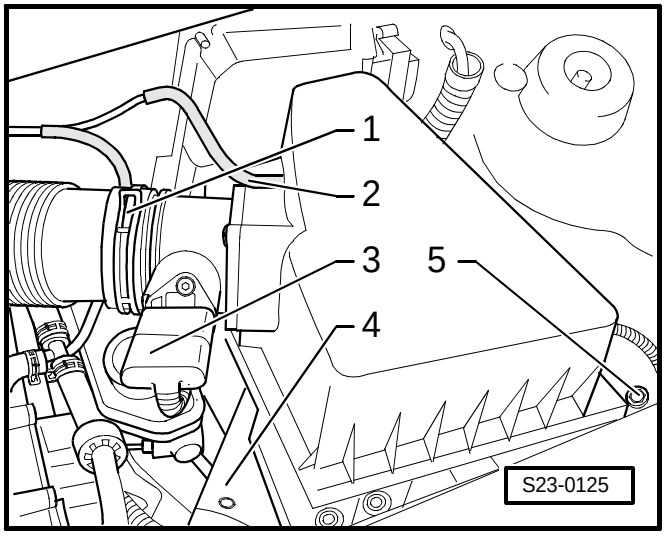
– Loosen spring strap clamp -1- on the air guide hose and remove the hose from the air filter. ►

– Disconnect the ventilation hose -2- and the plug on the air mass meter -3-.

– Remove the air deflector -4- from the air filter.

– Unscrew the fixing screw -5- from the air filter (tightening torque: 8 Nm).

– Carefully remove air filter from the top.



Installing

Note

Pay attention to correct positioning of the stop buffer on the bottom part of the air filter (front and rear side).

– Installation is carried out in the reverse order.

23-2 Disassembling and assembling the unit injector

Summary of components

Note

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

1 - 20 Nm + torque a further $^1/_4$ turn (90 °)
- ❑ replace

2 - Valve-lever shaft
- ❑ with valve lever
- ❑ removing and installing ⇒ **23-2** page 3

3 - Lock nut, 30 Nm

4 - Adjusting screw
- ❑ - replace after replacing the unit injector adjusting screw

5 - The unit injector
- ❑ removing and installing ⇒ **23-2** page 3

6 - Top O-ring
- ❑ replace ⇒ **23-2** page 2

7 - Centre O-ring
- ❑ replace ⇒ **23-2** page 2

8 - Bottom O-ring
- ❑ replace ⇒ **23-2** page 2

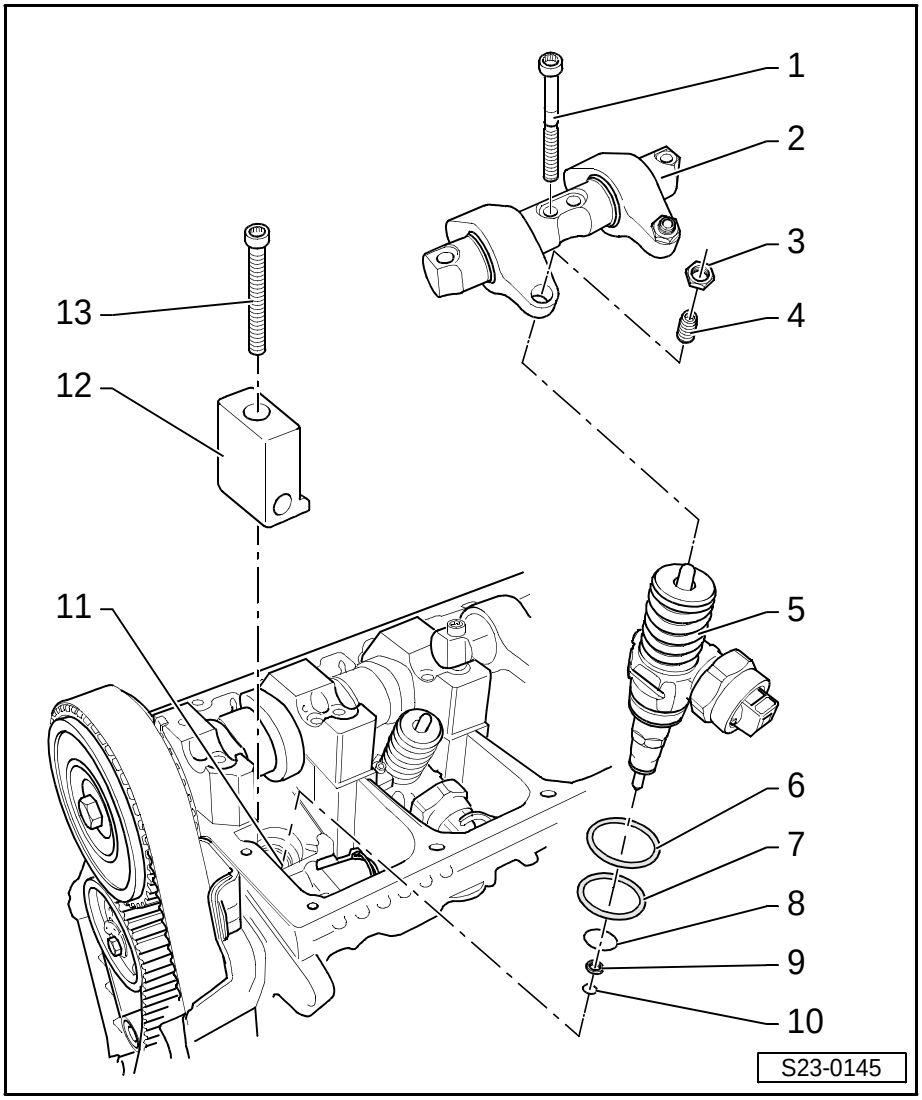
9 - Heat-protection seal
- ❑ replace

10 - Circlip

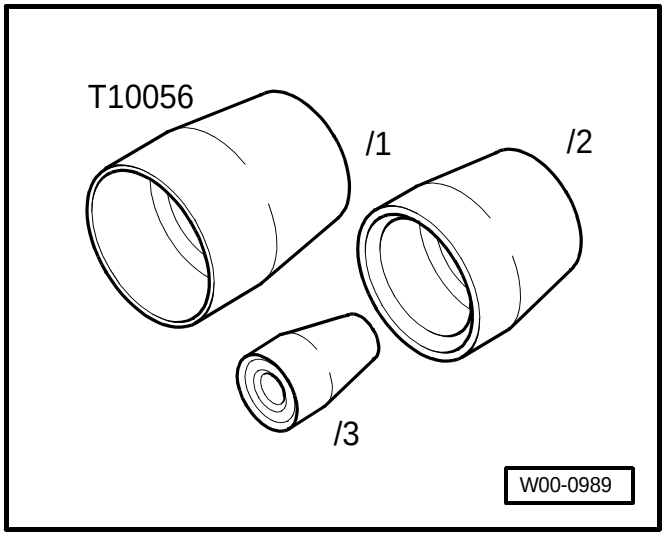
11 - Cylinder head

12 - Clamping pad

13 - 12 Nm + torque a further $^3/_4$ turn (270 °)
- ❑ replace



Removing and installing O-rings for unit injector ►



Special tools, test and measuring equipment and auxiliary items required

- Assembling sleeves -T10056-

Removing

– Lever off the old O-rings from the unit injector with extreme care.

– Make sure, above all, that no gradient occurs at the base of the O-rings.

Installing

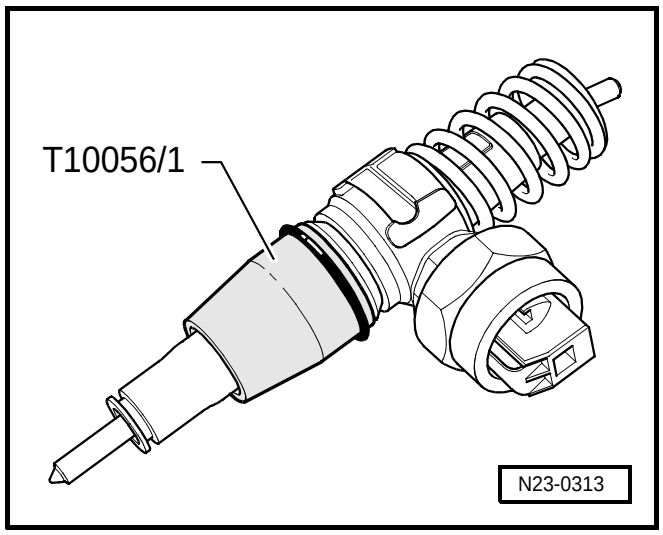
Note

- *Always use the assembling sleeves to install the O-rings. Otherwise there is the danger of damaging the O-rings.*
- *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.

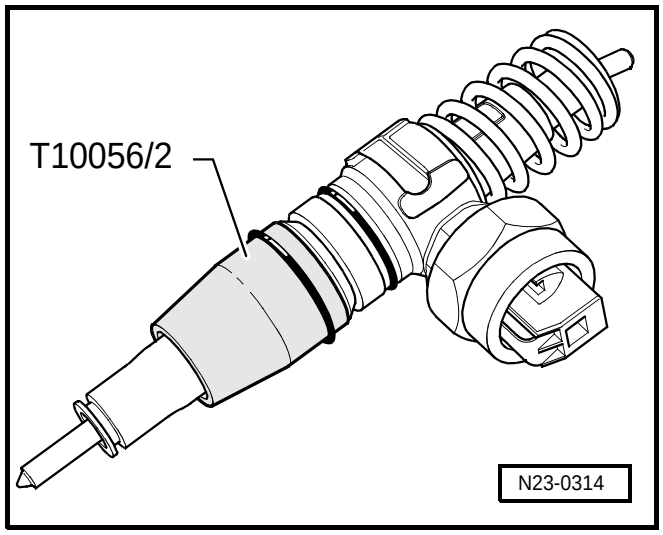
– Insert the assembling sleeve -T10056/1- on the unit injector up to the stop. ►



– Carefully slide the top O-ring onto the assembling sleeve and into the groove of the unit injector.

– Remove the assembling sleeve.

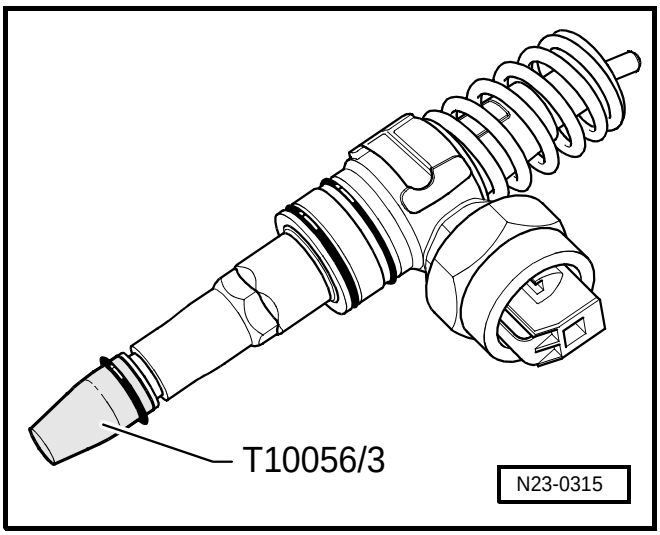
– Insert the assembling sleeve - T10056/2- on the unit injector up to the stop. ►



– Carefully slide the middle O-ring onto the assembling sleeve and in the groove of the unit injector.

– Remove the assembling sleeve.

– Insert the assembling sleeve - T10056/3- on the unit injector up to the stop.
– Carefully slide the lower O-ring onto the assembling sleeve and in the groove of the unit injector.
– Remove the assembling sleeve.
– Push on a new heat-protection seal along with the circlip.



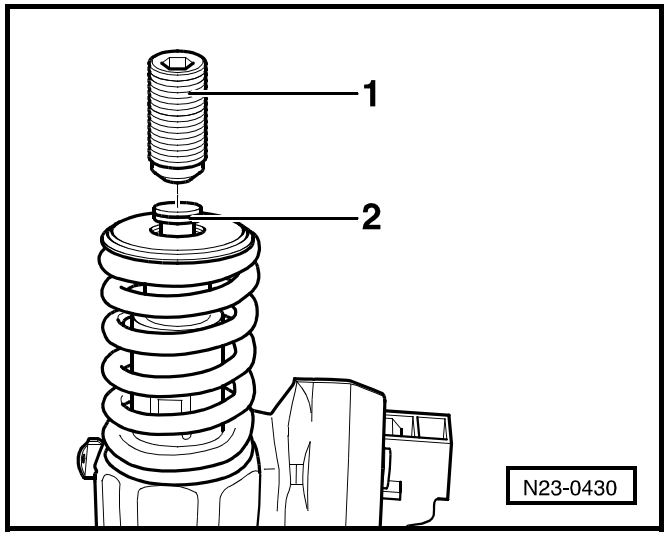
Removing and installing the pump/unit injector

Special tools, test and measuring equipment and auxiliary items required

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

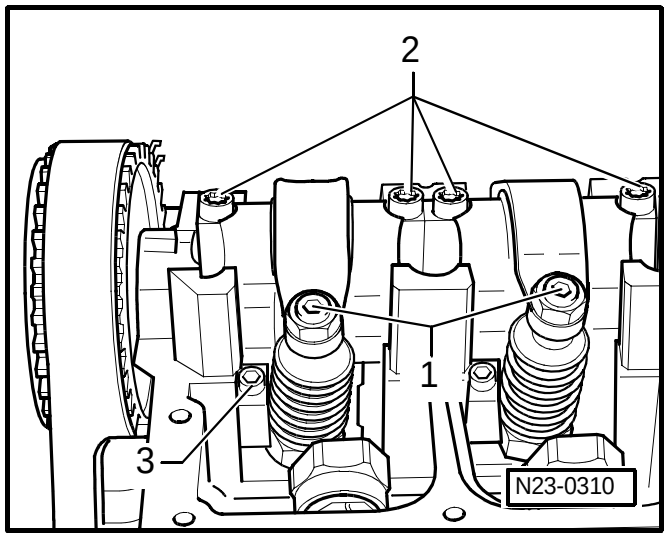
Note

When using service interval extension, setting screw -1- and the ball pins -2 - on the unit injector must be changed. A mixed lining is admissible for older engines without service interval extension.

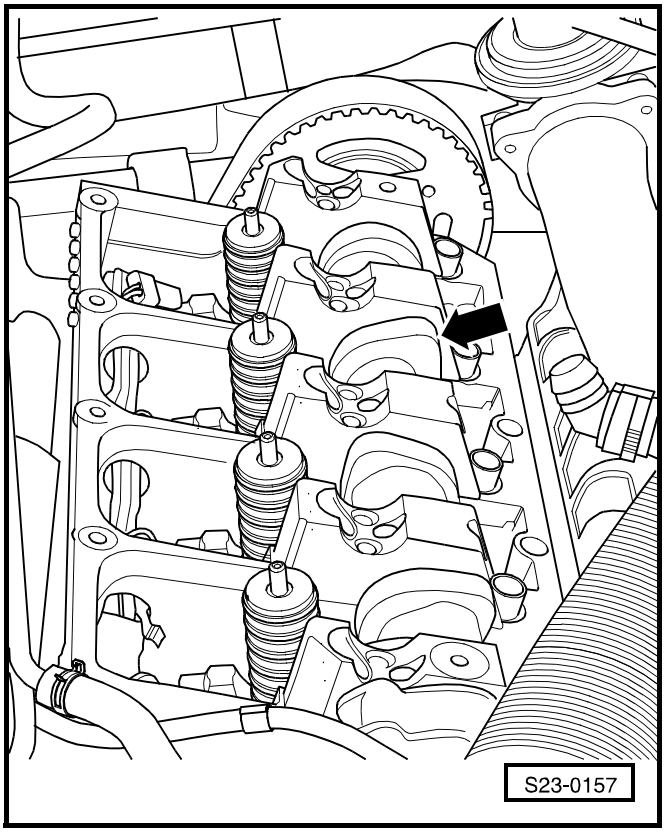


Removing

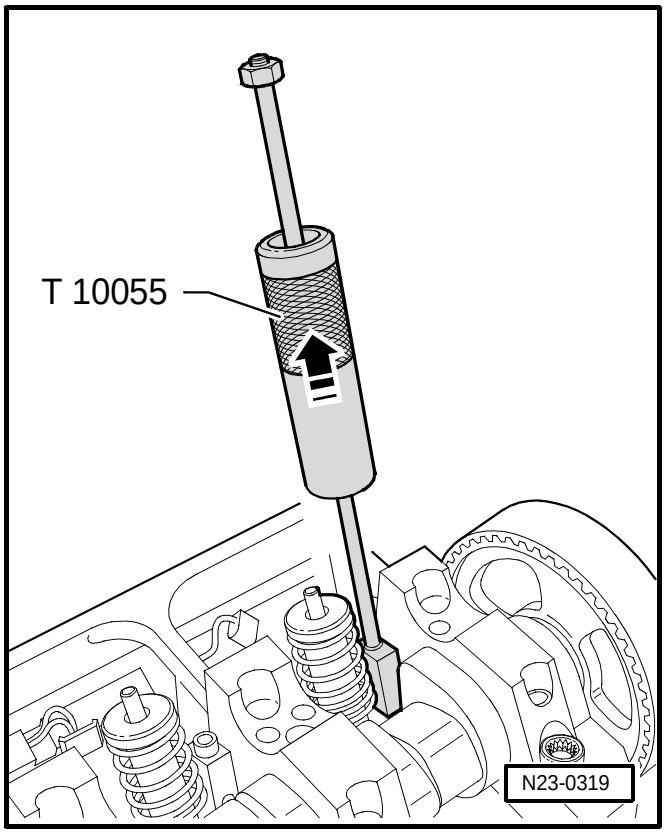
– Remove the upper timing belt cover and the cylinder head cover ⇒ 1.9/74 TDI engine - mechanics; Rep. Gr. 15
– Turn the crankshaft until the cam pair of the relevant unit injector to be removed points uniformly upwards.
– Release the counternuts of the adjusting screws -1- and unscrew the adjusting screws until the relevant valve lever rests against the tappet spring of the unit injector.
– Screw out the fixing screws -2- for the rocker shaft from the outside to the inside and remove the rocker 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 the connector 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 deadstop in -direction of arrow-.



Note

Do not confuse the unit injectors with each other so if necessary mark the assignment to each cylinder.

Installing

Note

- *The associated setting 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 bolt pin and the adjusting screw.*
- *Grease the contact surfaces between the ball pins and the setting 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.

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 slit of the unit injector.

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.

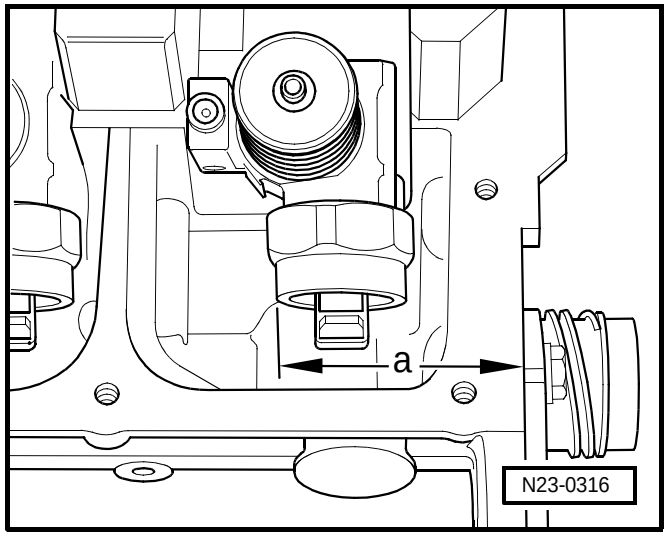
– Align the unit injector as follows:
– Screw the new fixing screw in the clamping pad until the unit injector can still easily be turned.
– Set the unit injector at a right angle to the bearing shell of the camshaft.
– Using a caliper gauge, check dimension -a- from the outer side of the cylinder head to the round surface of the unit injector.

Note

Sliding use of the unit injectors with a new solenoid valve nut. A mixed lining is admissible when one maintains dimension -a-.

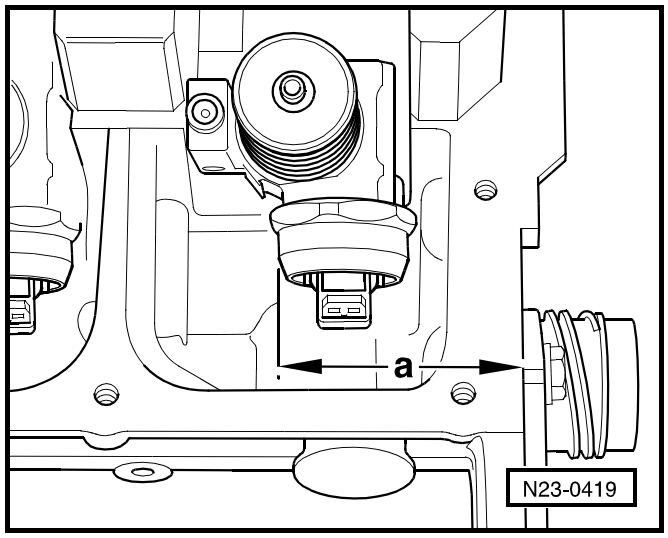
Removing and installing the unit injector with the old solenoid valve nut ►

Cylinder	Dimension -a-
1	332.2 ± 0.8 mm
2	244.2 ± 0.8 mm
3	152.8 ± 0.8 mm
4	64.8 ± 0.8 mm



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 the 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 a dial gauge on the setting 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.

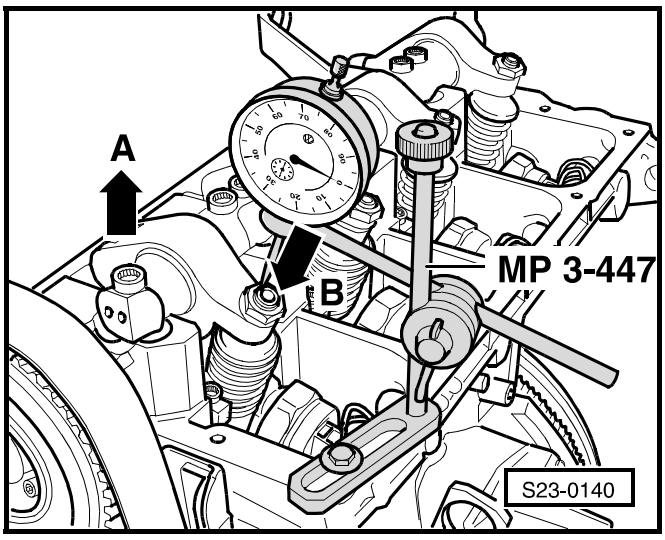
– Remove the dial gauge.

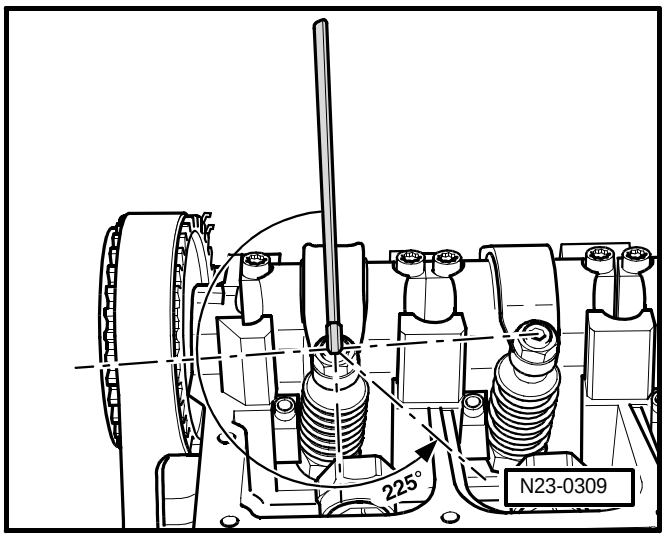
– Turn the setting screw in the valve lever until one feels a significant resistance (the unit injector is against the stop).

– Turn the setting screw in the opposite direction from the stop by about 225° ►

– Hold the setting screw in this position and tighten up the lock nut using a torque of 30 Nm

– Place the connector onto the unit injector and install the cylinder head cover and the timing belt cover.





23-3 Testing components

Testing lines 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 boxconnected (e.g. measuring signals while the engine is running).

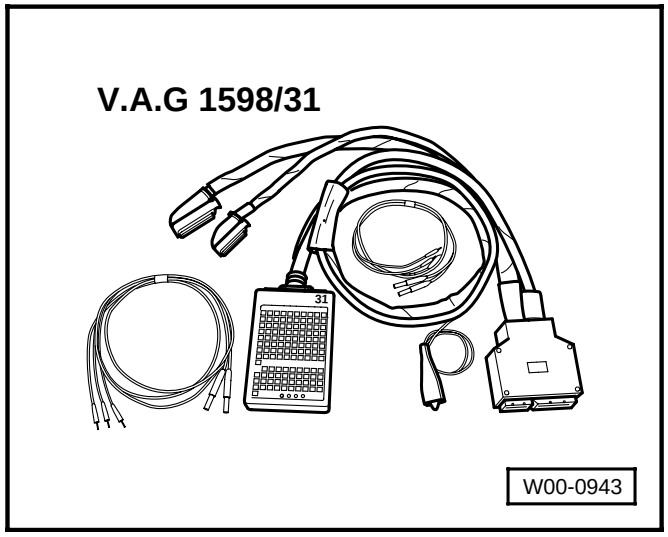
Whether the control unit is additionally connected to the test box or not, is indicated in the particular test procedure.

Always use the measuring tool set - V.A.G 1594 A- to connect the measuring tools (e.g. handheld multimeter -V.A.G 1526 A- 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.

– Switch off ignition.

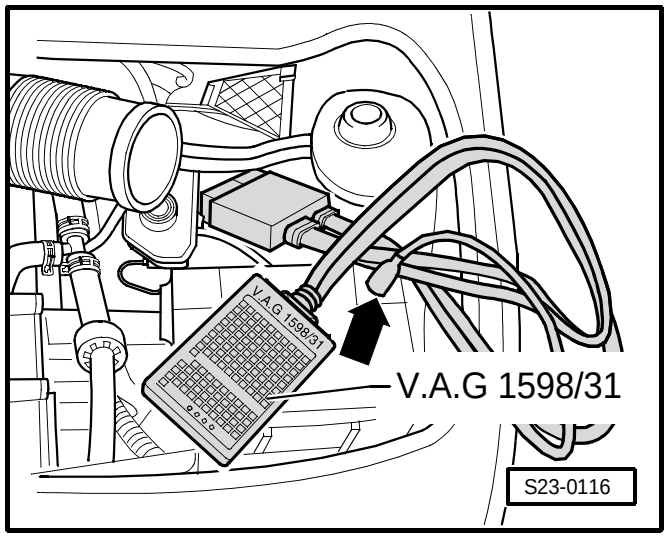
– Remove air filter ⇒ Chapter 23-1.

– 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 -arrow- to the battery negative pole (-).

  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.



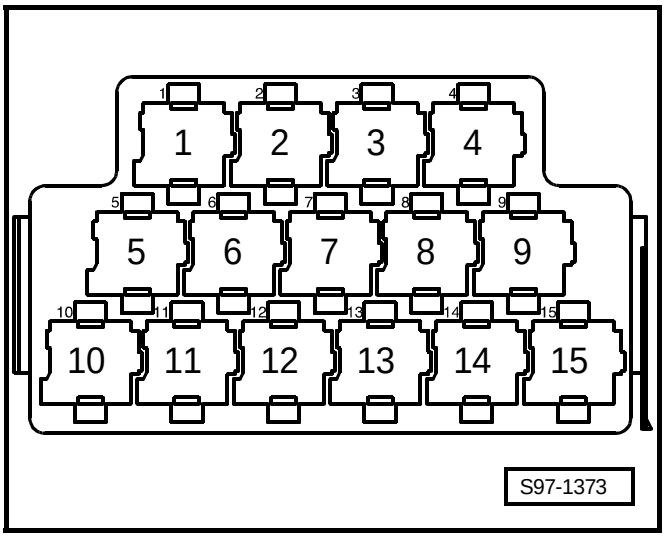
Testing the diesel direct injection system relay -J322-

The power supply of the injection system occurs via the diesel direct injection system relay -J322-. The precondition for closing of the relay is a voltage supply via terminal 15 to the diesel direct injection system control unit -J248-. This means that relay -J322- only receives ground (via the Diesel direct injection system control unit -J248-), if

the control unit -J248- receives a voltage supply via terminal 15.

Fitting location

The diesel direct injection system relay - J322- is located on the relay carrier in the driver's footwell on the left, relay base 12.



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

- Battery voltage at least 11.5 V
- Fuses in fuse holder on battery are O.K.

Inspect proper operation

– Remove lower part of the dash panel insert on the driver's side ⇒ Body work; Rep. Gr. 70.

– Switch on ignition.

Diesel direct injection system relay -J322 - must advance.

Note

The clicking of the relay is difficult to hear and can therefore best be felt.

If the relay is not activated:

Test control

– Switch off ignition.

– Connect test box -V.A.G 1598/31 - to wiring loom to engine control unit ⇒ **23-3** page 1.

– Interconnect bush 18 and bush 4 of the test box using an auxiliary line.

The relay must be activated.

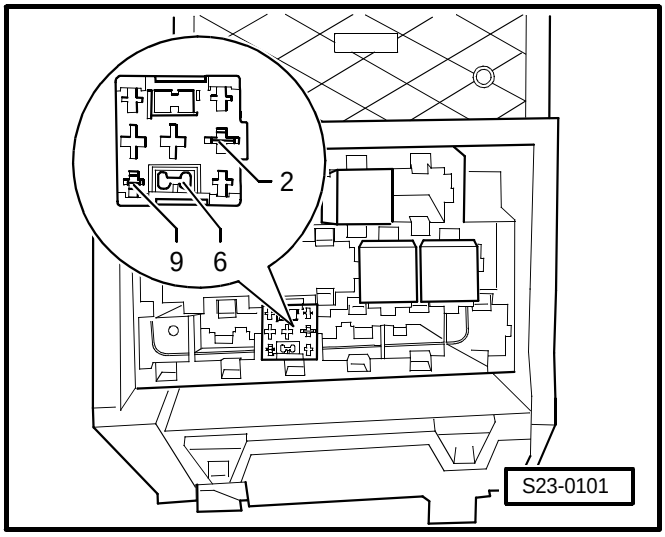
If the relay is now activated but did not open during the functional test:

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

If the relay is not activated:

– Pull diesel direct injection system relay -J322- out of the relay socket.

– Connect the handheld multimeter for voltage measurement to contact 2 and earth.



Specified value: approx. battery voltage

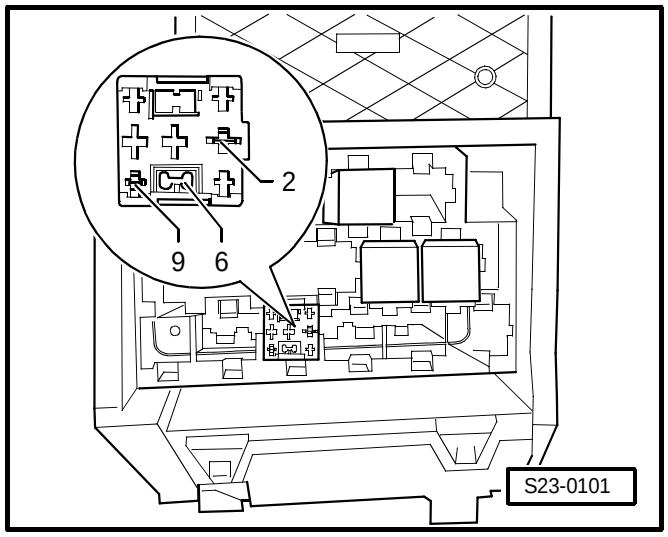
If the specified value is not reached:

– Testing the wiring ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

If the specified value is reached:

– Switch off ignition.

– Check the following wire for interruption or short-circuit to earth or positive:



Contact	Test box - V.A.G 1598/31- contact
9	18

– If necessary eliminate wire interruption or short-circuit.

If the wiring is O.K.:

– Replace the diesel direct injection system relay - J322-.

Check sender for coolant temperature -G62-

Special tools, test and measuring equipment and auxiliary items required

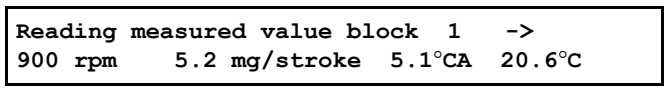
- Vehicle system tester -V.A.G 1552-
- Diagnostic cable -V.A.G 1551/3, 3A, 3B oder 3C-
- Hand multimeter (e.g. -V.A.G 1526 A-)
- Adapter cable set (e.g. -V.A.G 1594 C-)
- Test box -V.A.G 1598/31-
- Cooling spray

Test sequence

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

– Select function 08 „Read measured value block“ and display group number 001.

– Observe the coolant temperature in display field 4.



Specified value: the temperature reading must rise evenly

In the event of a fault the fuel temperature or value -5.4 °C is displayed instead.

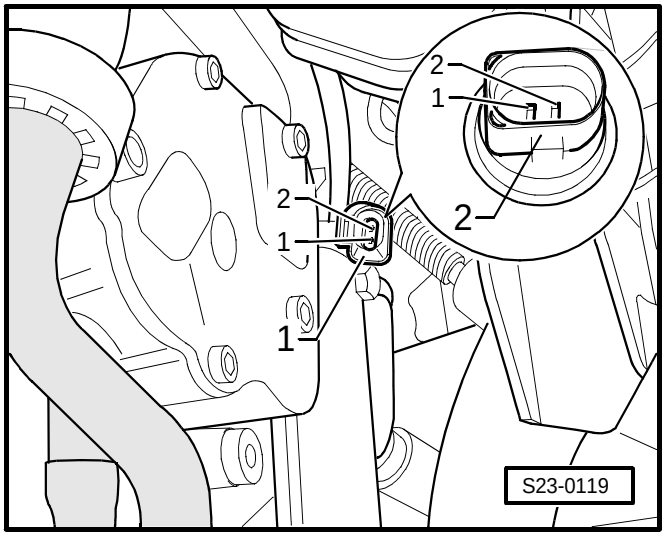
If an implausible value is displayed in display field 4 or if the fuel temperature is displayed instead:

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

– Switch off ignition.

– Remove the engine trim panel.

– Disconnect plug -1- from Coolant temperature sender (-G62-) -2-.
– Connect the handheld multimeter to measure the resistance onto both contacts of the coolant temperature sender (-G62-) -2-.

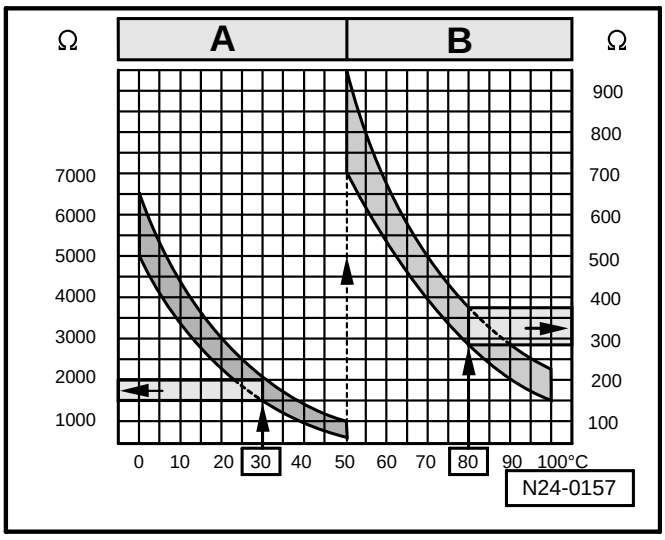


Specified value:

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



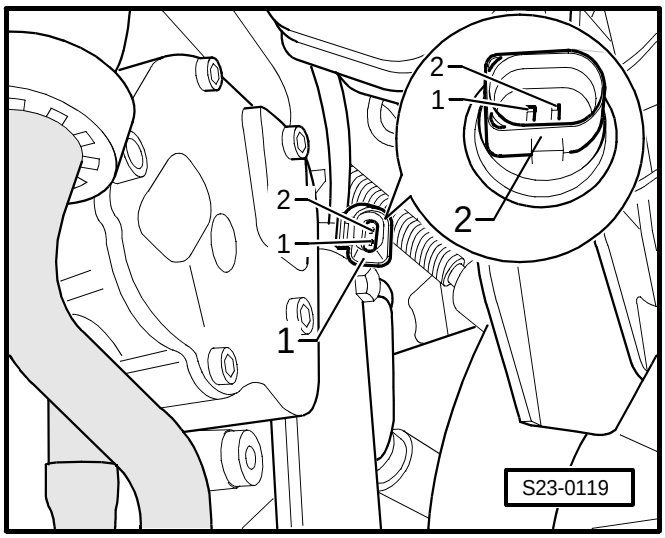
If the specified value is not reached:

– Replace the coolant temperature sender -G62 -.

If the specified value is reached:

– Connect test box -V.A.G 1598/31 - to wiring loom to engine control unit ⇒ **23-3** page 1.
– Test the following cable connections for open circuit and for short circuit to earth and to positive:

Connector -1-, contact	Test box -V.A.G 1598/31-, bush
1	112
2	104



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

Testing Intake manifold temperature sender -G72-

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 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 and select address word 01 „Engine electronics“ ⇒ Chapter 01-1.

– Select function 08 „Read measured value block“ and display group number 007.

– Observe intake manifold temperature in display field 3. ►

```
Reading measured value block  7   ->
15.4 °C     0 %     15.9 °C     16.7 °C
```

Specified value: approx. ambient temperature

In the event of a fault a replacement temperature of 136.8 °C is displayed.

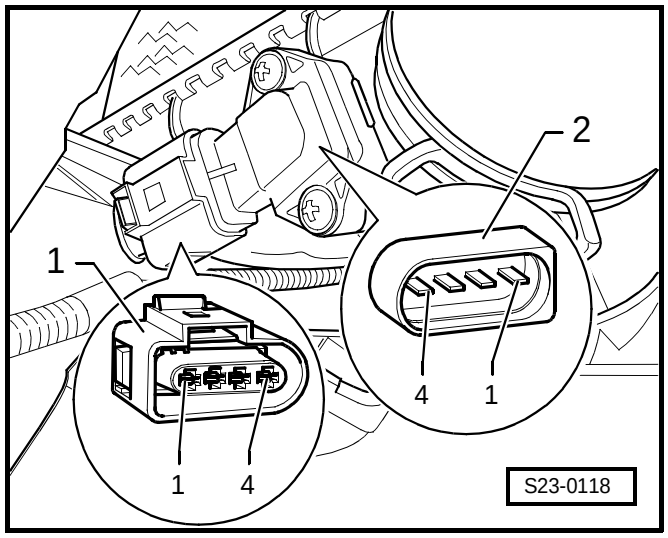
If an implausible value is displayed in display field 4 or if a replacement temperature of 136.8 °C is displayed instead:

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

– Switch off ignition.

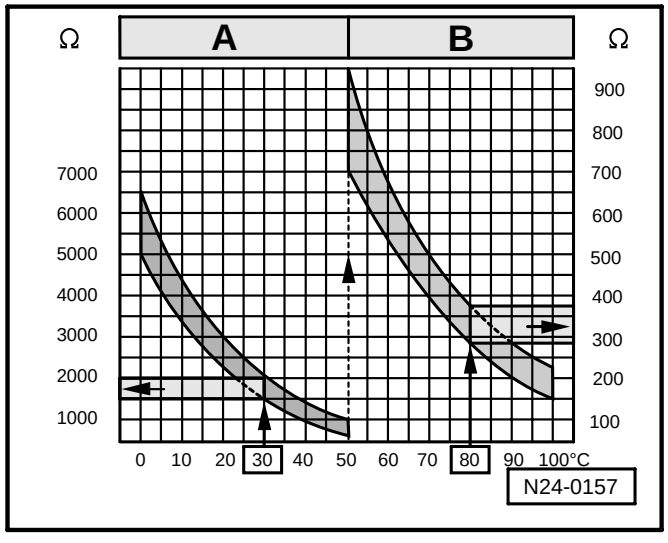
– Removing right headlights ⇒ Electrical System; Rep. Gr. 94.

– Disconnect plug -1- from Coolant temperature sender -G72- -2-. ►



– Connect the handheld multimeter to measure the resistance onto contacts -1- and -2- of the Intake manifold temperature sender -G72- -2-.

Specified value: ►



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

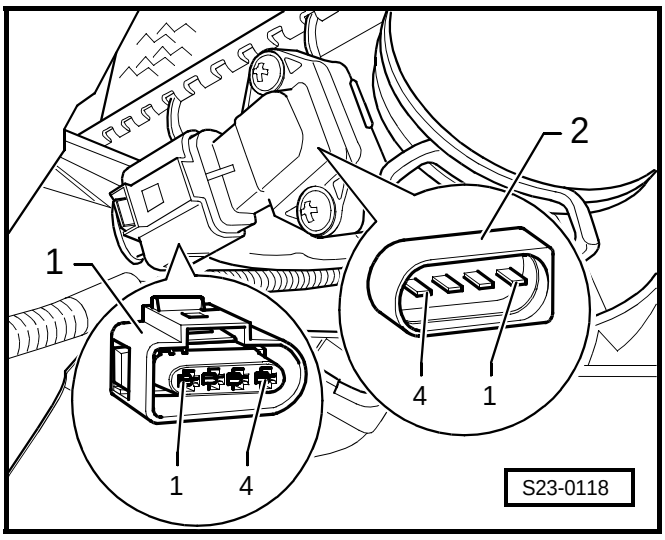
If the specified value is not reached:

– Replace the intake manifold temperature sender -G72-.

If the specified value is reached:

– Connect test box -V.A.G 1598/31 - to wiring loom to engine control unit ⇒ **23-3** page 1.
– Test the following cable connections for open circuit and for short circuit to earth and to positive:

Connector -1-, contact	Test box -V.A.G 1598/ 31-, bush
1	52
2	73



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

If the lines are not found to be faulty:

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

Testing Engine speed sender -G28-

The Engine speed sender -G28- is a speed and reference marking sender. The engine stops if there is no signal received.

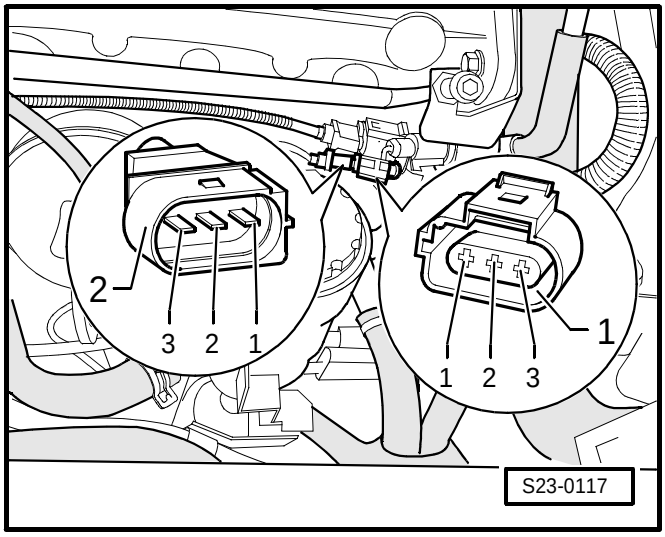
Special tools, test and measuring equipment and auxiliary items required

- 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 sequence

– Switch off ignition.
– Remove the engine trim panel.
– Disconnect the plug connection -1- of the engine speed sender -G28- -2-.
– Connect the handheld multimeter onto contacts 1+2 of plug -2- to measure the resistance.

Specified value: 450…550 Ω



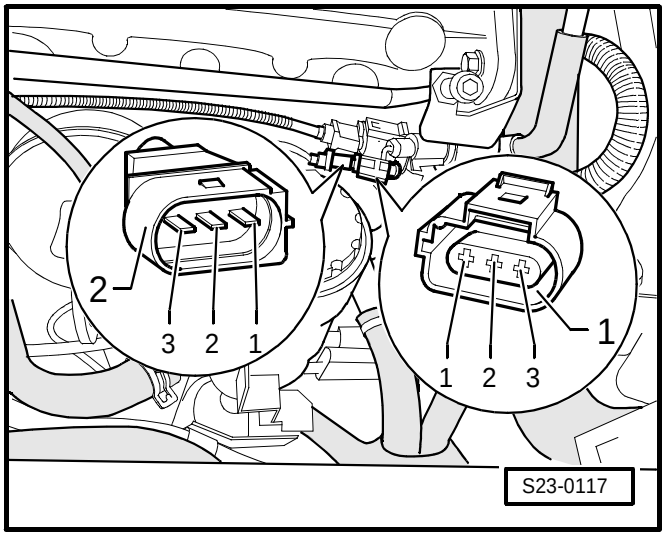
If the specified value is not reached:

– Replace engine speed sender -G28-.

If the specified value is reached:

– Connect test box -V.A.G 1598/31 - to wiring loom to engine control unit ⇒ **23-3** page 1.
– Test the following cable connections for open circuit and for short circuit to earth and to positive:

Connector -1-, contact	Test box -V.A.G 1598/ 31-, bush
1	110
2	102
3	102



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

If the lines are not found to be faulty:

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

Testing Intake manifold pressure sender -G71- and Altitude sender -F96-

[1)]

Special tools, test and measuring equipment and auxiliary items required

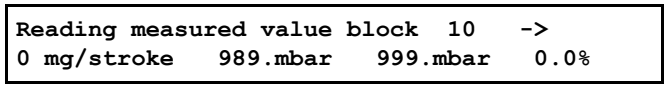
- Vehicle system tester -V.A.G 1552-
- Diagnostic cable -V.A.G 1551/3, 3A, 3B oder 3C-
- Hand multimeter (e.g. -V.A.G 1526 A-)
- Adapter cable set (e.g. -V.A.G 1594 C-)
- Test box -V.A.G 1598/31-
- Barometer

Test sequence

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

– Select function 08 „Read measured value block“ and display group number 010.

– Compare the displays in display field 2 (altitude sender - F96-) and in display field 3 (intake manifold pressure sender -G71-) with the display on the barometer.



Specified value: the pressures must correspond (±30 mbar)

Note

The display on the barometer serves as comparative value.

If the value in display field 2 is different:

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

– Switch off ignition.

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

If the value in display field 3 is different:

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

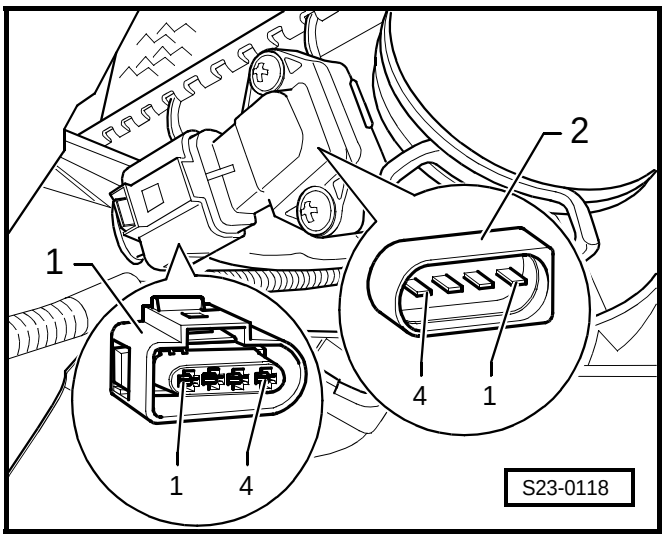
– Start the engine and select function 08 „Read measured value block“ and display group number 010.

[1)] The altitude sender is located in the diesel direct injection system control unit. The intake manifold pressure sender is a separate component and is located together with the intake manifold temperature sender in a common housing on the charge-air cooler.

Note

In order to disconnect the plug on the intake manifold pressure sender - G71- it is necessary to remove the right headlight ⇒ Electrical System; Rep. Gr. 94.

– Disconnect the plug -1- of the intake manifold pressure sender -G71- -2-.



– Observe the values shown in indicator fields 2 and 3.

```
Reading measured value block  10   ->
0 mg/stroke  989.mbar  999.mbar  0.0%
```

Values must fall steadily.

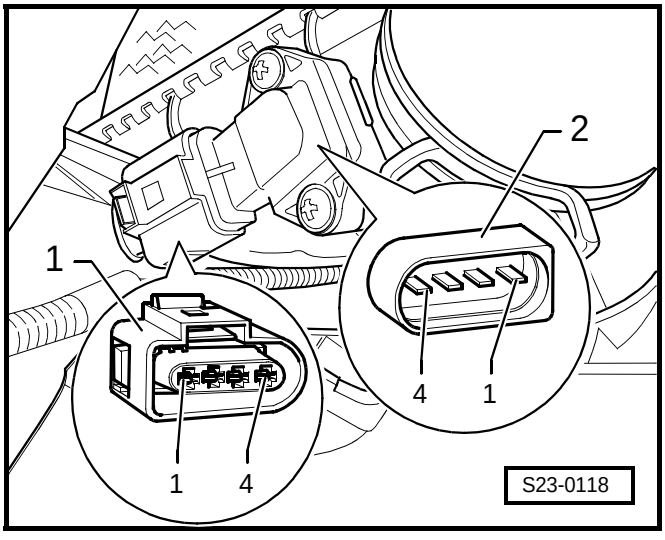
If the specified value is reached:

– Select function 06 „End output“ and confirm entry with Q.
– Switch off ignition.
– Replace the intake manifold pressure sender -G71- with intake manifold temperature sender -G72-.

If the specified value is not reached:

– Select function 06 „End output“ and confirm entry with Q.
– Switch off ignition.
– Connect test box -V.A.G 1598/31 - to wiring loom to engine control unit ⇒ **23-3** page 1.
– Test the following cable connections for open circuit and for short circuit to earth and to positive:

Connector -1-, contact	Test box -V.A.G 1598/ 31-, bush
1	52
3	31
4	71



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

If the lines are not found to be faulty:

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

Testing Fuel temperature sender -G81 -

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 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 (tick-over) and select address word 01 „Engine electronics“ ⇒ Chapter 01-1.

– Select function 08 „Read measured value block“ and display group number 007.

– Observe display in display field 1. ►

```
Reading measured value block 7  ->
15.4 °C     0 %      15.9 °C     16.7 °C
```

Specified value: approx. ambient temperature

In the event of a fault a replacement temperature of -5.4 °C is displayed.

If an implausible value is displayed in display field 1 or if a replacement temperature of -5.4 °C is displayed instead:

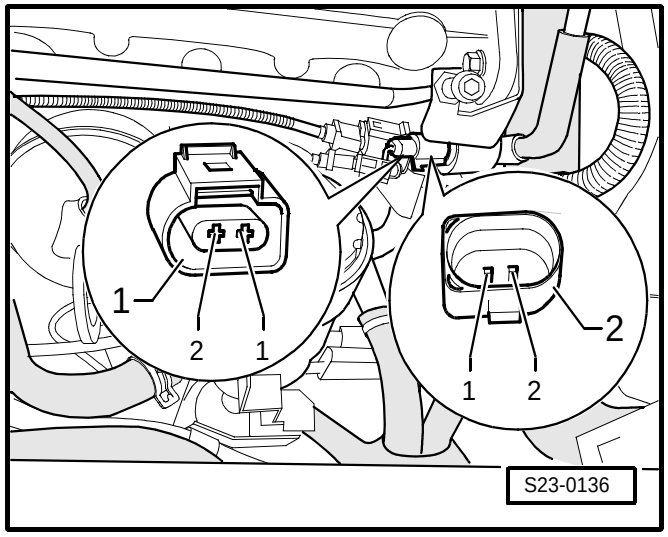
– Select function 06 „End output“ and confirm entry with Q.

– Switch off ignition.

– Remove the engine trim panel.

– Disconnect plug -1- from intake manifold temperature sender -G81- -2-. ►

– Connect the handheld multimeter onto contacts 1 and 2 of plug -2- to measure the resistance.



Specified value:

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.

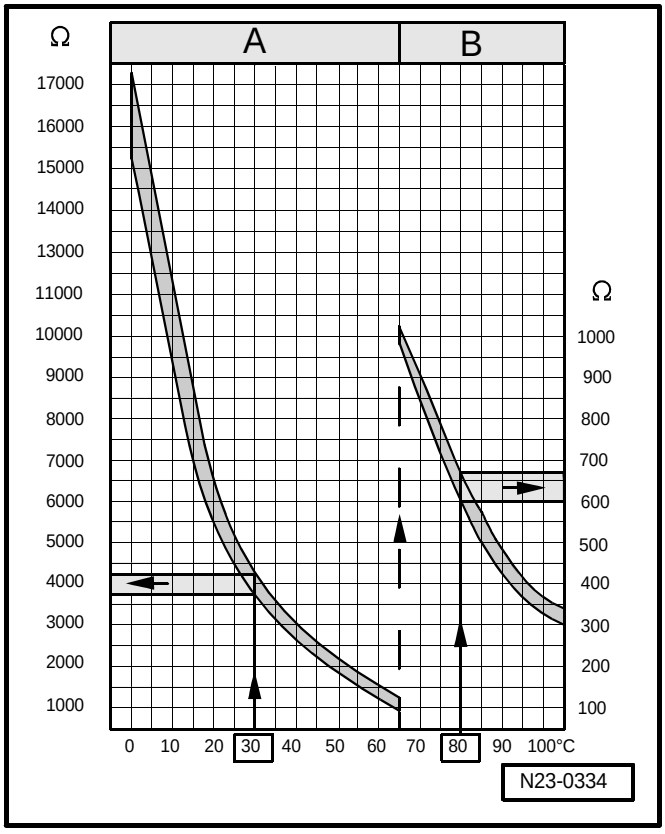
Read out examples:

- 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

If the specified value is not reached:

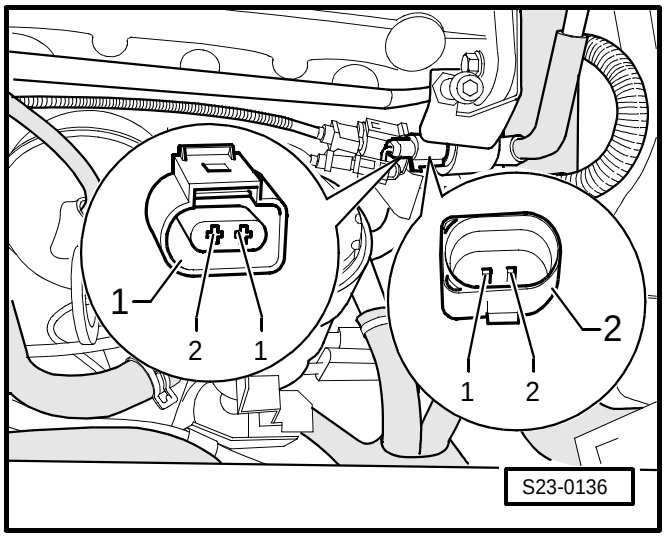
– Replace the fuel temperature sender -G81-.

If the specified value is reached:



– Connect the text box -V.A.G 1598/31 - to the wiring loom of the engine control unit ⇒ Chap. 23-3.
– Test the following cable connections for open circuit and for short circuit to earth and to positive:

Connector -1-, contact	Test box -V.A.G 1598/ 31-, bush
1	103
2	111



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

Testing the air mass meter -G70-

The air mass meter signal is required by the control unit to calculate the allowed injection rate and to control the exhaust gas recirculation. The lower the signal from the air mass meter the less fuel may be injected.

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 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 (tick-over) and select address word 01 „Engine electronics“ ⇒ Chapter 01-1.

– Select function 08 „Read measured value block“ and display group number 010.

– Observe display in display field 1. ►

```
Reading measured value block 10  ->
209 mg/stroke  989.mbar  999.mbar  0.0%
```

Specified value: 200 through to 320 mg/h

If the specified value is not reached:

– Test exhaust gas recirculation ⇒ Chap. 23-4.

If the specified value is reached:

Note

The V.A.G 1552 should be operated by a second person.

– The vehicle should be accelerated in such a way that engine revolutions of 1,500 rpm are achieved when the accelerator pedal is fully pressed down (in second gear for a vehicle with manual gearbox, in lever selection position 2 for an automatic gearbox).

– At approx. 3000 rpm read off display fields 1 and 4. The accelerator pedal (display field 4) must be fully pressed down at this stage.

Readout on display: ►

```
Reading measured value block  10  ->
780 mg/stroke  989.mbar  999.mbar 100 %
```

Specification in display field 1: above 700 mg/s

Specification in display field 4: 100 %

If the nominal value in display field 1 is not reached:

– Replace the air mass meter -G70-.

If display field 1 constantly displays 550 mg/stroke (fixed replacement temperature):

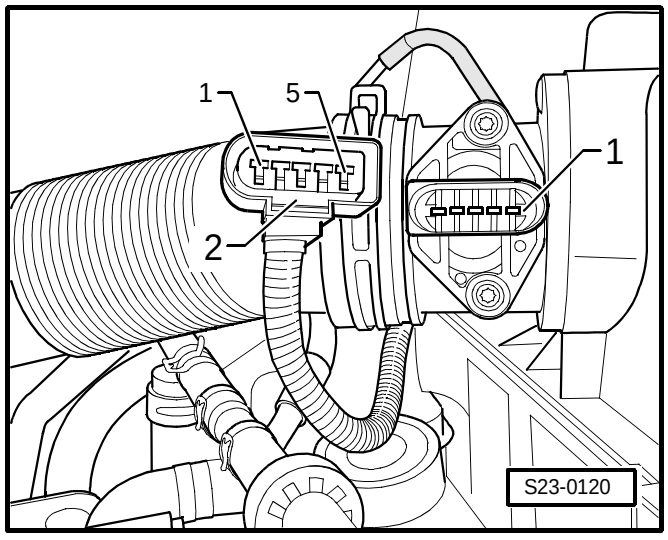
– Select function 06 „End output“ and confirm entry with Q.

– Switch off ignition.

– Disconnect plug connector -1- from the air mass meter -G70- -2-. ►

– Switch on ignition.

– Measure the voltage being applied to the following contacts using the hand multimeter:



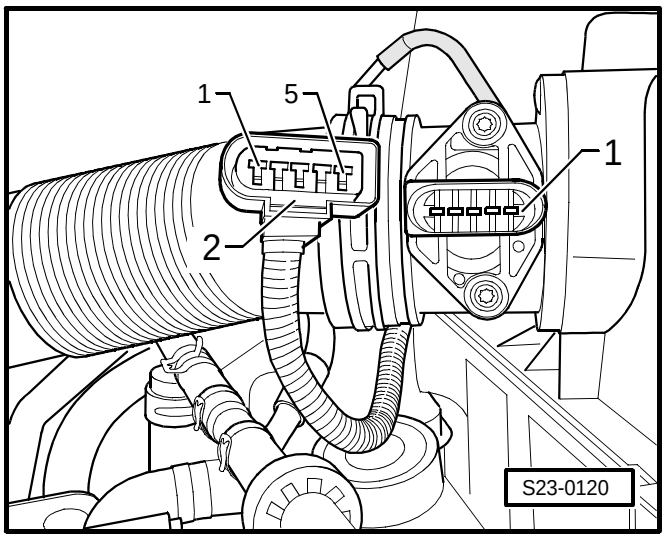
Connector -1-, contact	Specification
2 + earth	approx. battery voltage
2 + 3	approx. battery voltage
4 + earth	approx. 5 V
4 + 3	approx. 5 V

If the specified values are not reached:

– Switch off ignition.

– Connect the text box -V.A.G 1598/31 - to the wiring loom of the engine control unit ⇒ Chap. 23-3.
– Test the following cable connections for open circuit and for short circuit to earth and to positive:

Connector -1-, contact	Test box -V.A.G 1598/ 31-, bush
2	1 + 2
3	49
4	30
5	68



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

Inspecting the change-over of the intake manifold flap

Special tools, test and measuring equipment and auxiliary items required

- Hand vacuum pump (e.g. -V.A.G 1390-)
- 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-

Note

- *On vehicles 11.01 ➢ the change-over valve for intake manifold flap -N239- ia a component part of the valve block.*
- *Functional testing of the change-over valve for intake manifold flap -N239- can also be undertaken using the actuator diagnosis ⇒ Chapter 01-1.*

Inspect proper operation

– Remove the engine trim panel.
– Start engine and run in idle.
– Switch off ignition.
– Observe the setting lever on the intake manifold flap (2nd person required).

After the ignition is switched off the intake manifold flap must shut for approx. 3 seconds and then move back to its original position.

If the change-over with the intake manifold flap does not occur, perform the following tests:

– Check the change-over mechanics on the intake manifold flap for ease of movement. To this end activate the linkage by hand. The intake manifold flap must move easily.
– Check the functionality of the vacuum setting element using the hand vacuum pump.
– Check the vacuum line to ensure that it is attached properly and tightly.

If no fault is found on the mechanical components:

– Test the change-over valve for intake manifold flap -N239-.

Test sequence

– Pull out the plug on the change-over valve for intake manifold flap -N239-, if necessary from the valve block.
– Connect the handheld multimeter onto the contacts of the change-over valve for intake manifold flap -N239- to measure the resistance ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

  Specified value: 25....45 Ω

If the specified value is not reached:

– Replace the change-over valve for intake manifold flap -N239- or the valve block.

If the specified value is reached:

– Check lines to the change-over valve for intake manifold flap -N239- for breakages or short-circuiting ⇒ 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.

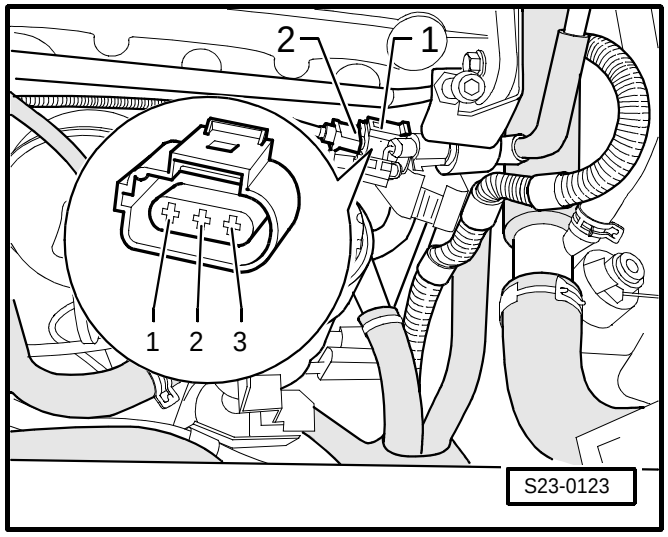
Inspecting thecamshaft position sensor -G40-

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 sequence

– Remove the engine trim panel.
– Unplug the plug -1- from the camshaft position sensor -G40- -2-. ►
– Switch on ignition.



– Connect up the hand multimeter and measure the voltage being applied to the following contacts:

Connector -1-, contact	Specification
1 + earth	approx. battery voltage
3 + battery positive terminal	approx. battery voltage

If the specified values are not reached:

Switch off ignition.

– Connect the text box -V.A.G 1598/31 - to the wiring loom of the engine control unit ⇒ Chap. 23-3.
– Check the following line connections for an open circuit:

Connector -1-, contact	Test box -V.A.G 1598/31-, bush
1	1 + 2
2	109
3	101

– Also test the cables for short circuiting with each other.
– If necessary eliminate wire interruption or short-circuit.

If the wires are not found to be faulty and if the voltage is OK:

– Replace the camshaft position sensor -G40-.

If the wires are not found to be faulty and if there is no voltage in the lines:

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

Testing unit injector 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, 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 (tick-over) and select address word 01 „Engine electronics“ ⇒ Chapter 01-1.

Note

*If the engine does not start check the resistances on the pump-nozzle unit valves ⇒ **23-3** page 15.*

– Select function 08 „Read measured value block“ and display group number 018.

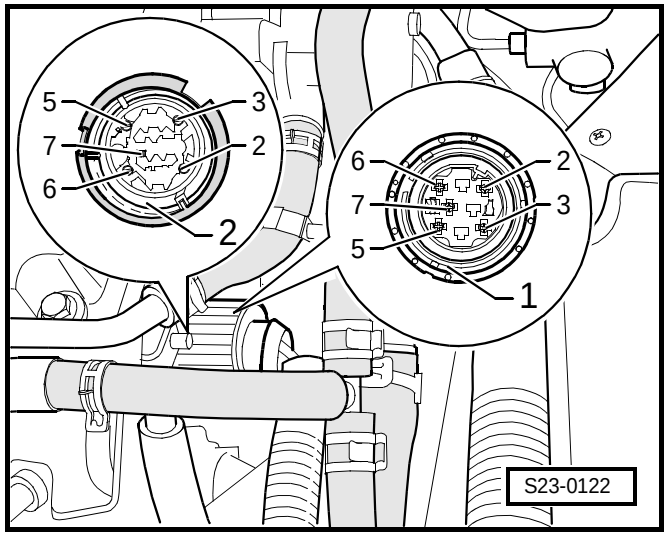
Display field 1 = Cyl. 1; 2 = cyl. 2; 3 = cyl. 3; 4 = cyl. 4

```
Reading measured value block  18 ->
 0          0           0          0
```

Specified value: in all indicator fields „0“.

If a number is displayed instead of zero:

– Select function 06 „End output“ and confirm entry with Q.
– Switch off ignition.
– Remove the engine trim panel.
– Test the resistance of the unit injector valve.
– Unplug plug -1- for the unit injector at the cylinder head.
– Connect handheld multimeter between the contacts of connector -2- to measure the resistance of the unit injector:



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: ∞ Ω

If the specified value is reached:

– Test cables to diesel direct injection system control unit -J248-:
– Connect the text box -V.A.G 1598/31 - to the wiring loom of the engine control unit ⇒ Chap. 23-3.
– Check the following line connections for an open circuit:

Connector -1-, contact	Test box -V.A.G 1598/ 31-, bush
7	114
6	121
5	116
3	117
2	118

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

If the specified values are not reached:

– Remove the upper timing belt cover and the cylinder head cover ⇒ 1.9/74 TDI engine - mechanics; Rep. Gr. 15
– 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.

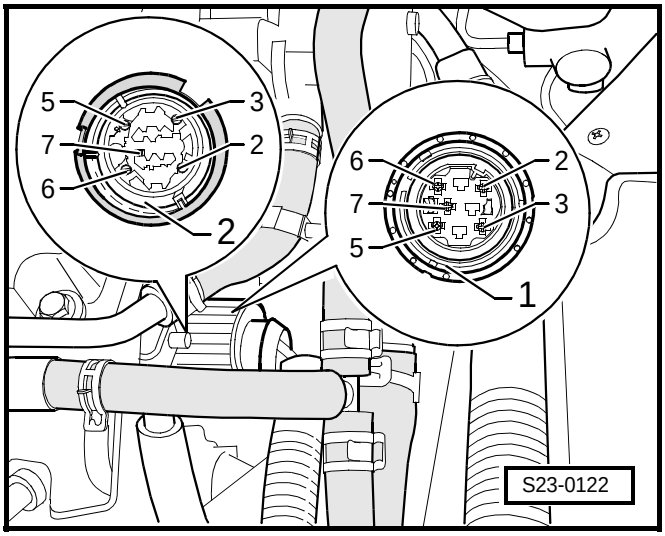
  Specified value: approx. 0.5 Ω

If the specified value is not reached:

– Replace faulty unit injector ⇒ Chapter 23-1.

If the specified value is reached:

– Test cables between the plug connection of unit injector and all 4 connectors for an open circuit. ►



Connector to 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

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

Testing Accelerator pedal position sender -G79-

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 1526 A-)
- Adapter cable set (e.g. -V.A.G 1594 C-)
- Test box -V.A.G 1598/31-
- Current flow diagram

Test sequence

– Connect vehicle system tester -V.A.G 1552-. Switch on the ignition and select engine electronics 01 „Engine electronics“ ⇒ Chapter 01-1.

– Select function 08 „Read measured value block“ and display group number 002.

– Check display of accelerator pedal position in display field 2. While doing so do not press the accelerator pedal. ►

```
Reading measured value block 2 ->
1/min       0.0 %       0 0 0      18.4 °C
```

Specified value: 0,0 %

– Check the additional display for the idle switch in display field 3.

Specified value: 0 1 0

– Slowly press the accelerator pedal and observe display fields 2 and 3. ►

```
Reading measured value block 2 ->
0/min      100.0 %      0 0 0      18.4 °C
```

- Display field 2: the accelerator pedal value must increase constantly.

  Nominal value at full throttle position: 100.0 %

- Display field 3: The value must become 0 0 0.

– Press [→].

– Select function 06 „End output“ and confirm entry with [Q].

– Switch off ignition.

If the final nominal value is not reached:

– Replace accelerator pedal position sender -G79- ⇒ 1.9/74 TDI engine - mechanics; Rep. Gr. 20 .

If the display does not change or changes irregularly:

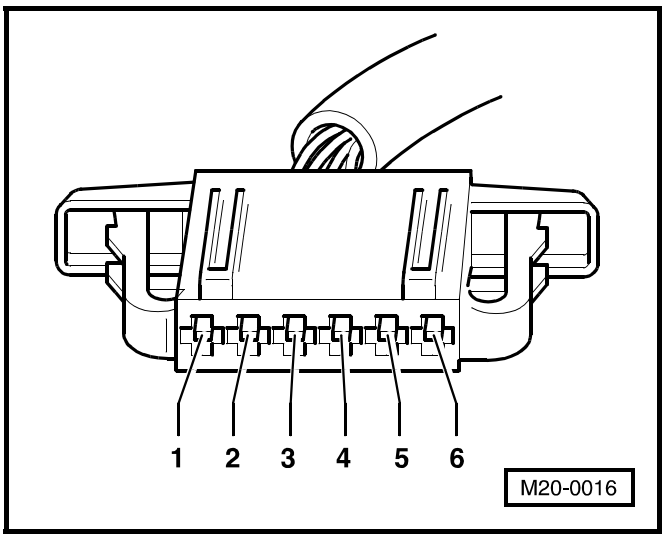
Then test the wires of the accelerator pedal position sender as follows:

– Connect the text box -V.A.G 1598/31 - to the wiring loom of the engine control unit ⇒ Chap. 23-3.

– 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 -G79-.
– Test the following cable connections for open circuit and for short circuit to earth and to positive:

6-pin plug on wiring loom, contact	Test box -V.A.G 1598/ 31-, bush
1	63
2	12
3	50
4	69
5	70
6	51



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

If the lines are not found to be faulty:

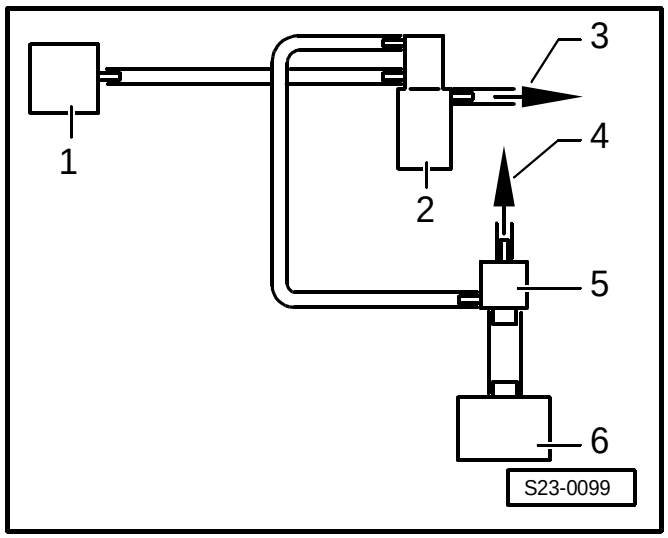
– Replace accelerator pedal position sender -G79- ⇒ 1.9/74 TDI engine - mechanics; Rep. Gr. 20 .

If the specified values are not reached:

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

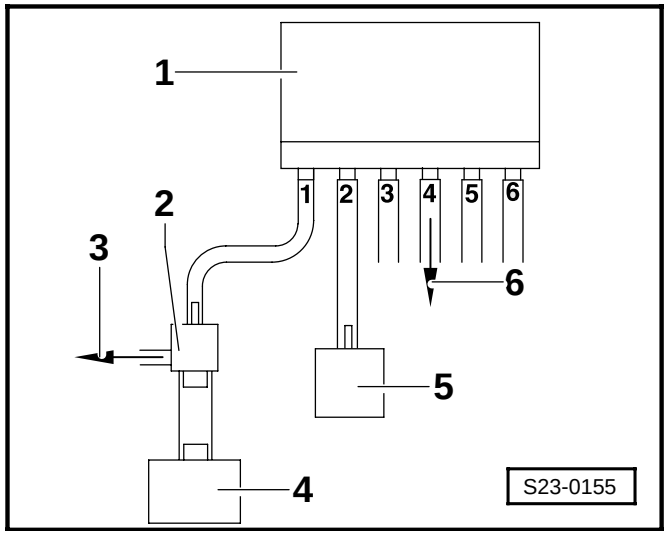
23-4 Testing exhaust gas recirculation

Hose installation diagram for vacuum hoses for exhaust gas recirculation for vehicles ➢ 11.01



1 - Mechanical exhaust gas recirculation valve
2 - Exhaust gas recirculation valve -N18-
3 - To air filter
4 - To the brake servo unit
5 - Non-return valve
6 - Vacuum pump

Hose installation diagram for vacuum hoses for exhaust gas recirculation for vehicles 11.01 ➢



1 - Valve block
2 - Non-return valve
3 - To the brake servo unit
4 - Vacuum pump
5 - Mechanical exhaust gas recirculation valve
6 - To air filter

Testing exhaust gas recirculation

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 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 number 003.

Note

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

The display in display field 2 must switch between EGR.active and EGR active every 10 seconds.

```
System in basic setting 3              ->
1400 rpm  EGRn.active  500 mg/s    20 %
```

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

Note

If a constant value of 539 mg/stroke and higher is shown in display field 3, test the air mass meter ⇒ Chapter 23-3.

EGRn.active:

Specification in display field 3: 410…600 mg/H
specified value in display field 4: 18…22 %

EGR active.

Specification in display field 3: 160…310 mg/H
specified value in display field 4: 63…67 %

If the specified values are not reached:

– Inspecting mechanical exhaust gas recirculation valve ⇒ 1.9/74 TDI Engine, Mechanics; Rep. Gr. 26.
– Check hose installation diagram for the vacuum hoses ⇒ **23-4** page 1.
– Testing Exhaust gas recirculation valve -N18 - ⇒ **23-4** page 2.

Testing Exhaust gas recirculation valve -N18-

Note

- *On vehicles 11.01 ➢ the exhaust gas recirculation valve -N18- is a component part of the valve block.*
- *Functional testing of the exhaust gas recirculation valve -N18- can also be undertaken using the actuator diagnosis ⇒ Chapter 01-1.*

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

- Fuse No. 24 OK
- Check that the diesel direct injection system relay -J322 - is OK ⇒ Chapter 23-3
- Battery voltage at least 11.5 volts

Test sequence

– Pull out the plug on the exhaust gas recirculation valve -N18-, if necessary from the valve block.
– Measure the resistance between the contacts of the exhaust gas recirculation valve -N18- ⇒ Current Flow

Diagrams, Electrical Fault Finding and Fitting Locations.

Specified value: 14…20 Ω

Note

At ambient temperatures the resistance is at the bottom of the tolerance range, while at operating temperature it is to be found at the top of the tolerance range.

If the specified value is not reached:

– Replace the exhaust gas recirculation valve -N18- or the valve block.

If the specified value is reached:

– Check the connecting lines to the exhaust gas recirculation valve -N18- for an open circuit and short-circuiting ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.
– Also check the line connections from fuse 24 to the relay for the diesel direct injection system -J322-.

If the lines are not found to be faulty:

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

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 Nos. 14, 24 and 48 O.K.
- Battery voltage at least 11.5 volts
- AC generator O.K.
- Fuses in fuse holder on battery 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.

– Enter function 08 „read measured value block“ and select display group number 012.

Readout on display:

– Read off value indicated in display field 3.

Specified value: approx. battery voltage (constant)

– Select function 06 „End output“ and confirm with Q.

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

– Switch off ignition.

– Connect test box -V.A.G 1598/31- at 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.

– Once again measure the voltage between the sockets.

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:

– Inspecting Diesel direct injection system relay - J322- ⇒ Chap. 23-3.

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.:

```
038906019AF 1.9l R4  EDC G000SG  1056 ->
Coding 00002                    WSC XXXXX
```

– Note Part No. of control unit and coding.

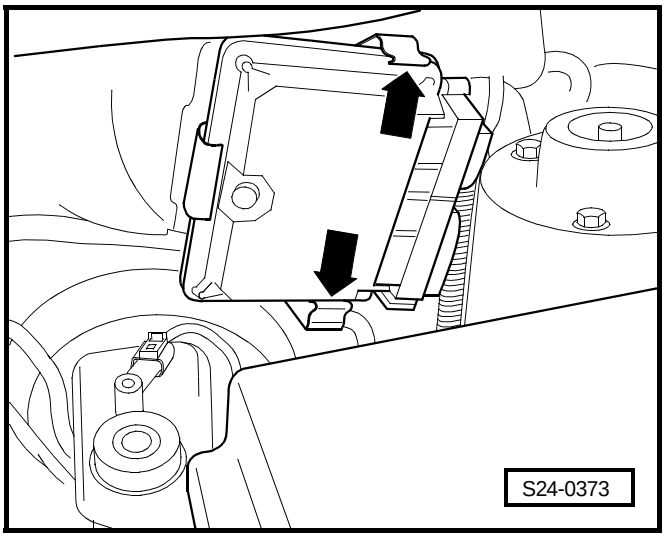
– Select function 06 „End output“ and confirm with Q.

– Switch off ignition.

– Remove air filter ⇒ Chap. 23-1.

– Release the connector catches and unplug the connectors of the diesel direct injection control unit -J248-.

– Press the clips -arrows- outwards and pull the engine control unit out sideways.



– 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 the new diesel direct injection system control unit -J248- to the immobiliser control unit ⇒ Electrical System; Rep. Gr. 96.

– For vehicles with cruise control system: 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

Comply with the applicable safety instructions 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.

– Select function 07 „coding control unit“.

Readout on display:

```
Coding control unit
Enter code number   xxxxx (0 -32767)
```

– Enter code number by referring to table of codes and confirm with Q.

Table of codes:

Control unit identification	WIV	Equipment		Code number
038 906 019 AF	no	with air conditioning	with ABS	00002
	no	without air conditioning	with ABS	00005
038 906 019 CN	no	with air conditioning	without ABS	00002
	no	without air conditioning	without ABS	00005
038 906 019 HT	no	with air conditioning	with ABS	00002
	no	without air conditioning	with ABS	00005
	no	with air conditioning	without ABS	00008
	no	without air conditioning	without ABS	00011
038 906 019 KT	yes	with air conditioning	with ABS	00002
	yes	without air conditioning	with ABS	00005
	yes	with air conditioning	without ABS	00008
	yes	without air conditioning	without ABS	00011
	no	with air conditioning	with ABS	00102
	no	without air conditioning	with ABS	00105
	no	with air conditioning	without ABS	00108
	no	without air conditioning	without ABS	00111

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

►
```
038906019AF 1.9l R4  EDC G000SG  1056 ->
Coding 00002                    WSC XXXXX
```

– Select function 06 „End output“ and confirm with Q.

– Switch ignition off and on again.

Note

The code entered is activated by switching the ignition off and on 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-

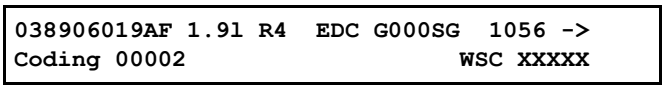
Test condition

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

Procedure

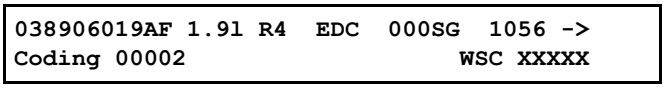
– Connect vehicle system tester -V.A.G 1552-. Switch ignition on and select address word 01 „Engine electronics“ ⇒ Chap. 01-1.

Readout on display, e.g.:



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

Readout on display:

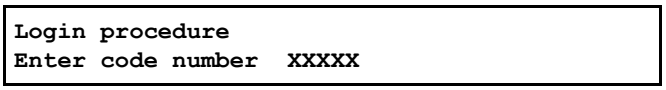


If „000SG“ is displayed, the cruise control system is not active

– Press (→).

– Select function 11 „login procedure“.

Readout on display:



– Enter code number as stated in the table.

Code number	Cruise control system
11463	Activate CCS
16167	Deactivate CCS

– Confirm with (Q).

– Select function 06 „End output“ and confirm with (Q).

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

23-6 Testing auxiliary signals

Testing signals from the air conditioning system

The air conditioning system is connected to the diesel direct injection system control unit -J248- via the data BUS. All signals of the air conditioning system from or to the diesel direct injection system control unit -J248- to the air conditioning system are transmitted via the data BUS.

Testing occurs via the measured value blocks of the air conditioning system and diesel direct injection system control unit -J248-.

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-

Test condition

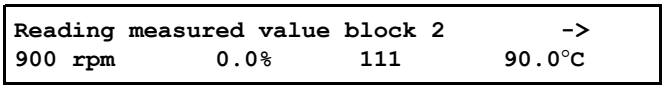
- No data bus fault⇒ Electrical System; Rep. Gr. 90; Gateway self-diagnosis

Test sequence

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

– Select function 08 „read measured value block“ and display group number 002.

– Read-out on display:



The air conditioning system is disconnected.

– Observe display field 3.

Nominal value: 0 1 0

– Switch on the air conditioning system.

– Observe display field 3.

Nominal value: 1 1 1

Meaning, if display positions = 1					
X			X	X	Operating position
				1	Air conditioning on
			1		Idling switch closed (accelerator pedal not pressed)
1					Speed increase with AC system on

– Switch off the air conditioning system.

– If the display does not occur as described:

– Test the air conditioning system ⇒ Heating, Air Conditioning; Rep. Gr. 01; self-diagnosis
– Test the data BUS. ⇒ Electrical System; Rep. Gr. 90; data BUS

Testing the speed signal

The 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

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

Test condition

- Function and display of the speedometer O.K., ⇒ Electrical System; Rep. Gr. 90

Test sequence

Note

- *The vehicle must be driven in order to test the speed signal. The assistance of a second person is required.*
- *Comply with the applicable safety instructions for test drives ⇒ Chap. 23-1.*

– Connect vehicle system tester -V.A.G 1552-. Leave the engine on and select the engine control unit with „Address word“ 01 ⇒ Chap. 01-1.
– Select function 08 „read measured value block“ and display group number 006.
– Read-out on display:

```
Reading measured value block 6        ->
0 km/h        000        0.0 %       255
```

– Determine by means of a test drive whether the driving speed is displayed in display field 1.

Caution!

Secure the vehicle system tester to the rear seat and operate from that position.

– If the driving speed is not displayed:
– Select function 06 „End output“ and confirm entry with Q.
– Switch off the ignition.
– Connect the test box -V.A.G 1598/31- to the wiring loom on the engine control unit ⇒ Chap. 23-3.

– Connect the handheld multimeter to measure the voltage between bushes 4/5+20 of the test box -V.A.G 1598/31-.
– Switch on the ignition.
– Raise vehicle until the front left wheel is free.
– Turn the left front wheel manually and observe the voltage display on the handheld multimeter.

  Nominal value: fluctuating between 0 and 4 V.

If the display does not fluctuate:

– Check the following wiring for interruption or short-circuit to earth or 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.

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

As the injection system operates with an accelerator pedal position sender (potentiometer), which may become defective, for reasons of safety the engine is cut-off when the brake is activated. To do so the brake light switch signal and additionally the brake pedal swicth signal in the diesel direct injection system control unit -J248- is required.

If the brake pedal is activated with the accelerator pedal constantly pressed, the engine immediately slows down to idling speed. A defective brake pedal switch may result in involuntary cut-off procedures.

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

Test condition

- Fuses No. 2 and No. 28 O.K.

Inspecting proper operation

– 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 08 „read measured value block“ and display group number 006.

Read-out on display:

```
Reading measured value block 6        ->
0 km/h       000          0 %         0
```

– Observe the display in display field 2

Nominal value:

X00 (if brake pedal not pressed)

X11 (if brake pedal pressed)

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

– Switch off the ignition.

– If the display does not occur as described:

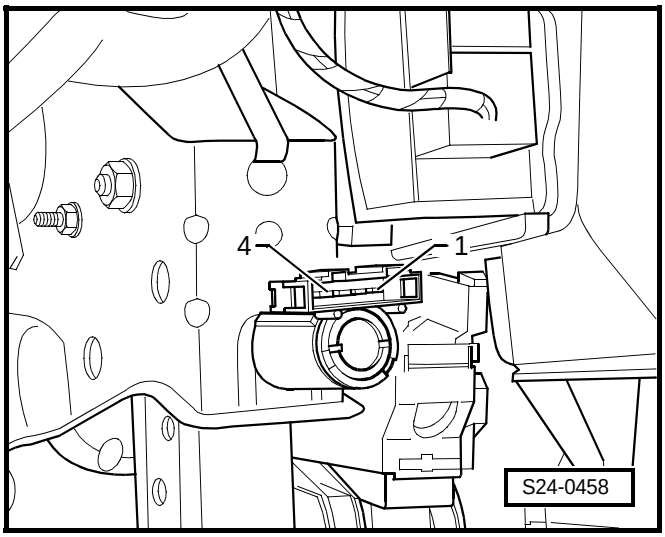
Testing switch

– Remove the bottom part of the dash panel on the driver's side ⇒ Body Work; Rep. Gr. 70.

– Remove the left footwell blower.

– Unplug the connector from the brake light/brake pedal switch.

– Connect the handheld multimeter for voltage measurement between contact 1 and 4.

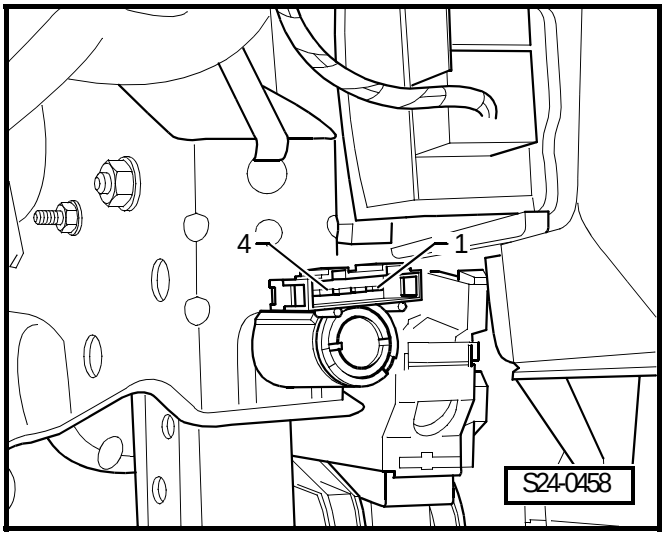


Nominal value: ∞ Ω (no continuity)

– Operate brake pedal.

Nominal value: max. 1.5 Ω

– Connect the handheld multimeter for voltage measurement between contact 2 and 3.



Nominal value: max. 1.5 Ω

– Operate brake pedal.

Nominal value: ∞ Ω (no continuity)

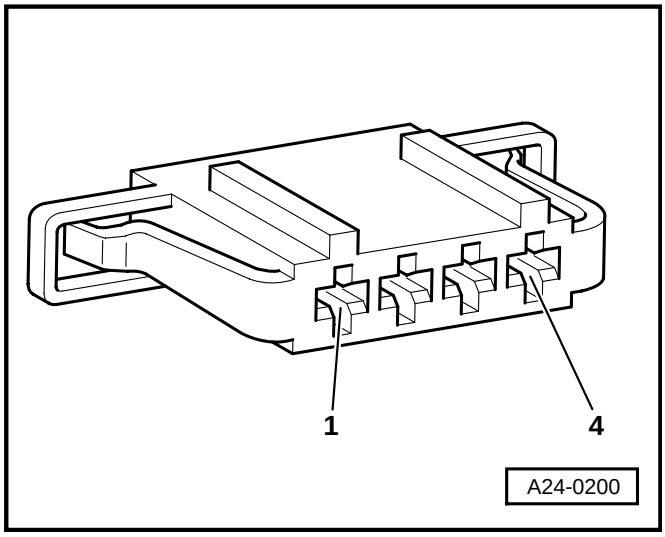
If the nominal values are not reached:

– Replace the brake light/brake pedal switch.

If the nominal values are reached:

Checking voltage supply

– Connect the handheld multimeter for voltage measurement as follows:



Plug connection contact	Nominal value
1 + earth	approx. battery voltage

– Switch on the ignition.

Plug connection contact	Nominal value
2 + earth	approx. battery voltage

If the nominal values are not reached:

– Check the cable between contact 1 of the plug and fuse 2 according to the current flow diagram for interruption ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.
– Check the cable between contact 2 of the plug and fuse 28 according to the current flow diagram for interruption ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

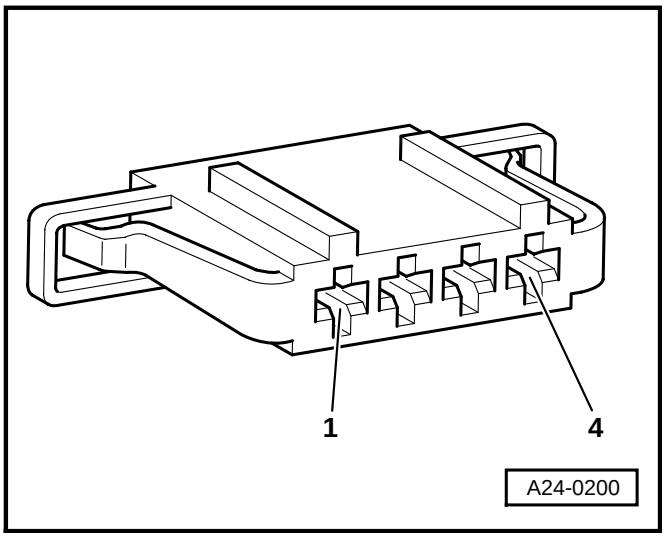
If the nominal values are reached:

Checking wires

– Switch off the ignition.
– Connect the test box -V.A.G 1598/31- on the wiring loom to the engine control unit ⇒ Chap. 23-3.
– Check the following wires for interruption or short-circuit to earth or positive:

Plug connection contact	Test box -V.A.G 1598/31- bush
3	65
4	32

– if necessary eliminate wire interruption or short-circuit.



Testing clutch pedal switch -F36-

The clutch pedal switch -F36- signal serves to avoid overspeed and load alteration shocks when declutching.

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

Test condition

- Fuse No. 28, O.K.

Inspecting proper operation

– 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 08 „read measured value block“ and display group number 006.
– Read-out on display:
– Observe the display in display field 2.

```
Reading measured value block 6        ->
0 km/h       000          0 %          0
```

Nominal value:

0XX (if clutch pedal not pressed)

1XX (if clutch pedal pressed)

– Select function 06 „End output“ and confirm entry with Q.
– Switch off the ignition.
– If the display does not occur as described:

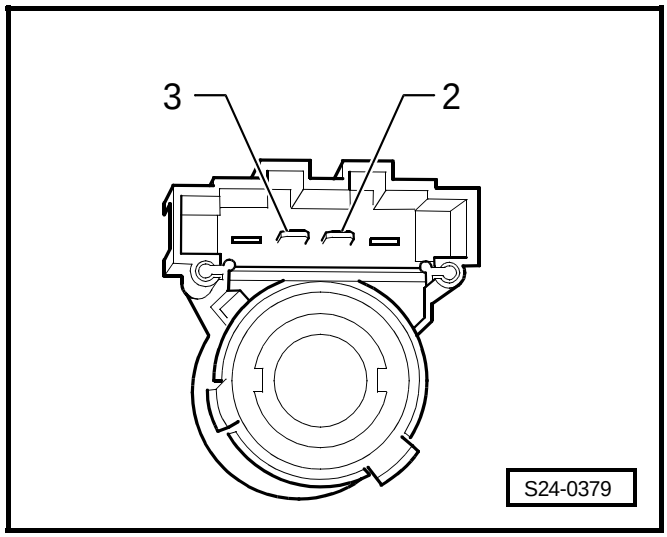
Testing switch

– Remove the bottom part of the dash panel on the driver's side ⇒ Body Work; Rep. Gr. 70.
– Unplug the connector at the clutch pedal switch.
– Connect the handheld multimeter for voltage measurement between contact 2 and +3. ►

Nominal value: max. 1.5 Ω

– Operate clutch pedal.

Nominal value: ∞ Ω (no continuity)



If the nominal value is not reached:

– Replace the clutch pedal switch.

If the nominal values are reached:

Checking voltage supply

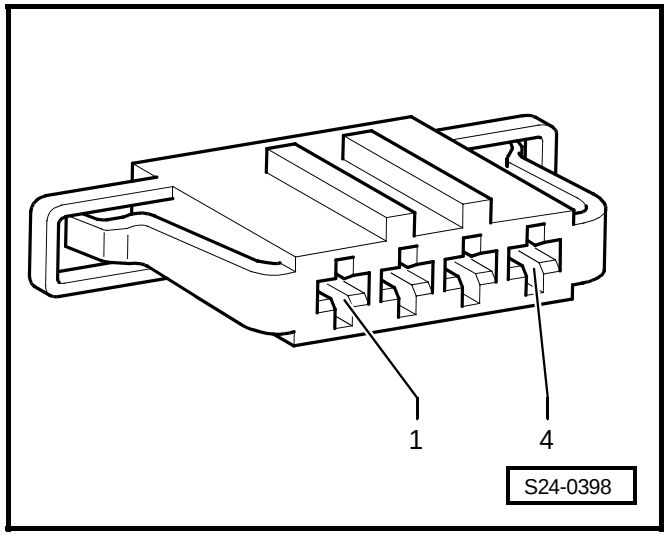
– Switch on the ignition.

Note

2- and 4-pin versions are used.

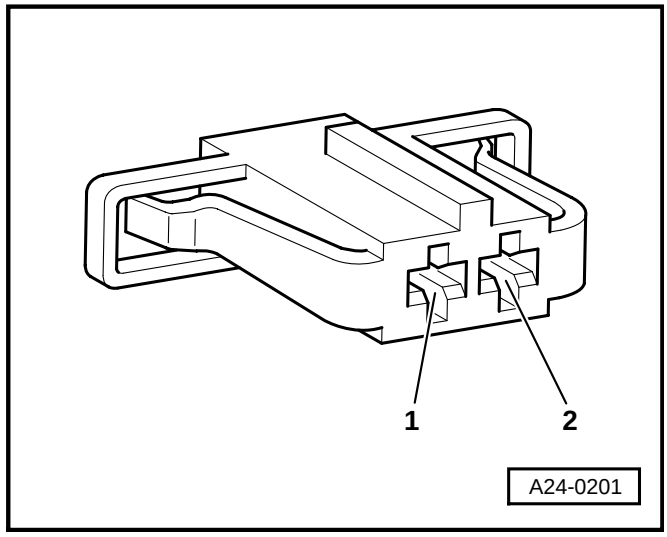
– Connect the handheld multimeter with adapter cables from -V.A.G 1594 A- to the 4-pin plug as follows: ►

4-pin plug on wiring loom, contact	Nominal value
2 + earth	approx. battery voltage



– Connect the handheld multimeter with adapter cables from -V.A.G 1594 A- to the 2-pin plug as follows: ►

2-pin plug on wiring loom, contact	Nominal value
1 + earth	approx. battery voltage



If the nominal value is not reached:

– Check the wiring of contact 2 (4-pin plug) or of contact 1 (2-pin plug) of the plug and fuse 28 for interruption or short-circuit to earth ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.
– if necessary eliminate wire interruption or short-circuit.

If the nominal value is reached:

Checking wires

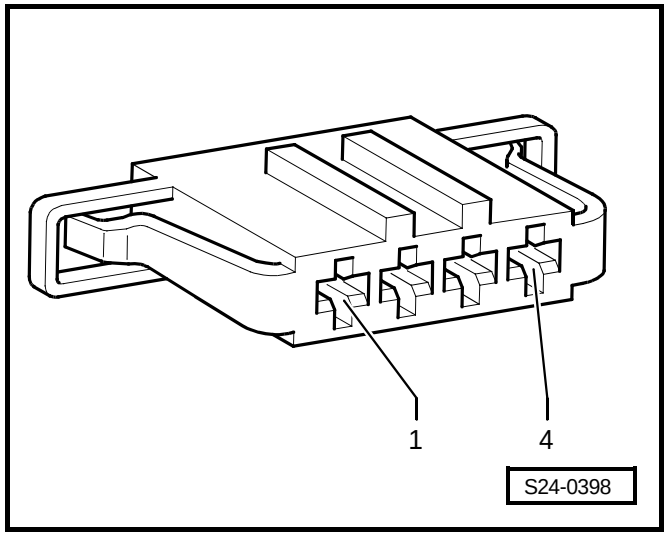
– Switch off the ignition.

Note

2- and 4-pin versions are used.

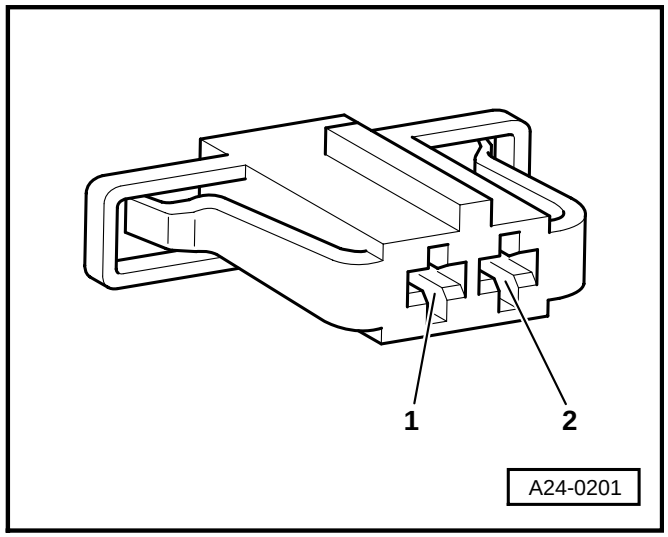
– Connect the test box -V.A.G 1598/31- on the wiring loom to the engine control unit ⇒ Chap. 23-3.

– Check the following wiring on the 4-pin plug for interruption or short-circuit to earth or positive:



4-pin plug on wiring loom, contact	Test box -V.A.G 1598/31- bush
3	66

– Check the following wiring on the 2-pin plug for interruption or short-circuit to earth or positive:



2-pin plug on wiring loom, contact	Test box -V.A.G 1598/31- bush
2	66

– if necessary eliminate wire interruption or short-circuit.

Checking the data BUS

Operation

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

- Data BUS drive
- Data BUS Comfort version

Indication of which control unit is connected to the data BUS drive or data BUS Comfort ⇒ Electrical System; Rep. Gr. 90; data BUS.

The control units are connected via two twisted data BUS cables (CAN_High and CAN_Low) and exchange information (messages). Both the engine control unit and the other control units detect missing information on the data BUS as faults.

Other information: ⇒ Self-study Programme No. 24; The CAN data bus ⇒ Electrical system; Rep. Gr. 90; data BUS

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 A-)
- Test box -V.A.G 1598/31-

Test conditions

- A data BUS fault was detected by the diesel direct injection system control unit -J248-. e.g. fault code 18055,18057 or 18097
- Coding of all control units O.K.

Test sequence

– Switch off the ignition.

– Remove the air filter ⇒ Chap. 23-1.

– Unlock the connector from the diesel direct injection system control unit -J248- and unplug.

– Connect the test box -V.A.G 1598/31- to the diesel direct injection system control unit -J248-. The control unit wiring loom is not connected ⇒ Chap. 23-3.

– Test the central terminating resistor in the diesel direct injection system control unit -J248-.

– To this end perform a resistance measurement between test box bushes 6 +7.

Nominal value: 60…72 Ω

If the resistance is not within the nominal value range:

– Replace the Diesel direct injection system control unit -J248- ⇒ Chap. 23-5.

If the resistance is within the nominal value range:

– Eliminate fault in the data BUS wiring or in the other data BUS control units according to ⇒ Electrical System; Rep. Gr. 90; data BUS.

Testing cruise control system

Apart from the control switch on the steering column switch the cruise control system (CCS) has no other components. All functions are performed by the diesel direct injection system control unit -J248-. The data transfer from the control switch to the diesel direct injection system control unit -J248- occurs with a data BUS via the vehicle voltage control unit -J519-. The CCS is active above a speed of 30 km/h.

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

Test conditions

- Fuse 28 O.K.
- Cruise control not activated.

– Activating cruise control system ⇒ Chap. 23-5

Inspecting proper operation

– 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 08 „read measured value block“ and display group number 006.

– Read-out on display:

```
Reading measured value block 6        ->
0 km/h       000       0 %             0
```

– Observe the display in display field 4.

Nominal value:

0 = CCS disconnected

1 = CCS connected

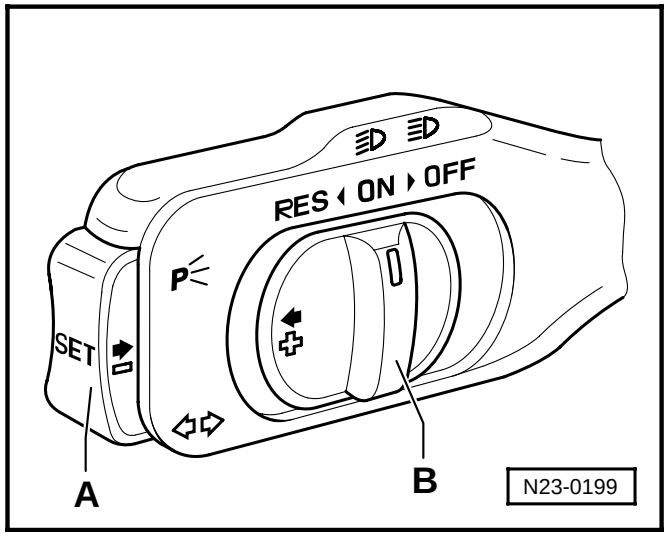
– If the display does not occur as described:

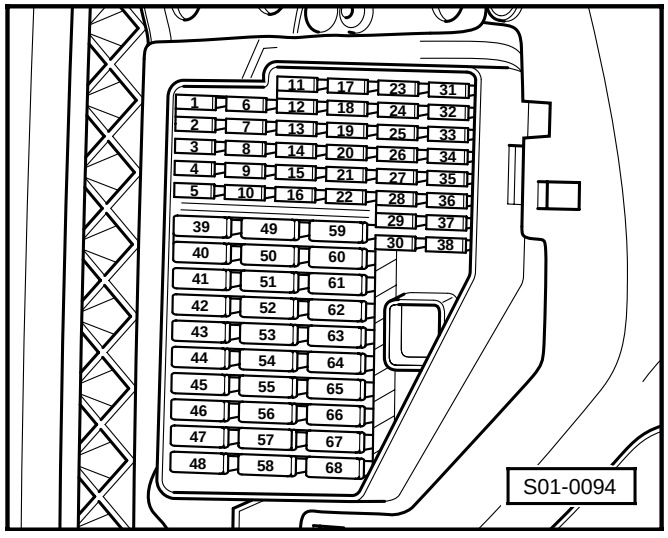
– Select function 06 „End output“ and confirm entry with Q.

– Switch off the ignition.

– Inspect the CC switch with the hand multimeter (resistance measurement) according to the following table:

Switch position of the CC switch	10-pin plug on CC switch, contact	Nominal value
Switch B on „ON“	4 + 5 6 + 7	max. 1.5 Ω
Switch B on „RES“	4 + 5 2 + 7 6 + 7	max. 1.5 Ω
Switch A pressed	3 + 7	max. 1.5 Ω
Switch B switched to „OFF“	6 + 7 4 + 5	max. 1.5 Ω ∞ Ω
Switch B switched to „OFF“	6 + 7 2 + 7 4 + 5	∞ Ω





– Test the wires of the CCS switch to the vehicle voltage control unit -J519- according to the current flow diagram.

– Test the wire from the CCS switch to fuse 28 for interruption or short-circuit.

– Connect the test box -V.A.G 1598/31- to the diesel direct injection system control unit -J248-. The control unit wiring loom is not connected ⇒ Chap. 23-3.

– Check the following wiring for interruption or short-circuit to earth or positive:

10-pin CCS plug contact	Test box -V.A.G 1598/31- bush
4	14
7	14

If the wires are not found to be faulty:

– Perform self-diagnosis of the vehicle voltage control unit -J519- ⇒ Electrical System; Rep. Gr. 90; Self-diagnosis of the vehicle voltage control unit
– Checking the data BUS ⇒ **23-6** page 7

28 – Glow Plug System

28-1 Testing preheating system

Inspecting proper operation

Special tools, test equipment and aids required

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

Test conditions

- Battery voltage min. 11.5 V
- Diesel direct injection system control unit -J248- O.K.
- Fuses in fuse holder on battery O.K.

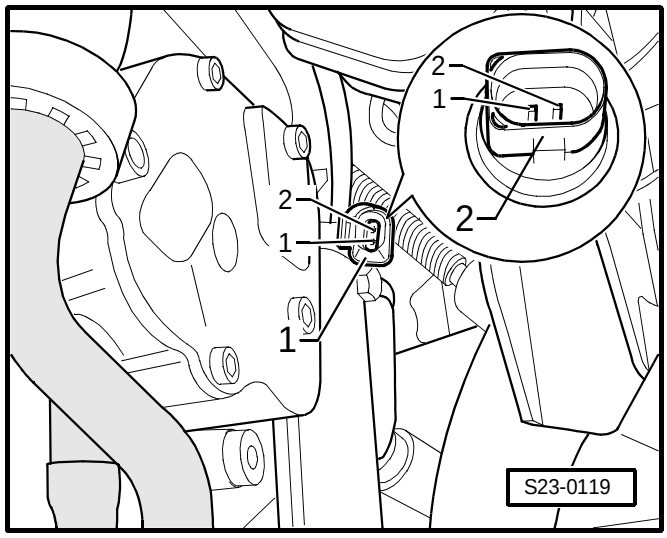
Test sequence

– Switch off the ignition.

– Remove engine cover.

To do so pull 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 sender engine condition „cold“ is simulated and when the ignition is switched on a corresponding preheating process is performed.

– Remove the glow plug connectors from the glow plugs.

– Connect the handheld multimeter for voltage measurement to a glow plug connector and engine mass.

– Switch on the 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, Fault Finding Electrics, 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, Fitting Locations.

Checking glow plugs

Special tools, test 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 min. 11.5 V

Test sequence

– Switch off the ignition.

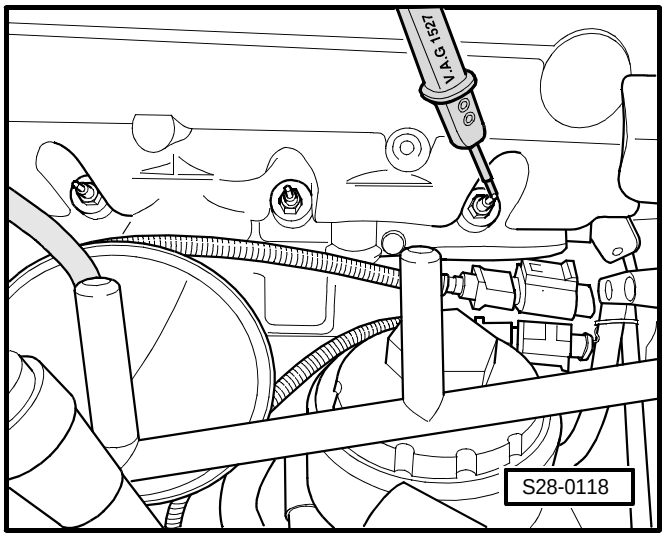
– Remove engine cover.

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

– Remove the glow plug connectors from the glow plugs.

– Connect the wire of the diode test lamp to battery positive (+).

– Apply the test prod of the diode test lamp to each glow plug in turn. ►



Diode lights up: Glow plug O.K.

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