Self-Study Programme 301

Touareg
Heating/air-conditioning system

Design and function
The automobile is accompanying people more and more in their recreational time. In addition to the pure transport function, the vehicle itself becomes an ever greater fun and recreational value.

This trend has been taken into account in the development of the Touareg. The Touareg offers not only a sophisticated, robust chassis technology and navigation electronics, but it also includes comfort requirements as a substantial criterion in the vehicle concept.

This applies especially to the heating/air-conditioning system, which provides fast and comfortable heating, cooling and ventilation of the passenger compartment.

This self-study programme will provide you with interesting information regarding the different heating/air-conditioning systems of the Touareg.
At a glance

Introduction ................................................. 4

4C-Climatronic ............................................. 18
  Constructional features ................................. 18
  Functional features ..................................... 34
  System overview ........................................ 42
  Operational diagram ................................... 46

2C-Climatronic ............................................. 50
  Constructional features ................................. 50
  Functional features ..................................... 54
  System overview ........................................ 56
  Operational diagram ................................... 58

Manual air-conditioning system ....................... 60
  Constructional features ................................. 60
  Functional features ..................................... 62
  System overview ........................................ 64
  Operational diagram ................................... 66

CAN data bus network ..................................... 68

Sensors and actuators ..................................... 70

Check your knowledge .................................... 74
Introduction

In order to satisfy different comfort demands when equipping an offroad vehicle, three different air-conditioning systems are available:

- 4C-Climatronic with 4-zone air-conditioning
- 2C-Climatronic with 2-zone air-conditioning
- Manual heating/air-conditioning system

At the first glance, the systems can be differentiated by the operating and display units and the operational functions that are possible. Despite these differences, the air-conditioning unit in the front forms the constructive base for the three systems.

Starting with the 4C-Climatronic, the construction and function of all the variants are described in this self-study programme. The description of each section is divided into the following sections:

- Constructional and functional features,
- System overview, and
- Operational diagram.

The sections

- CAN data bus network and
- Sensors and actuators

contain descriptions of all three systems.
Shared constructional features

Regardless of their specific constructional and functional features, all three air-conditioning systems have shared constructional features. The emphasis is on the air-conditioning unit. In all the variants, it has the same basic construction. The arrangement of the components, such as the evaporator or the heat exchanger in the air-conditioning unit, and the attachment points of the housing are the same. There are differences in the number of servomotors and in the design of the ventilation flaps.

Attachment of the front air-conditioning unit

The air-conditioning unit is attached to the assembly plate using two fastening elements. Each fastening element has a screw thread on one side and a star-shaped mandrel on the other side. Both sides are flexibly connected to one another by a rubber element.

The fastening element is screwed onto the assembly plate on the thread side. The air-conditioning unit is placed onto the mandrel. The job of the rubber element is to compensate for tension that can occur during the adjustment of the gap dimension of the dash panel with the door panels. This prevents the air distribution ducts that are connected to the air-conditioning unit from being mechanically stressed.
Introduction

Shared constructional features

Additional shared features include:

- the dust and pollen filter with activated carbon,
- the air outlets in the B-pillar,
- the components for the residual-heat function,
- the glove compartment cooling system.

The dust and pollen filter with activated carbon

In all three variants, a filter is integrated in the air-conditioning unit. It is located directly in front of the evaporator, so that the interior air can be transported through the filter by the blower even if the circulation function is active. It is inserted from above into the air-conditioning unit and can be replaced during inspections and maintenance, even if the air-conditioning unit is installed.
**Heat exchanger**

The heat exchanger provides temperature control on the air-side. This means that the coolant from the engine circulation always flows through the heat exchanger. The heat exchanger can also be replaced while the air-conditioning unit is installed; a portion of the air-conditioning unit is housing is swung downwards to permit access.

**Air outlets in the B-pillar**

The outlets are laid out in such a manner that one flap cannot be adjusted; instead, it has a fixed defrost position for the side window. The other flaps can be positioned manually using the actuating element.
Introduction

**Residual heat function**

All the variants of the heating/air-conditioning system are equipped with a residual heat function so that the interior can be supplied with warm air even if the engine is switched off. This works without an additional water heater only as long as the heat stored in the engine is available after the engine has been switched off. With the additional water heater, the coolant can be heated even after the engine has cooled down.

To execute the residual heat function, an electrical pump must circulate the coolant. Depending on the engine type and functional equipment, these pumps can be different.

**Heat circulation of the 4C-Climatronic with additional water heater using the V10-TDI engine as an example**

Information regarding the conditions for switching on and switching off the residual heat function can be found in the repair guidelines for the heating/air-conditioning system.

To prevent exhaustion of the batteries when the engine is switched off, only a reduced blower performance is available for the active residual heat function. However, this power-saving mode of the blower is not shown in the blower strength display.
Which electrical pumps are used in the heat circulation of the Touareg depends, on the one hand, with which engine the vehicle is equipped and, on the other hand, which additional functions, such as coolant after-run, heater support, residual heat function, additional water heater or auxiliary heater, are equipped.

The following table, sorted according to the type of engine, provides you with an overview of the variants.

<table>
<thead>
<tr>
<th>Description</th>
<th>V6 engine with AWH</th>
<th>V6 engine without AWH</th>
<th>V8 engine, W12 engine with AWH</th>
<th>V8 engine, W12 engine without AWH</th>
<th>V10-TDI engine with AWH</th>
<th>V10-TDI engine without AWH</th>
<th>R5-TDI engine with AWH</th>
<th>R5-TDI engine without AWH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coolant after-run (CAR)</td>
<td><img src="icon.png" alt="Water pump V36" /></td>
<td><img src="icon.png" alt="Circulation pump V55" /></td>
<td><img src="icon.png" alt="Water pump V36" /></td>
<td><img src="icon.png" alt="Circulation pump V55" /></td>
<td><img src="icon.png" alt="Water pump V36" /></td>
<td><img src="icon.png" alt="Circulation pump V55" /></td>
<td><img src="icon.png" alt="Water pump V36" /></td>
<td><img src="icon.png" alt="Circulation pump V55" /></td>
</tr>
<tr>
<td>Heater support (HS)</td>
<td><img src="icon.png" alt="Water pump V36" /></td>
<td><img src="icon.png" alt="Circulation pump V55" /></td>
<td><img src="icon.png" alt="Water pump V36" /></td>
<td><img src="icon.png" alt="Circulation pump V55" /></td>
<td><img src="icon.png" alt="Water pump V36" /></td>
<td><img src="icon.png" alt="Circulation pump V55" /></td>
<td><img src="icon.png" alt="Water pump V36" /></td>
<td><img src="icon.png" alt="Circulation pump V55" /></td>
</tr>
<tr>
<td>Residual heat function (RH)</td>
<td><img src="icon.png" alt="Water pump V36" /></td>
<td><img src="icon.png" alt="Circulation pump V55" /></td>
<td><img src="icon.png" alt="Water pump V36" /></td>
<td><img src="icon.png" alt="Circulation pump V55" /></td>
<td><img src="icon.png" alt="Water pump V36" /></td>
<td><img src="icon.png" alt="Circulation pump V55" /></td>
<td><img src="icon.png" alt="Water pump V36" /></td>
<td><img src="icon.png" alt="Circulation pump V55" /></td>
</tr>
<tr>
<td>Additional water heater* (AWH)</td>
<td><img src="icon.png" alt="Water pump V36" /></td>
<td><img src="icon.png" alt="Circulation pump V55" /></td>
<td><img src="icon.png" alt="Water pump V36" /></td>
<td><img src="icon.png" alt="Circulation pump V55" /></td>
<td><img src="icon.png" alt="Water pump V36" /></td>
<td><img src="icon.png" alt="Circulation pump V55" /></td>
<td><img src="icon.png" alt="Water pump V36" /></td>
<td><img src="icon.png" alt="Circulation pump V55" /></td>
</tr>
<tr>
<td>Auxiliary heater* (AH)</td>
<td><img src="icon.png" alt="Water pump V36" /></td>
<td><img src="icon.png" alt="Circulation pump V55" /></td>
<td><img src="icon.png" alt="Water pump V36" /></td>
<td><img src="icon.png" alt="Circulation pump V55" /></td>
<td><img src="icon.png" alt="Water pump V36" /></td>
<td><img src="icon.png" alt="Circulation pump V55" /></td>
<td><img src="icon.png" alt="Water pump V36" /></td>
<td><img src="icon.png" alt="Circulation pump V55" /></td>
</tr>
</tbody>
</table>

**Description**

- In the case of the coolant after-run function, pumps V36, V51 and V55 are activated using the corresponding engine control unit. All other functions, such as the residual heat function, are triggered by the Climatronic control unit.
- In the case of heater support, the given pump starts up to ensure that, for example in the case of a low engine speed with a simultaneous high heating demand, enough air flows through the heat exchanger.

* The additional water heater also takes on the function of the auxiliary heater in the case of V10-TDI and R5-TDI engines.
**Introduction**

**Shared constructional features**

**Glove compartment cooling**

The cold air for cooling the glove compartment is transported by the front air-conditioning unit. The connection to the air-conditioning unit is near the evaporator and the temperature sensor of the evaporator G308.

The supply of cold air in the glove compartment can be set manually using a rotary knob with an air outlet opening.

**Note regarding servicing**

In order to be able to carry out certain maintenance or repair work on the air-conditioning unit even when the unit is installed, a break-out point is provided in the rear wall of the glove compartment. After the perforated surface has been removed, the sender for the blower control or, for the manual air-conditioning system, the protective resistor for the fresh air blower on the air-conditioning unit can be reached.

After work is completed, the opening is closed by a cover plate.
**Shared functional features**

All the variants have the following functions:

- a temperature control range from 16 °C to 29.5 °C,
- residual heat function,
- manual air recirculation,
- manual defrosting,
- electrical rear and front window heater (optional),
- possibility for switching the air-conditioning function off with the ECON button (or, for the manual air-conditioning unit, with the AC button).

Front operating and display unit of the 2C-Climatronic in the Touareg dash panel
Introduction

The 4C Climatronic

This represents the highest stage of development of the Touareg’s heating/air-conditioning system; it can fulfil the highest expectations of an air-conditioning system.

Climate zones

The 4C-Climatronic utilises four climate zones; the following parameters can be independently set and controlled automatically or manually for each climate zone:

- temperature,
- air distribution and
- air quantity.

Air distribution

The significant feature is the two separate air-conditioning systems for the front and rear seats. The front air-conditioning unit is installed under the dash panel; its design is the same as the other variants. The rear air-conditioning unit is located behind the side panel in the left side of the luggage compartment. As two air-conditioning units are utilised, the components for the air distribution for the front and rear climate zones are separate.
Operation is executed using two separate operating units in the dash panel and in the rear centre console.

**Functions of the front operating and display unit**

The following functions are available on the front operating unit:

- temperature control for all four seats,
- air distribution adjustment,
- setting of the blower strength, front/rear,
- manual and automatic recirculation function,
- automatic climate regulation
- synchronisation with the climate zone of the driver,
- rear button for setting the temperature, the blower strength and the air distribution of the two rear climate zones,
- defrost,
- econ,
- residual heat function,
- rear window heater,
- electric front window heater (optional).

**Functions of the rear operating and display unit**

The rear operating unit has:

- temperature control for the two rear seats,
- air distribution adjustment,
- setting of the blower strength, rear,
- automatic climate regulation.
Introduction

2C-Climatronic

This is the mid-range comfort class of Touareg air-conditioning systems.

Climate zones

The 2C-Climatronic has two climate zones. In automatic operation, this means that the temperature for the left-hand and right-hand passenger compartments can be regulated independently, while the regulation of the blower strength and the air distribution are set for the entire passenger compartment.

Air distribution

In order to maintain two independent climate zones, one air-conditioning unit under the dash panel is used.

The air distribution systems for conditioning the four seats are all connected to this air-conditioning unit. Thus, the air for the B-pillar air outlets are laid out through the front doors.
The 2C-Climatronic has one operating and display unit in the dash panel. The range of functions of this operating unit is adapted to the requirements for operation with two climate zones, as opposed to the 4C-Climatronic.

The following functions are available:

- temperature control, left/right
- air distribution adjustment,
- setting of the blower strength,
- manual and automatic recirculation function,
- automatic climate regulation,
- defrost,
- econ,
- residual heat function,
- rear window heater,
- electric front window heater (optional).
Introduction

Manual air-conditioning system

As standard equipment, the Touareg is supplied with a manual air-conditioning system.

Climate zones

In the manual air-conditioning system, the entire interior is pooled into one climate zone. This means that the settings made by the driver apply for the conditioning of all seats.

The following parameters can be set manually on the operating unit:

- temperature,
- blower strength,
- air distribution.

The air quantity and distribution for the individual seats are set mechanically on each air outlet.

Air distribution

The air distribution of the manual heating/air-conditioning system generally corresponds to the air distribution of the 2C-Climatronic. One difference, for example, is in the design of the air-conditioning units of the two variants.
The interior climate is controlled according to the personal sensitivity of the occupants using the operating unit in the dash panel.

The following functions are available:

- temperature adjustment,
- setting of the blower strength,
- manual recirculating air function,
- defrost,
- switch-off of the air-conditioning function,
- residual heat function,
- rear window heater,
- electric front window heater (optional).
The 4C-Climatronic

The structural features

Due to the specialised concept of the 4C-Climatronic in the Touareg, this section will discuss the following subjects:

- the cooling circuit,
- the air distribution in the front passenger compartment and
- the air distribution in the rear passenger compartment.

Cooling circuit

Due to the two air-conditioning units, the cooling circuit of the 4C-Climatronic air-conditioning system has two evaporators; these are connected in parallel in the cable ducts. Both evaporators are operated together by an externally controlled compressor.

The drive of the compressor depends on the engine type. For petrol engines, the air-conditioning compressor runs directly in the belt drive. For diesel engines V10-TDI and R5-TDI, the drive operates together with the power steering pump via the gearwheel drive.

The highly compressed coolant is relieved upstream of the evaporator using an expansion valve. The condenser is equipped with a dry cartridge.

The cooling circuit has single-block connections.

Depending on the engine type, the system for detecting and controlling a slow loss of coolant has a sender for the coolant temperature and a separate high-pressure sender. Currently, this combination for the simultaneous detection of the coolant temperature and the coolant pressure can be found in the V10-TDI engine.
Sender for coolant temperature* G454
High-pressure sender G65

Dry cartridge
Condensor with dry cartridge

Compressor

Service connection

Expansion valve

Expansion valve 1

Expansion valve 2

Evaporator in air-conditioning unit front

Evaporator in air-conditioning unit rear

Temperature sensor for evaporator G308

Blower in air-conditioning unit front

Blower in air-conditioning unit rear

Low pressure
High pressure
Fresh air
Air recirculated from the passenger compartment

* depending on engine type
**4C-Climatronic**

- The drive of the externally controlled air-conditioning compressor

In the Touareg, a one-sided-working 7-piston swash-plate compressor is used for the compression of the coolant. Due to the swash-plate, the compressor has a variable displacement, so that the compressor performance can be adapted to the required cooling capacity of the air-conditioning system. The compressor is regulated by the external control valve for compressor N280.

In petrol engines, the compressor is driven by a ribbed belt.
In diesel engines, the compressor is driven by the drive axle of the power steering pump.
To protect the high-quality mechanical system of the compressor from damage, the compressor is driven via a coupling that is located between the power steering pump and the compressor.

Currently, two different couplings are used for diesel engines V10-TDI and R5-TDI.

Drive for the V10-TDI engine

The compressor is connected with the drive axle of the power steering pump by two Hardy discs operating as a coupling.

The Hardy discs are rubber elements that are screwed onto the flanges of the drive axles of the compressor and the power steering pump as a frictional connection. The rubber elements can be used to compensate for torque fluctuations that may occur.
Drive for the R5-TDI engine

In this engine, a flexible torsion coupling is used. “Flexible torsion” means that running disturbances in the longitudinal direction of the drive axle can be compensated or dampened.

The flexible torsion coupling consists of two toothed metal end pieces that are mechanically connected to one another by a rubber sleeve. This design provides good dampening and additional overload protection. A possible load can be read using the imprinted torque lines on the rubber sleeve. The greater the load, the more that the lines on the sleeve deform.

Further information regarding the cooling circuit can be found in SSP 208 “Air-Conditioning Systems in the Vehicle” and SSP 271 “The Phaeton – Heating/Air Conditioning System”.

---

Lines with equal load on both axles

Lines with one-sided overload
Air distribution in the front passenger compartment

Fresh air enters the entry opening of the air-conditioning system in the plenum chamber on the right-hand side of the vehicle.

After the air has passed the air-conditioning unit, it is guided through air ducts that are integrated into the plastic body of the dash panel to the following air outlets:

- the defrost air outlets on the windscreen,
- an air outlet for indirect ventilation on the top side of the dash panel,
- the left-hand and right-hand face-level air outlets in the middle of the dash panel,
- the two side air outlets on the left-hand and right-hand exterior sides of the dash panel as well as
- the two footwell air outlets, front left and right.

There is no connection to the rear air outlets. The openings provided for air distribution of the rear passenger compartment on the underside of the dash display and on the air-conditioning unit in the 2C and the manual system are blocked in the 4C system by specially shaped plastic elements.
Front air-conditioning unit

In addition to the evaporator, the housing of the air-conditioning unit contains the following components (among others):

- the fresh air/recirculated air valve with drive,
- the blower,
- the blower control sender,
- the dust and pollen filter,
- the heat exchanger.

● Fresh air / recirculating air flap

This is driven by a servomotor; it ensures that the air from the vehicle interior or from the outside is led into the air-conditioning unit after the recirculating function is activated/deactivated.

● Blower

After the air has entered the air-conditioning unit through the fresh air flap, it is transported to the blower. This is operated by an electronic controller that is inserted from outside into the housing of the air-conditioning unit.
Flaps, servomotors and temperature sensors on the front air-conditioning unit

All the flaps of the air-conditioning unit are driven electromechanically by direct current servomotors. Potentiometers integrated in the engines record the current position of the engine and the flap that is connected to it. In the 4C-Climatronic, the air-conditioning unit has 10 servomotors.
To permit temperature control, the 4C-Climatronic in this design has 6 temperature sensors:

- the temperature sensor for fresh air suction duct G89 in the air-conditioning unit,
- the temperature sensor downstream of evaporator G308 in the air-conditioning unit,
- the temperature sensor for the face-level air outlets, left and right (G385 and G386) in the air-conditioning unit and
- the temperature sensor for the front footwells, left and right (G261 and G262)
Function of the temperature flaps

It is possible to maintain independent temperatures for the two front climate zones by using independent temperature flaps (left and right).

The position of each temperature flap determines in which quantitative proportion the cold air from the evaporator is to be mixed with the warm air from the heat exchanger for the climate zones in order to attain the desired air outflow temperature.
Servomotor retaining plates

The disassembly and assembly of the servomotors during repair work is simplified by using retaining plates on which the motors are premounted in the required installation position.

Before a servomotor is removed, the Service function must be started with vehicle diagnostic system VAS 5051. This ensures that all the servomotors move to a predetermined position which simplifies assembly.

The Service function is indicated in the display of the operating and display unit on the driver’s side by the letters “SF”.

If the flaps are no longer connected to the servomotors, return springs also pull the flaps in the air-conditioning unit into an assembly position, so that the retaining plates, together with the servomotors, can be easily pushed onto the drive gates of the flaps.

When working on the air-conditioning unit, pay attention to the working steps listed in the repair guidelines.
Air distribution in the rear passenger compartment

The air distribution in the rear is provided by the rear air-conditioning unit, one distributor housing on the left and the right, and diverse air ducts to the left-hand and right-hand face-level air outlets in the centre, the air outlets in the B-pillar and the footwell air outlets in the rear.

The temperature sensors for recording the blow-out temperature of the two rear climate zones are located in the air ducts which lead to the left-hand and right-hand distributor housing as well as to the left-hand and right-hand air outlets in the centre.
Rear air-conditioning unit

This is the central component for conditioning the two rear seats; it is located behind the left side panels in the luggage compartment.

The rear air-conditioning unit takes the air out of the passenger compartment. The blower output is 2/3 of the output of the blower in the front air-conditioning unit.

The components that are important for the heating and cooling functions of the rear air-conditioning unit include:

- the blower,
- the sender for blower control,
- the evaporator,
- the heat exchanger.
4C Climatronic

- Air flaps on the air-conditioning unit

The rear air-conditioning unit has two temperature flaps and two air quantity flaps. One temperature and one air quantity flap each supply a rear climate zone with an air current that is limited by the air quantity flap. Additional air distribution flaps are located in the distributor housing for the rear centre air outlet and in the two distributor housings in the left rear and right rear.

- Servomotors

The rear air-conditioning unit has four servomotors, which, as is the case for two motors of the front air-conditioning unit, are equipped with internal potentiometers.

Of the four additional servomotors of the air distribution system, two are located on the distributor housing for the rear centre air outlet in the centre console. One motor each is located on the left and right rear distributor housings. Overall, the rear air distribution system has eight servomotors.
Temperature flaps

As is the case for the front air-conditioning unit, the rear air-conditioning unit also has two temperature flaps in order to be able to independently set the temperatures for the two rear climate zones. The desired air temperature is generated from the mixture proportion of cold air from the evaporator and warm air from the heat exchanger.

If only warm air is to be transported from the heat exchanger to the air outlets, the temperature flap is set in such a manner that the entire air flow from the evaporator is transported to the heat exchanger.

If cold air is desired at the air outlets, the temperature flap closes the access to the heat exchanger.
4C-Climatronic

- **Heat exchanger**

The rear air-conditioning unit also has a heat exchanger with air-side temperature control. It is located in the upper portion of the air-conditioning unit; if it is defective, it can be replaced without having to remove the entire air-conditioning unit and separating it from the cooling circuit.

- **Block connections for the rear air-conditioning unit**

These are located in the left rear wheel housing on a shared connector support; they are the connection to the cooling circuit. The coolant hoses are also guided through the connector support.

**Distributor housing for the rear centre air outlet**

Each flap that transports/blocks the air flow to/from the rear centre air outlets in the centre console is driven by a servomotor. Both servomotors for the left and right rear face-level air outlets (V315 and V316) are located in a shared housing that is connected to the bottom of the centre air outlet housing.
**Distributor housings**

These are located on the floor panel to the left and right of the centre duct.

In each housing, the air flow again separates into a branch that leads to the air outlets in the B-pillar and to the footwell air outlet. The air is distributed between these two destinations using the B-pillar and footwell shut-off valve, which is driven by a servomotor.

The shut-off valve consists of two flap elements that are arranged on a shared axis. The angle between the two flap elements is selected in such a way that the air flow to either the B-pillar air outlet or to the footwell air outlet is released in the end positions.

If the air is to be transported to the footwell air outlets, the broader flap element blocks the air flow to the B-pillar while the narrow flap element releases the air flow to the footwell air outlets.

If the air is to be transported to the air outlets of the B-pillar, the broader flap element opens the air flow to the B-pillar while the narrow flap element blocks the air flow to the footwell air outlets.
Functional features

The 4C-Climatronic has one operating and display unit in the dash panel and one operating and display unit in the centre console in the rear, under the face-level air outlets in the centre.

The two operating units exchange information concerning CAN data bus comfort. The operating unit in the dash panel is superordinate to the one in the rear. This means that the unit in the dash panel is the master unit and that in the rear is the slave unit. Without the master unit, the operating unit in the rear cannot execute any functions.

Front operating and display unit

Driver’s side display shows temperature and blower strength

Setting the driver’s side blower strength

Auto button
Automatic climate regulation, driver’s side
The system independently regulates the climate zone set to Automatic according to the set temperature.

Rear button
If this function is switched on, the climate settings for the rear seats can be made using the front control panel.

Econ
Switching off the air-conditioning function
As a result, the air is no longer cooled and dried.

Temperature controller, driver’s side

Temperature sensor, dash panel

Dash panel temperature sensor
This is part of the front operating and display unit. This sensor is not regarded as an independent component in the repair guidelines; if repairs are required, it cannot be replaced.
Residual heat function
When the residual heat function is activated, the interior can be heated for a limited time after the engine is switched off.

Synchronisation
When this button is pressed, all the climate settings are adapted to the values that were set for the climate zone of the driver.

Manual recirculating air function
Manual closing of the fresh air / recirculating air flap to outside air.

Automatic recirculating air function
If pollutants are found in the supplied fresh air by an air-quality sensor or if the windscreen wiper system is activated, the climate control switches automatically to the recirculation mode.
Below 0 °C, the automatic recirculation function is switched off to avoid steaming of the windows.
The running time of the automatic recirculation function is limited by a fixed value.

Display and operating unit, equipped with electric windscreen heater
The button assignments of the control units differ if the vehicle is equipped with an electric windscreen heater. In this case, the automatic and manual recirculation functions are triggered using a shared button.
Pressing the button once activates the manual recirculation function, pressing it again activates the automatic recirculation function and pressing it a third time switches the recirculation function off again.

Manual recirculating air function
Manual closing of the fresh air / recirculating air flap to outside air.

Automatic recirculating air function
If pollutants are found in the supplied fresh air by an air-quality sensor or if the windscreen wiper system is activated, the climate control switches automatically to the recirculation mode.
Below 0 °C, the automatic recirculation function is switched off to avoid steaming of the windows.
The running time of the automatic recirculation function is limited by a fixed value.
Rear display and operating unit for Climatronic E265

This is located under the face-level air outlets of the centre console; it permits the characteristics of the two rear climate zones to be set. Compared to the front operating unit, this unit offers a less extensive range of functions. The settings for the front climate zones can not be changed by the rear operating and display unit.
How does the 4-zone air-conditioning system function in the Touareg?

The 4C Climatronic air-conditioning system generally lies within a temperature range between 16 °C and 29.5 °C. When setting the climate for each individual seat, it must be taken into account that the climate zones in the passenger compartment are not physically separated from one another.

The following pages demonstrate the functional connection between the values set on the operating and display units and the participating components of the air-conditioning system for each climate zone.

The basic condition for our example is a sunny day with a temperature of approx. 24 °C. A person with individual desires regarding the temperature and air distribution is seated in each of the 4 climate zones.

The initial situation:

**Climate zone “driver”**
The driver selects a temperature of 22 °C and presses the Auto button on the display and operating unit.

**Climate zone “right front passenger”**
He selects a temperature of 20 °C and prefers that the air flows directly out of the central air outlets and the right front face-level air outlets.

**Climate zone “left rear passenger”**
This person sets the temperature on the rear operating and display unit to 24 °C and activates the footwell air outlet.

**Climate zone “right rear passenger”**
This passenger would like to be subjected to cooler air from the air outlets of the centre rear console and the B-pillar. He sets the temperature to 18 °C.
**Climate zone “driver”**

*Operation*

By pressing the Auto button, the driver has activated the automatic air-conditioning system for his climate zone. The Climatronic control unit decides on its own how the set temperature of 22 °C is to be maintained with highest degree of comfort. The solar irradiation is included in the selection of the air distribution and the blower strength.

*Function*

The control unit uses the servomotor to open the right-hand temperature flap so far, compared to the warm air from the heat exchanger, that a temperature of approx. 22 °C is maintained in this climate zone. Using the flaps for the centre and side air outlets on the driver’s side and the footwell air outlets, the tempered air flow is guided to the driver. Which flaps are opened how far is decided independently by the control unit based on the ambient conditions.
Climate zone ”right front passenger”

● Operation

The passenger sets his temperature to 20 °C and increases the blower strength. When the ”Centre air distribution” button is pressed, the prior operating status is revoked and the Climatronic control unit is instructed to open the flaps for the face-level air outlets.

● Function

In order to attain an air flow that is warm enough for this setting, the left-hand temperature flap is closed further in relation to the warm air. The blower strength is increased according to the set value. As the driver and passenger sides are supplied with air by a blower, the control device must readjust the settings for the automatic mode on the driver side so that the driver is not now subjected to an air flow that is stronger than desired.
4C-Climatronic

Climate zone "left rear passenger"

- **Operation**

  The passenger behind the driver presses the button for air distribution in the footwell and sets the desired temperature using the rotary knob of the rear operating and display unit of the 4C air-conditioning system.

- **Function**

  As is the case for the front air-conditioning unit, the Climatronic control unit also determines the mixture proportion of warm and cold air using a temperature flap. The warm air flow is transported from the rear air-conditioning unit to the left-hand distributor housing.

  When the left-hand B-pillar and footwell shut-off valves are pressed, the control unit ensures that the warm air can exit the footwell air outlet.
Climate zone “right rear passenger”

After the passenger in the right rear seat has used the rotary knob to set the temperature to 18 °C, he presses the button for air distribution on the side window and in the centre on the operating and display unit.

**Operation**

The Climatronic control unit opens the right-hand temperature flap further for the cold air from the evaporator so that the temperature reaches 18 °C in this climate zone. In order to guide air to the centre air outlet, the control unit activates the flap for the right rear face-level air outlet.

As direct air flow includes the air outlets in the B-pillar, the control unit also activates the shut-off valve for the right-hand B-pillar and footwell so that air can flow into the B-pillar.
System overview

Temperature sensor for air distribution, front
(For list, see page 44)

High-pressure sender G65

Photosensor 2 for solar irradiation G134

Air-quality sensor G238

Coolant temperature sender G454
(depending on engine type)

Potentiometer in servomotors of air distribution, front
(For list, see page 44)

A defective potentiometer is not separately recorded by the diagnostics; instead it is displayed as a faulty servomotor.

Temperature sensor for air distribution, rear
(For list, see page 44)

Potentiometer in servomotors of air distribution, rear
(For list, see page 44)
Additional output signals
e.g.
heated windscreen Z2 or
relay for residual heat J708

CAN data bus comfort

Diagnosis interface for data bus J533
in control unit with display unit in dash panel insert
J285

Servomotors for air distribution, rear
(For list, see page 45)

Control valve for compressor, air-conditioning system
N280

Blower control sender, front G462
Blower control motor, front V305

Blower control sender, rear G463
Blower control motor, rear V306

Servomotors for air distribution, front
(For list, see page 45)
System overview

Temperature sensor for air distribution, front

Temperature sensor – fresh air suction duct G89
Sender for blow-out temperature, left footwell G261
Sender for blow-out temperature, right footwell G262
Temperature sensor for evaporator G308
Temperature sensor for face-level air outlet, left front G385
Temperature sensor for face-level air outlet, right front G386

Temperature sensor for air distribution, rear

Sender for blow-out temperature, left rear G405
Sender for blow-out temperature, right rear G406

Potentiometer for air distribution, front

Potentiometer in servomotor for defrost flap G135
Potentiometer in servomotor for footwell flap, left G139
Potentiometer in servomotor for footwell flap, right G140
Potentiometer - servomotor for air recirculation flap G143
Potentiometer - servomotor for temperature flap, left G220
Potentiometer - servomotor for temperature flap, right G221
Potentiometer - servomotor for defrost shut-off valve and face-level air outlet, right front G317
Potentiometer - servomotor for defrost shut-off valve and face-level air outlet, left front G318
Potentiometer for face-level air outlet, left front G387
Potentiometer for face-level air outlet, right front G388

Potentiometer for air distribution, rear

Potentiometer - servomotor for B-pillar and footwell shut-off valve, right G328
Potentiometer - servomotor for B-pillar and footwell shut-off valve, left G329
Potentiometer for air quantity flap, left rear G389
Potentiometer for air quantity flap, right rear G390
Potentiometer for temperature flap, left rear G391
Potentiometer for temperature flap, right rear G392
Potentiometer for face-level air outlet, left rear G471
Potentiometer for face-level air outlet, right rear G472
**Servomotors for air distribution, front**

- Servomotor for defrost flap V107
- Servomotor for footwell flap, left V108
- Servomotor for footwell flap, right V109
- Servomotor for centre air outlet, left V110
- Servomotor for centre air outlet, right V111
- Servomotor for fresh air / recirculating air flap V154
- Servomotor for temperature flap, left V158
- Servomotor for temperature flap, right V159
- Servomotor for left-hand side air outlet V299
- Servomotor for right-hand side air outlet V300

**Servomotors for air distribution, rear**

- Servomotor for B-pillar and footwell shut-off valve, right V211
- Servomotor for B-pillar and footwell shut-off valve, left V212
- Servomotor for air quantity flap, left rear V239
- Servomotor for air quantity flap, right rear V240
- Servomotor for temperature flap, right rear V313
- Servomotor for temperature flap, left rear V314
- Servomotor for face-level air outlet, left rear G315
- Servomotor for face-level air outlet, right rear G316
4C-Climatronic

Operational diagram

- G89 temperature sensors - fresh air suction duct
- G139 potentiometer in servomotor for footwell flap, left
- G140 potentiometer in servomotor for footwell flap, right
- G143 potentiometer - servomotor for air recirculation flap
- G238 air-quality sensor
- G261 sender for blow-out temperature, footwell, left
- G262 sender for blow-out temperature, footwell, right
- G308 temperature sensor for evaporator
- G385 temperature sensor for face-level air outlet, left front
- G386 temperature sensor for face-level air outlet, right front

- J255 Climatronic control unit
- N280 control valve for compressor, air-conditioning system
- S fuse
- V108 servomotor for footwell flap, left
- V109 servomotor for footwell flap, right
- V154 servomotor for fresh air / recirculating air flap

Input signal
Output signal
Positive
Ground
CAN data bus

S301_063
G65  high-pressure sender
G134  photosensor 2 for solar irradiation
G317  potentiometer - servomotor for defrost shut-off valve and face-level air outlet, right front
G318  potentiometer - servomotor for defrost shut-off valve and face-level air outlet, left front
G220  potentiometer - servomotor for temperature flap, left
G221  potentiometer - servomotor for temperature flap, right
G387  potentiometer for face-level air outlet, left front
G388  potentiometer for face-level air outlet, right front
G454  coolant temperature sender
J255  Climatronic control unit
J533  diagnostic interface for data bus
J285  control unit with display unit in dash panel insert
V110  servomotor for centre air outlet, left
V110  servomotor for centre air outlet, right
V158  servomotor for temperature flap, left
V159  servomotor for temperature flap, right
V299  servomotor for left-hand side air outlet
V300  servomotor for right-hand side air outlet
Operational diagram (continued)

E265 operating and display unit for Climatronic, rear

G135 potentiometer in servomotor for defrost flap
G405 sender for blow-out temperature, left rear
G406 sender for blow-out temperature, right rear
G462 blower control sender, front
G463 blower control sender, rear
G471 potentiometer for face-level air outlet, left rear

J255 Climatronic control unit
J708 relay for residual heat

V36 water pump*
V55 circulation pump*
V107 servomotor for defrost flap
V305 blower control motor, front
V306 blower control motor, rear
V315 servomotor for face-level air outlet, left rear

* Also see the table on page 10
operating and display unit for Climatronic, rear

G328: potentiometer - servomotor for B-pillar shut-off valve and footwell, right
G329: potentiometer - servomotor for B-pillar shut-off valve and footwell, left
G389: potentiometer for air quantity flap, left rear
G390: potentiometer for air quantity flap, right rear
G391: potentiometer for temperature flap, left rear
G392: potentiometer for temperature flap, right rear
G472: potentiometer for face-level air outlet, right rear

V211: servomotor for B-pillar shut-off valve and footwell, right
V212: servomotor for B-pillar shut-off valve and footwell, left
V239: servomotor for air quantity flap, left rear
V240: servomotor for air quantity flap, right rear
V313: servomotor for temperature flap, left rear
V314: servomotor for temperature flap, right rear
V316: servomotor for face-level air outlet, right rear

S301_066
Structural features

The construction of the 2C-Climatronic differs from that of the 4C-Climatronic in a few points. The following subjects are discussed:

- the cooling circuit and
- the air distribution in the passenger compartment.

Cooling circuit

In general, the design of the 2C-Climatronic cooling circuit is the same as that of the 4C-Climatronic. The important difference is that the cooling circuit has a blower and an evaporator with an expansion valve.
Air distribution in the passenger compartment

The two climate zones of the 2C-Climatronic are maintained by one air-conditioning unit. The air is separated into that for the left-hand and that for the right-hand half of the vehicle and is guided to the following air outlets:

- the side and centre air outlets in the dash panel,
- the front footwell air outlets,
- the centre air outlets in the rear centre console,
- the air outlet in the B-pillar and
- the rear footwell air outlets.

The air for the B-pillar air outlets is guided through the front doors.
2C-Climatronic

Air-conditioning unit

As the flaps for the side, centre and footwell air outlets for the left-hand and right-hand sides are mechanically connected in the 2C-Climatronic air-conditioning unit, the air-conditioning unit has a total of 7 servomotors.

The servomotor for the fresh air / recirculated air flap cannot be seen in the figures below. It is installed in the same position as in the 4C-Climatronic.

- Flaps and servomotors on the air-conditioning unit

Servomotor for defrost flap V107

Servomotor for side air outlet V262

Servomotor for centre air outlet V102

Servomotor for footwell flap V261

Heat exchanger

Flap for side air outlet

Defrost flap

Footwell flap

Flap for centre air outlet
Air ducts of the front air distribution system

In the 2C-Climatronic, as in the manual air-conditioning system, the air for the B-pillar air outlets is guided by air ducts from the dash panel through the front doors to the B-pillar.

There are one air outlet screen and one air inlet screen between the dash panel and the front door, as well as one air outlet screen and one air inlet screen between the front door and the B-pillar.

Another feature is the material from which a portion of the air ducts is manufactured. These are the ducts that connect the air-conditioning unit to the rear centre air outlets. The material is a flexible plastic foam that is distinguished by its:

- good screening from flow noises,
- good heat insulation characteristics and
- good assembly characteristics.

During assembly, ensure that the flexible material is not squeezed by other components, which would then interrupt the air flow.
2C-Climatronic

Functional features

The 2C-Climatronic is operated using an operating and display unit in the dash panel in the front.

Operating and display unit

Driver’s side display
shows temperature and blower strength

Setting the driver’s side blower strength

Temperature sensor, dash panel

Defrosting function

Manual recirculating air function

Auto button
Automatic climate regulation driver’s side
The system independently regulates the climate zones that are set to Automatic according to the set temperature.

Operating and display unit when equipped with electric windscreen heater

The button assignments of the control units differ if the vehicle is equipped with an electric windscreen heater. In this case, the automatic and manual recirculation functions are triggered using a shared button. Pressing the button once activates the manual recirculation function, pressing it again activates the automatic recirculation function and pressing it a third time switches the recirculation function off.
Distributes the air flow to the **footwell air outlets**

Distributes the air flow to the **face-level air outlets**

Distributes the air flow to the **air outlets on the upper side of the dash panel**

**Residual Heat Function**
When the residual heat function is activated, the interior can be heated for a limited time after the engine is switched off.

**Rear Window Heater**

**Automatic Recirculating Air Function**

**Econ**
Switching off the air-conditioning function
As a result, the air is no longer cooled and dried.
System overview

High-pressure sender G65

Photosensor 2 for solar irradiation G134

Air-quality sensor G238

Coolant temperature sender G454
(depending on engine type)

Temperature sensor – fresh air suction duct G89
Sender for blow-out temperature, footwell
left G261
Sender for blow-out temperature, footwell
right G262
Temperature sensor for evaporator G308
Temperature sensor for face-level air outlet,
left front G385
Temperature sensor for face-level air outlet,
right front G386

Potentiometer in servomotor for defrost flap G135
Potentiometer – servomotor for air recirculation flap G143
Potentiometer – servomotor for temperature flap,
left G220
Potentiometer – servomotor for temperature flap,
right G221
Potentiometer – servomotor for centre air outlet G467
Potentiometer – servomotor for side air outlet G469
Potentiometer – servomotor for footwell flap G468
Diagnostic interface for data bus J533 in control unit with display unit in dash panel insert J285

- Servomotor for centre air outlet V102
- Servomotor for defrost flap V107
- Servomotor for fresh air / recirculating air flap V154
- Servomotor for temperature flap, left V158
- Servomotor for temperature flap, right V159
- Servomotor for footwell flap V261
- Servomotor for side air outlet V262

- Control valve for compressor, air-conditioning system N280

- Blower control sender, front G462
- Blower control motor, front V305

- Additional output signals, e.g. for the residual heat function or the windscreen heater

- CAN data bus comfort

- Diagnostic interface for data bus J533 in control unit with display unit in dash panel insert J285
Operational diagram

G89 temperature sensors
- fresh air suction duct
G135 potentiometer in servomotor for
defrost flap
G143 potentiometer - servomotor for
air recirculation flap
G238 air-quality sensor
G261 sender for blow-out temperature, footwell left
G262 sender for blow-out temperature, footwell right
G308 temperature sensor for evaporator
G385 temperature sensor for face-level air outlet,
left front
G386 temperature sensor for face-level air outlet,
right front
G467 potentiometer - servomotor
for face-level air outlet

J255 Climatronic control unit
N280 control valve for compressor, air-conditioning system
S fuse
V102 servomotor for centre air outlet
V107 servomotor for defrost flap
V154 servomotor for fresh air / recirculating air flap
**G65** high-pressure sender
**G107** photosensor for solar irradiation
**G220** potentiometer - servomotor for temperature flap, left
**G221** potentiometer - servomotor for temperature flap, right
**G454** coolant temperature sender
**G462** blower control sender, front
**G469** potentiometer for side air outlet, footwell flap

**J255** Climatronic control unit
**J533** diagnostic interface for data bus
**J285** control unit with display unit in dash panel insert
**J708** relay for residual heat

**V36** water pump*
**V55** circulation pump*
**V158** servomotor for temperature flap, left
**V159** servomotor for temperature flap, right
**V261** servomotor for footwell flap
**V262** servomotor for side air outlet
**V305** blower control motor, front

* Also see the table on page 10
Manual air-conditioning system

Structural features

The design of the manual air-conditioning system is generally similar to that of the 2C-Climatronic. Due to the requirements of a manual air-conditioning system, however, certain servomotors and sensors that are in the 2C system are not used in the manual system.

Air distribution in the passenger compartment

Other than the air-conditioning unit itself, the air distribution components are identical to those of the 2C-Climatronic.
Air-conditioning unit

Generally, the air-conditioning unit of the manual system differs from that of the 2C-Climatronic in two ways:

- The flap for the centre air outlets is driven together with the flap for side air outlets by the servomotor for front air distribution V145.
- The two temperature flaps are permanently connected to one another and are operated by a motor via a shared axis.

• Flaps and servomotors on the air-conditioning unit

Servomotor for defrost flap V107

Servomotor for footwell flap V261

Servomotor for air distribution, front V145

Servomotor for temperature flap V68

Flap for centre air outlet

Flap for side air outlet

Footwell flap

Mechanically connected temperature flaps
Manual air-conditioning system

**Functional features**

Depending on whether the manual air-conditioning system is equipped with an electrical windscreen heater, the button assignment differs for this operating unit also.

The figure on this page shows the operating unit without an electrical windscreen heater. In the system with an electrical windscreen heater, the windscreen and rear window heaters are switched on and off using the centre button in the button bar of the operating unit.

Front operating unit with the control unit for air-conditioning system J301

Defrost function

Recirculating air function

Residual heat function

Temperature controller

AC button
Switching off the air-conditioning function
As a result, the air is no longer cooled and dried.
As opposed to the operating and display units of the 4C and 2C systems, the electrical connection to the protective resistor for the fresh air blower is inserted from behind into the blower switch of the operating unit in the manual air-conditioning system.
Manual air-conditioning system

System overview

High-pressure sender G65

Sender for blow-out temperature, evaporator G263

Coolant temperature sender G454 (depending on engine type)

Potentiometer - servomotor for temperature flap G92
Potentiometer in servomotor for defrost flap G135
Potentiometer - servomotor for front air distribution G470
Potentiometer - servomotor for footwell flap G468
Diagnostic interface for data bus J533 in control unit with display unit in dash panel insert J285

Servomotor for temperature flap V68
Servomotor for defrost flap V107
Servomotor for air distribution, front V145
Servomotor for fresh air / recirculating air flap V154
Servomotor for footwell flap V261

Control valve for compressor, air-conditioning system N280

Protective resistor for fresh air blower with overheating protection N24
Blower control motor, front V305

Additional output signals, e.g. for the residual heat function or the windscreen heater

CAN data bus comfort

Diagnostic interface for data bus J533 in control unit with display unit in dash panel insert J285
Manual air-conditioning system

Operational diagram

E9  switch for fresh air blower
G65 high-pressure sender
G92 potentiometer - servomotor for temperature flap
G263 sender for blow-out temperature, evaporator
G454 coolant temperature sender
J59  relief relay for X contact
J285 control unit with display unit
J301 air-conditioning system control unit
J533 diagnostic interface for data bus
J486 relay for fresh air blower, 2nd stage
N24 protective resistor for fresh air blower with overheating protection
N280 control valve for compressor, air-conditioning system

S fuse
V68 servomotor for temperature flap
V305 blower control motor, front
V154 servomotor for fresh air / recirculating air flap
G135  potentiometer in servomotor for defrost flap
G468  potentiometer - servomotor for footwell flap
G470  potentiometer - servomotor for front air distribution
J301  air-conditioning system control unit
J708  relay for residual heat
V36   water pump*
V55   circulation pump*
V107  servomotor for defrost flap
V145  servomotor for front air distribution
V261  servomotor for footwell flap

* Also see the table on page 10
The front operating and display unit contains the control unit for Climatronic J255. It is included in the CAN data bus comfort; within this data bus it exchanges information with the displayed control units that are required to control the heating/air-conditioning system.

The information is exchanged with the CAN data bus drive and the CAN data bus infotainment via the diagnostic interface J533 in the control unit for the display unit in the dash panel insert J285.

**Climatronic control unit J255**
in the front operating and display unit

- Signals of connected sensors and actuators for J255 to control the two rear climate zones
- Signal concerning the operation of the heated rear window
- Signal of terminal 15
- Signal of terminal X
- Signal for detecting the radio-remote key
- Signal for switching off the heated rear window
- Signal for reducing the output and switching off the air-conditioning compressor
- Signal for switching off the blower

**Rear display and operating unit for Climatronic E265**

**Comfort system central control unit J393**

**Access and start authorisation control unit J518**

**Control unit for on-board network J519**

In Out
Control unit for the display unit in dash panel insert J285 with diagnostic interface for data bus J533

Control unit for wiper motor J400

Control unit for the auxiliary water heater J604*

* Depending on engine type. Only when equipped with auxiliary water heater or auxiliary heater.

Control unit for the display unit in dash panel insert J285 with diagnostic interface for data bus J533

Engine control unit J...

CAN data bus infotainment

Signal concerning the operation of the windscreen wiper system to prevent steaming of the windows.
Signal concerning the operation of the windscreen wiper/washer system for the recirculated air function.

Signal concerning the operation of the auxiliary water heater and the activation of the circulation pump V55.

e.g.
Velocity signal
Coolant temperature sender

Signal for cooler fan control unit
Signal for the residual heat function from the Climatronic control unit

Engine speed signal for engine starting detection
Signal for cooler fan control unit
Signal for reducing output and switching off the compressor
Signal of the engine variant for detecting the drive transmission of the compressor.

CAN data bus drive
Sensors and actuators

Air-quality sensor G238

This is installed in the plenum chamber on the left-hand side; its purpose is to check the fresh air that is supplied to the air-conditioning unit for pollutants.

Function

The sensor is activated by oxidisable and reducible gases such as carbon monoxide or nitrous oxides. The sensor is not an olfactory sensor; it can detect unpleasant odours only if these are caused by oxidisable or reducible gases.

Signal utilisation

The signal is used for the automatic air recirculation function.

Effect of drop-out

If the air-quality sensors drops out, the automatic recirculating air function is highly restricted.

Detailed information regarding the functioning of this sensor can be found in Self-Study Programme 271 “The Phaeton – Heating/Air-Conditioning System”
Photosensor 2 for solar irradiation G134

This is installed under a design cover in the centre of the dash panel, in front of the defrost air outlets.

Function

It is an active sensor. This means that it is supplied with a voltage of 5V by the control unit for the Climatronic. The photosensor has two light-sensitive diodes within an optical element. Using the signals of the two photodiodes, the climate management system can include the height of the sun in the conditioning of the vehicle interior. This can counteract undesired heating of a climate zone by direct solar irradiation.

Effect of drop-out

If a diode is defective, a fixed replacement value is used together with the signal of the intact diode. If both photodiodes drop out, two fixed replacement values are processed.

Signal utilisation

The signal is utilised by the Climatronic to, for example, control the temperature flaps and the blower strength.

Detailed information regarding the functioning of this sensor can be found in Self-Study Programme 271 “The Phaeton – Heating/Air-Conditioning System”
Sensors and actuators

Coolant temperature sender G454

The utilisation of the sender depends on the engine type of the vehicle. It is installed near the compressor, in the high-pressure cable of the cooling circuit.

Function

The sender G454 has an NTC sensor; it records the temperature of the coolant in a measuring range of -20 °C to +150 °C. The normal operating range is +40 °C to +130 °C.

Signal utilisation

Using the temperature signal and the pressure signal of the high-pressure sender G65, the Climatronic control unit can detect a slow coolant leak, such as that which can be caused by a defective seal. In this case, the air-conditioning function is switched off to protect the compressor.

Effect of drop-out

If there is no signal for the coolant temperature, an entry is made in the error memory. A slow coolant leak cannot be detected if a sensor is defective. Therefore, if there is a leak in the cooling circuit, damage to the air-conditioning compressor may occur due to insufficient lubrication.
Sender for blower control, front G462

In the 4C-Climatronic and the 2C-Climatronic, this is inserted immediately next to the blower in the housing of the air-conditioning unit and secured by two screws. In the manual air-conditioning system, a protective resistor is installed in place of the regulator.

Effect of drop-out

If a blower is defective, the entire heating and cooling function of the air-conditioning system fails. The diagnostics can be used only indirectly to localise a fault on the blower control unit or on the blower. For this purpose, there is a resistor in the blower control unit; this is connected with the minus pole of the blower motor.

Due to this arrangement, the control unit receives "acknowledgement information", which can be used to determine whether the fault is at the sender, at the blower or both. There is no direct indication for a fault on the control or on the blower.

However, the voltage signal of the resistor in the blower control is not a signal for the actual voltage on the blower motor, but rather a signal with which the Climatronic control unit can "observe" the behaviour of the sender for the blower control.
Check your knowledge

1. Which of these statements about the Climatronic variants are true?

☐ a) The temperature, air distribution and air amount can be automatically regulated individually and independently for each climate zone in the 4C-Climatronic.

☐ b) Air-conditioning in the 4C-Climatronic is carried out with two air-conditioning units for the front and back climate zones.

☐ c) The rear air-conditioning unit permits separate air-conditioning of the boot.

☐ d) Temperature control in the 4C and 2C-Climatronic lies in the range between 16 °C and 29.5 °C.

☐ e) In the 2C-Climatronic, the temperature for the left-hand and right-hand passenger compartments can be controlled automatically and independently.

2. Which constructional and functional characteristics do all three air-conditioning system variants share?

☐ a) The front air-conditioning units are fastened to the assembly plate by two fastening elements.

☐ b) The dust and pollen filter is integrated into the front air-conditioning unit and can be replaced while the air-conditioning unit is installed.

☐ c) The air-conditioning units have one evaporator, one heat exchanger and one blower.

☐ d) A residual heat function to provide the passenger compartment with warm air when the engine is switched off.

☐ e) One operating and display unit each in the front dash panel and the rear centre console.
3. You have to replace a defective servomotor on the air-conditioning unit. Which of the following statements and working steps are correct?

- a) You use the diagnostics to determine which motor is defective.
- b) After you have determined which motor is defective, replace the servomotor without carrying out any further working steps.
- c) You use the VAS 5051 to bring all the servomotors into the prescribed Service position.
- d) You loosen the retaining plate on which the defective motor is located from the air-conditioning unit.
- e) You replace the servomotor and re-attach the retaining plate to the air-conditioning unit.
- f) Before attaching the retaining plate, you use the VAS 5051 to move the new servomotor until the drive of the motor and the corresponding gate fit to each other.

4. In the table, indicate in which air-conditioning systems the specified components are installed.

<table>
<thead>
<tr>
<th>Component</th>
<th>4C-Climatronic</th>
<th>2C-Climatronic</th>
<th>Manual air-conditioning system</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Rear operating and display unit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) Air-quality sensor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) Photosensor 2 for solar irradiation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) Sender for air humidity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e) Sender for air outflow temperature of evaporator / temperature sensor of evaporator</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f) Blower control sender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g) Protective resistor for fresh air blower</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
No chlorine was used to bleach this paper during manufacture.