Workshop Manual
FABIA 2000 ➢

Heating, Air Conditioning
Edition 08.99

Printed in Czech Republic
S00.5302.00.20

Printed in Czech Republic
S00.5302.00.20

List of Supplements to Workshop Manual

FABIA 2000 ➢

Heating, air conditioning unit

Edition 08.99

Supple-ment	Edition	Subject	Article Number
	08.99	Basic Edition	S00.5302.00.20
1	05.00	Supplement to Basic Edition	S00.5302.01.20
2	03.02	Torques, additions to text	S00.5302.02.20

Table of Contents

01 – Self-diagnosis

80 – Heating

87 – Air Conditioning Unit

01 – Self-diagnosis

01-1 Self-diagnosis of the Air Conditioning I

Initiating self-diagnosis

Operation

The air conditioning control unit receives information from the electrical and electronic components (information transmitters), which are processed by the control unit in compliance with the nominal values. The output signals of the control unit control the electrical components (actuators).

The air conditioning control unit -J301- is located behind the heating and air conditioning control.Both components form a unit that must not be disassembled.In order to rapidly determine the cause of the fault in the event of the failure of a component or a line interruption, the control unit is fitted with a fault memory that can be read with vehicle system tester -V.A.G 1552-.

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

Faults that only occur temporarily (sporadically) are displayed with the suffix „/SP“. Possible causes of sporadic faults are e.g. a loose contact or a momentary line interruption.If a sporadic fault no longer occurs after 50 engine starts, it is erased from the fault memory.

The displayed fault information refers to a fault table including indications on the possible causes as well as targeted repairs.

Vehicle system tester -V.A.G 1552- is used for self-diagnosis.Fault read-out scan tool -V.A.G 1551- may also be used.

Note!

The following versions only relate tovehicle system tester -V.A.G 1552- using the current program card.

Test preconditions for self-diagnosis

- All fuses must be OK in compliance with the current flow diagram.
- Battery voltage at least 11 Volts
- Check whether negative terminal of battery is properly connected.

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

Special tools, test and measuring equipment and auxiliary items required

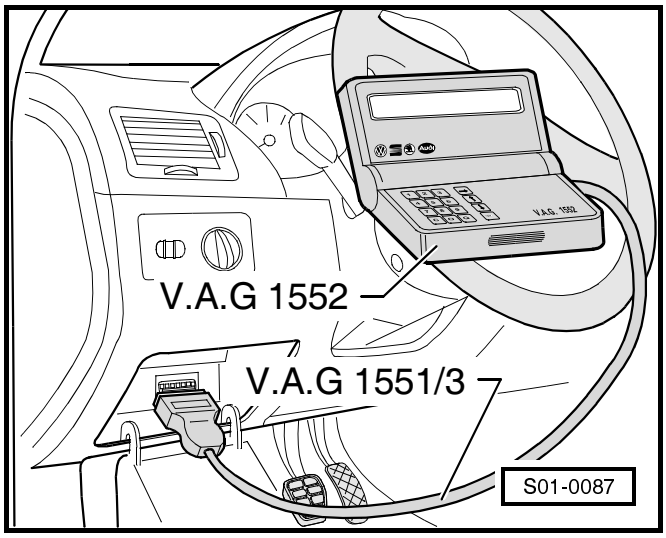
- Vehicle system tester -V.A.G 1552-
- Diagnostic cable -V.A.G 1551/3- or -V.A.G 1551/3 A-

Work sequence

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

– Unclip the cover and fold down.

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



– Switch on ignition.

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

Read-out on display:

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

Note!

- *If because of an input error „data transfer fault“is displayed, remove the cable from the vehicle system tester, re-connect and repeat 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.
```

– Wth „address word“ 08 select the air conditioning control unit.

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

```
6Y0820045    Air conditioning   X0731 ->
```

- 6Y0820045 = Part No. of the control unit (for current control unit version see spare parts catalogue)
- Air conditioning = system denomination
- X0731 = Data status (Software version of the control unit)

– Press (→).

Read-out on display:

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

– Further procedure, see repair sequences.

Self-diagnosis functions

The following functions are possible:

02 - Interrogating fault memory ⇒ **01-1** page 3
03 - Actuator diagnosis ⇒ **01-1** page 4
04 - Basic setting ⇒ **01-1** page 5
05 - Erasing fault memory ⇒ **01-1** page 4
06 - Ending output ⇒ **01-1** page 5
08 - Reading measured value block ⇒ Chap. 01-3

Interrogate and erase fault memory

Interrogating fault memory

– Connect vehicle system tester -V.A.G 1552-.Switch on the ignition and with „address word“ 08 select the control unit for air conditioning ⇒ **01-1** page 2.

Read-out on display:

– Select function 02 „Interrogate fault memory“.

The display shows the number of faults stored in the memory or „ no fault detected! “. will be displayed.

If no fault is stored in the memory:

– Press (→).

Read-out on display:

– Ending output ⇒ **01-1** page 5.

If one or more faults are stored in the memory:

– Press (→).

The stored faults are displayed in sequence.

– Press (→).

Read-out on display:

– Ending output ⇒ **01-1** page 5.

– Refer to the fault table to remove the indicated faults ⇒ Section 01-2 .

Note!

During testing and installation other control units may also detect faults, e.g. pulled-out connectors.This is why you must conclude the self-diagnosis by interrogating and erasing the fault memories of all control units.For this you must proceed as follows:

– With address word 00 select „automatic test sequence“.

The -V.A.G 1552- sends all known address words in sequence.

Erasing fault memory

Test conditions

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

After interrogating the fault memory:

Read-out on display:

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

– Select function 05 „Erase fault memory“.

Read-out on display:

```
Vehicle system test                 ->
Fault memory erased
```

Note!

If the ignition has been switched off between „ interrogate fault memory “ and „ erase fault memory “, the fault memory will not be erased.

– Press →.

– Ending output ⇒ **01-1** page 5.

Final control diagnosis

The final control diagnosis performs the following tests:

- Functional test of the two control motors (control motor for temperature flap -V68- and control motor for fresh-air/circulating air flap -V154-).
- Test the regulating valve for compressor, air conditioning -N280-.
- Both blowers for coolant are activated.
- All sensors are checked.

Note!

- *Final control diagnosis must be performed with the engine stopped, the ignition on and the air conditioning off.*
- *This function may be repeated a number of times if necessary.*

– Connect vehicle system tester -V.A.G 1552-.Switch on the ignition and with „address word“ 08 select the control unit for air conditioning ⇒ **01-1** page 2.

Read-out on display:

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

– Select function 03 „final control diagnosis“.

Read-out on display:

```
Final control diagnosis             ->
Self-test
```

– Press → after having activated the two blower motors.

Read-out on display:

```
Final control diagnosis             ->
END
```

– Final control diagnosis is completed when „END“ is displayed.

– Press →.

– Subsequently interrogate the fault memory of the air conditioning control unit ⇒ **01-1** page 3.

Basic setting

The function „basic setting“ must be performed after:

- the air conditioning control unit -J301- has been replaced.
- the control motor of the temperature flap -V68- or the control motor for fresh-air/circulating air flap -V154- has been replaced.

– Connect vehicle system tester -V.A.G 1552-.Switch on the ignition and with „address word“ 08 select the control unit for air conditioning ⇒ **01-1** page 2.

Read-out on display (function selection):

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

– Select function 04 „basic setting“ and display group number 001.

Note!

Thecontrol motor for temperature flap -V68- and control motor for fresh-air/circulating air flap -V154- are activated successively.Their final settings (resistance values of the potentiometer built into the control motor) is stored by the air conditioning control unit -J301-.

Read-out on display:

```
System in basic setting       1       ->
XXX          XXX
```

Note!

The motions of the two control motors can be monitored on the display. The changes in the feedback values do not indicate a possibly faulty control motor.

Read-out on display:

```
System in basic setting       1       ->
0             0
```

Display „0“ indicates that the basic setting is completed.

– Press (→).

– Subsequently interrogate the fault memory of the air conditioning control unit ⇒ **01-1** page 3.

Ending output

Read-out on display:

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

– Select function 06 „end output“.

Read-out on display:

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

– Switch off ignition.

– Disconnect plug connection from vehicle system tester -V.A.G 1552-.

01-2 Self-diagnosis of the Air Conditioning II

Fault table

Note!

- *All the possible faults which can be detected by the air conditioning system control unit -J301- and can be displayed by -V.A.G 1552- are listed below according to the fault code.*
- *If faults only occur occasionally, these faults are displayed as „sporadic faults“ („SP“).*
- *If parts are output as faulty:First check the cables and connectors to these parts as well as the earth leads of the system by referring to the current diagram.Only if no fault is detected here should the part be replaced.This applies in particular for faults that are output as „ sporadically occurred “(SP) faults.*
- *After repair always interrogate the fault memory again using vehicle system tester -V.A.G 1552- and erase the memory.*
- *If in spite of a problem with the heating/air conditioning electronics no fault is detected, function „final control diagnosis 03“ ⇒ Chap.01-1 or function „read measured value block 08“ ⇒ Chap.01-3 must be performed. If applicable problem-related fault finding without self-diagnosis must be performed.*
- *If the display reads vehicle system tester -V.A.G 1552- „look up information in the documentation“, the required text is to be found in the fault table according to the fault code.*

Read-out on -V.A.G 1552-		Possible cause of fault	Rectifying fault
00538 Reference voltage	Signal too great Signal too small	♦ Short circuit or open circuit on wiring or plug connections to air conditioning system control unit -J301-	– Check wiring and plug connections to the air conditioning system control unit -J301- according to the current flow diagram.
		♦ The temperature flap control motor -V68- or the fresh/re-circulating air flap control motor -V154- is defective.	– Analysing measured value block 004 and 005 ⇒ Chap. 01-3 – Performing final control diagnosis (function 03) ⇒ Chap. 01-1 – Successively remove plug connections on the temperature flap control motor -V68- and on the fresh/re-circulating air flap control motor -V154-, erase fault memory and interrogate again ⇒ Chap. 01-1. If the fault „reference voltage“ is no longer detected, replace the corresponding control motor causing the fault once the connector is plugged in.
		♦ Air conditioning system control unit -J301- defective	– If necessary replace the air conditioning system control unit -J301- ⇒ Chap. 87-10 and perform basic setting (function 04).

Read-out on -V.A.G 1552-		Possible cause of fault	Rectifying fault
00576 Terminal 15	Signal too high	♦ Voltage regulator on AC generator defective	– Inspect AC generator ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
		♦ Wiring or plug connections to the air conditioning system control unit -J301- defective	– Check wiring and plug connections to the air conditioning system control unit -J301- according to the current flow diagram.
	Signal too low	♦ Battery discharged	– Check battery ⇒ electrical system; Rep. Gr. 27
		♦ AC generator defective	– Check AC generator ⇒ electrical system; Rep. Gr. 27
		♦ Wiring or plug connections to the air conditioning system control unit -J301- defective	– Check wiring and plug connections to the air conditioning system control unit -J301- according to the current flow diagram.
	Open circuit/Short-circuit to earth	♦ Open circuit or short-circuit to earth on wiring or plug connections to air conditioning system control unit -J301-	– Check wiring and plug connections to the air conditioning system control unit -J301- according to the current flow diagram.
00705 Relay for radiator fan 1st speed -J279 a)	Short-circuit to positive terminal	♦ Short-circuit to positive terminal on wiring or plug connections to the radiator fan control unit -J293-	– Check wiring and plug connections to the radiator fan control unit -J293- according to the current flow diagram.
		♦ -J293- defective	– -J293-replace⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
	Open circuit/Short-circuit to earth	♦ Open circuit or short-circuit to earth on wiring or plug connections to radiator fan control unit -J293-	– Check wiring and plug connections to the radiator fan control unit -J293- according to the current flow diagram.
		♦ -J293- defective	– -J293-replace⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
00706 Relay for radiator fan 2nd speed -J513 a)	Short-circuit to positive terminal	♦ Short-circuit to positive terminal on wiring or plug connections to the radiator fan control unit -J293-	– Check wiring and plug connections to the radiator fan control unit -J293- according to the current flow diagram.
		♦ -J293- defective	– -J293- replace ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations
	Open circuit/Short-circuit to earth	♦ Open circuit or short-circuit to earth on wiring or plug connections to radiator fan control unit -J293-	– Check wiring and plug connections to the radiator fan control unit -J293- according to the current flow diagram.
		♦ -J293- defective	– -J293- replace ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations

a) The radiator fan relay 1st speed -J279- and the radiator fan relay 2nd speed -J513- are integrated in the Radiator fan control unit -J293-.

Read-out on -V.A.G 1552-		Possible cause of fault	Rectifying fault
00818 Evaporator vent temperature sender -G263	Short-circuit to earth	♦ Short-circuit to earth on wiring or plug connections to the evaporator vent temperature sender -G263- ♦ -G263- defective	– Check wiring and plug connections to the evaporator vent temperature sender -G263- according to the current flow diagram. – Reading measured value block 002 ⇒ Chap. 01-3 – replacing -G263- ⇒ Chap. 87-8
	Open circuit/Short-circuit to pos. term.	♦ Open circuit or short-circuit to positive terminal on wiring or plug connections to the evaporator vent temperature sender -G263- ♦ -G263- defective	– Check wiring and plug connections to the evaporator vent temperature sender -G263- according to the current flow diagram. – Reading measured value block 002 ⇒ Chap. 01-3 – replacing -G263- ⇒ Chap. 87-8

Read-out on -V.A.G 1552-		Possible cause of fault	Rectifying fault
00819 High pressure sender -G65	Short-circuit to positive terminal	♦ Short-circuit to positive terminal or plug connections to the high pressure sender -G65- ♦ -G65- defective	– Check wiring and plug connections to the high pressure sender -G65- in accordance with the current flow diagram – Reading measured value block 002 ⇒ Chap. 01-3 – replacing -G65- ⇒ Chap. 87-6
	Open circuit/Short-circuit to earth	♦ Open circuit or short-circuit to earth on wiring or plug connections to high pressure sender -G65- ♦ -G65- defective	– Check wiring and plug connections to the high pressure sender -G65- in accordance with the current flow diagram – Reading measured value block 002 ⇒ Chap. 01-3 – replacing -G65- ⇒ Chap. 87-6
	Signal too great Signal too small	♦ Open circuit or short-circuit to earth or positive terminal on wiring or plug connections between high pressure sender -G65- and air conditioning system control unit -J301- ♦ Faults in the refrigerant circuit (positive pressure or negative pressure) ♦ -G65- defective ♦ Compressor regulating valve, air conditioning system -N280- defective ♦ Air conditioning system control unit -J301- defective	– Check wiring and plug connections to the high pressure sender -G65- in accordance with the current flow diagram – Proceed with fault finding without self-diagnosis – replacing -G65- ⇒ Chap. 87-6 – Reading measured value block 002 ⇒ Chap. 01-3 – If necessary replace the air conditioning system control unit -J301- ⇒ Chap. 87-10 and perform basic setting (function 04).

Read-out on -V.A.G 1552-		Possible cause of fault	Rectifying fault
00898 Air conditioning compressor control	Short-circuit to earth	♦ Short-circuit to earth on wiring or plug connections to the compressor regulating valve, air conditioning system -N280-	– Check wiring and plug connections to the compressor regulating valve, air conditioning system -N280- according to the current flow diagram.
		♦ -N280- defective	– Reading measured value block 002 ⇒ Chap. 01-3 – Performing final control diagnosis (function 03) ⇒ Chap. 01-1 01-1 – replacing compressor ⇒ Chap. 87-6
		♦ Air conditioning system control unit -J301- defective	– If necessary replace the air conditioning system control unit -J301- ⇒ Chap. 87-10 and perform basic setting (function 04).
	Open circuit/Short-circuit to pos. term.	♦ Short-circuit to positive terminal on wiring or plug connections to the compressor regulating valve, air conditioning system -N280-	– Check wiring and plug connections to the compressor regulating valve, air conditioning system -N280- according to the current flow diagram.
		♦ -N280- defective	– Reading measured value block 002 ⇒ Chap. 01-3 – Performing final control diagnosis (function 03) ⇒ Chap. 01-1 01-1 – replacing compressor ⇒ Chap. 87-6
		♦ Air conditioning system control unit -J301- defective	– If necessary replace the air conditioning system control unit -J301- ⇒ Chap. 87-10 and perform basic setting (function 04).
00926 Terminal 30	Signal too low	♦ Battery discharged	– Check battery ⇒ electrical system; Rep. Gr. 27
		♦ AC generator defective	– Check AC generator ⇒ electrical system; Rep. Gr. 27
		♦ Wiring or plug connections to the air conditioning system control unit -J301- defective	– Check wiring and plug connections to the air conditioning system control unit -J301- according to the current flow diagram.
	Signal too high	♦ Voltage regulator on AC generator defective	– Check AC generator ⇒ electrical system; Rep. Gr. 27
		♦ Wiring or plug connections to the air conditioning system control unit -J301- defective	– Check wiring and plug connections to the air conditioning system control unit -J301- according to the current flow diagram.

Read-out on -V.A.G 1552-		Possible cause of fault	Rectifying fault
01087 Basic setting not performed		♦ Basic setting (function 04) was not or incorrectly performed.	– Performing basic setting (function 04) ⇒ Chap. 01-1
01233 Coolant shut-off valve -N279	Short-circuit to positive terminal	♦ Short-circuit to positive terminal on wiring or plug connections to the coolant shut-off valve -N279- ♦ -N279- defective	– Check wiring and plug connections to the coolant shut-off valve -N279- according to the current flow diagram. – -N279- replace
	Open circuit/Short-circuit to earth	♦ Open circuit or short-circuit to earth on wiring or plug connections to coolant shut-off valve -N279- ♦ -N279- defective	– Check wiring and plug connections to the coolant shut-off valve -N279- according to the current flow diagram. – -N279- replace

Read-out on -V.A.G 1552-		Possible cause of fault	Rectifying fault
01271 Temp. flap control motor -V68	Short-circuit to positive terminal	♦ Short-circuit to positive terminal on wiring or plug connections to the control motor for temperature flap -V68- ♦ control motor for temperature flap -V68- defective	– Check wiring and plug connections to the control motor for temperature flap -V68- according to the current flow diagram. – Analysing measured value block 005 ⇒ Chap. 01-3 – Performing final control diagnosis (function 03) ⇒ Chap. 01-1 01-1 – -V68- replacing ⇒ Chap. 87-10 and perform basic setting (function 04) ⇒ Chap. 01-1
	Short-circuit to earth	♦ Short-circuit to earth on wiring or plug connections to the control motor for temperature flap -V68- ♦ control motor for temperature flap -V68- defective	– Check wiring and plug connections to the control motor for temperature flap -V68- according to the current flow diagram. – Analysing measured value block 005 ⇒ Chap. 01-3 – Performing final control diagnosis (function 03) ⇒ Chap. 01-1 01-1 – replacing -V68- ⇒ Chap. 87-10 and perform basic setting (function 04) ⇒ Chap. 01-1
	Blocked or dead adaption limit exceeded adaption limit not reached	♦ Open circuit or short-circuit to earth or positive terminal on wiring or plug connections to the control motor for temperature flap -V68- ♦ Temperature flap jams ♦ control motor for temperature flap -V68- defective	– Check wiring and plug connections to the control motor for temperature flap -V68- according to the current flow diagram. – Check smooth operation of temperature flap – Analysing measured value block 005 ⇒ Chap. 01-3 – Performing final control diagnosis (function 03) ⇒ Chap. 01-1 01-1 – replacing -V68- ⇒ Chap. 87-10 and perform basic setting (function 04) ⇒ Chap. 01-1
	Adaption not performed	♦ Basic setting (function 04) was not or incorrectly performed.	– Performing basic setting (function 04) ⇒ Chap. 01-1

Read-out on -V.A.G 1552-		Possible cause of fault	Rectifying fault
01296 Vent temperature senderCentre -G191	Short-circuit to earth	♦ Short-circuit to earth on wiring or plug connections to the vent temperature sender, centre -G191- ♦ -G191- defective	– Check wiring and plug connections to the -G191- according to the current flow diagram – Analysing measured value block 003 ⇒ Chap. 01-3 – replacing -G191- ⇒ Chap. 87-8
	Open circuit/Short-circuit to pos. term.	♦ Open circuit or short-circuit to positive terminal on wiring or plug connections to the vent temperature sender, centre -G191- ♦ -G191- defective	– Check wiring and plug connections to the -G191- according to the current flow diagram – Analysing measured value block 003 ⇒ Chap. 01-3 – replacing -G191- ⇒ Chap. 87-8
01297 Vent temperature senderFootwell -G192	Short-circuit to earth	♦ Short-circuit to earth on wiring or plug connections to the vent temperature sender, footwell -G192- ♦ -G192- defective	– Check wiring and plug connections to the -G192- according to the current flow diagram – Analysing measured value block 003 ⇒ Chap. 01-3 – replacing -G192- ⇒ Chap. 87-8
	Open circuit/Short-circuit to pos. term.	♦ Open circuit or short-circuit to positive terminal on wiring or plug connections to the vent temperature sender, footwell -G192- ♦ -G192- defective	– Check wiring and plug connections to the -G192- according to the current flow diagram – Analysing measured value block 003 ⇒ Chap. 01-3 – replacing -G192- ⇒ Chap. 87-8
01299 Data bus diagnostic interface -J533[a)]	no communication	♦ Fault in data BUS wiring ♦ Wrong or faulty vehicle voltage control unit -J519-	– Test data BUS prüfen⇒ Electrical system; Rep. Gr. 90; data BUS – Read-out Gateway fault memory ⇒ Electrical system; Rep. Gr. 90; Gateway self-diagnosis
	please read out fault memory [b)]	♦ Fault entry in Gateway	– Read-out Gateway fault memory ⇒ Electrical system; Rep. Gr. 90; Gateway self-diagnosis
01314 4AV Control unit	please read out fault memory [b)]	♦ Fault entry in 4AV control unit	– Read out fault memory of the 4AV control unit ⇒ Engine, Fuel Injection; Rep. Gr. 01

[a)] The data bus diagnostic interface -J533 is also called the Gateway.The Gateway is integrated in the vehicle voltage control unit -J519-.

[b)] The fault is automatically erased once the data BUS signal is again faultless.

Read-out on -V.A.G 1552-		Possible cause of fault	Rectifying fault
01317 Control unit with display in dash panel insert -J285	please read out fault memory [a]	♦ Fault entry in the control unit with display in dash panel insert -J285-	– Read-out dash panel insert fault memory ⇒ Electrical system; Rep. Gr. 90; dash panel insert self-diagnosis
	Implausible signal	♦ Fault in data BUS wiring	– Test data BUS prüfen⇒ Electrical system; Rep. Gr. 90; data BUS
		♦ Wrong or defective dash panel insert	– Read-out dash panel insert fault memory ⇒ Electrical system; Rep. Gr. 90; dash panel insert self-diagnosis

[a] The fault is automatically erased once the data BUS signal is again faultless.

Read-out on -V.A.G 1552-		Possible cause of fault	Rectifying fault
01596 Fresh/re-circulating air flap control motor - V154	Short-circuit to positive terminal	♦ Short-circuit to positive terminal on wiring or plug connections to the fresh/re-circulating air flap control motor -V154- ♦ Fresh/re-circulating air flap control motor -V154- defective	– Check wiring and plug connections to the fresh/re-circulating air flap -V154- according to the current flow diagram. – Analysing measured value block 004 ⇒ Chap. 01-3 – Performing final control diagnosis (function 03) ⇒ Chap. 01-1 01-1 – replacing -V154- ⇒ Chap. 80-3 and perform basic setting (function 04) ⇒ Chap. 01-1
	Short-circuit to earth	♦ Short-circuit to earth on wiring or plug connections to the fresh/re-circulating air flap control motor -V154- ♦ Fresh/re-circulating air flap control motor -V154- defective	– Check wiring and plug connections to the fresh/re-circulating air flap -V154- according to the current flow diagram. – Analysing measured value block 004 ⇒ Chap. 01-3 – Performing final control diagnosis (function 03) ⇒ Chap. 01-1 01-1 – replacing -V154- ⇒ Chap. 80-3 and perform basic setting (function 04) ⇒ Chap. 01-1
	Blocked or dead adaption limit exceeded adaption limit not reached	♦ Open circuit or short-circuit to earth or positive terminal on wiring or plug connections to the fresh/re-circulating air flap control motor -V154- ♦ Fresh/re-circulating air flap jams ♦ Fresh/re-circulating air flap control motor -V154- defective	– Check wiring and plug connections to the fresh/re-circulating air flap -V154- according to the current flow diagram. – Test smooth operation of fresh/re-circulating air flap – Analysing measured value block 004 ⇒ Chap. 01-3 – Performing final control diagnosis (function 03) ⇒ Chap. 01-1 01-1 – replacing -V154- ⇒ Chap. 80-3 and perform basic setting (function 04) ⇒ Chap. 01-1
	Adaption not performed	♦ Basic setting (function 04) was not or incorrectly performed.	– Performing basic setting (function 04) ⇒ Chap. 01-1
65535 Control unit defective		♦ Air conditioning system control unit -J301- defective	– replacing air conditioning system control unit -J301- ⇒ Chap. 87-10 and perform basic setting (function 04) ⇒ Chap. 01-1

01-3 Self-diagnosis of the Air Conditioning Unit III

Reading measured value block

– Connect vehicle system tester -V.A.G 1552-. Next start the engine and use the „address word“ 08 to select the air conditioning system control unit ⇒ Chapter 01-1.

Readout on display:

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

– Select function 08 „read measured value block“.

Readout on display:

```
Reading measured value block
Enter display group number    XXX
```

– Enter desired display group number ⇒ **01-3** page 1.

Note

To switch to another display group proceed as follows:

Display group	-V.A.G 1552-
higher	Press ↑ key
lower	Press ↓ key
skip	Press C key

List of display groups

Display group number	Display field	Denomination
001	1	Supply voltage for the air conditioning system control unit -J301-
	2	Voltage for fresh air blower -V2-
	3	1. Stage for the fresh air blower
	4	2. stage for the fresh air blower
002	1	Compressor output
	2	Coolant pressure via high pressure sender -G65-
	3	Conditions for regulating the compressor output
	4	Evaporator vent temperature sender via -G263-
003	1	Vent temperature sender, footwell via -G192-
	2	Vent temperature sender, centre via -G191-
	3	Interior temperature via dash panel temperature sensor -G56-
	4	Disregard display
004	1	Actual feedback value of the potentiometer in the re-circulating air flap control motor - G143-
	2	Nominal feedback value of the potentiometer in the re-circulating air flap control motor - G143-
	3	Established value of the potentiometer in the re-circulating air flap control motor -G143- during fresh-air operation according to the basic setting
	4	Established value of the potentiometer in the re-circulating air flap control motor -G143- in re-circulating air operation according to the basic setting

Display group number	Display field	Denomination
005	1	Actual feedback value of the potentiometer - temperature flap control motor - G92-
	2	Nominal feedback value of the potentiometer - temperature flap control motor - G92-
	3	Established value of the potentiometer - temperature flap control motor -G92- in flap position: warm according to the basic setting
	4	Established value of the potentiometer - temperature flap control motor -G92- in flap position: cold according to the basic setting
006	1	Engine speed
	2	Engine speed increase
	3	Driving speed
	4	Reversing light switch
007	1	Immobilization time
	2	Status terminal X
	3	Terminal 58d
	4	Heating element for auxiliary heating -Z35-
008	1	External temperature via ambient temperature sensor -G17-
	2	Coolant temperature via coolant temperature sender -G62 -
	3	Signal for coolant temperature „too high“
	4	Compressor output limitation

Measured value block 001

Reading measured value block 1 →

12.1 V 0.0 V off off

Readout on display

2. Radiator fan speed
- off
- on

1. Radiator fan speed
- off
- on

Voltage for fresh air blower -V2-
- dependent on the position of the fresh air blower switch -E9-
- Nominal values: ⇒ **01-3** page 3

Supply voltage for the air conditioning system control unit -J301- (terminal 15)
- approx. battery voltage

Analysis: Measured value block 001, display field 2

Fresh air blower switch -E9- on speed	Nominal value in V
0	0.0
1	3.0...4.5
2	5.0...7.0
3	7.5...10.0
4	10.5...14.0

Measured value block 002

Reading measured value block 2			→	Readout on display
50 %	7 bar	0	16.0 °C	
				Evaporator vent temperature sender via -G263- [1]
				Conditions for regulating the compressor output ♦ Meaning ⇒ **01-3** page 3
				Coolant pressure via high pressure sender -G65- ♦ Specified value: 2...32 bar (0.2...3.2 MPa) [2]
				Compressor output ♦ if display 0%, observe compressor output regulating conditions in display field 3

[1] If a temperature is displayed that greatly deviates from the ambient temperature of the sender, replace the sender.

[2] In the event of deviations from the nominal value, check the conditions for regulating the compressor output in display field 3.

Analysis: Measured value block 002, display field 3

The compressor is not disconnected by a magnetic clutch but keeps on running. Its output is regulated externally via the regulating valve for compressor, air conditioning system -N280-.

Display -V.A.G 1552-	Conditions for regulating the compressor output	Rectifying fault
0	♦ none	
1	♦ Coolant pressure above 32 bar (3.2 MPa)	– Interrogate fault memory ⇒ Chapter 01-1
3	♦ Coolant pressure below 2 bar (0.2 MPa)	– Interrogate fault memory ⇒ Chapter 01-1
5	♦ low engine speed	– Read out fault memory of the 4AV control unit ⇒ Engine, Fuel Injection; Rep. Gr. 01 – If necessary check engine speed sender -G28-
6	♦ Air conditioning switched off (AC function not activated)	no defect – Push AC button on the heating and air conditioning control
7	♦ Air conditioning switched off (fresh air blower switch on position „0“)	no defect – Switch fresh air blower switch to „1“
8	♦ Ambient temperature below -3 °C (± 1 °C)	no defect – If necessary check ambient temperature sensor - G17-
10	♦ Supply voltage too small or too great	– Analysing measured value block 001 ⇒ **01-3** page 2 – Interrogate fault memory ⇒ Chapter 01-1
11	♦ Coolant temperature above 118 °C	– Read out fault memory of the 4AV control unit ⇒ Engine, Fuel Injection; Rep. Gr. 01
12	♦ Compressor output limitation of the engine control unit	– Read out fault memory of the 4AV control unit ⇒ Engine, Fuel Injection; Rep. Gr. 01
14	♦ Evaporator vent temperature below 1 °C	– Analysing measured value block 002 ⇒ **01-3** page 2 – Interrogate fault memory ⇒ Chapter 01-1
16	♦ Evaporator vent temperature sender - G263- defective ♦ Coolant fan not operational	– Performing a final control diagnosis (function 03) ⇒ Chapter 01-1 – Analysing measured value block 002 ⇒ **01-3** page 2 – Interrogate fault memory ⇒ Chapter 01-1

Measured value block 003

Reading measured value block 3			→	Readout on display
24.0 °C	25.0 °C	25.0°C	off	
				Heat exchanger disconnected (only on vehicles with mapping cooling) ♦ off ♦ on
				Interior temperature via dash panel temperature sensor -G56-
				Vent temperature sender, at the centre via -G191- 1)
				Vent temperature sender, in the footwell via -G192- 1)

1) If display -51 °C or 99 °C there is a cable short-circuit to earth or pos. term.

Measured value block 004

Reading measured value block 4			→	Readout on display
52	52	206	52	
				After performing basic setting (Function 04) established value of the potentiometer -G143- (in the fresh/re-circulating air flap control motor -V154-) in re-circulating air operation ♦Specified value: 5...100
				After performing basic setting (Function 04) established value of the potentiometer -G143- (in the fresh/re-circulating air flap control motor -V154-) in fresh air operation ♦ Specified value: 150...250 1)
				Nominal feedback value of the potentiometer -G143- (in the fresh/re-circulating air flap control motor -V154-) ♦ Specified value: 0...255
				Actual feedback value of the potentiometer - G143- (in the fresh/re-circulating air flap control motor -V154-) ♦ allowed deviation from nominal value ± 2

1) If there are deviations from the nominal value, interrogate fault memory ⇒ Chapter 01-1.

Measured value block 005

Reading measured value block 5 →				Readout on display
227	227	228	25	
				After performing basic setting (Function 04) established value of the potentiometer - G92- (in the temperature flap control motor - V68-) in flap position: cold ♦ Specified value: 5...100
				After performing basic setting (Function 04) established value of the potentiometer -G92- (in the temperature flap control motor -V68-) in flap position: warm ♦ Specified value: 150...250 [1]
				Nominal feedback value of the potentiometer -G92- (in the temperature flap control motor -V68-) ♦ Specified value: 0...255
				Actual feedback value of the potentiometer - G92- (in the temperature flap control motor - V68-) ♦ allowed deviation from nominal value ± 2

[1] If there are deviations from the nominal value, interrogate fault memory ⇒ Chapter 01-1.

Measured value block 006

Reading measured value block 6 →				Readout on display
800/min	off	0 km/h	Rev. OFF	
				Reversing light switch ♦ Rev. OFF - Reverse gear not engaged ♦ Rev. ON - Reverse gear engaged
				Driving speed
				Engine speed increase ♦ off ♦ on
				Engine speed

Measured value block 007

Reading measured value block 7			→	Readout on display
0:0 h	on	0 %	on	

Heating element for additional heating -Z35- (PTC)

- off
- on

Terminal 58 d (display illumination)

- Specified value: 0...100 % (depending on the setting of the illumination control)

Status terminal X

- off
- on

Immobilization time

- time measured between the last switching off and switching on of the ignition

Measured value block 008

Reading measured value block 8			→	Readout on display
21.0 °C	21.0 °C	off	off	

Compressor output limitation

- off
- on (observe conditions for regulating the compressor output in measured value block 002 ⇒ **01-3** page 3)

Signal for coolant temperature „too high“ from dash panel insert

- off (coolant temperature O.K.)
- On (coolant temperature not O.K., coolant temperature/ coolant shortage warning light -K28- lights up in dash panel insert)

Coolant temperature above -G62-

- with ignition on (engine cool and standing): approx. ambient temperature [1]

Ambient temperature above -G17- [2]

[1] If deviation: Read out fault memory of engine control unit ⇒ engine, fuel injection; Rep. Gr. 01 and if necessary check coolant temperature sender -G62-.

[2] If a temperature is displayed that greatly deviates from the ambient temperature of the sender, replace the sender.

80 – Heating

80-1 Repairing heating system

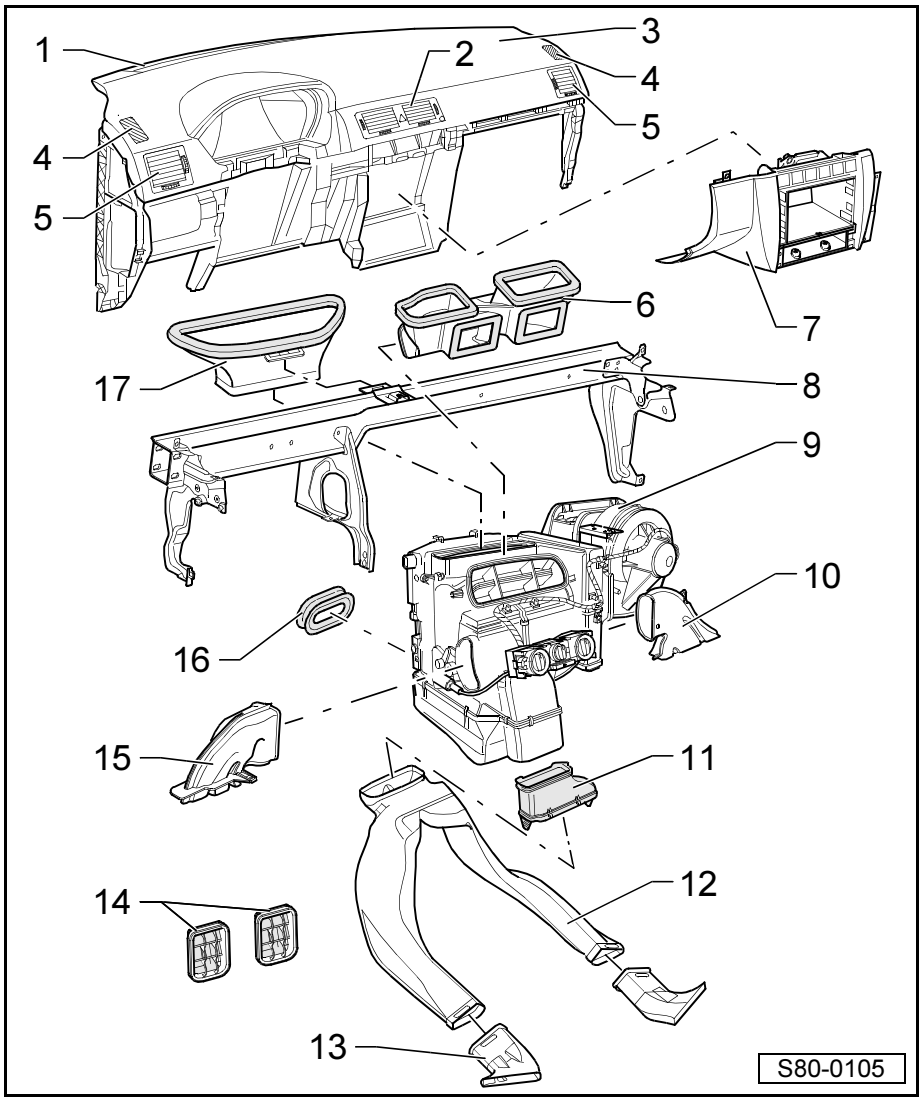
⚠ Caution!

Disconnect earth strap from the battery before commencing work on the electrical system.

Note

- *Before disconnecting the battery determine the code of radio sets fitted with anti-theft coding.*
- *If the battery earth strap is disconnected and connected then additional operations must be carried out ⇒ Electrical System; Rep. Gr. 27.*

Summary of components



- **1 - Defroster vent**
  - ❑ integrated in dash panel
- **2 - Centre dash panel vent**
  - ❑ with warning light switch
  - ❑ removing and installing ⇒ Fig. 1 in **80-1** page 2
- **3 - Dash panel**
  - ❑ removing and installing ⇒ Body Work; Rep. Gr. 70
- **4 - Side window vent**
  - ❑ use removal tool -3409- to carefully lever out
- **5 - Outer dash panel vent**
  - ❑ use removal tool -3409- to carefully lever out at top and bottom (in the same way as for the centre dash panel vent)
- **6 - Intermediate piece for dash panel vents**
  - ❑ attached to heater unit with clips
  - ❑ for removing, take out dash panel
- **7 - Centre part of dash panel**
  - ❑ removing and installing ⇒ Body work; Rep. Gr. 70
- **8 - Module carrier**
- **9 - Heater unit**
  - ❑ Summary of components ⇒ **80-1** page 3
  - ❑ disassembling and assembling ⇒ **80-1** page 4
  - ❑ removing and installing ⇒ Chapter 80-3

10 - Right footwell vent
- ❑ bolted to heater unit (1.5 Nm)

11 - Connection part for rear duct

12 - Rear duct

13 - End piece for rear duct
- ❑ clipped into rear duct and seat cross member

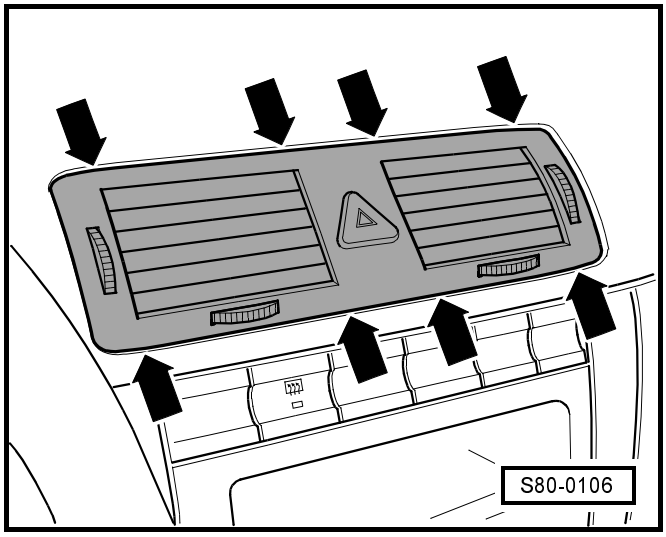
14 - Ventilation frames
- ❑ clipped into rear cross member ahead of spare wheel well from outside
- ❑ sealing lips must operate freely and close automatically
- ❑ area in front of ventilation frames must be clear otherwise ventilation of interior does not operate

15 - Left footwell vent
- ❑ bolted to support (1.5 Nm)

16 - Gasket
- ❑ for connection of heat exchanger
- ❑ in bulkhead (assembly plate)

17 - Intermediate piece for defroster duct
- ❑ fitted onto heater unit and module carrier
- ❑ for removing, take out dash panel

Fig. 1: Removing and installing the centre dash panel vent ►

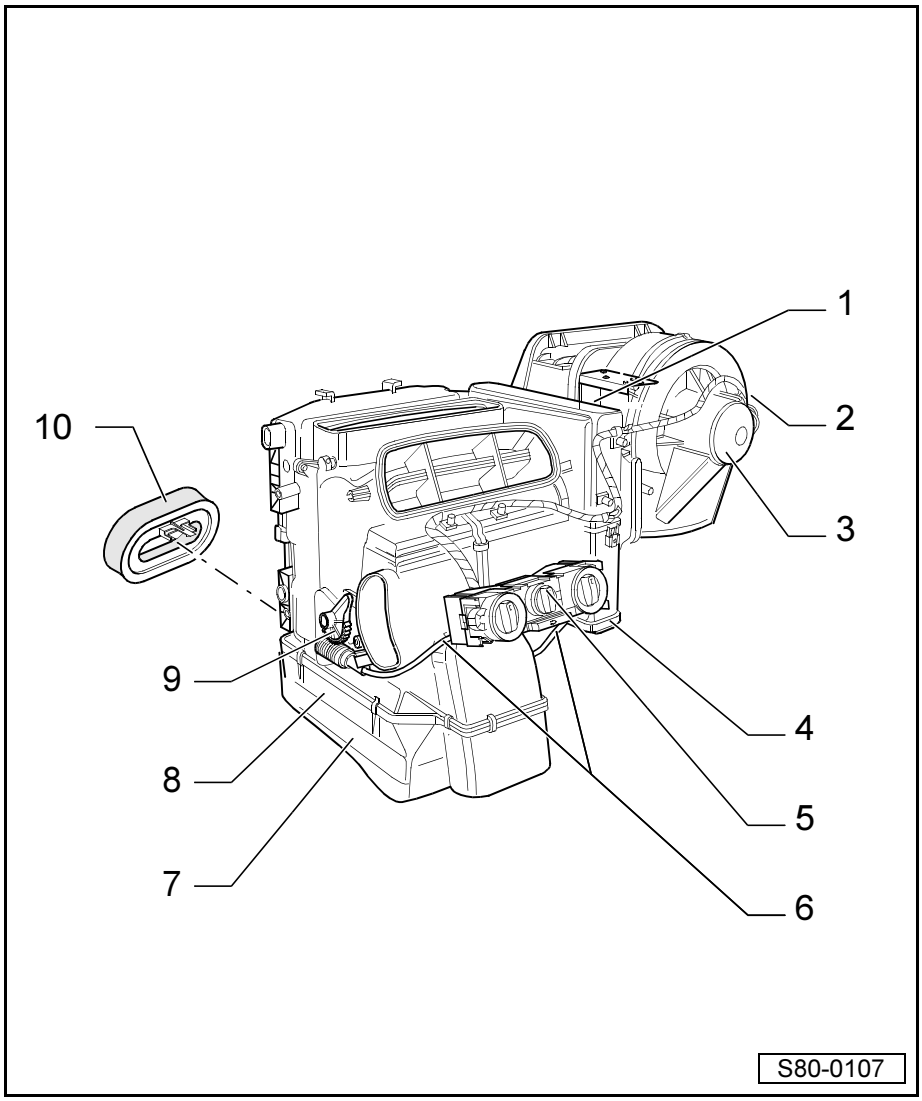


– Use removal tool -3409- to carefully lever out in the area of the retaining clips -arrows-.

– Unplug connector of warning light switch.

When installing, ensure that the retaining clips are correctly fitted.

Summary of components heater unit



1 - Fresh air blower series resistor -N24-
- ❑ removing and installing ⇒ Chapter 80-2

2 - Fresh/re-circulating air flap control motor -V154-
- ❑ removing and installing ⇒ Chapter 80-3

3 - Fresh air blower -V2-
- ❑ removing and installing ⇒ Chapter 80-2

4 - Dust and pollen filter
- ❑ also as combination filter with odour filter
- ❑ removing and installing ⇒ Chapter 80-2

5 - Heater control
- ❑ with fresh/re-circulating air flap control unit -J251-
- ❑ with fresh-air blower switch - E9-
- ❑ with fresh/re-circulating air flap switch - E159-
- ❑ must be replaced completely
- ❑ removing and installing ⇒ Chapter 80-2

6 - Flex shaft
- ❑ for temperature flap positioning unit (colour: purple; 256 mm long)
- ❑ for air distribution flaps positioning unit (colour: blue; 250 mm long)
- ❑ removing and installing ⇒ Chapter 80-2

7 - Heating element for additional heating (PTC) -Z35-
- ❑ only fitted to certain models
- ❑ Summary of components ⇒ **80-1** page 6

8 - Heat exchanger
- ❑ Summary of components ⇒ **80-1** page 6
- ❑ removing and installing ⇒ Chapter 80-2

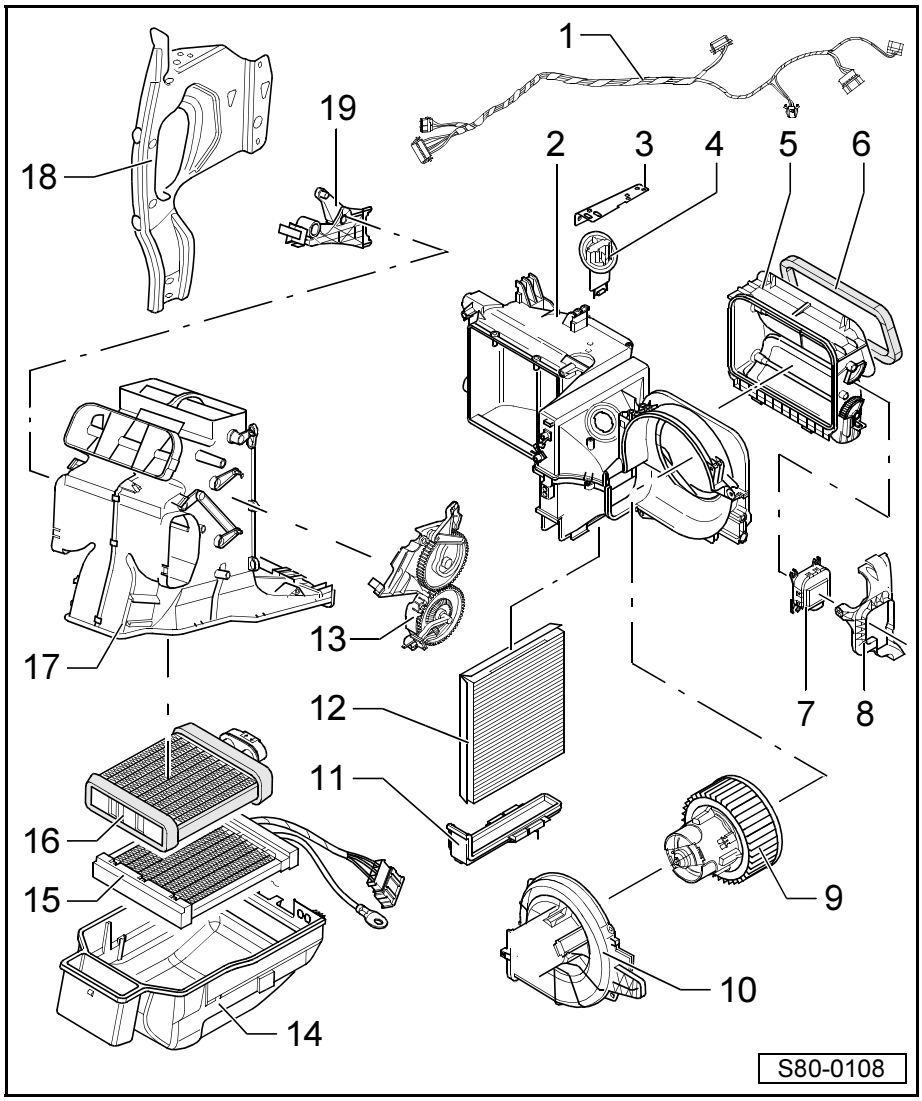
9 - Positioning unit for temperature flap
- ❑ removing and installing ⇒ Chapter 80-3

10 - Gasket with holder
- ❑ clipped into heater unit
- ❑ replace if damaged

Disassembling and assembling the heater unit

Note

*Connection elements of the heater unit ⇒ Fig. 2 in **80-1** page 5*



1 - Heater unit wiring loom
- ❑ carefully cut open to remove cable strap
- ❑ when installing new cable strap fit in same location

2 - Upper and lower part of the heater housing
- ❑ connected using clips ⇒ Fig. 2 in **80-1** page 5

3 - Bracket
- ❑ screwed onto the module carrier and the heater unit
- ❑ Module carrier tightening torque: 12 Nm
- ❑ Heater unit tightening torque: 5 Nm

4 - Series resistor for fresh air blower with overheating fuse -N24-
- ❑ removing and installing ⇒ Chapter 80-2

5 - Air inlet housing
- ❑ with fresh and re-circulating air flap
- ❑ Fitted to housing top and bottom part with retaining clips ⇒ Fig. 2 in **80-1** page 5

6 - Gasket
- ❑ replace if damaged
- ❑ adhesive
- ❑ before fitting remove glue residues on housing with acetone

7 - Fresh/re-circulating air flap control motor -V154-
- ❑ clipped into holder ⇒ item 8

8 - Bracket
- ❑ for the fresh/re-circulating air flap control motor -V154- ⇒ item 7

9 - Fresh air blower -V2-

10 - Holder for fresh air blower -V2-
- ❑ Disconnecting fresh air blower holder ⇒ Chap. 80-2

11 - Filter cover

12 - Dust and pollen filter
- ❑ also as combination filter with odour filter

13 - Positioning unit for air distribution flaps
- ❑ removing and installing ⇒ Chapter 80-3

14 - Bottom part of distributor housing

15 - Heating element for additional heating (PTC) -Z35-
- ❑ removing and installing ⇒ Chapter 80-2

16 - Heat exchanger
- ❑ removing and installing ⇒ Chapter 80-2

17 - Top part of distributor housing

- ❑ screwed onto the upper and lower part of the heater housing

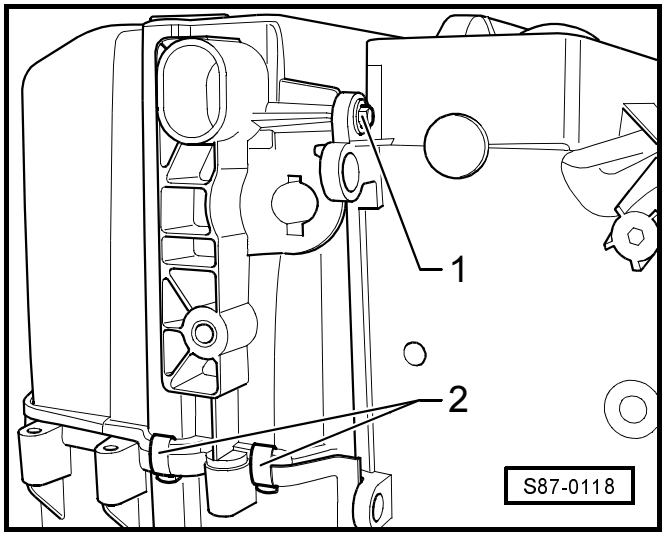
18 - Support, left

- ❑ screwed connection to module carrier, heater unit and centre console support
- ❑ module carrier tightening torque: 12 Nm
- ❑ heater unit tightening torque: 5 Nm
- ❑ centre console support tightening torque: 25 Nm

19 - Positioning unit for temperature flap

- ❑ removing and installing ⇒ Chapter 80-3

Fig. 2: Connection elements of the heater unit ►



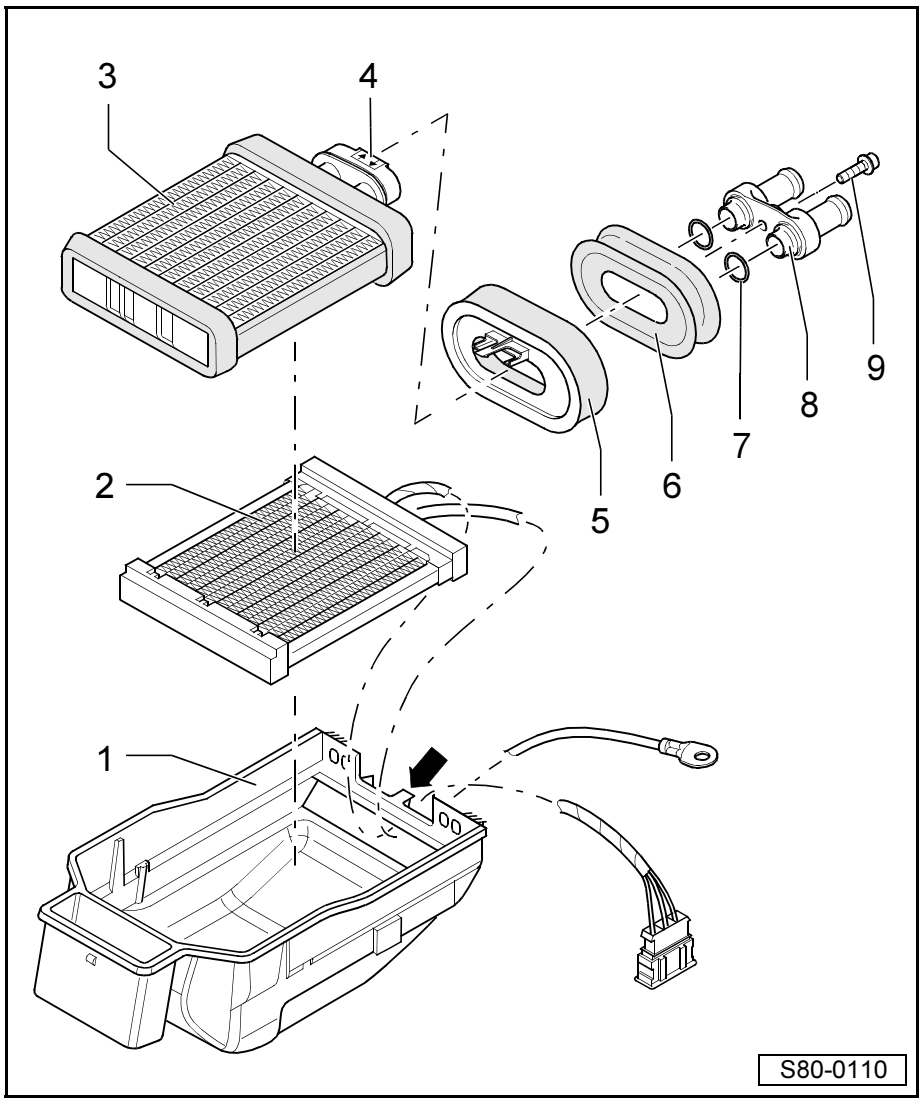
1 - Screw for plastic

- ♦ Tightening torque: 1 Nm

2 - Retaining clip

- ♦ Mark the position and location on housing before removing
- ♦ Replace if damaged
- ♦ When removing make sure the lug of the retaining clip catches in the housing slot

Summary of components Heat exchanger/Heating element for additional heating (PTC) -Z35-



1 - Bottom part of distributor housing

2 - Heating element for additional heating (PTC) -Z35-

- ❑ only fitted to certain models
- ❑ when temperature button on control is turned to „warm“ (microswitch) is regulated by the engine control unit and 2 relays in 3 speeds in line with ambient temperature, coolant temperature and alternator load.
- ❑ Test relay for Additional heater heating element (PTC) -Z35- in the final control diagnosis ⇒ Engine, Fuel injection; Rep. Gr. 01
- ❑ check additional heater heating element -Z35- (PTC) ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations

3 - Heat exchanger

- ❑ with sticker for feed and return flow ⇒ item 4
- ❑ check fitting position:
- ♦ Sticker must point upwards
- ♦ Pipe connections must be centred in the opening of the bottom part of distributor housing ⇒ item 1 in **80-1** page 6 -arrow-

4 - Sticker on heat exchanger for feed/return flow

- ❑ feed on left in direction of travel, return flow on right

5 - Gasket with holder

6 - Gasket in assembly plate

7 - O-rings

- ❑ replace

8 - Connection fitting for heat exchanger

- ❑ different versions possible

9 - 20 Nm

80-2 Removing and installing parts of the heater unit - Part 1

Removing and installing fresh air blower -V2-

Removing

– Removing the glove compartment ⇒ Body work; Rep. Gr. 68.

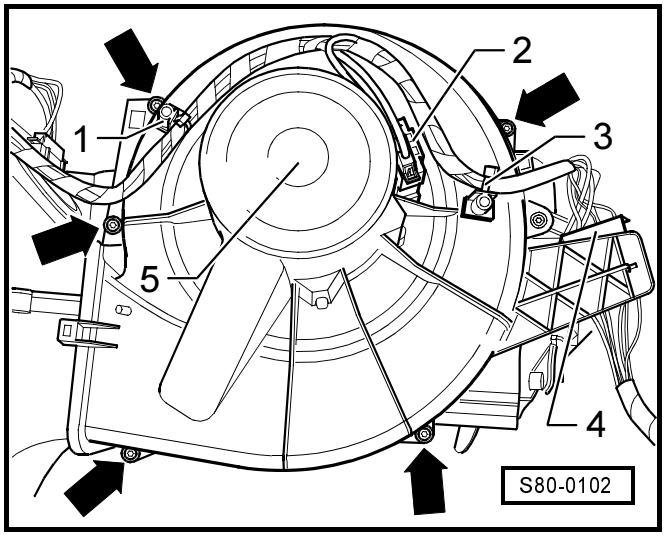
– Unplug connector -2-.

– Carefully cut through cable straps -1- and -3-.

– Separate connector -4- and push the plug out of the holder -5-.

To do so push the right plug forwards while simultaneously pushing outwards.

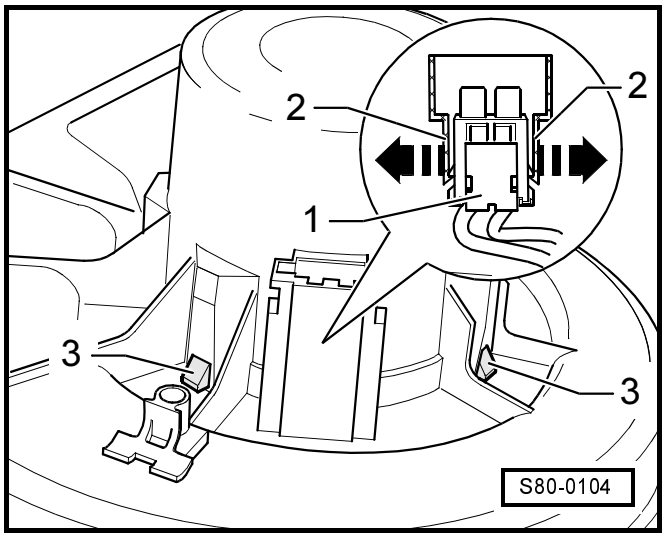
– Unbolt fresh air blower with holder -5- -arrows- (1 Nm) and take out of housing.



– Using a narrow screwdriver press the catch pegs -2- of the plug connection housing outwards in the direction of the arrow and press plug connection -1- downwards out of the catch.

– Press catches -3- inwards and down with a screwdriver.

– Remove fan motor and fan wheel from holder.



Installing

Installation is carried out in the reverse order. Pay attention to the following:

- Pay attention to the part numbers as the fan motor is different for the heating and air conditioning unit!
- The plug connection must lock securely in the housing.
- The rubber elements of the engine holder must fully protrude from the housing.
- Before installing check the operation of the fresh air blower.

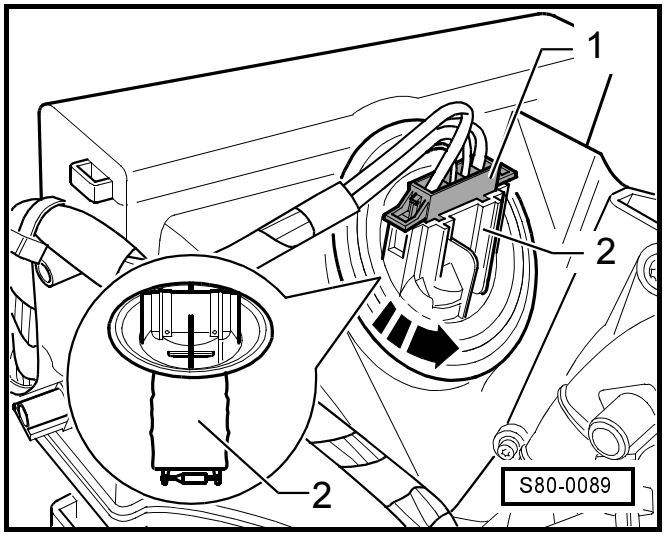
Removing and installing series resistor for fresh air blower -N24 -

Removing

– Removing the glove compartment ⇒ Body Work; Rep. Gr. 68.

– Unplug connector -1-.

– Turn series resistor -2- 45° to the left -direction of arrow- and take out of housing.



Installing

Installation is carried out in the reverse order. Pay attention to the following:

- Before installing the glove compartment check the operation of the series resistor by activating the blower.

Removing and installing heater control

– Removing centre part dash panel -1- ⇒ Body work; Rep. Gr. 70. ►

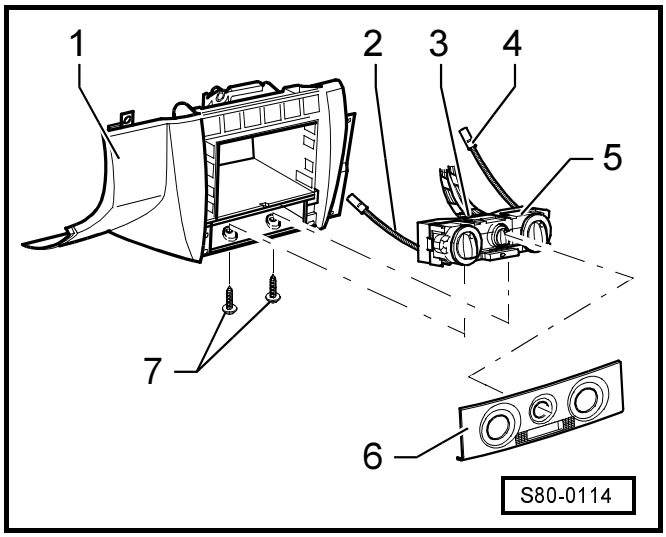
Tightening torque of screws -7-: 1 Nm

The trim panel -6- is clipped to the control -5- (press off carefully).

– Unplug connector -3-.

– Detach flex shaft -4- for positioning unit for air distribution flaps and flex shaft -2- for positioning unit of temperature flap ⇒ **80-2** page 3.

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



Removing and installing dust pollen filter

Removing

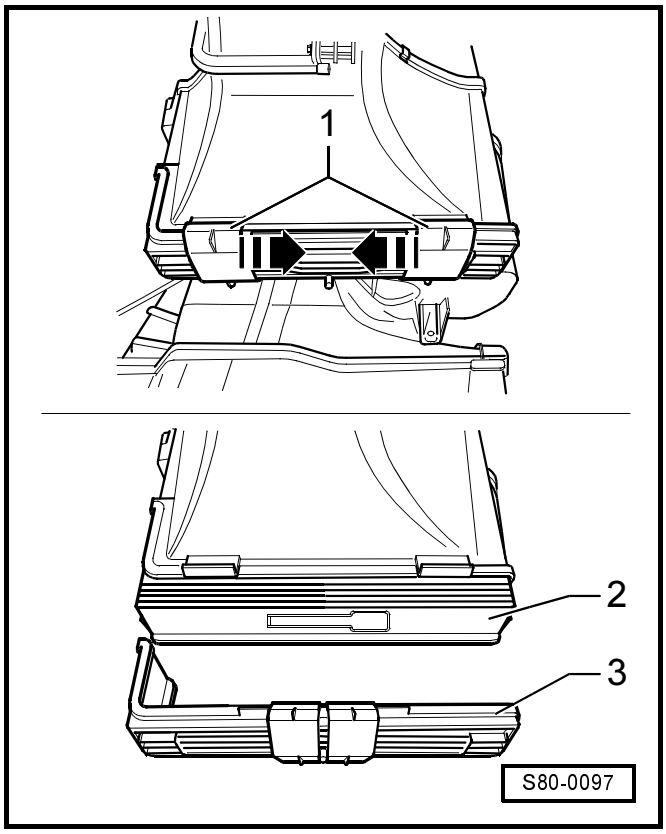
Note

- *It is possible to remove and install the filter without taking off any trim panel.*
- *A combination filter also exists. This has an integrated odour filter. The removal and installation procedure is similar.*
- *The filter insert and frame together constitute a replacement part.*

– Push slides -1- fully in -arrows-. ►

– Take filter cover -3- down and off.

– Pull dust and pollen filter -2- down and out by the tab.



Installing

Installation is carried out in the reverse order. Pay attention to the following:

- Before installing check the fitting position of the filter insert. The top and bottom fin of the filter insert must be in the frame.
- The 2 arrows on the frame and filter insert point to the flow direction.
- The frame grid must point to the distributor housing.
- The filter cover -3- must be correctly positioned in the housing and the slides -1- must be pushed fully outwards up to the stop.

Removing and installing flex shafts

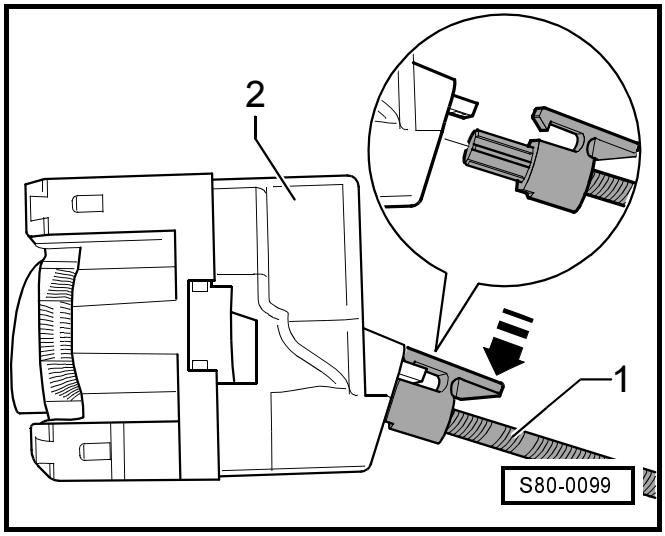
- Centre part of dash panel removed

Note

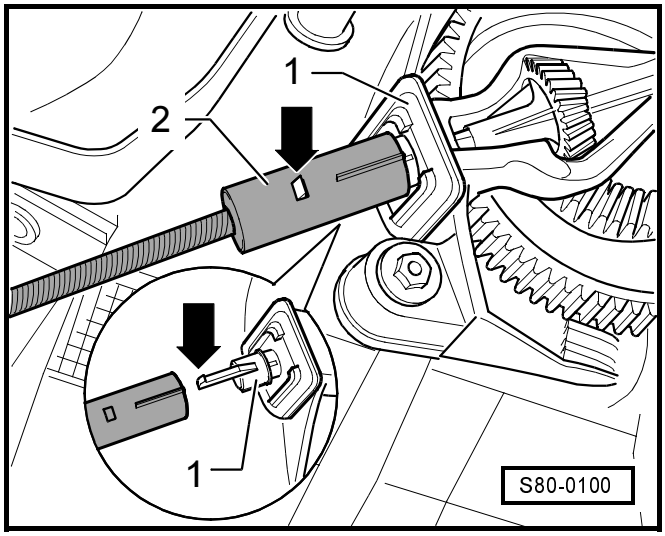
The attachment of the flex shaft for the positioning unit of the temperature flap is the same as the attachment of the flex shaft for the positioning unit of the air distribution flaps.

Removing

– Press platic part of the flex shaft -1- in direction of the arrow and pull out of the heater control -2-.



– Use a flat screwdriver to press in plastic lug -arrow- of positioning unit -1- and pull out flex shaft -2-.



Installing

Note

- *The flex shafts can only be installed in one way on the positioning units and on the heater control.*
- *When installing, however, the positioning units and the rotary knobs of the controls must be in a certain position relatively to each other, otherwise this will result in malfunctions.*

Installing flex shaft for positioning unit of air distribution flaps

– Fit flex shaft onto positioning unit of air distribution flaps and lock in place.

– Use the flex shaft to move the defrost flap into vertical position (open).

– Set air distribution knob on heater control to „defrost“.

– In this position, insert flex shaft into control and lock in place.

Note

- *If the dash panel is installed and the position of the defrost flap is not visible, insert flex shaft into heater control and lock in place. Run fresh air blower at maximum speed.*
- *If air also flows out of the defrost vent in the „defrost“ position and not out of the footwell vents, the flex shaft is correctly installed. If this is not the case, detach flex shaft from the control, turn rotary knob $^1/_2$ turn (180°) and fit on flex shaft again. Repeat check.*

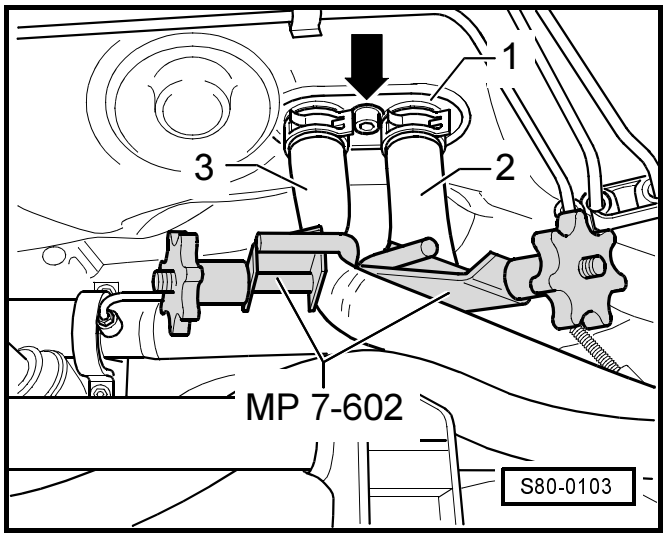
Installing flex shaft for positioning unit of temperature flap

– Fit flex shaft onto positioning unit of temperature flap and lock in place.
– Use the flex shaft to turn positioning unit for temperature flap fully to the right.
– Turn temperature knob on the heater control fully to the left („cold“).
– In this position, insert flex shaft into heater control and lock in place.
– Check whether it is possible to easily turn the temperature knob from „cold“ to „warm“.

Removing and installing heat exchanger

Removing

– Removing the centre console ⇒ Body work; Rep. Gr. 68.
– Reduce pressure in the coolant circuit by opening the cap on the coolant reservoir.
– Use -MP 7-602- to pinch off coolant hoses of heat exchanger (if not possible, drain coolant). ►

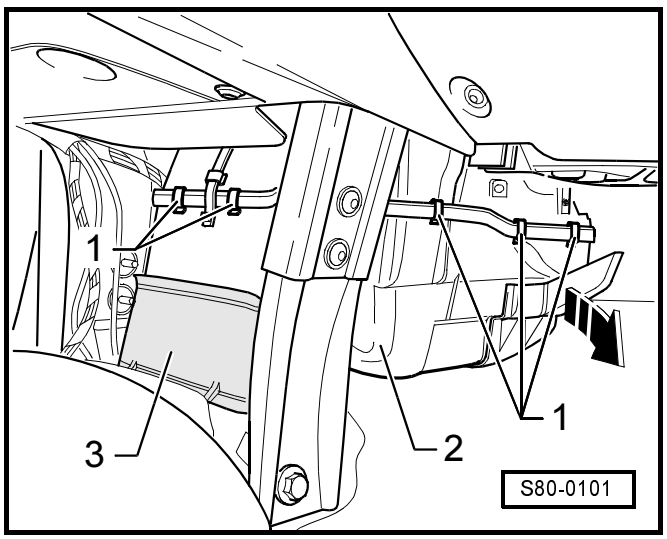


Note

If the heat exchanger is replaced, drain the entire coolant and fill system with fresh coolant.

– Place cleaning cloth below heat exchanger connection to collect drained coolant.
– Detach coolant hoses -2- and -3-.
– Carefully blow coolant out of the heat exchanger with compressed air.
♦ Connect up the hose for compressed air on the connection fitting for feeding
♦ Attach the container under the supports for return flow
– Unscrew connection fitting for the heat exchanger -1- -arrow- and lay to the front.

Tightening torque: 20 Nm



Vehicles with electrical auxiliary heating

– Separate plug connection of the auxiliary heating to the vehicle wiring loom on left or heater unit.
– Unscrew the earth cable of the auxiliary heating underthe bottom part of the distributor housing.

Continued for all vehicles

– Remove connecting part for rear duct -3-. ►
– Lever off retaining clips -1- on right, on left and at rear.

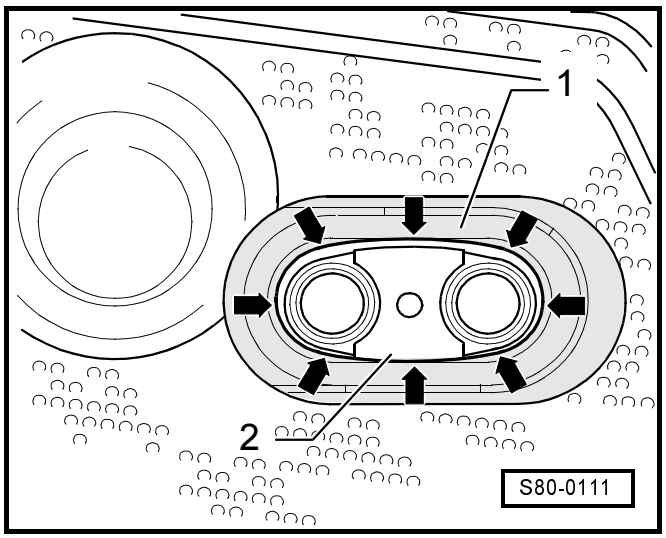
– Lower bottom part of distributor housing with heat exchanger -2- at the rear and pull out of the front catch towards the rear.
– Carefully swivel out bottom part of distributor housing to the right -arrow-.

Installing

Installation is carried out in the reverse order. Pay attention to the following:

– Moisten sealing lips of the gasket in bulkhead (assembly plate) - heat exchanger with a neutral soapy solution before installing the heat exchanger (easier mounting).
– Moisten sealing lips of the gasket in bulkhead (assembly plate) - heat exchanger with a neutral soapy solution before installing the heat exchanger (easier mounting).
– Carefully press gasket -1- in the bulkhead (assembly plate) from the outside into the groove of the connection fitting -2- of the heat exchanger -arrows-. ►
– Replace O-rings of connection fitting of heat exchanger.
– Connect coolant hoses the right way round.

  In direction of travel
  on the left: Feed
  on the right: Return flow



Note

If the heat exchanger was replaced, fill system with fresh coolant.

– Inspect coolant level, top up if necessary.

80-3 Removing and installing parts of the heater unit - Part 2

Removing and installing heater unit

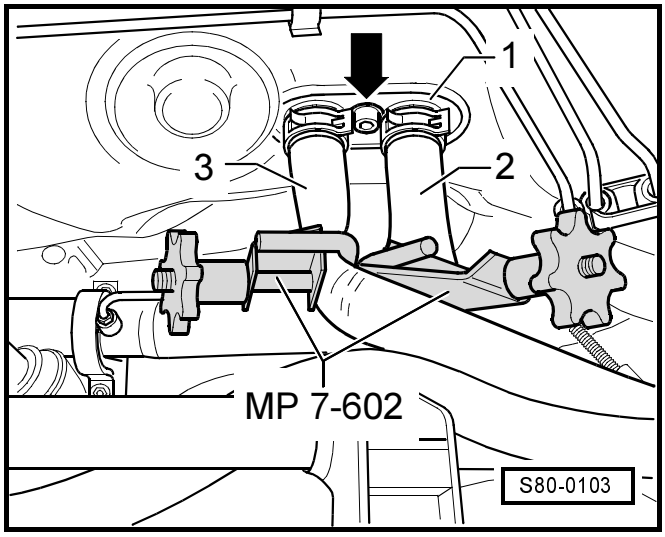
Removing

– On models fitted with a coded radio set, pay attention to the coding; determine if necessary.

– Disconnect the earth strap from the battery with the ignition off.

– Reduce pressure in the coolant circuit by opening the cap on the coolant reservoir.

– Use hose clamps -MP 7-602- to pinch off coolant hoses of heat exchanger (if not possible, drain coolant). ►



Note

If the heat exchanger is replaced, drain the entire coolant and fill system with fresh coolant.

– Place cleaning cloth below heat exchanger connection to collect drained coolant.

– Detach coolant hoses -2- and -3-.

– Carefully blow coolant out of the heat exchanger with compressed air.

Connect up the hose for compressed air on the connection fitting for the feed. Attach the container under the supports for return flow.

– Unscrew connection fittings for heat exchanger -1- -arrow-.

Tightening torque: 20 Nm

– Removing the centre console ⇒ Body Work; Rep. Gr. 68.

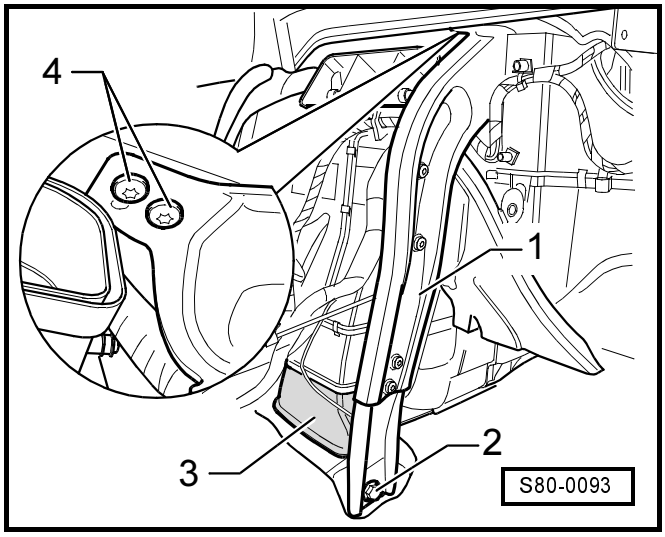
– Removing the dash panel ⇒ Body Work; Rep. Gr. 70.

– Removing the holder for front passenger airbag ⇒ Body Work; Rep. Gr. 69.

– Remove the intermediate piece for defrost dust and intermediate piece for dash panel vents (3 retaining clips).

– Unclip wiring loom from right support, unscrew earth cable and pull wiring loom out towards the top.

– Remove right support -1-. ►



Unscrew screws -2- (20 Nm) and -4- (12 Nm).

– Remove connecting part for rear duct -3-.

– Separate the plug connection to the right vehicle wiring loom next to the fresh air blower.

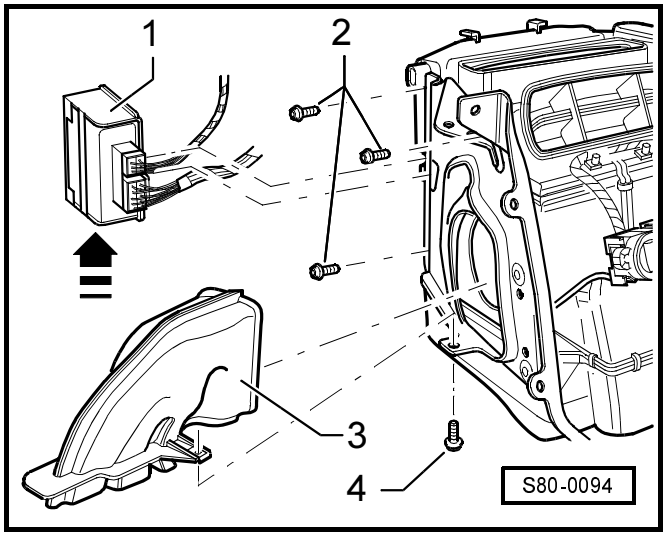
– Removing heater control (release plug, remove flex shafts ⇒ Chap. 80-2).

– Remove left footwell vent -3-.

Screws -4-: 1.5 Nm

– Push holder -1- with convenience control unit at the top outwards and slide out of the bracket in the direction of the arrow.

– Release screws -2- (5 Nm).



Vehicles with electrical auxiliary heating

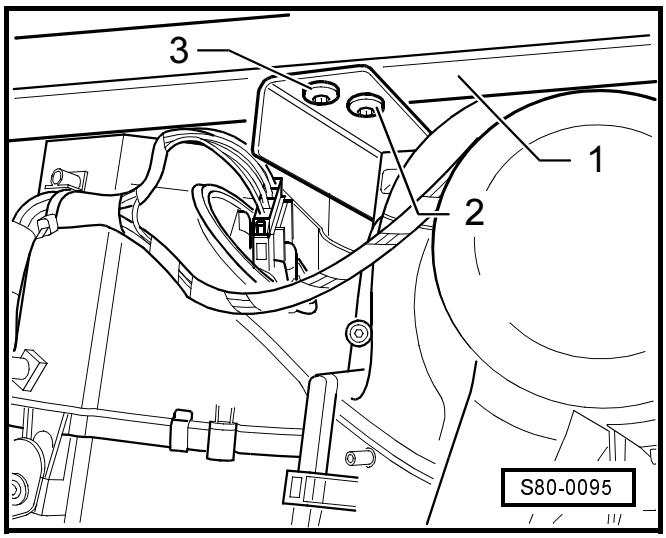
– Separate plug connection of the auxiliary heating to the vehicle wiring loom on left or heater unit.

– Unscrew the earth cable of the auxiliary heating underthe bottom part of the distributor housing.

Continued for all vehicles

– Release screws -2- and -3- (12 Nm) from the module carrier -1-.

– Swivel heater unit backwards from the top.



Installing

Installation is performed in the reverse order. Pay attention to the following points:

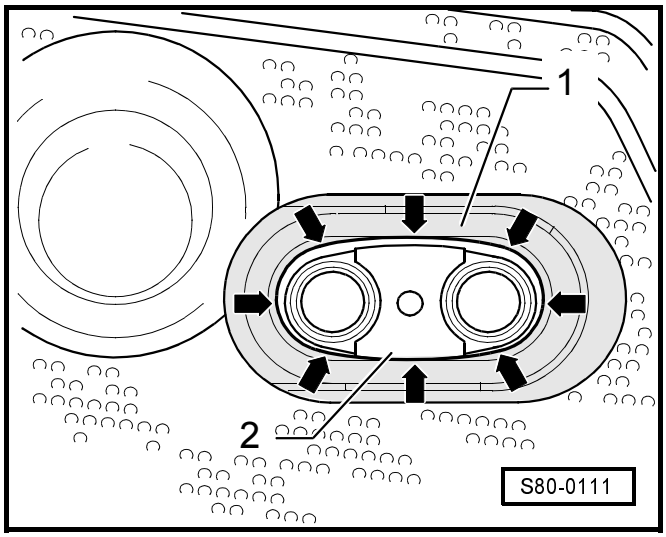
– Moisten sealing lips of the gasket in bulkhead (assembly plate) - heat exchanger with a neutral soapy solution before installing the heater unit (easier mounting).

– Carefully press gasket -1- in the bulkhead (assembly plate) from the outside into the groove of the connection fitting -2- of the heat exchanger -arrows-.

– Replace O-rings of connection fitting of heat exchanger.

– Connect coolant hoses the right way round.

In direction of travel
on the left: Feed
on the right: Return flow



Note

If the heat exchanger was replaced, fill system with fresh coolant.

– Inspect coolant level, top up if necessary.

Removing and installing control motor for fresh/re-circulating air flap -V154 -

Removing

– Removing fresh air blower ⇒ Chapter 80-2.

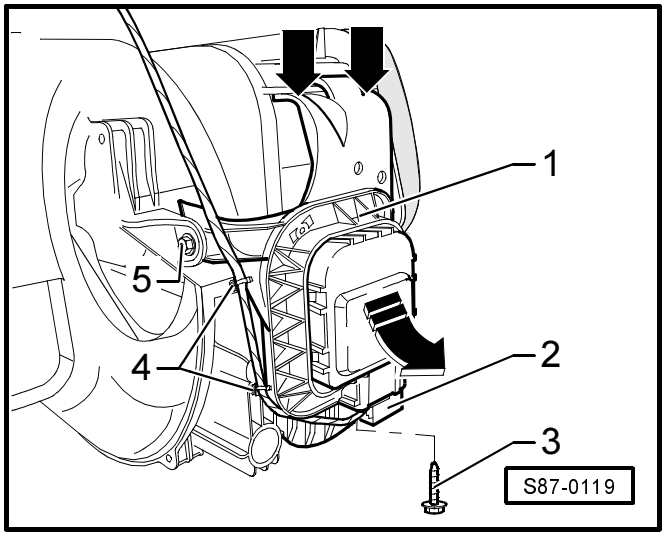
– Carefully cut through cable strap -4-.

– Unplug connector -2- from the control motor.

– Release screws -3- and -5-.

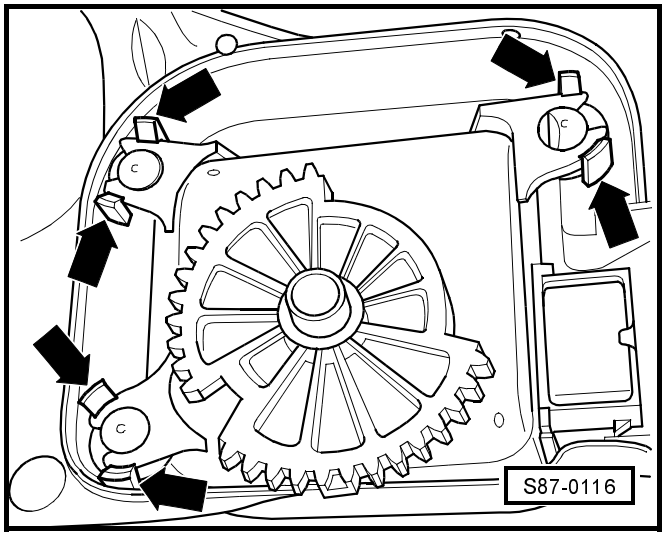
– Pull off the holder -1- with control motor in the direction of the arrow until the gear segments no longer engage.

– Push outside catches at the top of the holder -1- downwards -arrows- and remove holder with control motor.



– Remove control motor from holder.

To this end press the catch pegs -arrows- outwards while pushing the control motor out of the catches.



Installing

Note

- *The spare part control motor for fresh/re-circulating air flap -V154- is on position „re-circulating air“.*
- *If necessary connect the control motor to the wiring loom and switch to position „re-circulating air“.*
- *Pay attention to the part numbers as the control motor is different for the heating and air conditioning unit!*

– Press control motor into the holder.

– Press holder with control motor in top part onto the housing and lock into position.

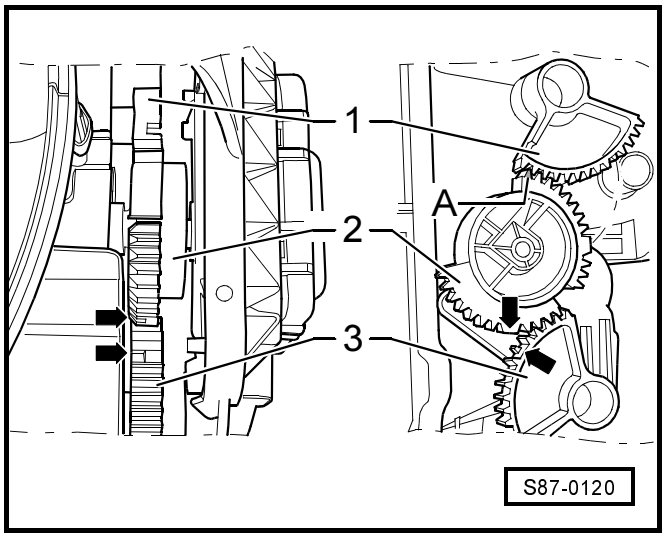
The gear wheels must not yet engage.

The following steps must occur simultaneously:

- Close fresh-air flap and hold shut.
- Insert the control motor on the housing in such a way that the 1st tooth -A- of gear wheel -2- of the control motor engages in the opening between the 1st and 2nd gear wheel of gear segment -1- of the fresh-air flap.
- Position the re-circulating air flap in such a way that the markings -arrows- on the gear wheel -2- and the gear segment -3- of the re-circulating air flap engage.
- Press the control motor fully onto the housing.

– Screw the holder of the control motor (1 Nm).

– Insert plug connection on control motor, switch on ignition and check operation of the control motor by pressing the re-circulating air button.



Caution!

When testing the control motor do not interfere with the gear wheel or flap kinematics.

Note

- *It must be possible to smoothly adjust the fresh air flap and the re-circulating air flap up to the stop.*
- *If the kinematics are stiff, immediately disconnect the ignition, again remove the control motor with holder and repeat installation.*

If the flap adjustment is smooth, proceed with the installation in reverse sequence to the removal.

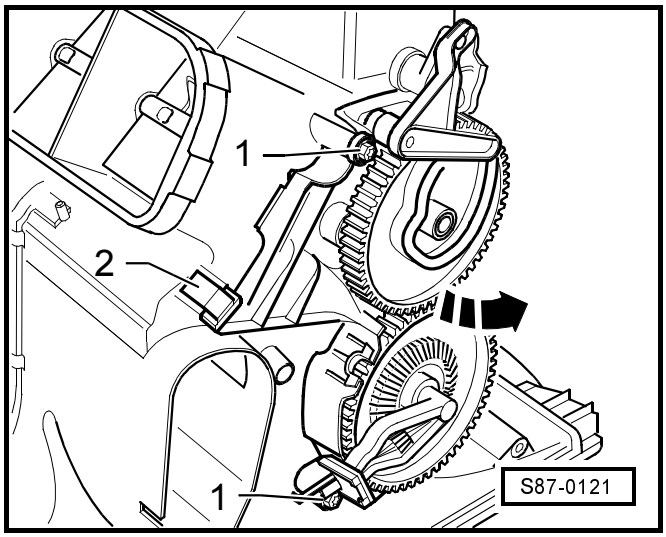
Removing and installing the control motor for air distribution flaps

- Distributor housing removed

Removing

– Release screws -1-.

– Release catch -2- and swivel out the control unit from the housing in the direction of the arrow.

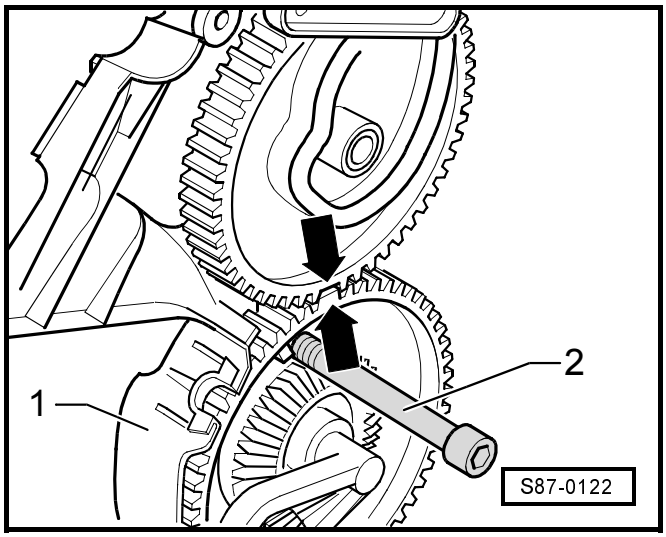


Installing

– Arrest the gear wheels of the control unit.

To this end turn the gear wheels until the markings -arrows- engage.

– In this position insert screw M6 -2- in the opening of the bottom gear wheel and the housing.



– Position the flap lever of the footwell vent -1- down -arrow- (flap closed).

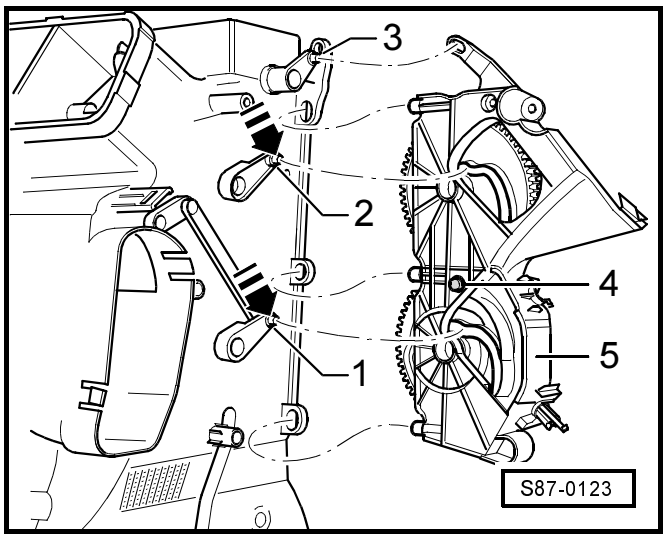
– Position the flap lever of the dash panel vent -2- down -arrow- (flap closed).

– Position the defrost flap lever -3- in such a way that the defrost flap is fully opened.

– Insert arrested control unit -5- obliquely into the 3 openings of the housing.

– Position the control unit on the housing in such a way that the lever bolts -1- and -2- engage in the relevant slides of the control unit -5-.

– Guide the holder bolt -3- in the corresponding opening of the control unit -5-.



Note

When installing it is possible to view the lever bolt -1- from the outside through an inspection hole in the bottom gear wheel of the control unit.

– Lock control unit -5- into position.

– Remove screws -4-.

– Check operation of the control unit -5-.

It must be possible to adjust all flaps to their end position in a smooth and easy manner.

The control unit has no stop; it must be possible to turn it fully round a number of times.

Flap adjustment not O.K.:

– Remove control unit and install again - as described -.

Flap adjustment O.K.:

– Screw control unit (1 Nm).

Removing and installing the control unit for temperature flap

Removing

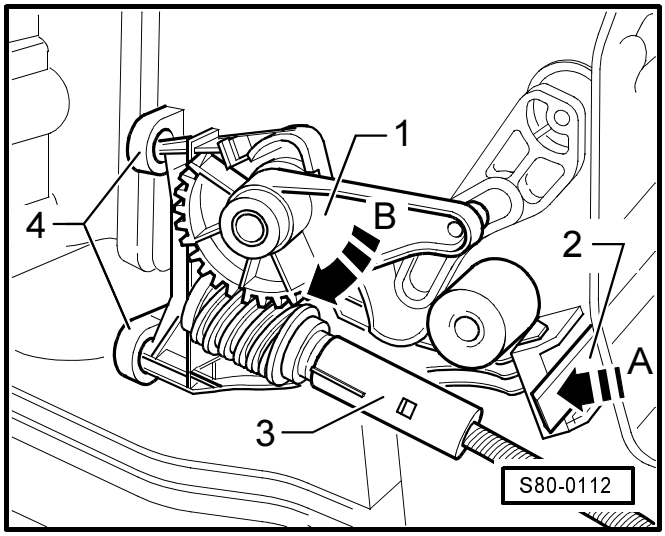
– Removing the dash panel centre part ⇒ Body work; Rep. Gr. 70.

– Remove left footwell vent.

– Remove flex shaft -3- from the control unit ⇒ Chapter 80-2. ►

– Release catch -2- by pressing in the direction of the arrow -A-.

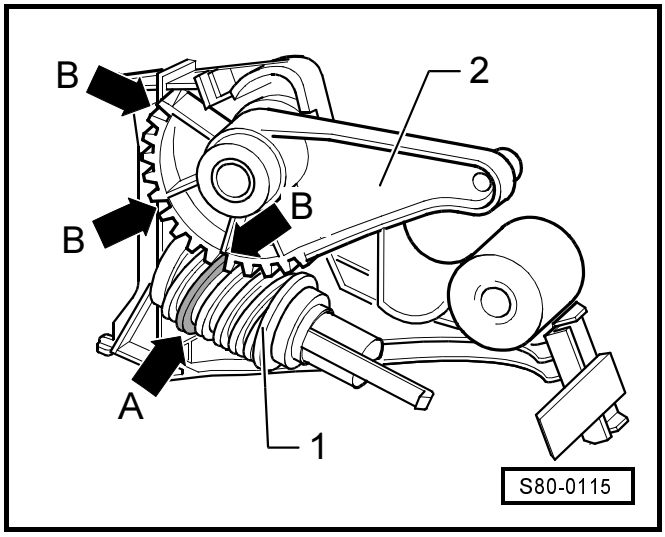
– Swivel out control unit -1- in the direction of the arrow -B- and remove from brackets -4-.



Installing

Note

- *Before installing check whether the position of the worm wheel -1- and gear segment -2- correspond.* ►
- *The higher turn (darker) -arrow A- must engage in the deeper gear openings -arrow B-.*



– Mark the position of the lever -3- of the temperature flap in the end positions (flap fully open/flap fully closed) on the housing, -2- and -4-.
– Switch control unit -1- to position „flap closed“.
– Close temperature flap.

  Position lever -3- down to stop.

– Insert the control unit -1- in the brackets -6- and guide into the housing in the direction of the arrow.

  The control unit bolt -1- must engage in the lever slide -3-.

– Lock the control unit onto the housing -5-.
– Insert flex shaft into the control unit -1- ⇒ Chap. 80-2.
– Check operation of the control unit.

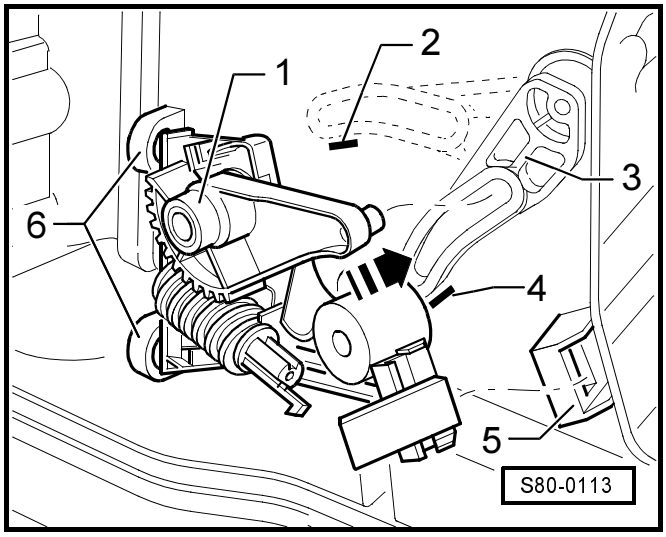
  It must be possible to adjust the temperature flap to its end position in a smooth and easy way (markings -2- and -4-).

Temperature flap adjustment N.O.K.:

– Remove control unit and install again - as described -.

Temperature flap adjustment O.K.:

– Install left footwell vent.
– Installing the dash panel centre part ⇒ Body work; Rep. Gr. 70.



87 – Air Conditioning

87-1 Safety measures when working on vehicles with air conditioning and when using refrigerant R 134a

The assemblies and the line system of the air conditioning system are filled with refrigerant R 134a (Tetrafluorethane CH_2F-CF_3).This refrigerant is also known under the trade name H-FCR 134a or SUVA 134a of the firm Dupont (in other countries other trade names may also be usual).

The following safety measures must be observed for refrigerant R 134a (additional directives may apply in individual countries):

If during repairs on the vehicle it is necessary to drain the refrigerant circuit, the vehicle must be entrusted to a service centre!

Reasons:

Only the service centres have suitable service positions where the refrigerant can be drained off professionally.

If the refrigerant circuit is opened in a service centre, avoid any contact with the liquid refrigerant or refrigerant vapours at all cost!If in spite of these safety measures refrigerant is spilt, do not inhale the resulting gas/air mixture.Switch on the available exhaust systems, wear rubber gloves and protective goggles to protect your hands and eyes.

Reasons:

The intensive effect of refrigerant on unprotected body parts will cause frostbite.Refrigerant gas is heavier than air, and as it is colourless and odourless it unnoticeably replaces the available oxygen.

Note!

- *It is recommended to hold an eye bath flask within reach.If liquid refrigerant gets into the eyes thoroughly rinse the eyes out with water for approximately 15 minutes.*
- *Subsequently apply eye drops and immediately contact a physician, even if the eyes are not painful.The physician must be informed that the frostbite was caused by refrigerant R 134a.*
- *If in spite of these safety measures refrigerant comes into contact with other body parts, rinse immediately with water for at least 15 minutes.*

Work on the air conditioning refrigerant circuit must only be carried out in well-ventilated areas.Refrigerant must not be stored in lower areas (e.g. cellars) or related exits or window openings.

Reasons:

Refrigerant is colourless and odourless.It is also heavier than air and thus replaces oxygen.This results in an unnoticeable risk of asphyxia in poorly ventilated areas or in workshop pits.

Remedial measures:

When working on the refrigerant circuit make sure there are no workshop pits, shafts or cellar entrances within a 5 meter radius.Switch on all available exhaust systems.

It is prohibited to weld, or hard or soft solder on parts of the filled air conditioning system.This also applies for welding and soldering operations on the vehicle if there is any risk that parts of the air conditioning heat up.Within the scope of repair paintwork the object temperatures in the drying oven or in its preheating zone must not exceed 80 °C.

Reasons:

Heating generates considerable overpressure in the system, which could result in one of the pressure relief valves opening.During electrical welding invisible ultraviolet rays are produced that penetrate the refrigerant hoses and decompose the refrigerant.

Remedial measures:

Damaged or untight parts of the air conditioning system must not be repaired by welding or soldering, they must systematically be replaced after having drained off the refrigerant from the refrigerant circuit at the service position (entrust the vehicle to a service centre).

Although refrigerant is not flammable it is nevertheless prohibited to smoke, weld or hard or soft solder in a room filled with refrigerant vapour.

Reasons:

The high temperature of a naked flame or hot bodies causes the refrigerant gas to chemically decompose.Inhaling the released toxic products will cause an irritating cough and nausea.

Refrigerant containers (e.g. filling cylinders at the service position) must never be heated considerably or be exposed to direct sunlight.

Never fill the containers completely with liquid refrigerant.With sufficient expansion space (gas blanket) the container will burst as the temperature rises with catastrophic consequences.

Under no circumstances must you pour refrigerant in systems or containers that still contain air.

Remedial measures:

Exhaust systems and containers before filling with refrigerant.

Refrigerant must not be released into the environment, it must be drained off from the refrigerant circuit using an exhaust system or service position. The drained off refrigerant is processed on site or is returned to the manufacturer for ecological disposal (different or additional directives may apply in certain countries).This is why the vehicle must be entrusted to a service centre (these workshops have the relevant systems and tools on site).

87-2 Description of the air conditioning system

Operation of the air conditioning system

The temperature in the passenger compartment is influenced by radiant heat through the window and by the contact heat emitted by metallic parts.In order to provide agreeable temperatures for the passengers on very hot days, some of the ambient heat must be evacuated.

As it is a well known fact that heat spreads towards colder temperatures, an aggregate that generates lower temperatures has been fitted to the vehicle, i.e. the evaporator.Liquid refrigerant is continuously evaporated in this aggregate.The heat required for this operation is drawn from the air flowing through the evaporator.

The refrigerant gas with the absorbed heat is pumped out of the evaporator by the compressor.The compressor's compression work increases the heat content and the temperature of the refrigerant.It is now considerably higher than the ambient air temperature.

The high-temperature refrigerant and its heat content flow to the condenser. There, because of the temperature difference between the refrigerant and the ambient air, the refrigerant releases heat into the ambient air via the condenser and liquifies.

The refrigerant is also a heat conveyor. As it will be reused, it is again pumped to the evaporator.

Structure of the refrigerant circuit

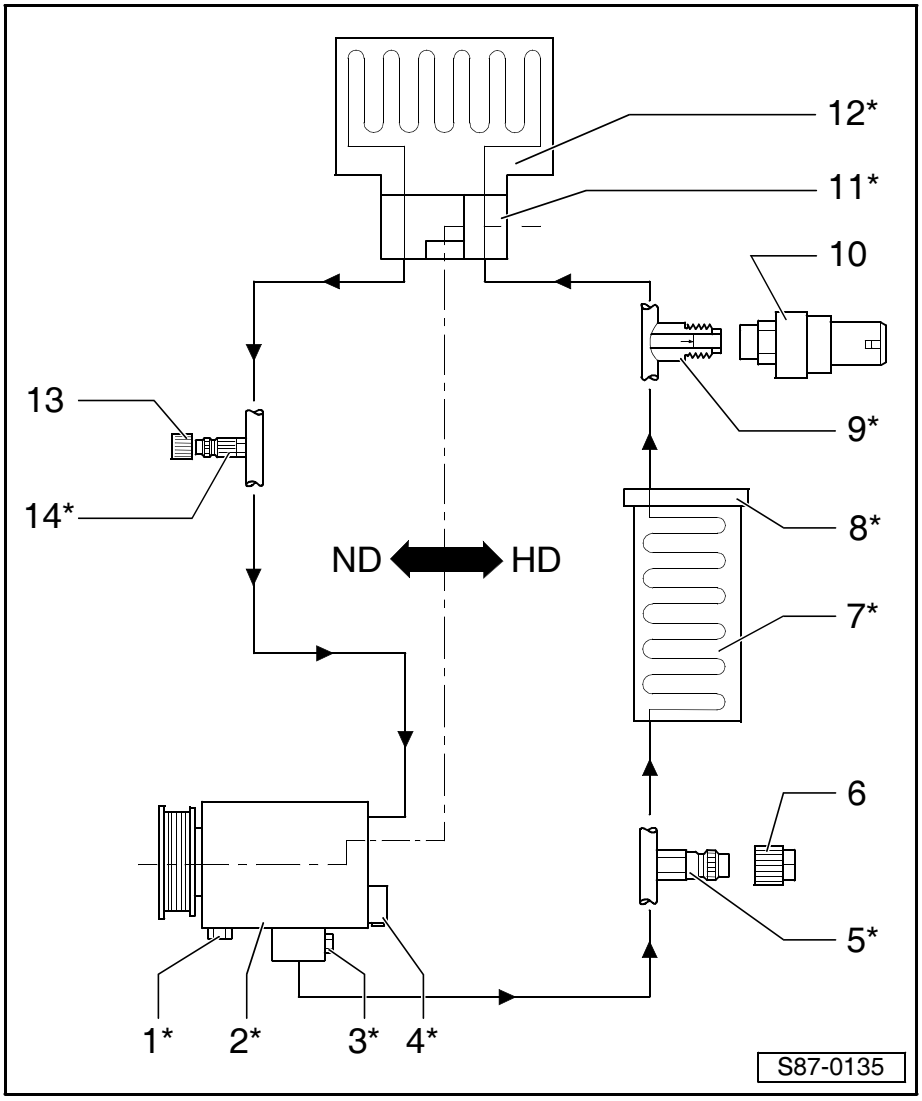
Note!

*All air conditioning components marked * as well as all refrigerant hoses and refrigerant lines must be repaired or replaced in service centres, as the refrigerant must first be drained off at a service position.*

HP = High-pressure side

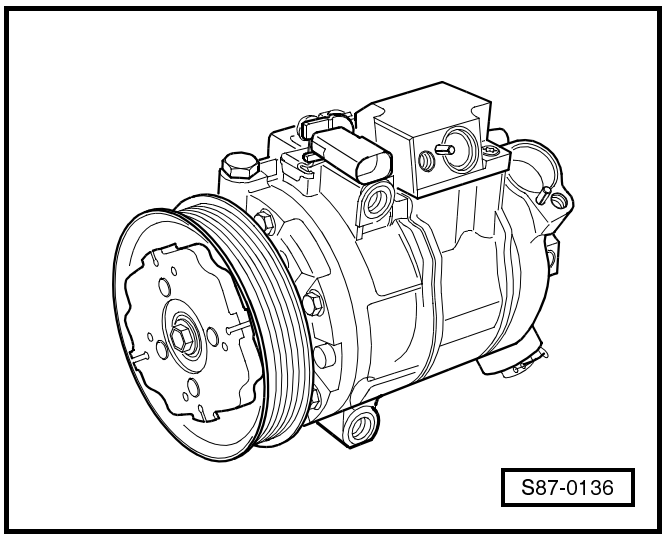
LP = Low-pressure side

- **1 - Oil drain plug***
- **2 - Compressor***
- **3 - Pressure relief valve***
- **4 - Regulating valve for compressor, air conditioning system -N280-***
- **5 - Exhaust and measurement valve***
  - ❑ Low-pressure side
- **6 - Cap**
- **7 - Condenser***
- **8 - Fluid container with desiccator insert***
- **9 - Connection with valve***
- **10 - High-pressure sender -G65-**
- **11 - Expansion valve***
- **12 - Evaporator***
- **13 - Cap**
- **14 - Exhaust, filler and measurement valve***
  - ❑ High-pressure side



Parts of the refrigerant circuit

Compressor



The new, externally controlled compressor 6 SEU 12C with variable displacement is driven by the engine's ribbed V-belt. It does not have a magnetic clutch.

The belt pulley/compressor shaft grip occurs via a driver clutch.

The displacement of the compressor is controlled via and externally driven regulating valve with PWM signal on the suction side in accordance with the required cooling output.

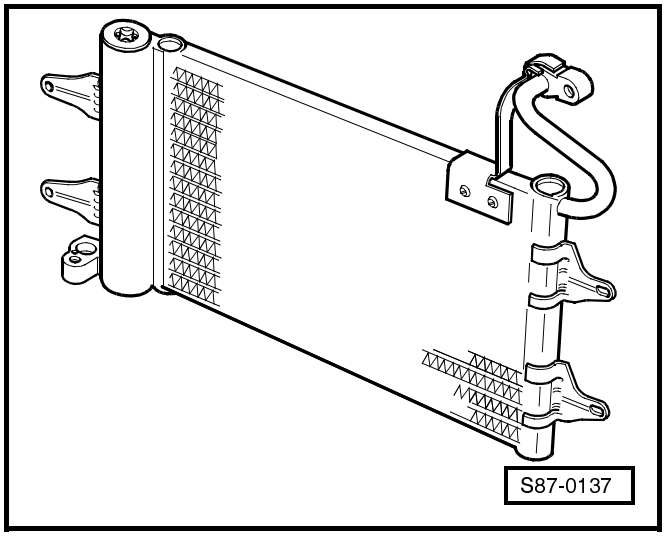
The compressor continues operating even when the air conditioning system is off with a minimum power supply requirement.

The compressor sucks refrigerant gas from the evaporator, compresses it and transfers it to the condenser.

Note!

The compressor contains refrigerant oil, which can be mixed with the R 134a refrigerant at all temperatures.

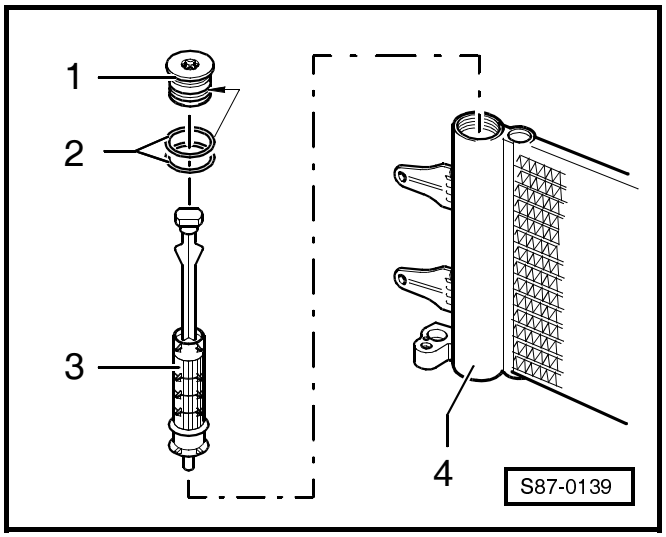
Condenser



The condenser dissipates heat from the compressed refrigerant gas into the ambient air.

During this process the refrigerant gas condenses and liquifies.

Fluid reservoir



The fluid reservoir -4- is a component part of the condenser.

It gathers the liquid drops and conveys them to the expansion valve in a constant flow.

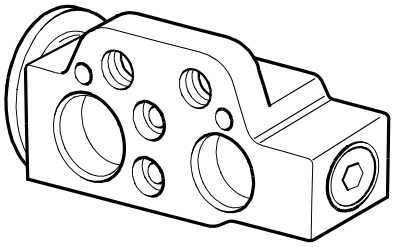
Humidity, that has penetrated into the refrigerant circuit during assembly, is bound by a dessicator insert -3- in the fluid reservoir.

Expansion valve

The expansion valve atomizes incoming refrigerant and controls the flow in accordance with the different pressures in such a way that, depending on the heat transport, the vapour only becomes gaseous at the outlet of the evaporator.

Note!

The expansion valves for refrigerant circuits using refrigerant R 134a are indicated with a green sticker.



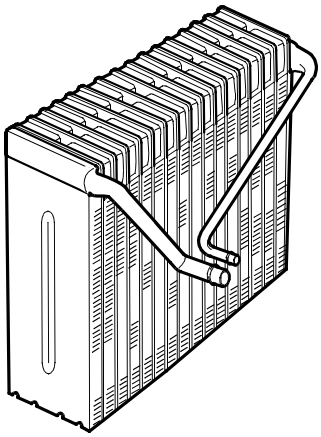
S87-0140

Evaporator

The liquid refrigerant evaporates in the evaporator.The heat required for this operation is drawn from the air flowing through the evaporator fins.

This cools down the evaporator.The refrigerant evaporates and is sucked in with the absorbed heat as gas by the compressor.

The externally regulated compressor allows a variable air outlet temperature of 1 - 11 °C.



S87-0147

Tubes and hoses of the refrigerant circuit

The mixture of refrigerant oil and refrigerant R 134a corrodes certain metals (e.g. copper) and alloys and dissolves certain hose materials.

Therefore only original spare parts may be used.

Note!

Pay attention to the prescribed tightening torques for the screwed connections.

O-Ring seals

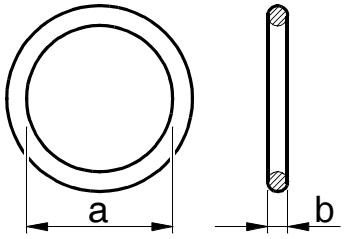
These rings seal off the connection points between the individual components of the refrigerant circuit.

Only use O-rings that are resistant to refrigerant R 134a and related refrigerant oils.Original spare parts offer this guarantee.

Black and coloured O-rings are fitted.

O-Ring seals:

- Only use once, replace.
- Pay attention to correct diameter -a- and -b-.
- Moisten with refrigerant oil before inserting.



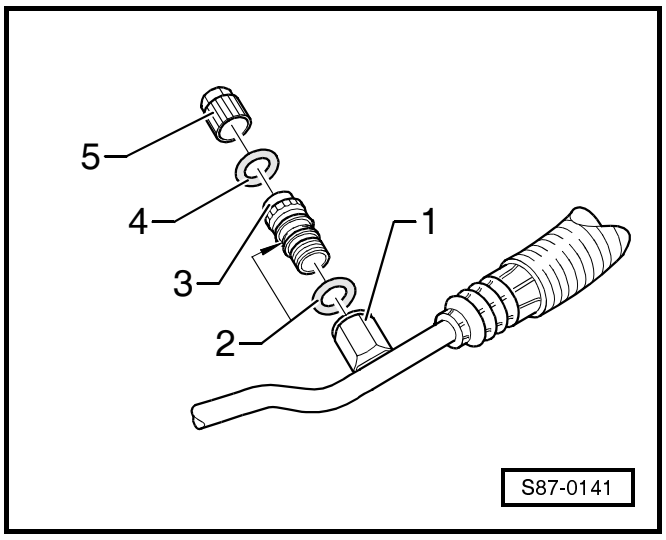
S87-0033

Connection for the quick-coupling adapter on the refrigerant circuit

- Only use valves and connections that are resistant to refrigerant R 134a and related refrigerant oils.
- Different connections (outside diameter) for high-pressure and low-pressure side guarantee that the quick-coupling adapters are not interchanged.
- After disconnecting the quick-coupling adapter tighten the caps to prevent any dirt from penetrating.

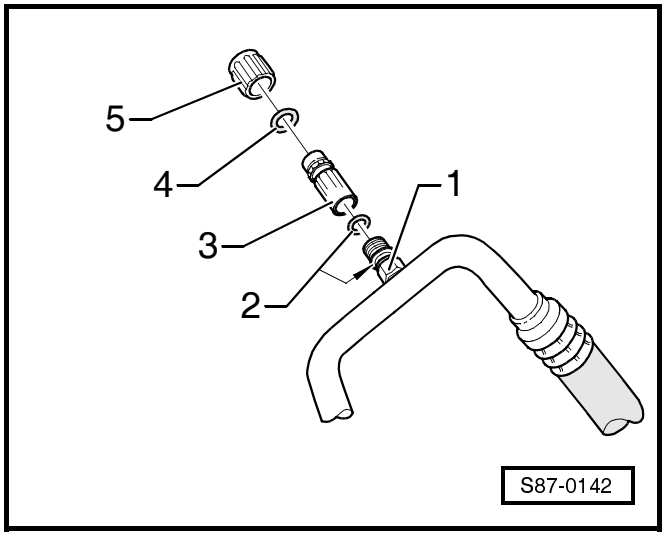
Connection to high-pressure valve

1 - Base with inside thread
2 - O-Ring 10.8 mm; 1.8 mm
3 - Valve with groove for O-ring and inside thread, M8 x 1 for cap
4 - Gasket ring
5 - Cap



Connection to low-pressure valve

1 - Base with outside thread and groove for O-ring
2 - O-Ring 7.6 mm; 1.8 mm
3 - Valve with inside thread for cap M8 x 1
4 - Gasket ring
5 - Cap



Parts for securing the refrigerant circuit

Pressure relief valve

The pressure relief valve is located on the compressor and opens in the event of overpressure.The refrigerant does not flow out completely.

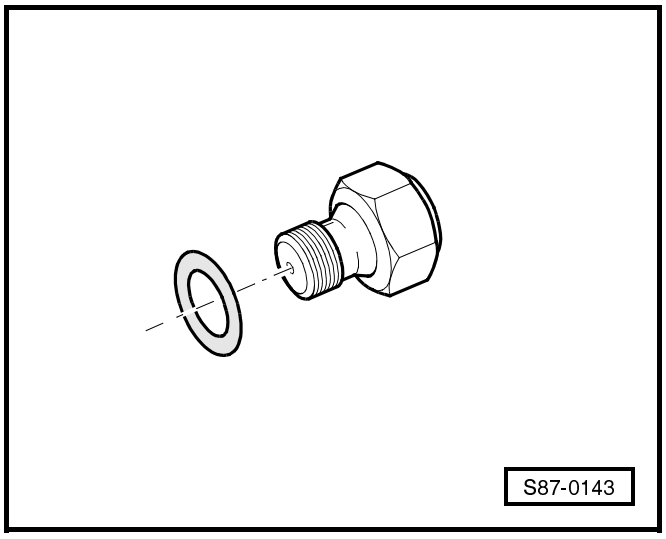
If the valve was opened the adjoining area is also covered in oil.

Opening pressure:4 ± 0.4 MPa (40 ± 4 bar)

Closing pressure:at least 3.1 MPa (31 bar)

Note!

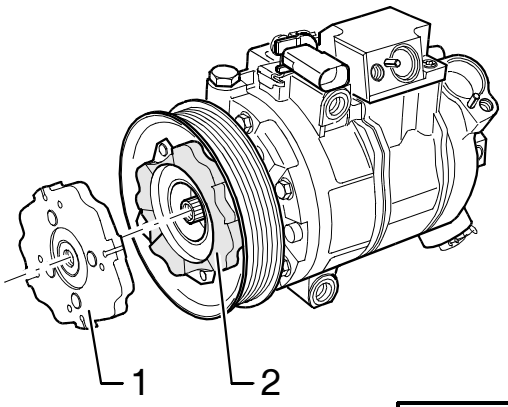
If the pressure relief valve was open, determine the cause of the overpressure in the system and adjust.



Belt protection for blocked compressor

The compressor operates continuously via a driver clutch -1- and -2- in the belt drive.

If the compressor blocks the rubber elements -2- are sheared off.The compressor belt pulley rotates while the compressor shaft stands still.



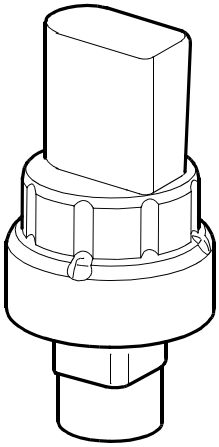
S87-0144

High-pressure sender -G65-

The high-pressure sender determines the pressure in the refrigerant circuit and transmits the values to the Air conditioning system control unit -J301-.

The air conditioning system control unit -J301- switches:

- The radiator fan -V7- to the next speed in the event of a pressure rise in the refrigerant circuit
- Reduction of the compressor output if the pressure is too high, 3.2 MPa (32 bar), e.g. too little engine cooling
- Reduction of the compressor output if the pressure is too low, 0.2 MPa (2 bar), e.g. refrigerant loss



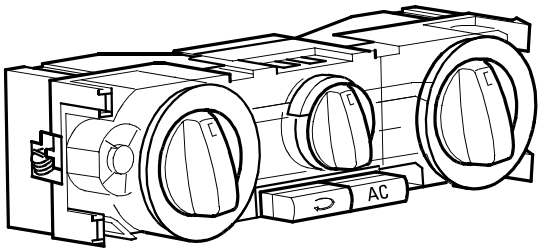
N87-0381

Air conditioning control unit -J301-

The air conditioning system control unit -J301- is integrated in the heating and air conditioning system control.

It processes information such as ambient temperature, actual and required interior temperature, evaporator temperature, pressure in the refrigerant circuit, engine load and driving conditions.

Depending on the required cooling output the air conditioning system control unit sends a PWM signal to the regulating valve of the compressor.

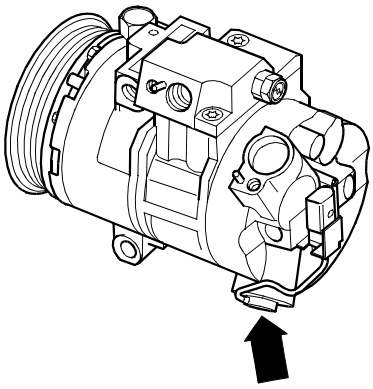


S87-0145

Regulating valve for compressor, air conditioning system -N280- ►

Depending on the required cooling output the regulating valve -arrow- (component of the compressor) receives a PWM signal from the air conditioning system control unit -J301- and regulates the displacement of the compressor via the suction pressure/position of the articulated disc..

This guarantees that the output of the compressor does not exceed the requirements.



S87-0146

87-3 Properties of refrigerant R 134a and of the refrigerant oil

Properties of refrigerant R 134a

Colour

As a vapour and liquid, refrigerant is as colourless as water, and as a gas it is invisible.

Vapour pressure

In a fully filled and closed reservoir, the vapour refrigerant that evaporates on the surface is of the same volume which again liquifies when the vapour particles fuse. This balanced status is created under pressure and is frequently called vapour pressure. The vapour pressure is temperature dependent.

Temperature in °C	Pressure (overpressure)	
	MPa	bar
-30	0	0
-20	0.03	0.3
-10	0.1	1.0
0	0.19	1.9
+10	0.31	3.1
+20	0.47	4.7
+30	0.67	6.7
+40	0.91	9.1
+50	1.22	12.2
+60	1.58	15.8
+70	2.02	20.2

Solubility of the refrigerant oil

The special refrigerant oil (poly-alkylene-glycol oil) required for lubricating the cylinder walls also flows to a small extent in the refrigerant circuit and mixes with refrigerant R 134a.

Air displacement as a result of gaseous refrigerant

Refrigerant gas is heavier than air and therefore disperses along the floor. It gathers in depressions where it displaces the available air.

Environmental compatibility

Refrigerant R 134a contributes to the greenhouse effect when released into the earth atmosphere. However, the greenhouse effect of refrigerant R 134a is considerably less than that of refrigerant R12.

Toxicity

Up to a temperature of 101 °C refrigerant is non-toxic and has no adverse effects on the human body provided the instructions for use of refrigerant R 134a are observed. It is odourless, non-irritant and is therefore panicproof.

Refrigerant gas or vapour has no influence on foodstuff. It does not become toxic or unfit for human consumption.

Behaviour with plastics

Refrigerant is a solvent for certain platcis. These dissolved plastics may be eliminated during cooling in the expansion valve. The valve blocks. Therefore only use original spare parts!

Behaviour with metals

In pure condition refrigerant R 134a is chemically stable and does not corrode iron and aluminium. Contaminations of the refrigerant, e.g. with chlorine compounds, may result in certain metals and plastics being corroded. This may lead to choking, leaks or other deposits on the compresssor piston.

Critical temperature and critical pressure

Up to a gas pressure of 3.95 MPa (39.5 bar) overpressure (this corresponds to a temperature of 101 °C) refrigerant R 134a remains chemically stable, above this temperature the refrigerant decomposes (see flammability).

Water content

Water is only soluble in very small quantities in the liquid refrigerant. As opposed to this refrigerant vapour and water vapour mix in any proportion.

Water possibly present in the system is conveyed through the refrigerant circuit as drops, once the dessicator in the fluid reservoir has become saturated. The function of the dessicator is no longer guaranteed. This water flows to the nozzle of the expansion valve and turns to ice. This reduces the efficiency of the cooling.

Water destroys the air conditioning system, as acids are produced under high pressures and temperatures in combination with other contaminations.

Flammability

Refrigerant is non-flammable. On the contrary it has a fire-retardant or fire extinguishing effect. Refrigerant decomposes when brought into contact with flames or red-hot surfaces. UV light also splits the refrigerant (generated during electrical welding). This results in toxic fission products (hydrogen fluoride and traces of carbonyl fluoride and fluorine), which give adequate advance warning as they irritate the mucous membranes.

Filling factor

The reservoir must also include vapour space in addition to the fluid space. As the temperature rises the fluid expands. The space filled with vapour becomes smaller. At a given moment there will only be fluid left in the reservoir. After this only a minor temperature increase is required to generate very high pressures in the reservoir as the fluid can no longer expand because there is no more space. The resulting forces are great enough to burst the reservoir. In order to ensure a reservoir is not over-filled, the pressure gas regulations stipulate how many kilos of refrigerant may be filled per litre inside volume of the reservoir. This „filling factor“ multiplied by the inside volume indicates the authorised filling content. For refrigerant R 134a, it is 1.15 kg/l.

Evidence of leaks

The refrigerant circuit may start leaking because of external damage. Because of the small amount of leaked refrigerant evidence of minor leaks can only be detected with an electronic leak detector.

Properties of the refrigerant oil

To lubricate the compressor special property oil also flows in the refrigerant circuit.

The main properties are high dissolving power with refrigerant, good lubricating properties, acid-free and no humidity.

The poly-alkylene-glycol (PAG) oils suitable for refrigerant R 134a are strongly hygroscopic (water retentive) and cannot be mixed with other oils. Therefore to ensure protection against penetrating humidity immediately close opened cans. Refrigerant oil is contaminated by humidity and acids; it becomes dark, viscous and corrodes metals.

Note

- *Never use oil commonly used for refrigerant circuits using refrigerant R 12 for refrigerant circuits using refrigerant R 134a.*
- *Because of its chemical properties refrigerant oil must not be disposed of with engine oil or gearbox oil. Refrigerant oil must be disposed of separately as special waste.*

87-4 Inspection and repair work on the air conditioning system

Important instructions for work on the refrigerant circuit

- Never use refrigerant R 12 in an air conditioning system for refrigerant R 134a. Similarly refrigerant R 134a must not be used in an air conditioning system intended for R 12, as the materials for the components in the circuit are specific to the relevant refrigerant.
- Also, do not mix the refrigerant oils specially developed for refrigerant circuits R 134a and R 12.
- The components of the refrigerant circuit for refrigerant R 134a are marked with green stickers or they are arranged in such a way that they cannot be switched with components for refrigerant R 12 (e.g. other thread).
- Never mix different refrigerants.
- Keep the work area and all tools clean.
- Wear protective goggles and gloves when handling refrigerant and nitrogen.
- Switch on all available exhaust systems.
- Use a service position only to empty the refrigerant circuit, only then may you open the screwed connections and replace defective components.
- Seal off opened aggregates and hoses immediately with caps to protect them against humidity and dirt.
- Only use tools and materials intended for refrigerant R 134a.
- Protect refrigerant oil from humidity by closing opened cans.
- Blow out the refrigerant circuit with compressed air and nitrogen if:

– Humidity or dirt has penetrated into the refrigerant circuit (e.g. after an accident)

– the refrigerant has become dark and viscous

– after a compressor replacement there is too much refrigerant oil in the refrigerant circuit

– the compressor needs to be replaced because of „internal“ damage (e.g. noise or no output)

- O-Ring seals

– only use gaskets that are resistant to refrigerant R 134a and related refrigerant oils

– only use once

– oil with refrigerant oil before fitting

– pay attention to correct inside diameter

- When blowing out components with compressed air and nitrogen always exhaust the gas mixture blown out of the components via a suitable exhaust system (workshop exhaust system).
- Screw caps on again after completing repair works on the filling valves.
- Never flush the refrigerant circuit with flushing agent R11.
- Never top up a filled refrigerant circuit with refrigerant (if there is any doubt about the volume of refrigerant in the circuit, drain off system, evacuate and fill again).

Detecting leaks in the refrigerant circuit with a leak detector

Notes:

- Minor leaks in refrigerant circuit R 134a can only be detected with special leak detectors (e. g. -V.A.G 1796-).
- Perform leak detection in compliance with the operating instructions of the commercially available devices.
- Once the refrigerant circuit is absolutely empty, fill circuit with approx. 100 g of refrigerant before leak detection.

Special devices for draining off, evacuating, filling and pressure measurement of the refrigerant circuit

When repairing the refrigerant circuit it is necessary to open the refrigerant circuit. Prior to this the refrigerant must be professionally drained off, after repair the refrigerant circuit must again be filled.

To this end special devices are commercially available for refrigerant R 134a, e. g. - SUN MRC 334 EB- and -Ecotechnics ECK 34 ME-.

The adapters required for connecting the special devices to the refrigerant circuit must be a part of the scope of delivery of the special devices.

All important instructions for working with the special devices are included in the relevant operating instructions.

Some special devices clean the drained refrigerant and use it again for refilling.

The drained off refrigerant must not be used for refilling if

- there is compressor damage (external leaks and external damage)
- dark, sticky deposits were found in the circuit
- There are doubts about the composition of the drained off refrigerant.

Draining off

The refrigerant circuit must be drained, if

- parts of the refrigerant circuit must be removed,
- there are doubts about the refrigerant volume in the circuit,
- it is necessary for reasons of safety.

Evacuate

Before the empty refrigerant circuit can be filled it must be evacuated, i.e. all air is to be removed. During this operation humidity is also drawn from the circuit.

The pressure gauge of the special devices must indicate an absolute pressure of 10 mbar (= 0.990 bar negative pressure) and, when the special devices are switched off, maintain a constant value for at least 1 hour. Then the refrigerant circuit is leakproof and may be filled.

Note

If during this period the pressure varies, either the refrigerant circuit leaks or there is residual humidity or refrigerant in the circuit.

Remedial measures

- Pour 100 g refrigerant in the circuit and use a leak detector to find leaks and eliminate them.
- Remove air again and repeat the pressure test.

Only when the negative pressure remains constant may the refrigerant circuit be filled.

Filling

Filling capacity for refrigerant R 134a ⇒ **87-4** page 4

The volume of refrigerant oil that was drained off must again be added to the circuit when filling. On condition that apart from the dessicator insert no other components were replaced and the refrigerant circuit was not cleaned with compressed air and nitrogen ⇒ **87-4** page 3. Filling capacity ⇒ **87-4** page 4.

Note

Fill refrigerant circuit on the high-pressure side only and not on the low-pressure side.

Check operation of the air conditioning system, possibly check pressures in the refrigerant circuit.

Pressure measurement

Special adapters are required to connect the pressure gauge to the high-pressure and low-pressure (extractor and filling valve).

Cleaning the refrigerant circuit with compressed air and nitrogen

- In order to evacuate decomposed refrigerant oil, humidity and other impurities in a clean, refrigerant-saving and environmentally friendly manner it is necessary to use compressed air and nitrogen.
- First blow through old refrigerant oil and dirt with compressed air, subsequently dehumidify the components with nitrogen.
- Compressed air and nitrogen cannot be blown through the compressor and the expansion valve.
- Always blow through the components against the flow direction of the refrigerant.
- Use a suitable adapter to connect the pressure hose to the refrigerant circuit.
- The refrigerant circuit must be blown through with compressed air first and then with nitrogen, if

– dirt or other impurities has/have entered into the circuit,

– when venting a gas tight refrigerant circuit of air the vacuum gauge is not constant (there is humidity in the refrigerant circuit which builds up pressure).

– the refrigerant circuit was open beyond standard assembly time (e.g. after an accident),

– pressure and temperature measurements in the circuit indicate that there is humidity in the refrigerant circuit,

– there are doubts about the refrigerant oil volume in the refrigerant circuit,

– the compressor needed to be replaced because of internal damage (e.g. noise or no output)

Caution!

Always use a reduction valve when working with nitrogen cylinders. The gas mixture emanating from the components must be exhausted via a suitable exhaust system.

Blowing through the refrigerant circuit with compressed air and nitrogen

– Connect the pressure hose with suitable adapters to the workshop compressed air system and connect the component to be blown through.

Note

- *To ensure neither oil nor moisture is transferred from the compressed-air system into the refrigerant circuit, the compressed air must be led through a compressed-air cleaning system for cleaning and drying. For this use a filter and dryer for compressed air (scope of delivery as tool for paint work).*
- *The adapters must not damage the refrigerant circuit components.*

– Switch on the exhaust system and vacuum impurities and refrigerant oil with the suction hose.

– Blow through components with compressed air until no more dirt and refrigerant oil is expelled (e.g. check with absorbant paper or a white cloth).

Note

- *Remove the dessicator insert before blowing through the condenser.*
- *The evaporator must be blown through via the low-pressure line connection (large diameter) once the expansion valve has been removed.*
- *Check expansion valve, replace if dirty or corroded.*
- *If there are dark, sticky deposits in the components that cannot be removed with compressed air, replace these components.*
- *Thin, light grey deposits on the inside do not hinder the operation of the components.*

– Connect the pressure reduction valve to the nitrogen cylinder (low pressure = 0.2 MPa/2 bar overpressure) and „dehumidify“ the individual components with nitrogen using the nitrogen pressure hose and the relevant adapters (exhaust system must be on).

– As no exact indication can be given concerning the residual volume of refrigerant oil in the compressor, drain off all oil from the compressor and fill the compressor again with refrigerant oil. The volume corresponds to the volume in the spare part-compressor ⇒ **87-4** page 4.

Note

- *Draining off the oil from the compressor is only possible through the filling opening, the compressor must therefore be removed.*
- *Once no more refrigerant oil runs from the compressor; turn on the compressor by hand and drain off residual oil.*

Replace the dessicator insert whenever the refrigerant cricuit has been opened and keep it closed as long as possible to prevent insofar as possible any humidity from penetrating into the dessicator insert.

Contents

Refrigerant circuit

550 ± 25 g refrigerant R 134a

Note

- *Fill the refrigerant circuit on the high-pressure side only.*
- *Always fill the refrigerant circuit up to the top tolerance limit (there will still be some refrigerant in the filling hoses).*

Refrigerant oil

For compressor manufacturer Denso: 140 ±10 cm^3 PAG oil
(Order No. G 052 300 A2)

The total volume of refrigerant oil is contained in the spare part-compressor.

Oil distribution

The oil, which before the first activation of the air conditioning system was located in the compressor's oil pan, is distributed as follows in the refrigerant circuit:

- Compressor approx. 50 %
- Condenser approx. 10 %
- Inlet hose approx. 10 %
- Evaporator approx. 20 %
- Fluid reservoir approx. 10 %

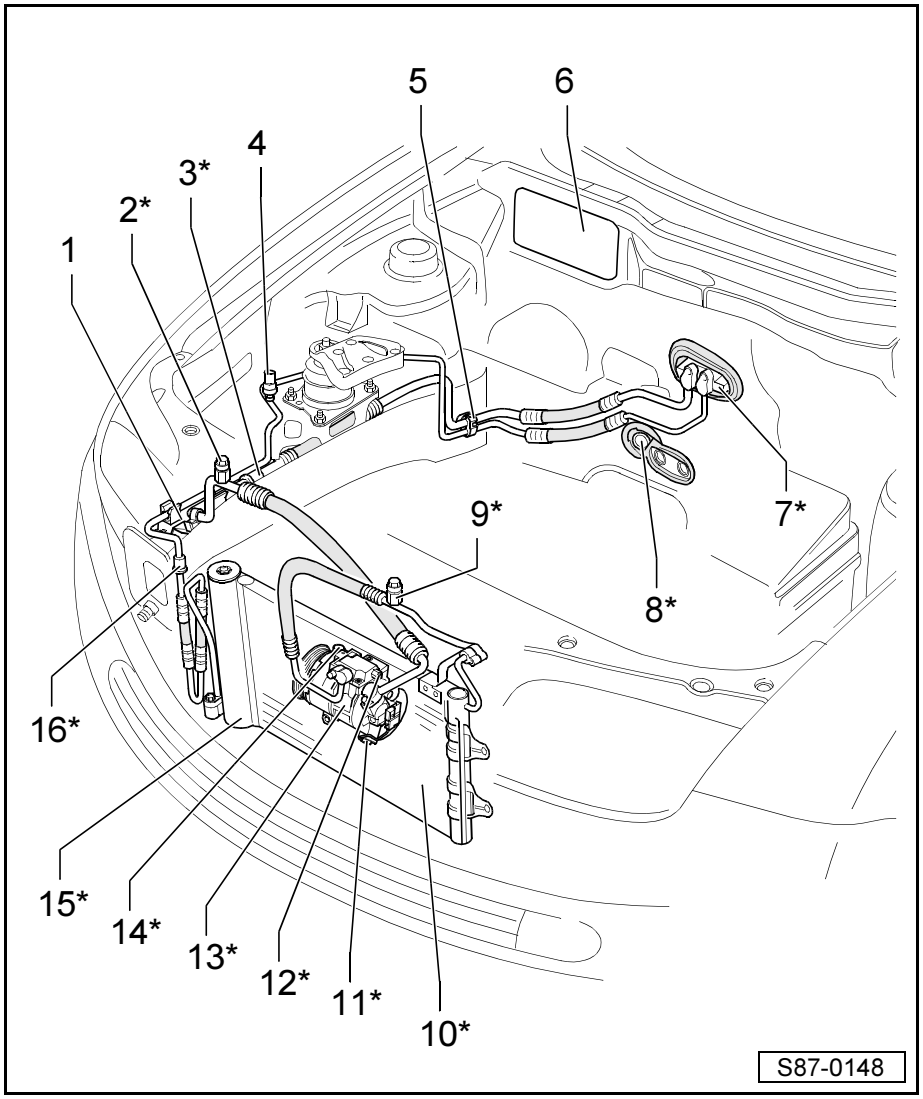
87-5 Repairing the air conditioning system - engine compartment

Caution!

Disconnect earth strap from the battery before commencing work on the electrical system.

Note

- *Before disconnecting the battery determine the code of radio sets fitted with anti-theft coding.*
- *If the battery earth strap is disconnected and connected then additional operations must be carried out ⇒ Electrical System; Rep. Gr. 27.*
- *All air conditioning components marked * as well as all refrigerant hoses and refrigerant lines can only be repaired or replaced at service centres since the refrigerant must first be drained off using a special device.*
- *Comply with the safety instructions for working on vehicles with air conditioning and when using refrigerant R 134a.*
- *Comply with the instructions for working on the refrigerant circuit.*
- *Do not start engine if the refrigerant lines are not connected to the compressor and the compressor is closed with plugs.*



1 - Holder for refrigerant lines
- ❑ ⇒ Fig. 7 in **87-5** page 5
- ❑ Properly secure the refrigerant lines

2 - Exhaust valve*
- ❑ Low-pressure side
- ❑ for exhaust and measurement only
- ❑ always screw on cap with gasket

3 - Quick coupling for refrigerant line*
- ❑ Low-pressure side
- ❑ disconnecting ⇒ Chapter 87-7

4 - High-pressure sender -G65-
- ❑ function ⇒ Chapter 87-2
- ❑ removing and installing, inspecting ⇒ Chapter 87-6

5 - Holder for refrigerant lines
- ❑ bolted with plastic nut (2.7 Nm)

6 - Opening for air inlet of air conditioning unit
- ❑ under cover in the cooling-water tank

7 - Expansion valve*
- ❑ Removing and installing the refrigerant lines ⇒ Fig. 8 in **87-5** page 5
- ❑ removing and installing ⇒ Chapter 87-6

8 - Valve for condensation water drain*
- ❑ behind heat-protection matting of the bulkhead (assembly plate)
- ❑ Fit only on removed air conditioning unit
- ❑ check ⇒ Fig. 9 in **87-5** page 5

9 - Extractor and filling valve*
- ❑ High-pressure side
- ❑ for exhausting, filling and measuring
- ❑ always screw on cap with a gasket

10 - Condenser*
- ❑ Removing and installing the refrigerant lines ⇒ Fig. 2 in **87-5** page 3 and ⇒ Fig. 1 in **87-5** page 3
- ❑ Removing and installing condenser ⇒ Chapter 87-6

11 - Regulating valve for compressor, air conditioning system - N280-*
- ❑ Elements of the compressor, do not replace individually
- ❑ check ⇒ Rep. Gr. 01
- – Coil resistor-regulating valve at 20 °C: 10.6 ± 0.4 Ω

Note

Depending on the required cooling output the regulating valve receives a PWM signal (500 Hz) from the air conditioning system control unit -J301- and regulates the displacement of the compressor via the suction pressure/ position of the articulated disc.

12 - Pressure relief valve*
- ❑ O-Ring seal: 8.6 mm; 1.8 mm
- ❑ Tightening torque: 10 Nm
- ❑ Function ⇒ Chap. 87-2
- ❑ inspecting ⇒ Chapter 87-6

13 - Compressor*
- ❑ Manufacturer: Denso, designation: 6 SEU 12C
- ❑ Removing and installing the compressor on the holder ⇒ Fig. 4 in **87-5** page 4
- ❑ Removing and installing the refrigerant lines ⇒ Fig. 5 in **87-5** page 4
- ❑ Belt protection for blocked compressor ⇒ Fig. 6 in **87-5** page 4
- ❑ Removing and installing the compressor ⇒ Chapter 87-6
- ❑ Running-in instruction ⇒ Chapter 87-6

Note

- ♦ *The compressor displacement is regulated on the suction side via the externally clock-pulsed regulating valve in accordance with the required cooling output.*
- ♦ *If the air conditioning system is switched off due to a loss of refrigerant, the lubrication of the compressor is ensured.*
- ♦ *Do not start engine if the refrigerant lines are not connected to the compressor and the compressor is closed with plugs (risk of overheating).*

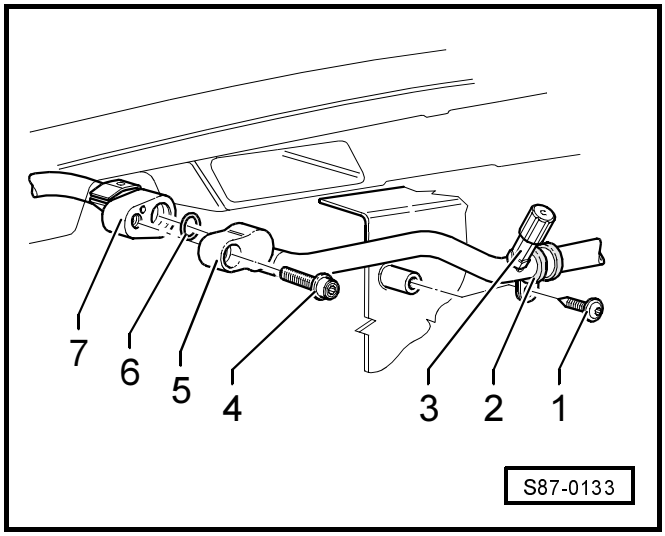
14 - Oil drain plug*
- ❑ with gasket
- ❑ tightening torque for:
  M 8 - 30 Nm
  M 10 -40 Nm

To drain off refrigerant oil:
- – Remove compressor:
- – Remove oil drain plug.
- – Turn the compressor over the belt pulley to speed up drainage of the oil.

15 - Fluid container with desiccator insert*
- ❑ Element of the condenser
- ❑ Replace dessicator insert after each opening of the refrigerant circuit
- ❑ Summary of components of the dessicator insert ⇒ Fig. 3 in **87-5** page 3
- ❑ Removing and installing the dessicator insert ⇒ Chapter 87-6

16 - Quick coupling for refrigerant line*
- ❑ High-pressure side
- ❑ disconnecting ⇒ Chapter 87-7

Fig. 1: Removing and installing refrigerant line - condenser inlet ►

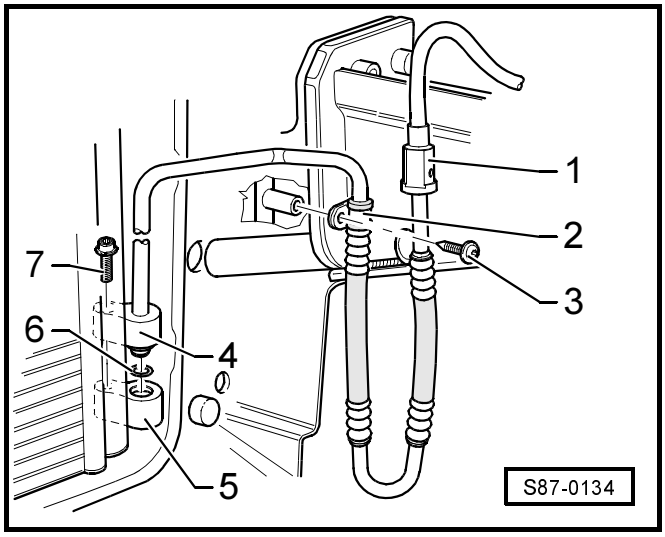


1 - 5 Nm
2 - Clamp
3 - High-pressure valve
4 - 12 Nm
5 - Connection fittings for refrigerant line
♦ Torsion stop with sleeve
6 - O-Ring 10.80 mm; 1.82 mm
♦ replace
7 - Condenser

Note

♦ *Shut off refrigerant line and condenser connection.*
♦ *Replacing dessicator insert ⇒ Chapter 87-6*

Fig. 2: Removing and installing refrigerant line - condenser outlet ►

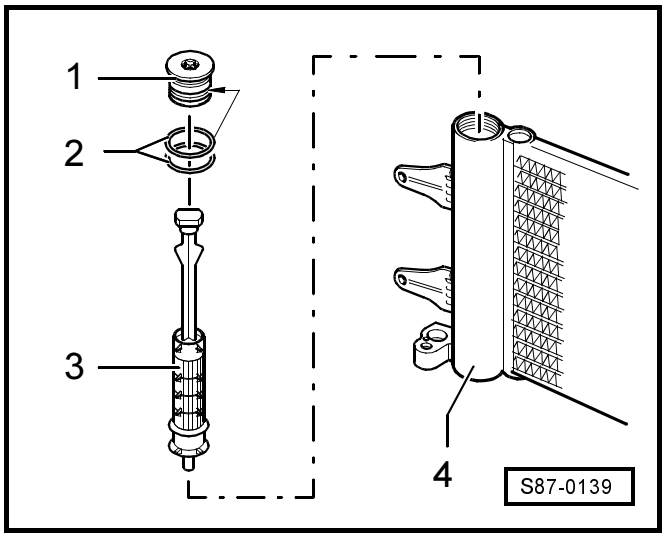


1 - Quick coupling
♦ disconnecting ⇒ Chapter 87-7
2 - Clamp
3 - 5 Nm
4 - Connection fittings for refrigerant line
♦ Torsion stop with fitting sleeve
5 - Condenser/fluid reservoir
6 - O-Ring 10.80 mm; 1.82 mm
♦ replace
7 - 15 Nm

Note

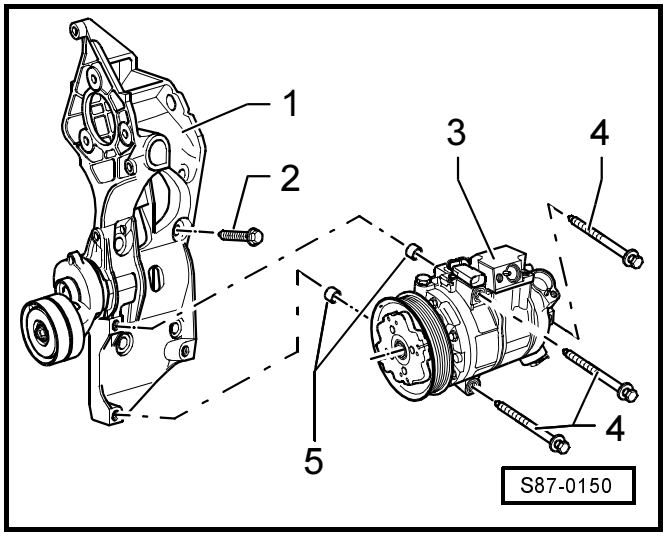
♦ *Shut off refrigerant line and condenser connection.*
♦ *Replacing dessicator insert ⇒ Chap. 87-6*

Fig. 3: Summary of components of the dessicator insert ►



1 - Screw plug, 15 Nm
2 - O-ring
♦ replace
3 - Dessicator insert
♦ replace
♦ removing and installing ⇒ Chapter 87-6
4 - Fluid reservoir/condenser

Fig. 4: Removing and installing the compressor from/on the holder



1 - Bracket

♦ engine specific - different versions

2 - 45 Nm

3 - Compressor

♦ removing and installing ⇒ Chapter 87-6

4 - Combination screws

♦ M8 = 25 Nm

♦ M10 = 45 Nm

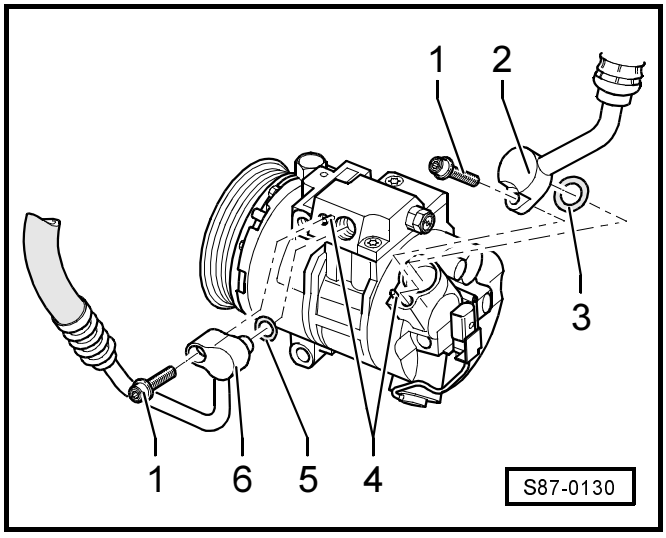
5 - Sleeves for compressor

♦ must be fitted in the holder -1- or compressor -3-

Note

After removal attach the compressor to the lock carrier and do not suspend on the refrigerant lines.

Fig. 5: Removing and installing the refrigerant lines on the compressor



1 - 22 Nm

2 - Connection fittings for suction line

♦ Torsion stop with sleeve -4-

3 - O-Ring 23.80 mm; 2.40 mm

♦ replace

4 - Fitting sleeve

5 - O-Ring 10.80 mm; 1.82 mm

♦ replace

6 - Connection fittings for pressure line

Torsion stop with sleeve -4-

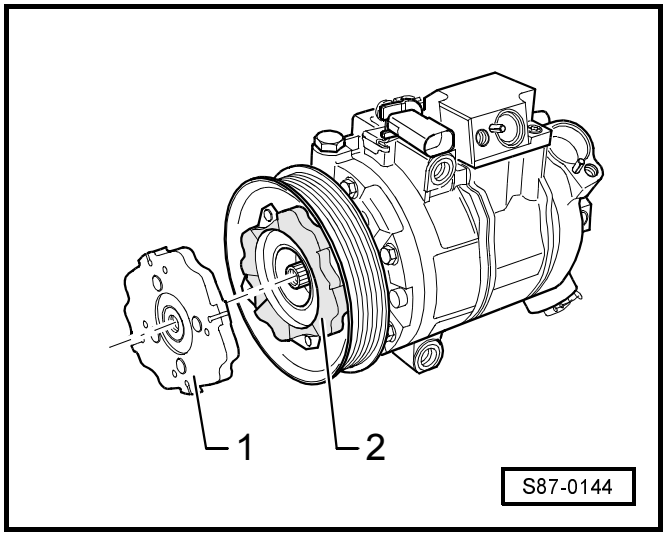
Note

♦ *The different versions of the refrigerant lines are engine specific. Fixing to the compressor is identical for all versions.*

♦ *Shut off refrigerant lines and compressor connections.*

♦ *Replacing dessicator insert ⇒ Chapter 87-6*

Fig. 6: Belt protection for blocked compressor



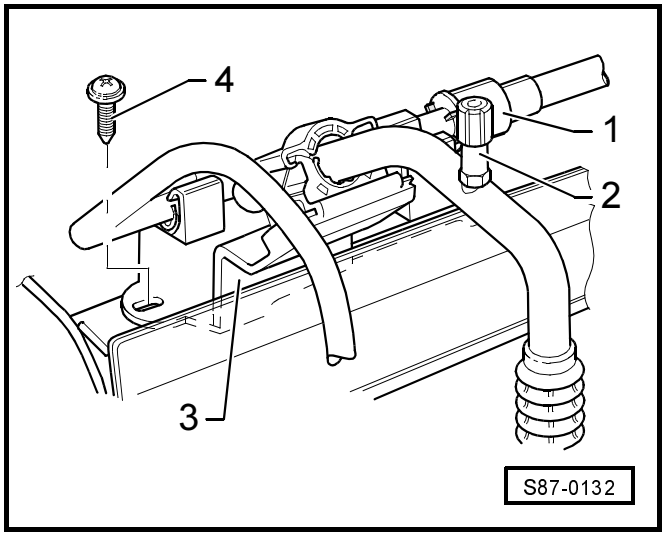
The compressor operates continuously via a driver clutch -1- and -2- in the belt drive, whether or not the air conditioning system is switched on.

If the compressor blocks, the rubber elements -2- will shear off or the driver disc -1- will become deformed depending on the compressor temperature.

In any case the belt pulley of the compressor can rotate while the driver disc/compressor shaft is at a standstill.

Replace the compressor.

Fig. 7: Holder for refrigerant lines



1 - Quick coupling

- disconnecting ⇒ Chapter 87-7

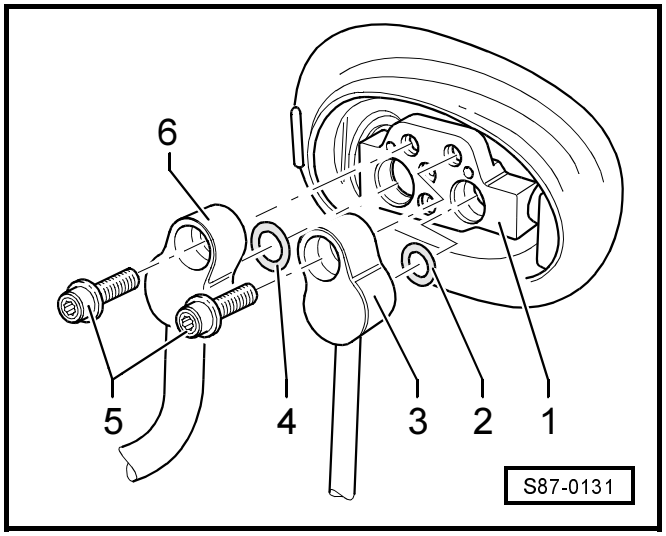
2 - Low-pressure valve

3 - Bracket

- screwed onto the frame side rail
- Properly secure the refrigerant lines

4 - 2 Nm

Fig. 8: Removing and installing the refrigerant lines on the expansion valve



1 - Expansion valve

- removing and installing ⇒ Chapter 87-6

2 - O-Ring 10.80 mm; 1.82 mm

- Replace

3 - Connection fittings for pressure line

- Torsion stop with sleeve

4 - O-Ring 14.30 mm; 2.40 mm

- Replace

5 - 10 Nm

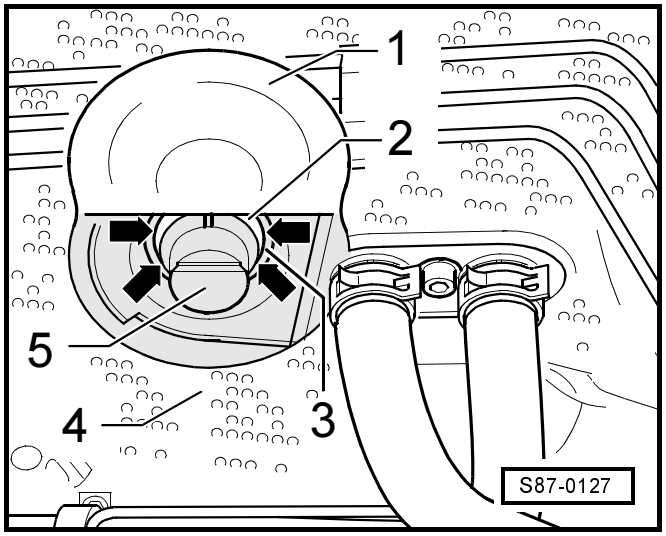
6 - Connection fittings for suction line

- Torsion stop with sleeve

Note

- *Shut off refrigerant lines and expansion valve connections.*
- *Replacing dessicator insert ⇒ Chapter 87-6*

Fig. 9: Check valve for condensation water drain



Perform the inspection if the floor covering under the air conditioning unit becomes damp when the air conditioning is on.

– Open perforation of the cover -1- at the bottom of the heat-protection matting -4- and fold up cover.

To guarantee the perfect operation of the valve for condensation water drain, check the following:

- The valve for condensation water drain -5- must not stick.
- The sealing lips -3- of the gasket in the bulkhead (assembly plate) must fit all round in the holder slot -2- -arrows-.

The valve for condensation water drain is positioned in the holder -2- and on the air conditioning unit.

- The heat-protection matting must neither be deformed nor damaged around the valve for condensation water drain.

Note

When closed the cover -1- must be flush with the heat-protection matting -4-. If the cover -1- is pressed too far inwards, the cap of the valve for condensation water drain -5- may become stuck.

87-6 Removing and installing parts of the air conditioning system - engine compartment

Removing and installing, inspecting high pressure sender -G65-

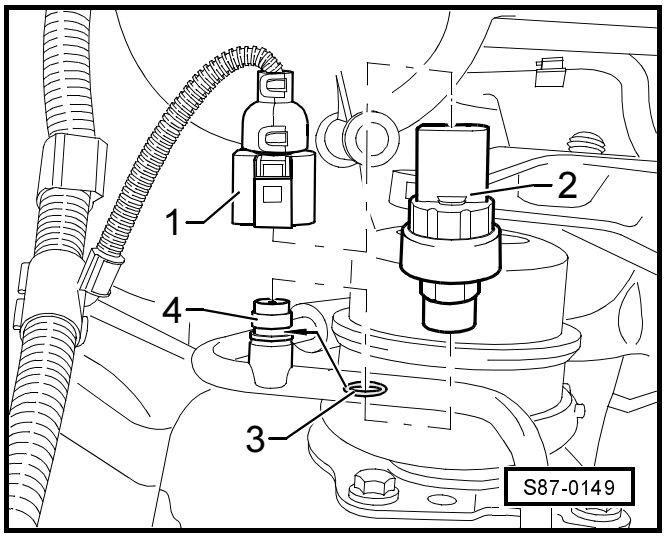
Removing and installing

– Unplug the 3 pin plug connection -1-.

– Unscrew high pressure sender (-G65-) -2-.

Tightening torque: 8 Nm

– Replace O-Ring (10.80 mm; 1.82 mm) -3-, moisten with refrigerant oil and carefully insert in the connection slot -4-.



Note

The refrigerant circuit remains closed, connection to valve.

Inspect proper operation

The function of the high pressure sender -G65- is checked via self-diagnosis of the air conditioning system control unit -J301- ⇒ Rep. Gr. 01.

Removing and installing the expansion valve

(Must only be performed in service centres!)

Removing

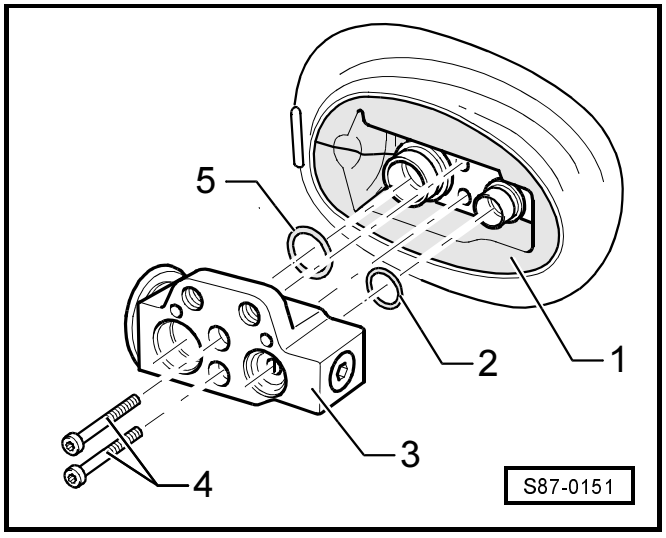
– Drain the coolant circuit ⇒ Chapter 87-4.

– Removing refrigerant lines from the expansion valve ⇒ Chapter 87-5.

– Release screws -4-.

Tightening torque: 5 Nm

– Remove expansion valve -3-.



Note

- *Shut off open connections on the evaporator.*
- *Replace O-ring -2- (11.10 mm; 1.78 mm) and -5- (17.17 mm; 1.78 mm), moisten with refrigerant oil and mount on the refrigerant lines of the evaporator.*
- *The expansion valve must be correctly positioned in the heat-protection insulation -1-.*

Installing

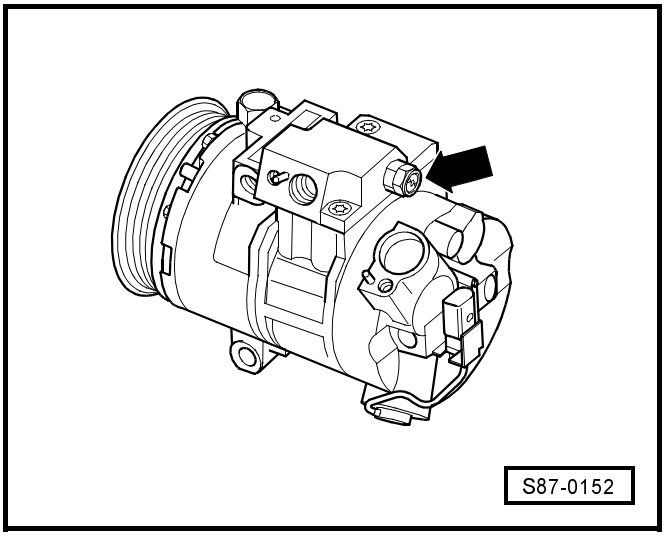
Installation is carried out in the reverse order. Pay attention to the following:

– Replacing dessicator insert ⇒ **87-6** page 4.

– Fill the coolant circuit ⇒ Chapter 87-4.

Inspecting the pressure relief valve on the compressor

Function: Protects the refrigerant circuit from excessive pressure.



If the area near the pressure relief valve -arrow- is heavily oiled, the pressure in the system was too high and refrigerant and refrigerant oil were released.

Removing and installing the compressor

(Must only be performed in service centres!)

Removing

– Drain the coolant circuit ⇒ Chapter 87-4.

– Removing refrigerant lines from the compressor ⇒ Chapter 87-5.

Note

The engine must not be started if the refrigerant lines are not connected to the compressor and the compressor is shut off with plugs (risk of overheating because of the internal refrigerant oil circuit).

– Removing compressor from the holder ⇒ Chapter 87-5.

Installing

Note

- *The total volume of refrigerant oil is contained in the spare part-compressor.*
- *If the other components of the refrigerant circuit do not need to be cleaned with compressed air and nitrogen ⇒ Chapter 87-4, the volume of refrigerant oil in the compressor can be determined as follows:*

– Drain off the refrigerant oil from the old compressor and measure the volume.

– Completely drain off the refrigerant oil from the new compressor.

– Fill the new compressor with as much new refrigerant oil as was drained off from the old compressor.

Installation is carried out in the reverse order. Pay attention to the following:

– Before fitting the new compressor rotate it 10 times by hand.
– Replacing dessicator insert ⇒ **87-6** page 4.
– Fill the coolant circuit ⇒ Chapter 87-4.
– Comply with the running-in instructions for the compressor ⇒ **87-6** page 3.

Running-in instructions for the compressor

After the initial filling of the refrigerant circuit or after blowing through the refrigerant circuit (⇒ Chapter 87-4) the whole volume of refrigerant oil is in the compressor.

To avoid damaging the compressor, the compressor must be loaded as follows:

– Position the rotary switch for air distribution on „person flow“.
– Open all dash panel vents.
– Position the fresh-air blower switch at least on speed 3.
– Position rotary switch for temperature selection on the left stop (minimum temperature).
– Start engine.
– Switch on air condition system once idle stabilisation has been achieved (after approx. 5 seconds).
– Run engine without interruption for at least 2 minutes at idle speed.

  Maximum engine speed: 1500 min[1]

– Subsequently switch off engine.

This shuts off the oil distribution in the refrigerant circuit and the compressor can be fully loaded.

Removing and installing the condenser

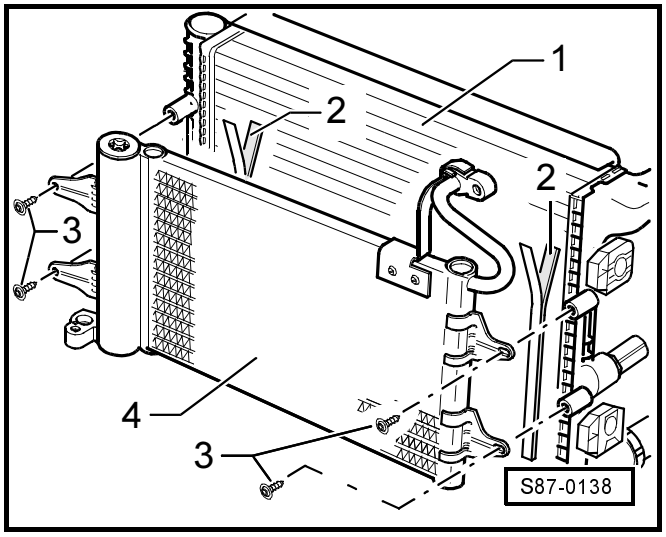
(Must only be performed in service centres!)

Removing

– Drain the coolant circuit ⇒ Chapter 87-4.
– Removing the lock carrier ⇒ Body Work; Rep. Gr. 50.
– Removing refrigerant lines from the condenser ⇒ Chapter 87-5.
– Release screws -3-.

  Tightening torque: 5 Nm

– Remove condenser -4- from the radiator -1-.
– In the event of damage replace the sealing strip -2- (adhesive).



Installing

Installation is carried out in the reverse order. Pay attention to the following:

– Replacing dessicator insert ⇒ **87-6** page 4.

– Fill the coolant circuit ⇒ Chapter 87-4.

Replacing dessicator insert

The dessicator insert must be replaced after each opening of the refrigerant circuit.

Special tools, test and measuring equipment and auxiliary items required

♦ Torx wrench T70

Removing

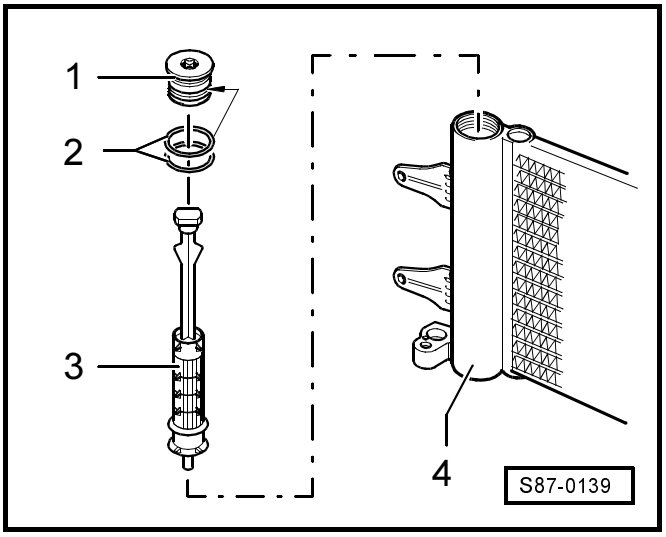
– Drain the coolant circuit ⇒ Chapter 87-4.

– Removing the lock carrier ⇒ Body work; Rep. Gr. 50.

– Remove screw plug -1- with Torx wrench T70. ►

– Pull out dessicator insert -3-.

If there is any resistance use pliers; during this procedure do not damage the thread of the fluid reservoir.



Installing

O-rings -2- are a part of the scope of delivery of the spare part-dessicator insert. ►

– Remove old O-rings -2- from screw plug -1-.

– Moisten a fuzzy-free cloth with refrigerant oil and clean the screw plug thread -1- and the fluid reservoir -4-.

– Moisten new O-rings with refrigerant oil and mount on screw plug.

– Insert the dessicator insert -3- into the fluid reservoir up to the stop.

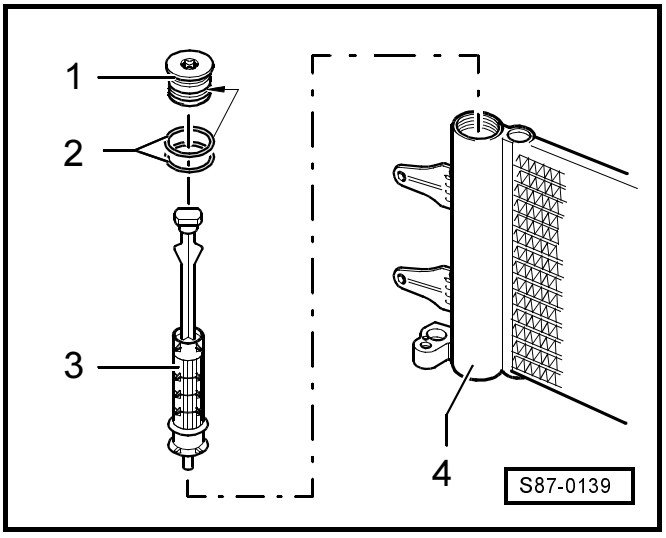
The top part is resilient.

– Tighten screw plug.

Tightening torque: 15 Nm

– Install the lock carrier ⇒ Body Work; Rep. Gr. 50.

– Fill the coolant circuit ⇒ Chapter 87-4.



87-7 Quick couplings for refrigerant lines

Separating quick couplings for refrigerant lines

(Must only be performed in service centres.)

Special tools, test and measuring equipment and auxiliary items required

- Release tool -VAS 5231- (for low-pressure line)
- Release tool -VAS 5231/1- (for high-pressure line)
- Pliers for circlip
- Protective goggles
- Gloves

Note

- *Whenever the quick coupling is disconnected, replace the O-ring, locking insert and circlip.*
- *These parts are available as repair kit (6G0 298 260 - for high-pressure line; 6G0 298 260A - for low-pressure line).*
- *The following describes the separating of the quick coupling of the low-pressure line. The work sequence for separating the quick coupling of the high-pressure line is the same.*

Procedure

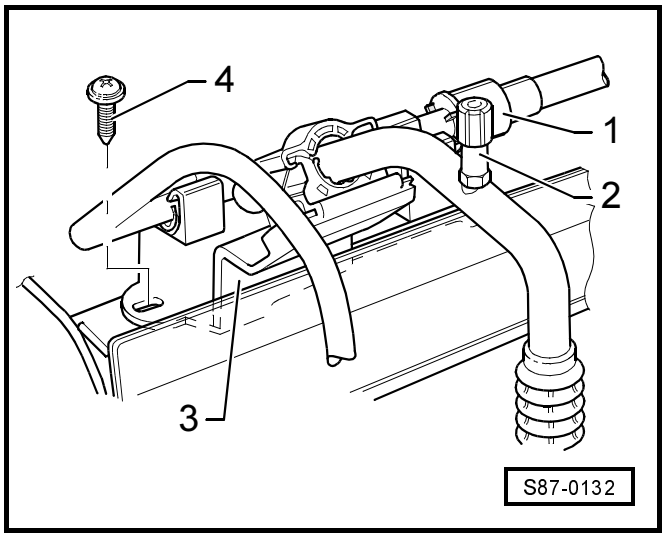
- The refrigerant circuit is empty.

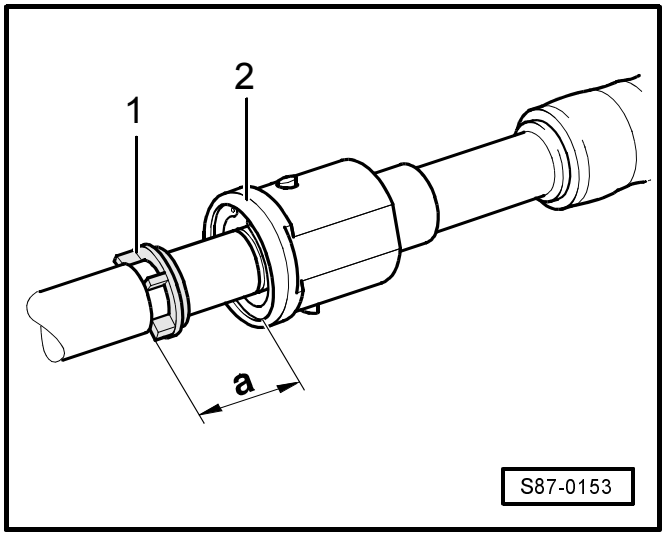
Separating the quick coupling

– Remove right headlight and noise insulation.

– Remove the refrigerant lines from the holder -3-. ►

– Release the dust-protection cap -1- from the coupling -2- so as to allow the release tool to be fitted. ►

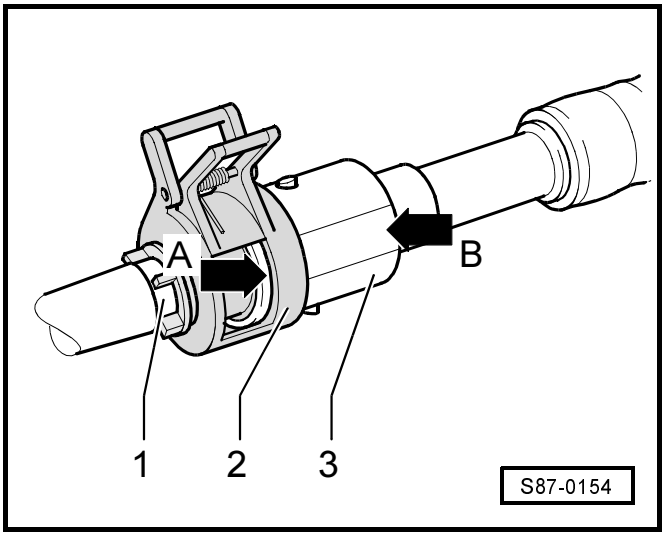




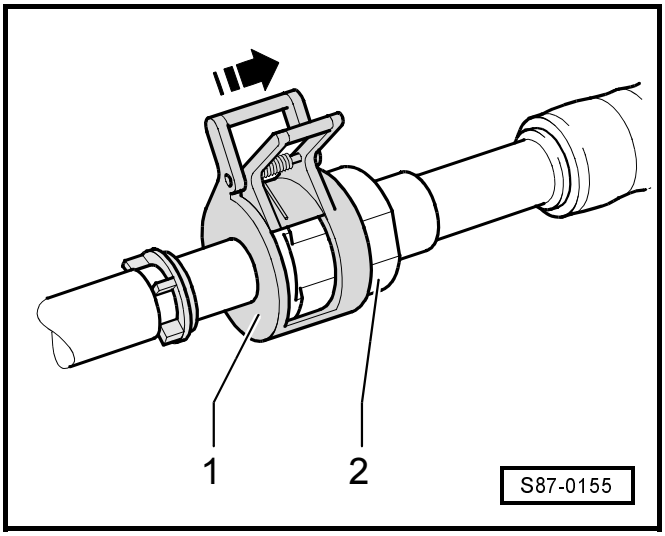
Note

- *The insulating hose on the low-presure line must be at a distance -a- of at least 20 mm from the coupling, as otherwise it is impossible to fit the release tool.*
- *If necessary after removing the dust-protection cap, carefully cut the insulating hose longitudinally and fold forwards.*

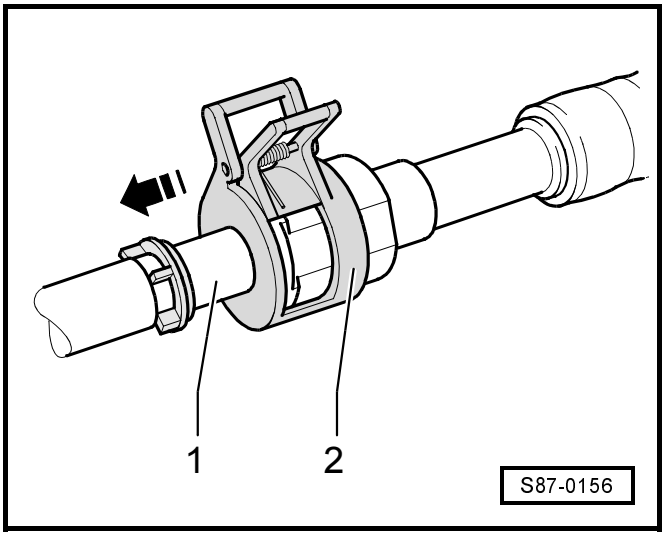
– Mount release tool -2- on the refrigerant line -1- and coupling housing -3- in such a way that the flattened parts on the release tool -arrow A- correspond with the flattened parts on the coupling -arrow B-.



– Insert release tool -1-, beyond a perceptible resistance up to the stop in the direction of the arrow, in the coupling housing -2-.

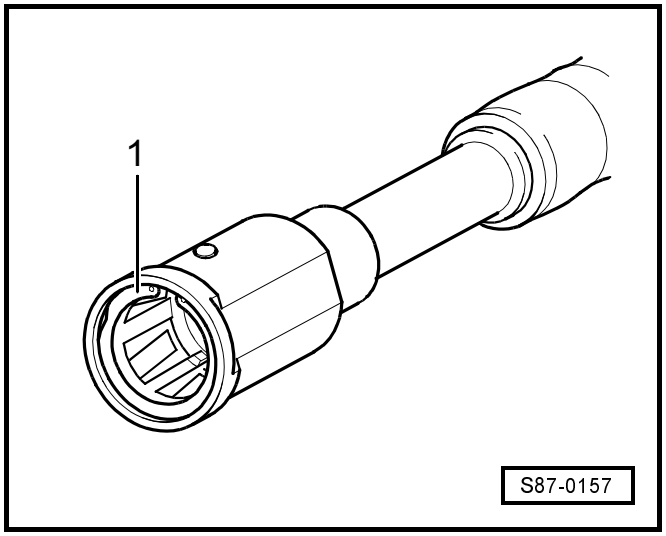


– Press release tool -2- against the stop on the refrigerant line -1-.
– Draw the refrigerant line -1- together with the release tool -2- from the coupling housing in the direction of the arrow.
– Fold up release tool -2- and remove.



Removing gasket

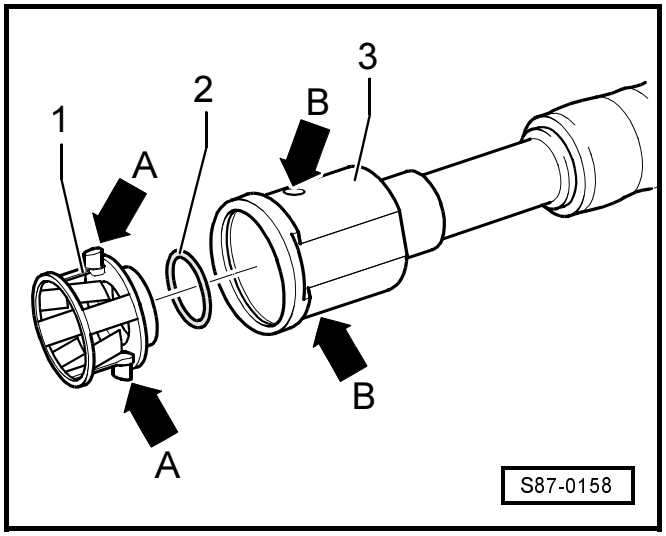
– Remove circlip -1- with suitable pliers. ►



– Remove locking insert -1- from the coupling housing -3-. ►

  To this end compress the 2 catches -arrows A- in the holes -arrows B- until the locking insert can be removed.

– Remove O-ring -2-.

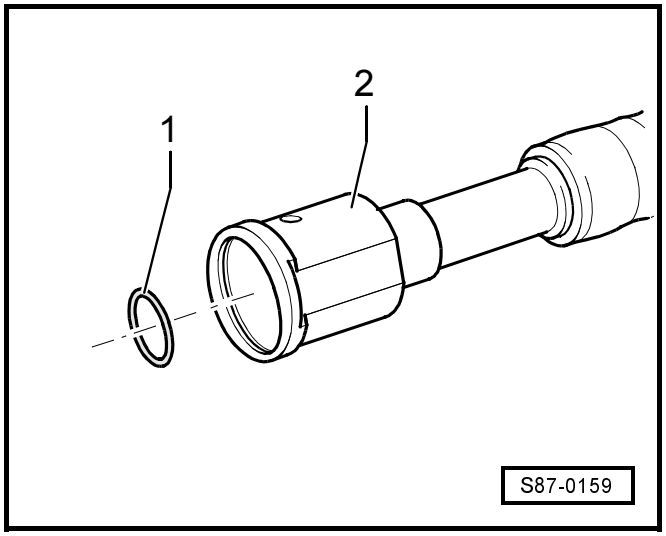


Installing gasket

– Moisten new O-ring -1- with refrigerant oil and insert in the coupling housing -2- up to the stop. ►

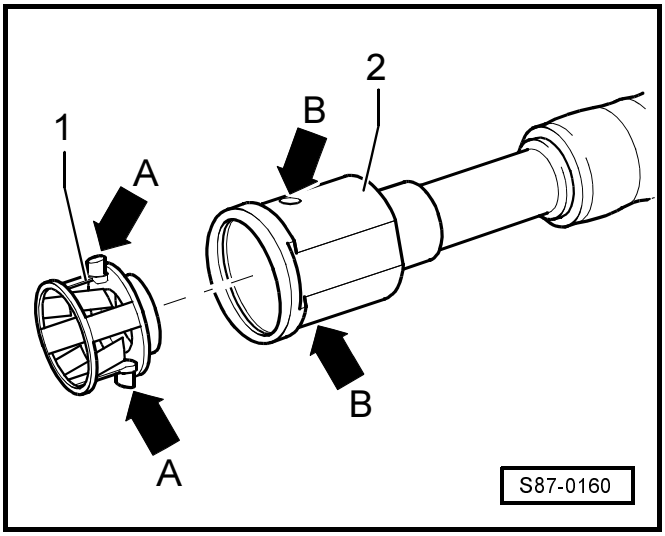
Note

Pay attention to the different O-rings for the high-pressure and low-pressure line.

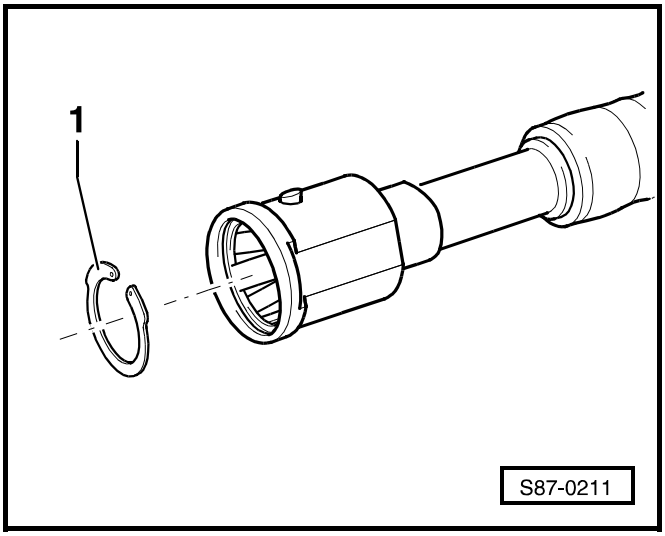


– Fit new locking insert -1- in the coupling housing -2-. ►

  Catches -arrows A- must lock into the holes -arrows B-.



– Install circlip -1- with suitable pliers. ►



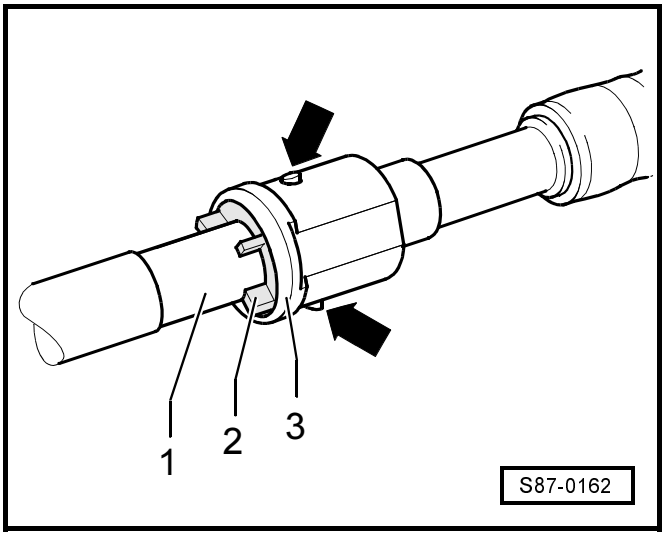
Connecting the quick coupling

– Press the refrigerant line -1- into the coupling housing -3- until it locks audibly. ►

  The catches of the locking insert must clearly protrude from the holes of the coupling housing -arrows-.

– Insert dust-protection cap -2- into the coupling housing up to the stop.

– Press the refrigerant lines back into the holder on the frame side rail.



87-8 Repairing the air conditioning system - passenger compartment

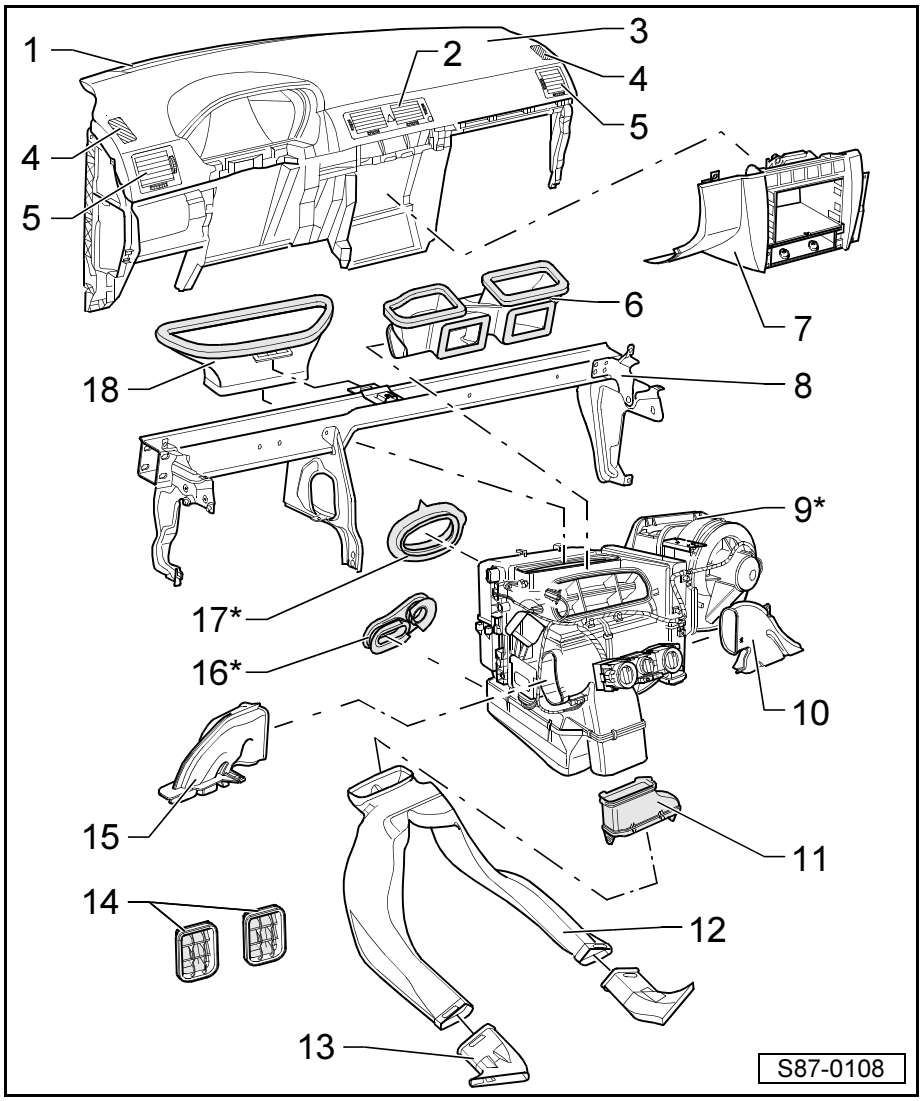
Summary of components

Caution!

Disconnect earth strap from the battery before commencing work on the electrical system.

Note

- *Before disconnecting the battery determine the code of radio sets fitted with anti-theft coding.*
- *If the battery earth strap is disconnected and connected then additional operations must be carried out ⇒ Electrical System; Rep. Gr. 27.*
- *The parts marked with an * can only be repaired or replaced at a service centre since the refrigerant must be drained off using a service station.*
- *Comply with the safety instructions for working on vehicles with air conditioning and when using refrigerant R 134a.*
- *Comply with the instructions for working on the refrigerant circuit.*



1 - Defroster vent
- ❑ integrated in dash panel

2 - Centre dash panel vent
- ❑ with warning light switch
- ❑ removing and installing ⇒ Fig. 1 in **87-8** page 2

3 - Dash panel
- ❑ removing and installing ⇒ Body work; Rep. Gr. 70

4 - Side window vent
- ❑ use removal tool -3409- to carefully lever out

5 - Outer dash panel vent
- ❑ use removal tool -3409- to carefully lever out at top and bottom (in the same way as for the centre dash panel vent)

6 - Intermediate piece for dash panel vents
- ❑ attached to heater unit with clips
- ❑ for removing, take out dash panel

7 - Centre part of dash panel
- ❑ removing and installing ⇒ Body work; Rep. Gr. 70

8 - Module carrier

9 - Air conditioning unit*
- ❑ Summary of components ⇒ **87-8** page 3
- ❑ disassembling and assembling ⇒ Chapter 87-9
- ❑ removing and installing ⇒ Chapter 87-10

10 - Right footwell vent
- ❑ bolted to heater unit (1.5 Nm)

11 - Connection part for rear duct

12 - Rear duct

13 - End piece for rear duct
- ❑ clipped into rear duct and seat cross member

14 - Ventilation frames
- ❑ clipped into rear cross member ahead of spare wheel well from outside
- ❑ sealing lips must operate freely and close automatically
- ❑ area in front of ventilation frames must be clear otherwise ventilation of interior does not operate

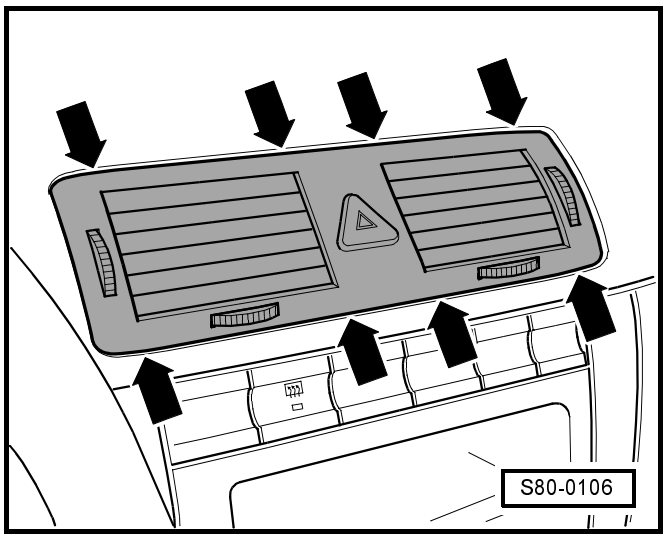
15 - Left footwell vent
- ❑ bolted to support (1.5 Nm)

16 - Gasket*
- ❑ for connection of heat exchanger
- ❑ in bulkhead (assembly plate)
- ❑ fitting position ⇒ Fig. 2 in **87-8** page 3

17 - Gasket*
- ❑ for expansion valve connection
- ❑ in bulkhead (assembly plate)
- ❑ fitting position ⇒ Fig. 2 in **87-8** page 3

18 - Intermediate piece for defroster duct
- ❑ fitted onto heater unit and module carrier
- ❑ for removing, take out dash panel

Fig. 1: Removing and installing the centre dash panel vent ►

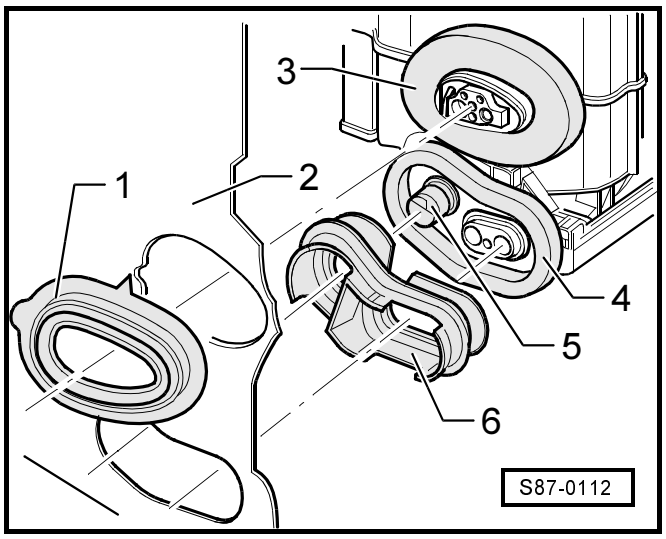


– Use removal tool -3409- to carefully lever out in the area of the retaining clips -arrows-.

– Unplug connector of warning light switch.

When installing, ensure that the retaining clips are correctly fitted.

Fig. 2: Fitting location - gaskets



1 - Rubber seal for the bulkhead and the expansion valve

♦ Mounting in bulkhead

2 - Bulkhead (assembly plate)

3 - Foam seal for the expansion valve and the bulkhead

♦ stuck to evaporator housing

4 - Foam seal with holder - bulkhead

♦ clipped in place on air-conditioning unit

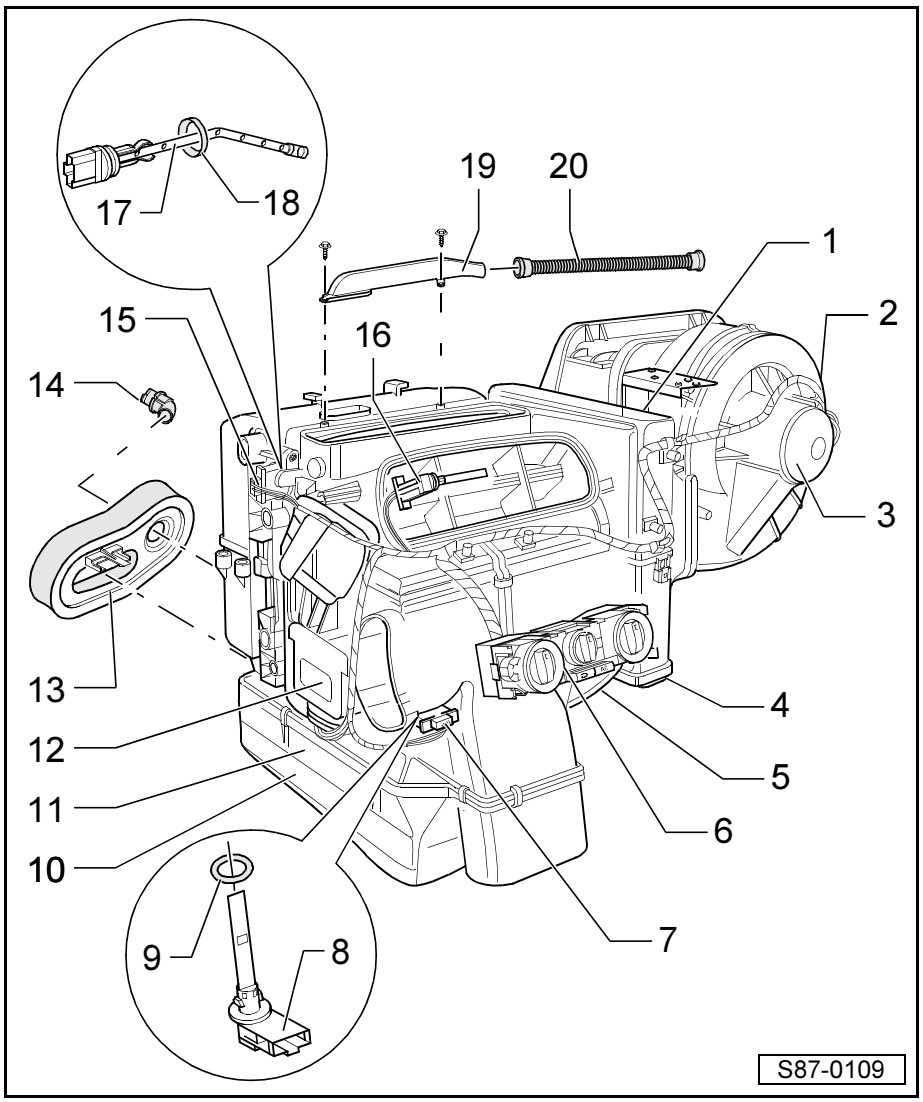
5 - Valve for condensation water drain

♦ installed in holder -4- and on the air conditioning unit

6 - Rubber gasket bulkhead - heat exchanger/valve for condensation water drain

♦ Mounting in bulkhead

Summary of components of air conditioning unit



1 - Fresh air blower series resistor -N24-
- ❑ removing and installing ⇒ Chapter 80-2

2 - Fresh/re-circulating air flap control motor -V154-
- ❑ with fitted potentiometer -G143-
- ❑ removing and installing ⇒ Chapter 87-10
- ❑ check ⇒ Rep. Gr. 01

3 - Fresh air blower -V2-
- ❑ removing and installing ⇒ Chapter 80-2

4 - Dust and pollen filter
- ❑ also as combination filter with odour filter
- ❑ removing and installing ⇒ Chapter 80-2

5 - Flex shaft
- ❑ for positioning unit for air distribution flaps

Colour: blue; 250 mm long
- ❑ removing and installing ⇒ Chapter 87-10

6 - Control for heating and air conditioning system
- ❑ Summary of components ⇒ **87-8** page 6
- ❑ must be replaced completely
- ❑ removing and installing ⇒ Chapter 87-10

7 - Plug for vent temperature sender, footwell -G192-

8 - Vent temperature sender, footwell -G192-
- ❑ to disassemble, remove dash panel, turn sender 90° to the left
- ❑ check ⇒ Rep. Gr. 01

9 - O-ring
- ❑ replace if damaged

10 - Heating element for additional heating (PTC) -Z35-
- ❑ only fitted to certain models
- ❑ Summary of components ⇒ **87-8** page 5

11 - Heat exchanger
- ❑ Summary of components ⇒ **87-8** page 5
- ❑ removing and installing ⇒ Chapter 80-2

12 - Control motor for temperature flap -V68-
- ❑ with fitted potentiometer -G92-
- ❑ removing and installing ⇒ Chapter 87-10
- ❑ check ⇒ Rep. Gr. 01

13 - Gasket with holder
- ❑ clipped into heater unit
- ❑ replace if damaged
- ❑ fitting position ⇒ Fig. 2 in **87-8** page 3

14 - Valve for condensation water drain
- ❑ mount together with holder ⇒ item 13 in **87-8** page 4 on air conditioning unit

15 - Plug for evaporator vent temperature sender -G263-

16 - Vent temperature sender, centre -G191-
- ❑ installed in the intermediate piece for dash panel vents
- ❑ to disassemble, remove dash panel and intermediate piece, turn sender 90° to the left
- ❑ check ⇒ Rep. Gr. 01

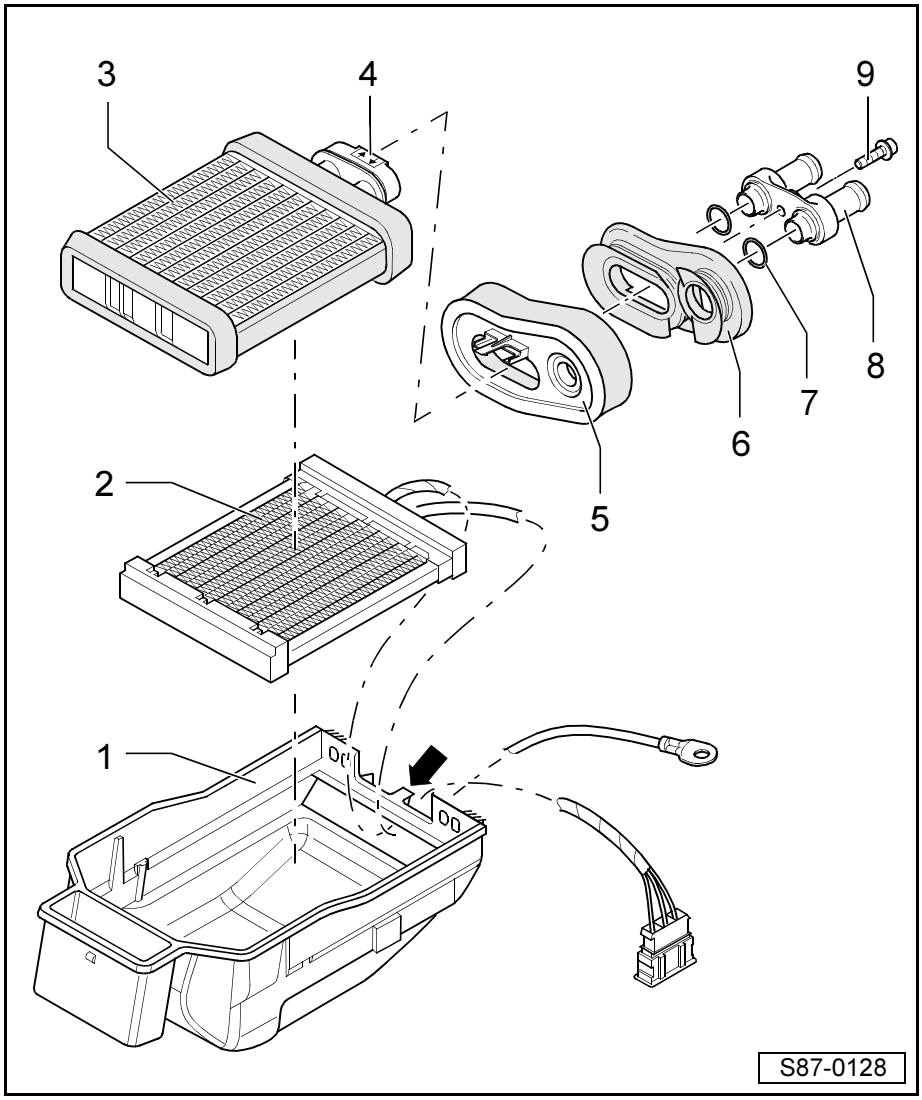
17 - Evaporator vent temperature sender -G263-
- ❑ to disassemble, remove dash panel, pull out sideways
- ❑ check ⇒ Rep. Gr. 01

18 - Gasket
- ❑ replace if damaged

19 - Supports
- ❑ for cooling the storage tray in the glove compartment
- ❑ screwed onto housing

20 - Connecting hose
- ❑ to the storage tray in the glove compartment

Summary of components Heat exchanger/Heating element for additional heating (PTC) -Z35-



1 - Bottom part of distributor housing

2 - Heating element for additional heating (PTC) -Z35-

- ❑ only fitted to certain models
- ❑ controlled in 3 speeds via the air conditioning control unit, engine control unit and 2 relays, depending on the ambient temperature, refrigerant temperature and generator load.
- ❑ Test relay for Additional heater heating element (PTC) -Z35- in the final control diagnosis ⇒ Engine, Fuel injection; Rep. Gr. 01
- ❑ Check additional heater heating element -Z35- (PTC) ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations

3 - Heat exchanger

- ❑ with sticker for feed and return flow ⇒ item 4
- ❑ check fitting position:
- ♦ Sticker must point upwards
- ♦ Pipe connections must be centred in the opening of the bottom part of distributor housing ⇒ item 1 -arrow-

4 - Sticker on heat exchanger for feed/return flow

- ❑ feed on left in direction of travel, return flow on right

5 - Gasket with holder

6 - Gasket in bulkhead (assembly plate)

7 - O-rings

- ❑ replace

8 - Connection fitting for heat exchanger

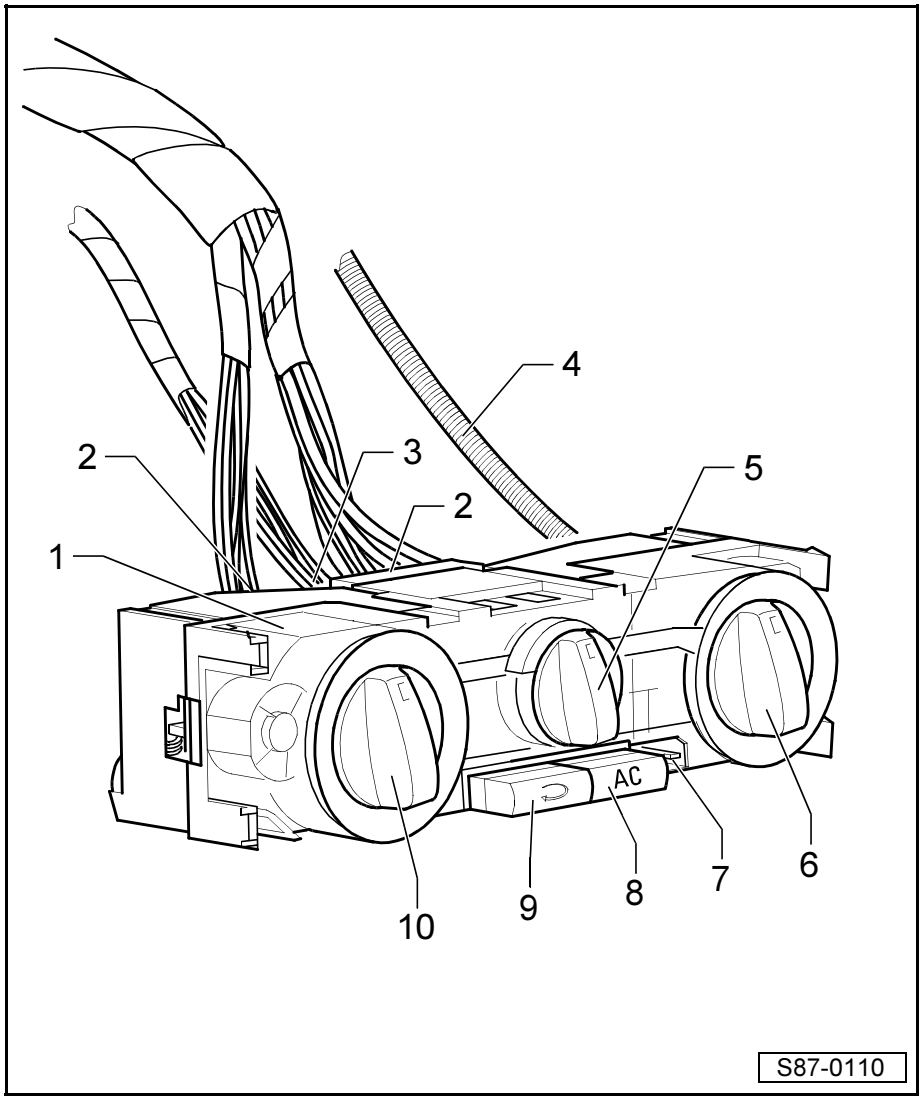
- ❑ different versions possible

9 - 20 Nm

Summary of components for heating and air conditioning system control

Note

All the listed components are elements of the heating and air conditioning system control and must not be replaced individually.



1 - Control for heating and air conditioning system
- ❑ with air conditioning system control unit -J301 -
- ♦ connected to other control units via a data bus
- ♦ receives information about the heating and cooling output requirement and sends corresponding signals to the regulating valve for the compressor or the temperature flap control motor
- ♦ is checked in the self-diagnosis ⇒ Rep. Gr. 01

2 - Plug - air conditioning wiring loom

3 - Plug - vehicle wiring loom

4 - Flex shaft
- ❑ for positioning unit for air distribution flaps
- ❑ removing and installing ⇒ Chapter 87-10

5 - Switch for fresh air blower -E9-
- ❑ 4 speeds
- ❑ The air conditioning system is only activated when the fresh-air blower is switched on

6 - Rotary switch for air distribution flaps
- ❑ manual control of the flaps via the flex shaft ⇒ item 4 in **87-8** page 6
- ❑ fresh-air operation is automatically activated (no misting up of windscreen) if „defrost“ is switched on during re-circulating air operation; return to re-circulating air operation by again pressing the re-circulating air button.

7 - Temperature sensor - dash panel -G56-
- ❑ with temperature sensor blower - V42-

8 - Switch for air conditioning system -E35-
- ❑ The air conditioning system is only activated when the fresh-air blower is switched on

9 - Switch for fresh and re-circulating air flap -E159-

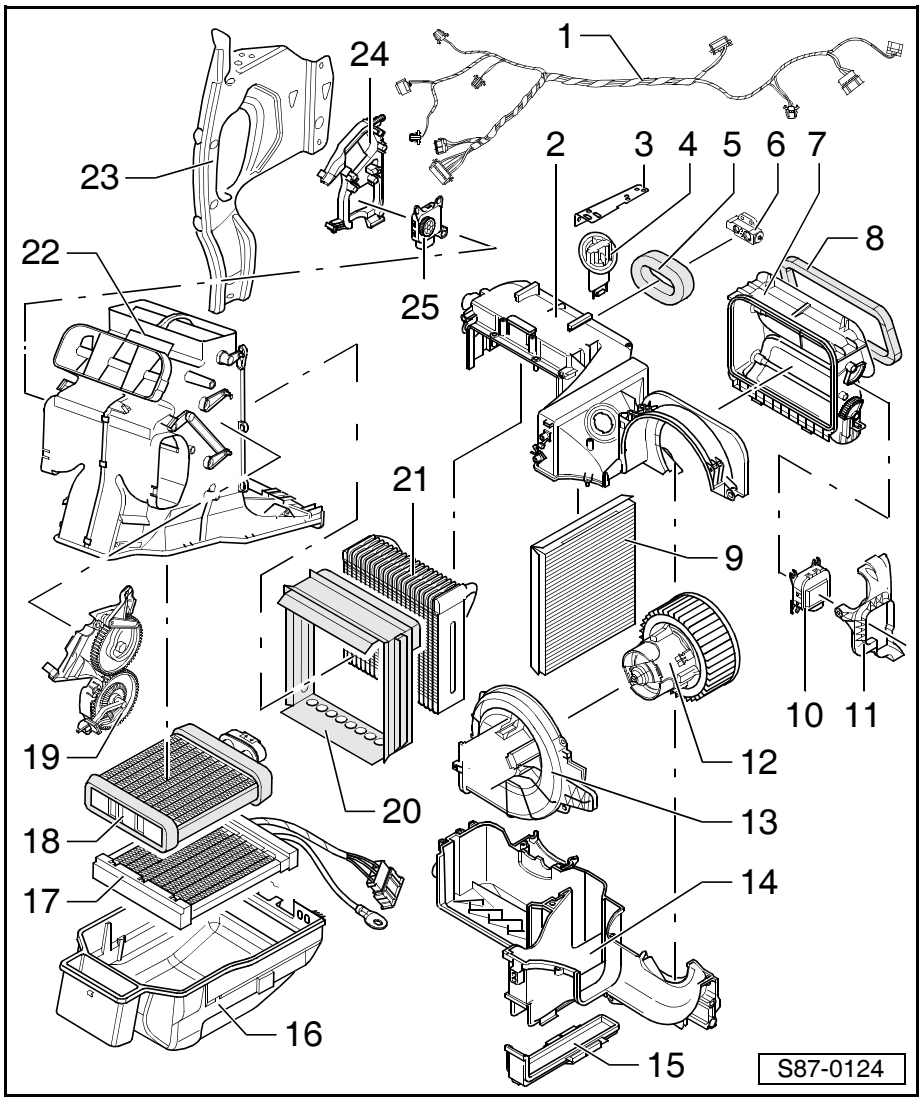
10 - Rotary switch for temperature control, potentiometer -G267-
- ❑ Control of interior temperature from 16…31 °C
- ❑ turning the rotary switch to the left or right up to the stop deactivates the temperature control (temperature flap is fully open or fully closed)
- ❑ if the ambient temperature is higher than the set interior temperature, the air conditioning system must be activated.

87-9 Disassembling and assembling the air conditioning unit

Summary of components

Note!

*Connection elements of the air conditioning unit ⇒ Fig. 1 in **87-9** page 2*



1 - Wiring loom of air conditioning unit
- ❑ carefully cut open to remove cable strap
- ❑ when installing new cable strap fit in same location

2 - Top part evaporator housing
- ❑ Top part - bottom part connection with screws and retaining clips ⇒ Fig. 1 in **87-9** page 2

3 - Holder
- ❑ Screwed connection on module carrier and on heater unit
- ❑ Module carrier tightening torque:12 Nm
- ❑ Tightening torque air conditioning unit:5 Nm

4 - Fresh air blower series resistor -N24-

5 - Foam seal
- ❑ replace if damaged
- ❑ adhesive
- ❑ stuck onto evaporator housing
- ❑ before fitting remove glue residues on housing with acetone

6 - Expansion valve
- ❑ Summary of components ⇒ **87-9** page 3

7 - Air inlet housing
- ❑ with fresh and re-circulating air flap
- ❑ Fitted to housing top and bottom part with retaining clips ⇒ Fig. 1 in **87-9** page 2

8 - Gasket
- ❑ replace if damaged
- ❑ adhesive
- ❑ before fitting remove glue residues on housing with acetone

9 - Dust and pollen filter
- ❑ also as combination filter with odour filter

10 - Fresh/re-circulating air flap control motor -V154-
- ❑ removing and installing ⇒ Chap. 87-10
- ❑ clipped into holder ⇒ item 11

11 - Holder
- ❑ for fresh/re-circulating air flap control motor -V154-⇒ [Fehler in H-KAP 87-9: QV-POS ZIEL="X-d26gzpvl9z"; Ziel in anderem H-KAP]

12 - Fresh air blower -V2-
- ❑ removing and installing ⇒ Chap. 80-2

13 - Holder for fresh air blower -V2-
- ❑ Disconnecting fresh air blower holder ⇒ Chap. 80-2

14 - Evaporator housing - bottom part
- ❑ Top part - bottom part connection with screws and retaining clips ⇒ Fig. 1 in **87-9** page 2

15 - Filter cover

16 - Bottom part of distributor housing

17 - Heating element for additional heating (PTC) -Z35-
- ❑ removing and installing ⇒ Chap. 80-2

18 - Heat exchanger
- ❑ removing and installing ⇒ Chap. 80-2

19 - Positioning unit for air distribution flaps
- ❑ removing and installing ⇒ Chap. 80-3

20 - Seal for evaporator
- ❑ Check fitting position:Water drain openings must point downwards

21 - Evaporator
- ❑ removing and installing ⇒ **87-9** page 3

22 - Top part of distributor housing
- ❑ on evaporator housing top part and bottom part

23 - Support, left
- ❑ Screwed connection to module carrier, air conditioning unit and centre console support
- ❑ Module carrier tightening torque:12 Nm
- ❑ Tightening torque air conditioning unit:5 Nm
- ❑ Centre console support tightening torque:12 Nm

24 - Holder
- ❑ for temperature flap control motor -V68-

25 - Control motor for temperature flap -V68-
- ❑ removing and installing ⇒ Chap. 87-10

Fig. 1: Connection elements of the air conditioning unit ►

1 - Screw for plastic

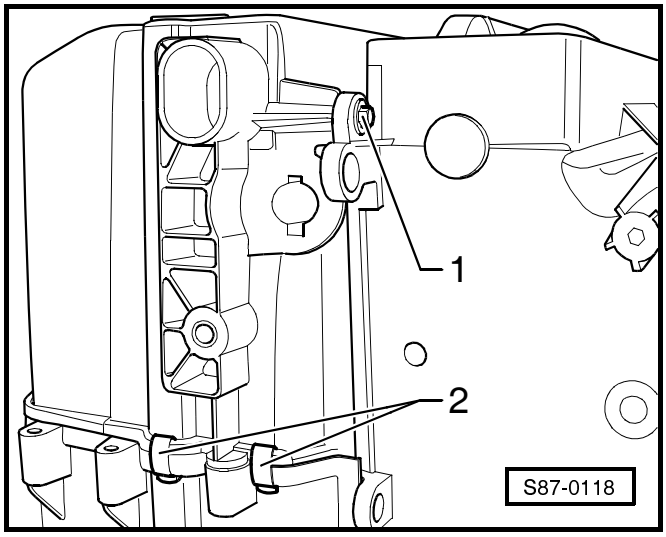
♦ Tightening torque:1 Nm

2 - Retaining clip

♦ Before removing mark position and location on housing.

♦ Replace if damaged

♦ When removing make sure the lug of the retaining clip catches in the housing slot.



Summary of components of expansion valve

1 - Evaporator
- ❑ removing and installing ⇒ **87-9** page 3

2 - Heat-protection insulation
- ❑ for expansion valve

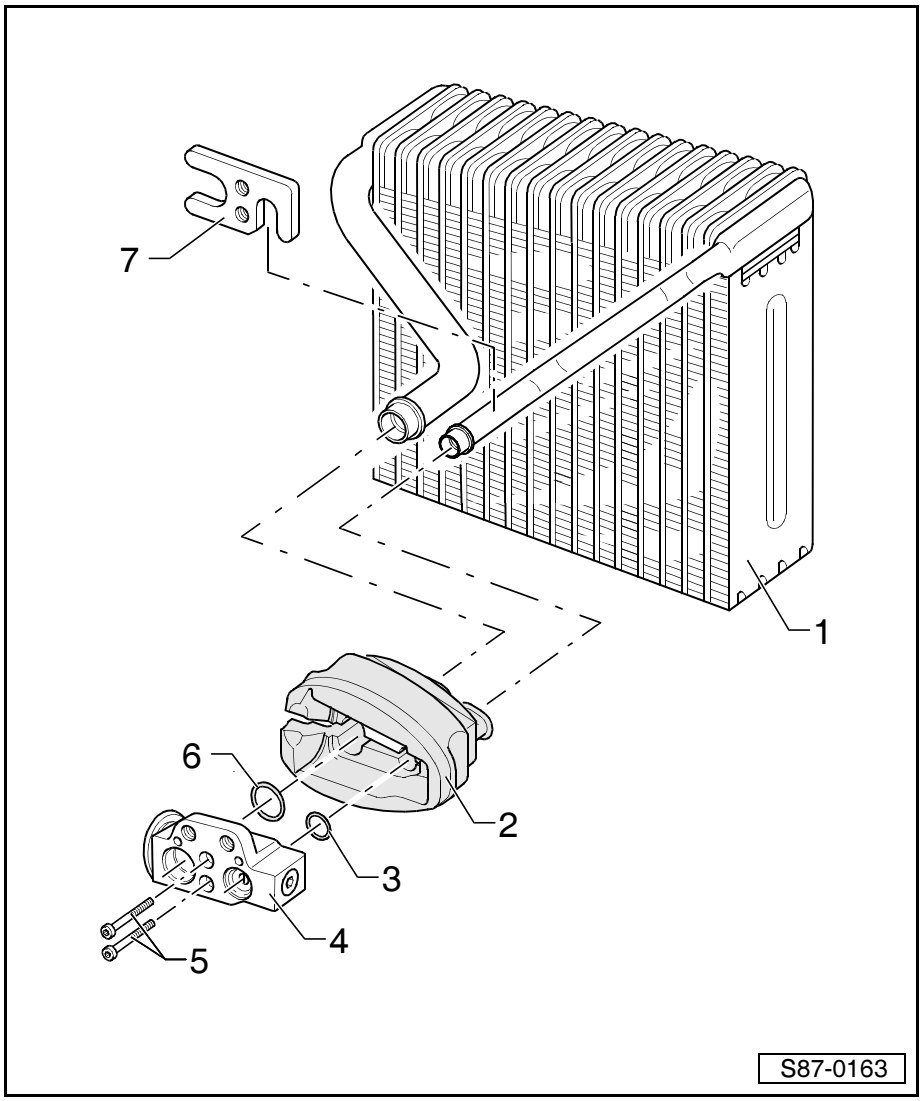
3 - O-ring
- ❑ replace
- ❑ 11.10 mm; 1.78 mm

4 - Expansion valve
- ❑ removing and installing ⇒ Chap. 87-6

5 - 5 Nm

6 - O-ring
- ❑ replace
- ❑ 17.17 mm; 1.78 mm

7 - Threaded plate



Removing and installing evaporator

- Air conditioning unit removed

Removing

– Disassemble or remove distributor housing, housing air inlet, fresh-air blower with holder, dust and pollen filter, evaporator vent temperature sender.

– Carefully separate foam seal from evaporator housing.

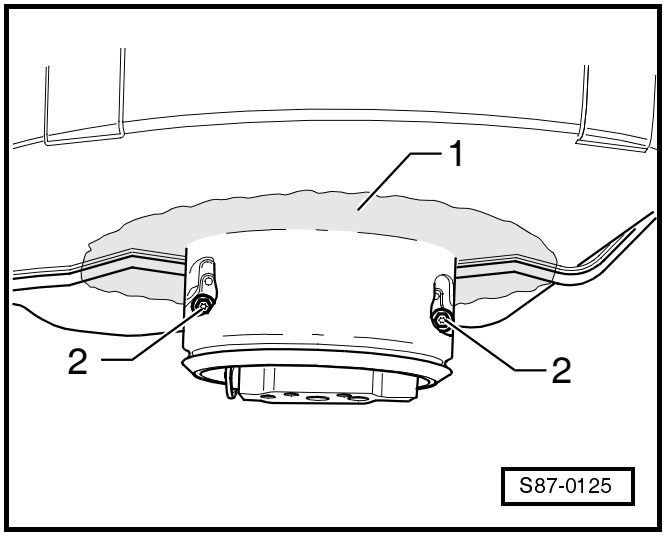
– Remove foam and glue residues -1- with acetone. ►

– Remove all retaining clips (mark position and location).

– Release screws -2-.

– Carefully separate the top and bottom part of the evaporator housing.

– Remove the evaporator with expansion valve from the housing half.



– Release expansion valve.

Installing

Note!

- *Installing the housing halves is made easier if the lateral guide surfaces of the heat exchanger seal are moistened with a neutral soapy solution.*
- *Never use other lubricants as this could cause unpleasant odours when the air conditioning is switched on.*
- *Replace the O-rings on the expansion valve connection.*

– Clean the water drain on the evaporator housing - bottom part.

– Moisten new O-rings with refrigerant oil and mount on the pipe connections.

– Screw on expansion valve -5-.

Tightening torque:5 Nm

– Fit gasket -3- on the correct side of the evaporator -2-.

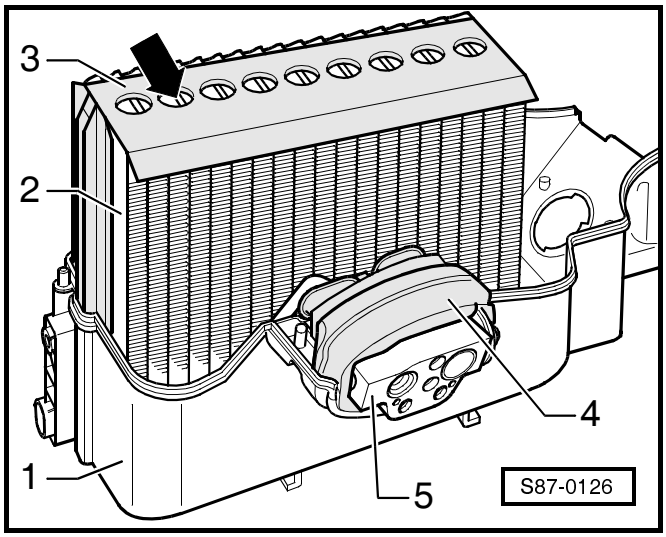
The water drain opening must point downwards -arrow- (Fig. shows the installation in the evaporator housing - top part).

– Mount heat-protection insulation -4-.

– Carefully insert the evaporator -2- with component parts in the evaporator housing-top part up to the stop.

Pay attention to the correct positioning of the gasket -3- in the lateral guide area and of the heat-protection insulation -4- in the housing.

– Carefully fit the evaporator housing-bottom part on the evaporaror.



Note!

- *The housing halves must fit easily onto one another.*
- *Pay attention to the correct position of the heat-protection insulation in the housing.*

– Secure the housing halves with the retaining clips and the 2 screws.

– Stick the new foam seal onto the evaporator housing.

87-10 Removing and installing parts of the air conditioning unit

Removing and installing air conditioning unit

(Must only be performed in service centres)

Removing

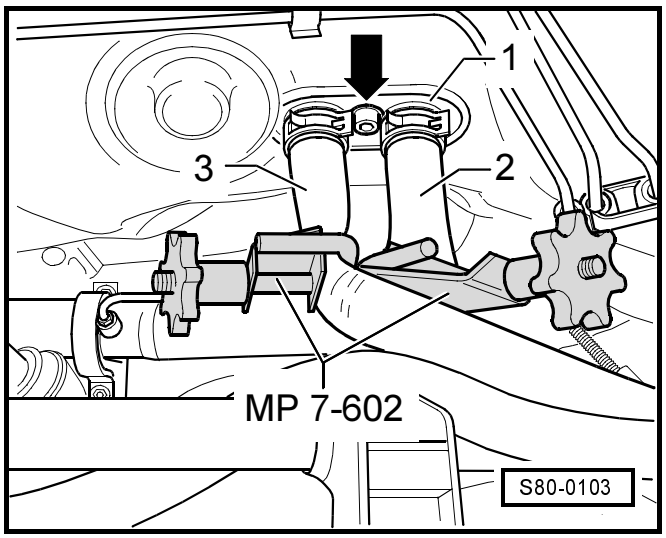
– Drain the coolant circuit ⇒ Chapter 87-4.

– On models fitted with a coded radio set, pay attention to the coding; determine if necessary.

– Disconnect the earth strap from the battery with the ignition off.

– Reduce pressure in the coolant circuit by opening the cap on the coolant reservoir.

– Use hose clamps -MP 7-602- to pinch off coolant hoses of heat exchanger (if not possible, drain coolant).



Note

If the heat exchanger is replaced, drain the entire coolant and fill system with fresh coolant.

– Place cleaning cloth below heat exchanger connection to collect drained coolant.

– Detach coolant hoses -2- and -3-.

– Carefully blow coolant out of the heat exchanger with compressed air.

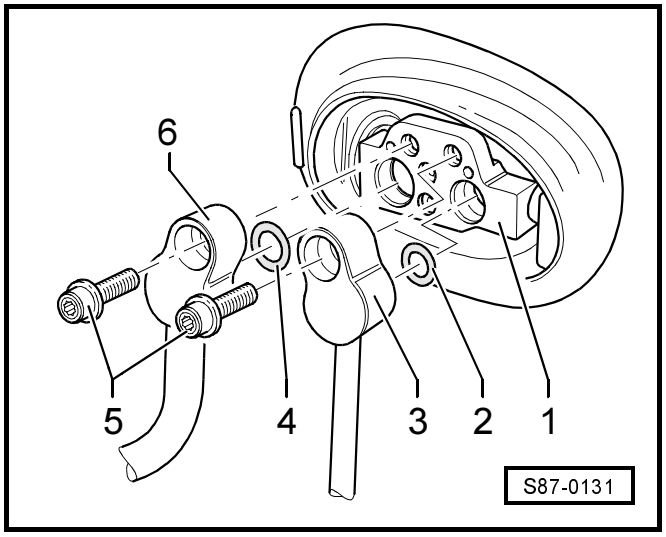
♦ Connect up the hose for compressed air on the connection fitting for feeding

♦ Attach the container under the supports for return flow

– Unscrew connection fittings for heat exchanger -1- -arrow-.

Tightening torque: 20 Nm

– Unscrew refrigerant lines -3- and -6- from expansion valve -1-.



Tightening torque: 5 Nm

– Shut off the openings of the refrigerant lines and expansion valve.

– Removing the centre console ⇒ Body Work; Rep. Gr. 68.

– Removing the dash panel ⇒ Body Work; Rep. Gr. 70.

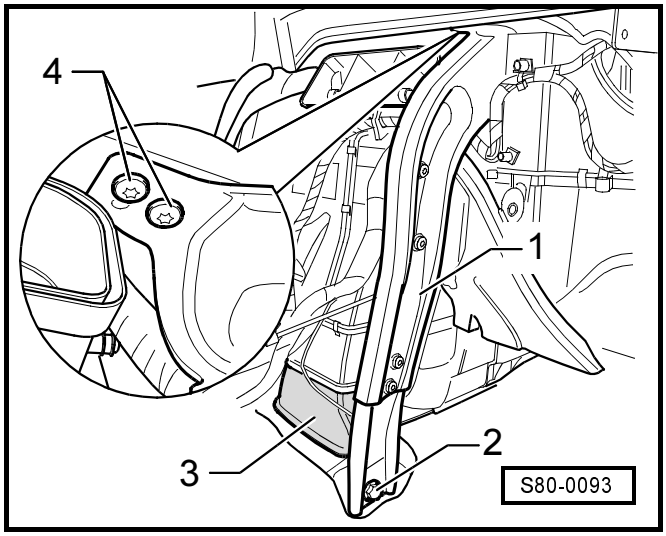
– Removing the holder for front passenger airbag ⇒ Body Work; Rep. Gr. 69.

– Remove the intermediate piece for defrost dust and intermediate piece for dash panel vents (3 retaining clips).

– Unclip wiring loom from right support, unscrew earth cable and pull wiring loom out towards the top.
– Remove right support -1-.

Unscrew screws -2- (20 Nm) and -4- (12 Nm).

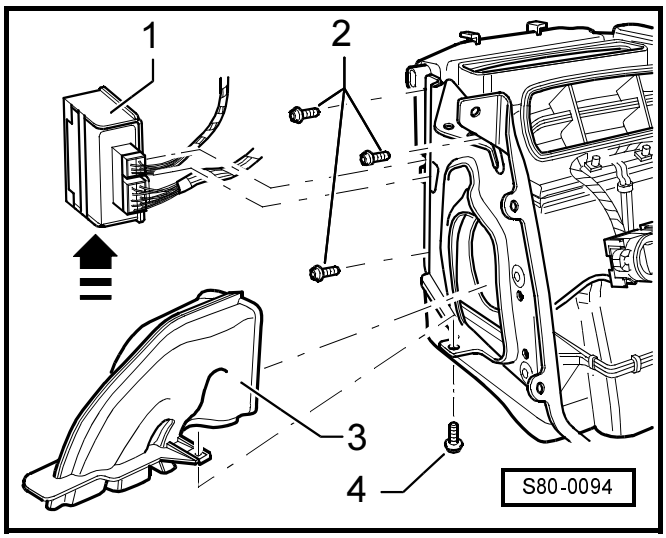
– Remove connecting part for rear duct -3-.
– Separate the plug connection to the right vehicle wiring loom next to the fresh air blower.
– Remove the heating and air conditioning system control (disconnect plug, remove flex shaft ⇒ **87-10** page 3).



– Remove left footwell vent -3-.

Screws -4-: 1.5 Nm

– Push holder -1- with convenience control unit at the top outwards and slide out of the bracket in the direction of the arrow.
– Release screws -2- (5 Nm).

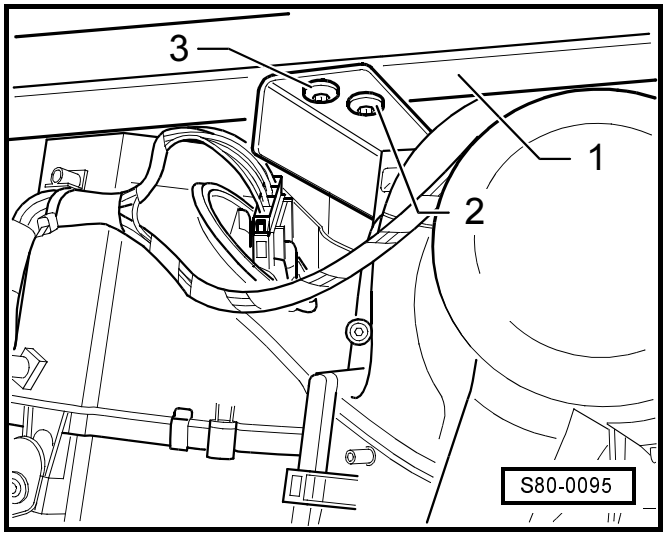


Vehicles with electrical auxiliary heating

– Separate plug connection of the auxiliary heating to the vehicle wiring loom on left or heater unit.
– Unscrew the earth cable of the auxiliary heating underthe bottom part of the distributor housing.

Continued for all vehicles

– Release screws -2- and -3- (12 Nm) from the module carrier -1-.
– Swivel out air conditioning unit backwards from the top.



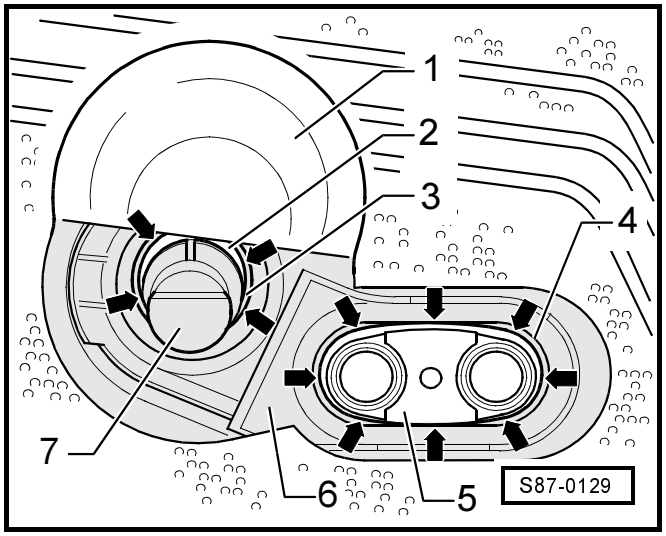
Installing

Installation is performed in the reverse order. Pay attention to the following points:

– Moisten sealing lips of the gaskets in the bulkhead (assembly plate) with a neutral soapy solution before installing the air conditioning unit (easier mounting).

To this end fold up the cover of the heat-protection matting before the valve for consendation water drain.

– Fold up cover -1-.
– Press the sealing lip -3- of the gasket -6- all around the slot of the support -2- for the valve for condensation water drain -7- -arrows-.
– Press the sealing lip -4- of the gasket -6- all around the slot of the heat exchanger -5- -arrows-.



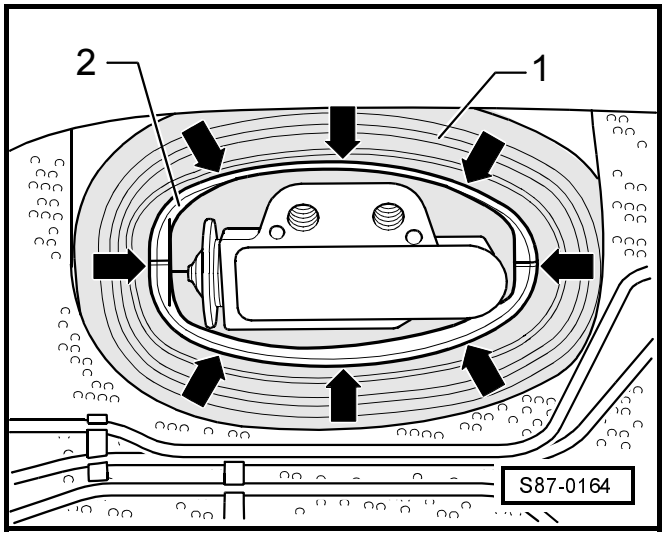
Note

When closed the cover -1- must be flush with the heat-protection matting. If the cover -1- is pressed too far inwards, the cap of the valve for condensation water drain -7- may become stuck.

– Press the sealing lip of the gasket -1- all around the slot of the evaporator housing -2- -arrows-.
– Removethe cover for the bore holes of the expansion valve.
– Replace O-rings of connection fitting of heat exchanger and on the expansion valve.
– Connect coolant hoses the right way round.

  In direction of travel
  on the left: Feed
  on the right: Return flow

– Inspect coolant level, top up if necessary.



Note

If the heat exchanger was replaced, fill system with fresh coolant.

– Replacing dessicator insert ⇒ Chap. 87-6
– Fill the coolant circuit ⇒ Chapter 87-4.

Removing and fitting the heating and air conditioning system control

– Removing centre part dash panel -1- ⇒ Body work; Rep. Gr. 70.

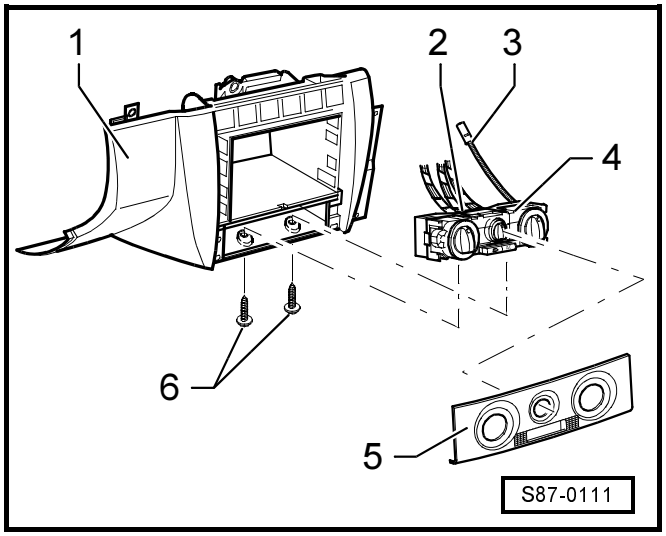
  Tightening torque of screws -6-: 1 Nm

  The trim strip -5- is clipped onto the heating and air conditioning system control -4- (press out carefully).

– Unplug connector -2-.
– Removing flex shaft -3- for positioning unit of air distribution flaps ⇒ **87-10** page 4.

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

♦ If the heating and air conditioning unit control was replaced, perform a basic setting ⇒ Chap. 01-1.

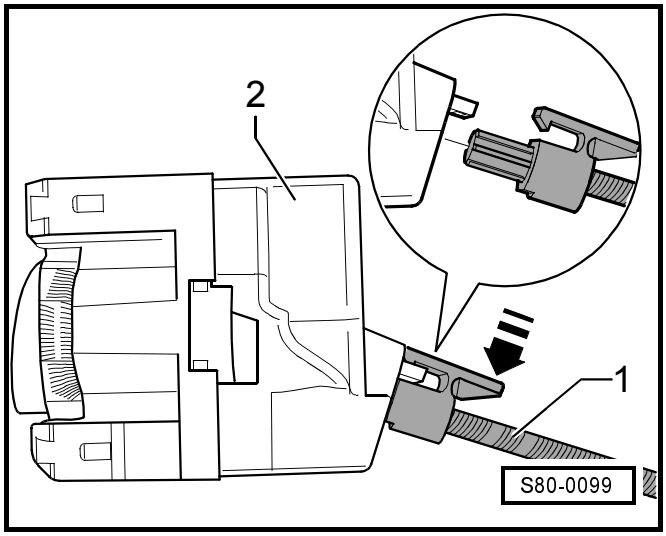


Removing and installing flex shaft for positioning unit of air distribution flaps

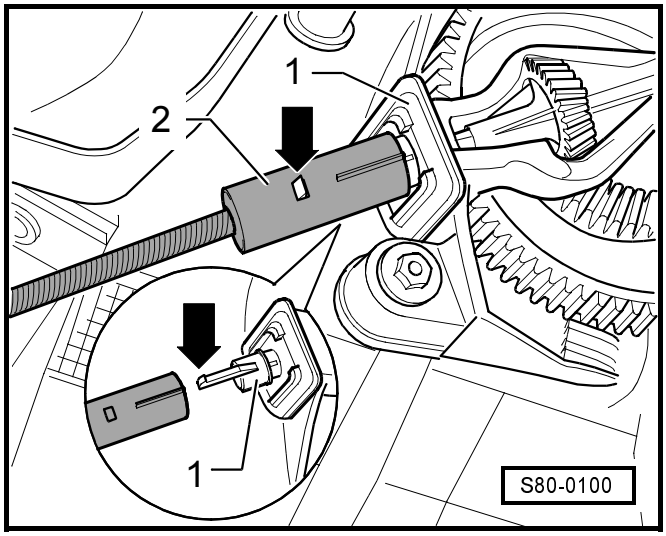
- Centre part of dash panel removed

Removing

– Press platic part of the flex shaft -1- in direction of the arrow and pull out of the heater and air conditioning system control -2-.



– Use a flat screwdriver to press in plastic lug -arrow- of positioning unit of air distribution flaps -1- and pull out flex shaft -2-.



Installing

Note

- *The flex shaft can only be installed in one way on the positioning unit and on the control.*
- *When installing, however, the positioning unit and the rotary knob of the control must be in a certain position relatively to each other, otherwise this will result in malfunctions.*

– Fit flex shaft onto positioning unit of air distribution flaps and lock in place.

– Use the flex shaft to move the defrost flap into vertical position („open“).

– Set air distribution switch on control to „defrost“.

– In this position, insert flex shaft into the control and lock in place.

Note

- *If the dash panel is installed and the position of the defrost flap is not visible, insert flex shaft into the control and lock in place. Run fresh air blower at maximum speed.*
- *If air also flows out of the defrost vent in the „defrost“ position and not out of the footwell vents, the flex shaft is correctly installed. If this is not the case, detach flex shaft from the control, turn rotary switch $^1/_2$ a turn (180°) and fit on flex shaft again. Repeat check.*

Removing and installing control motor for fresh/re-circulating air flap -V154 -

The description of the removal and installation of the fresh and re-circulating air flap control motor -V154- is the same as that for the heating unit ⇒ Chapter 80-3.

Note

If the control motor was replaced, perform a basic setting ⇒ Chapter 01-1.

Removing and installing the control motor for temperature flap -V68-

Special tools, test and measuring equipment and auxiliary items required

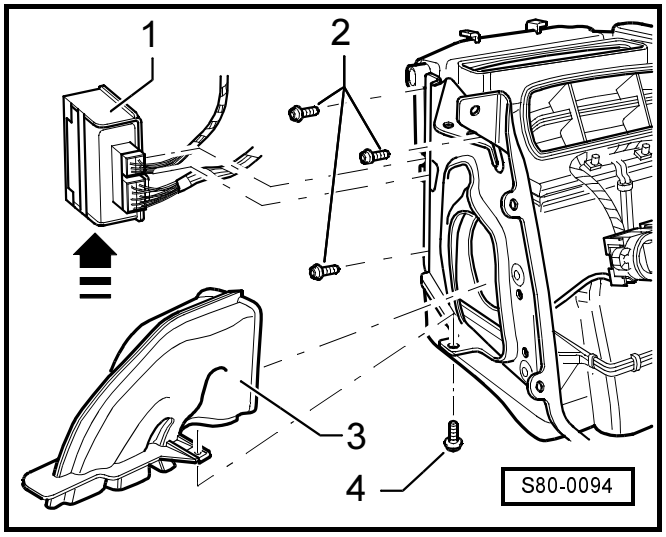
- Measuring tool set, e.g. -V.A.G 1594 A-

Removing

– Removing the dash panel ⇒ Body Work; Rep. Gr. 70.

– Support the air conditioning unit at the bottom towards the centre tunnel with suitable means.

– Remove left footwell vent -3-.



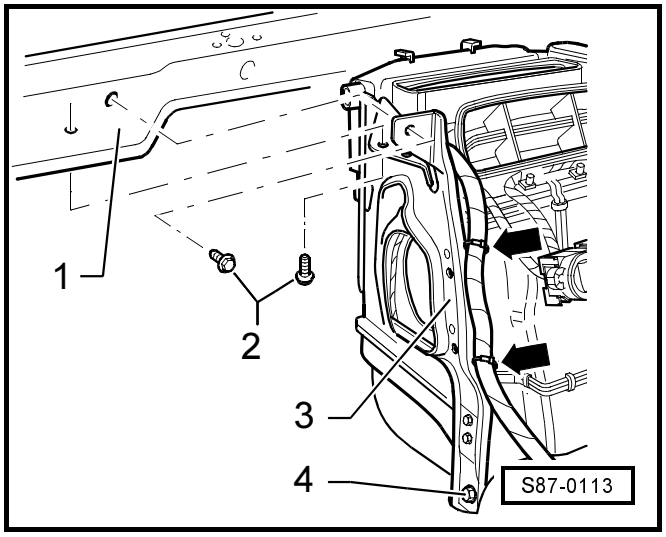
Screws -4-: 1.5 Nm

– Push holder -1- with convenience control unit at the top outwards and slide out of the bracket in the direction of the arrow.

– Release screws -2- (5 Nm).

– Unclip wiring loom from the left support -3- -arrows-.

– Release screws -2- from the module carrier -1-.



Tightening torque: 12 Nm

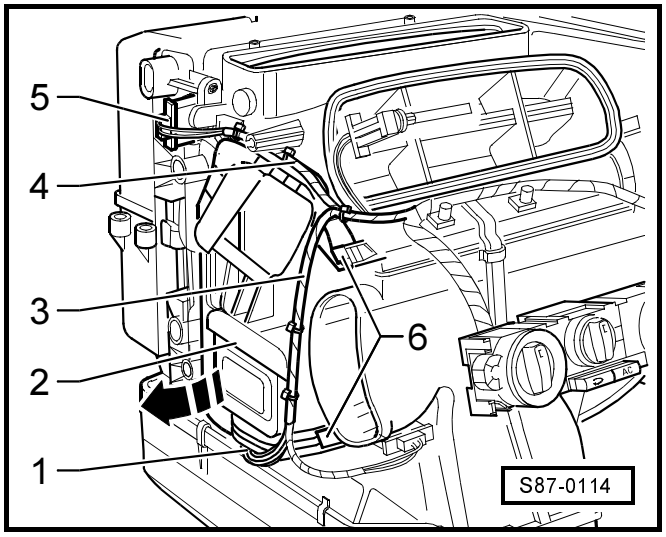
– Release screw -4- and remove support.

Tightening torque: 25 Nm

– Disconnect plugs -1- and -5-.

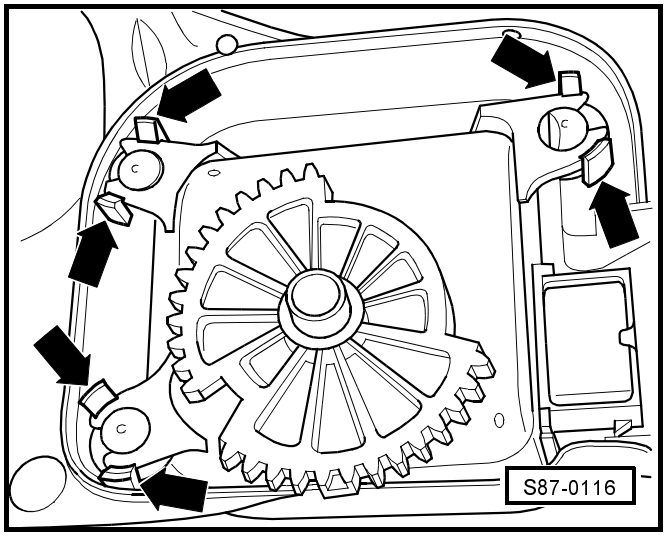
– Carefully cut open cable straps on wiring looms -3- and -4-.

– Press catches -6- lightly forwards, swivel holder with control motor -2- in the direction of the arrow and remove from the front holders.



– Remove control motor from holder.

  To this end press the catch pegs -arrows- outwards while pushing the control motor out of the catches.



Installing

Note

The spare part control motor for temperature flaps is on position „temperature flap closed“.

– Press control motor into the holder.

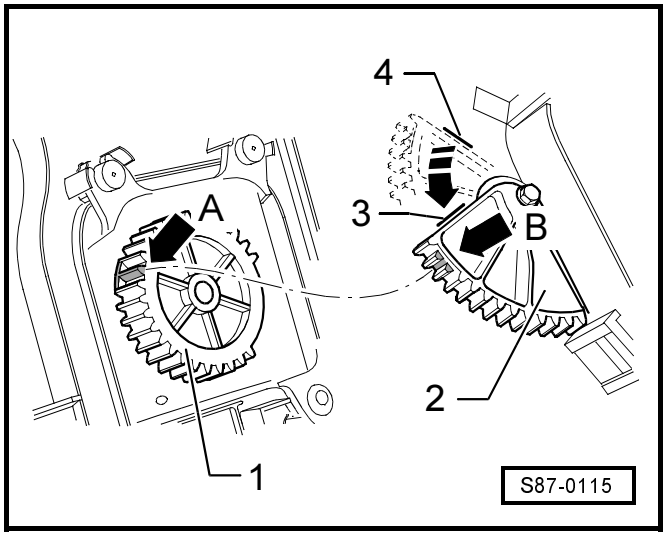
– Mark the top -4- and bottom -3- stop on the gear segment -2- on the housing with a white marker.

– Position gear segment -2- in the direction of the arrow on the bottom stop -3-.

– Mark„short“ tooth face of the control motor gear wheel -1- in white -arrow A-.

– Mark the side of the tooth opening of the short teeth of gear segment -2- in white -arrow B-.

– Insert the holder with control motor in the front brackets and clip onto the housing in such a way that the tooth -arrow A- engages in the tooth opening -arrow B-.

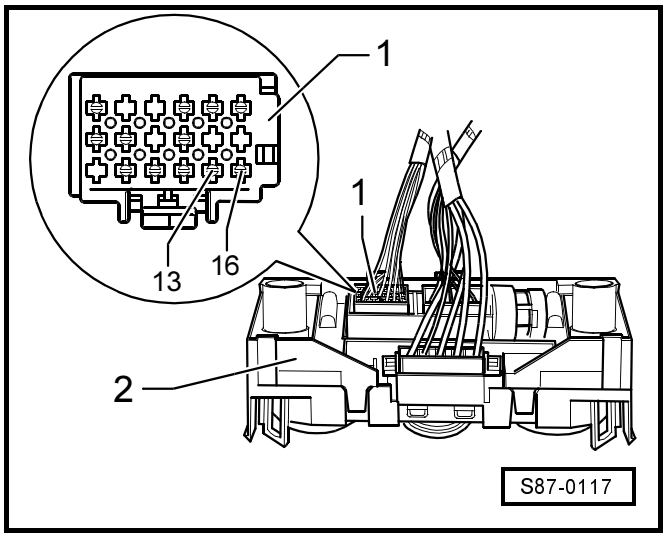


Functional test

– Insert plug of the control motor for temperature flap.

– Remove plug -1- from the heating and air conditioning system control -2-.

– Connect battery voltage to contacts 13 and 16 of plug -1- with auxiliary lines from -V.A.G 1594 A- and check engine running.



	Contact assignment	
	13	16
Control motor runs in position „cold“ (gear segment down)	-	+
Control motor runs in position „warm“ (gear segment up)	+	-

Note

- *During the above test the control motor must smoothly switch the temperature flap to the top -4- and bottom -3- stop.*
- *If there are functional problems abort test immediately, remove control motor with holder and repeat installation.*

– Further installation occurs in reverse order to removal.

– If the control motor was replaced, perform a basic setting ⇒ Chapter 01-1.