

Service.



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.

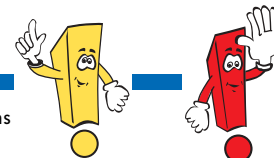
This self-study programme will provide you with interesting information regarding the different heating/air-conditioning systems of the Touareg.



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NEW

**Caution
Note**



**The self-study programme depicts the design and operation of new developments!
Contents will not be updated.**

Current testing, adjustment and repair instructions may be found in the appropriate service material.



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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.

4C Climatronic
Front operating and display unit



S301_009

Rear operating
and display unit



S301_055

2C-Climatronic
Front operating and display unit



S301_013

Manual heating/air-conditioning system
Front operating unit



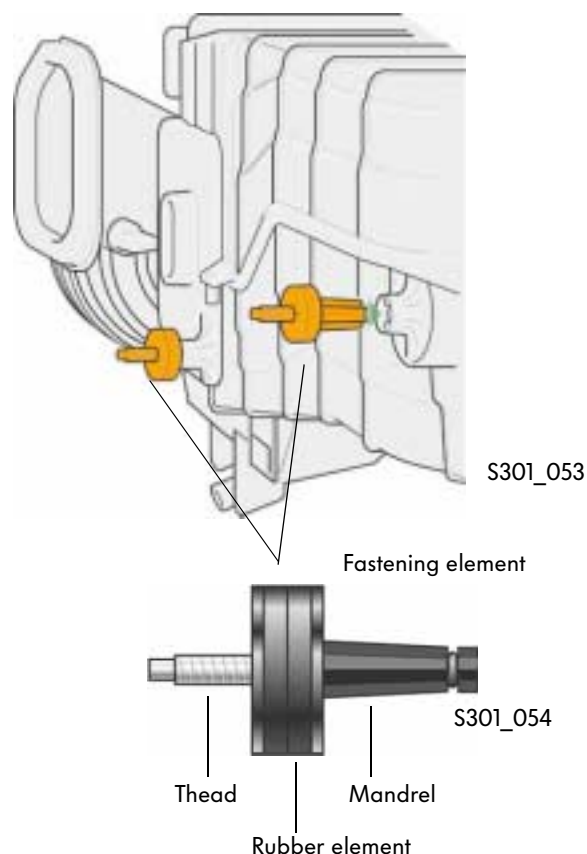
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Shared constructional features

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

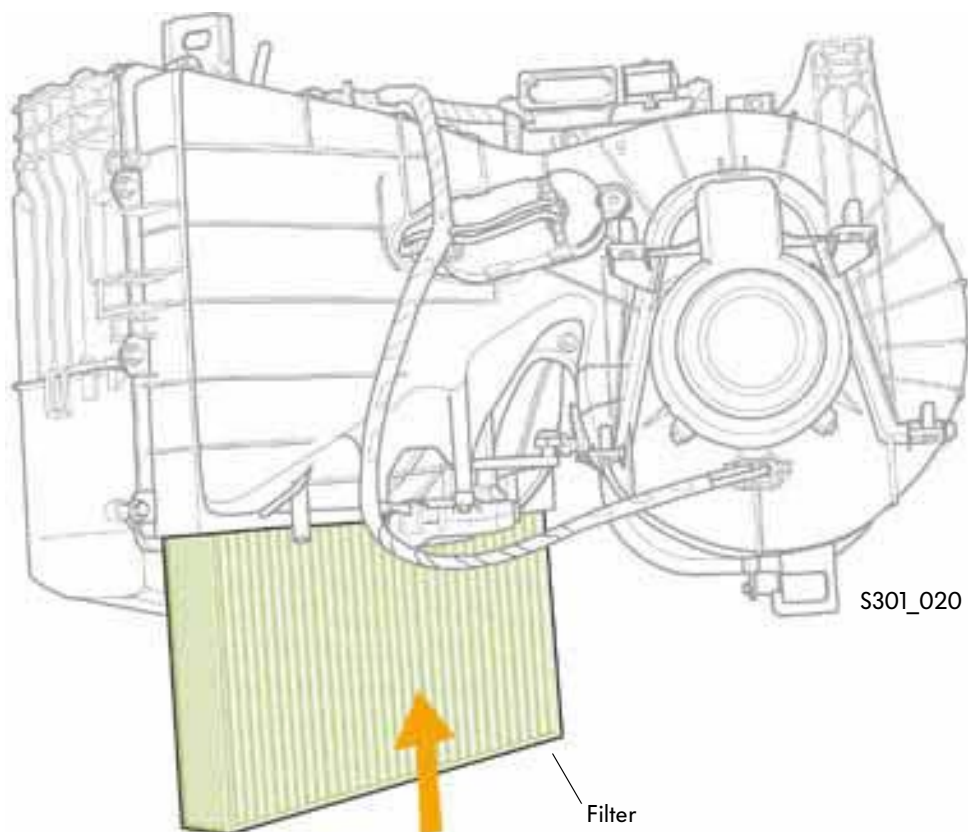
Additional shared features include:

- 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.



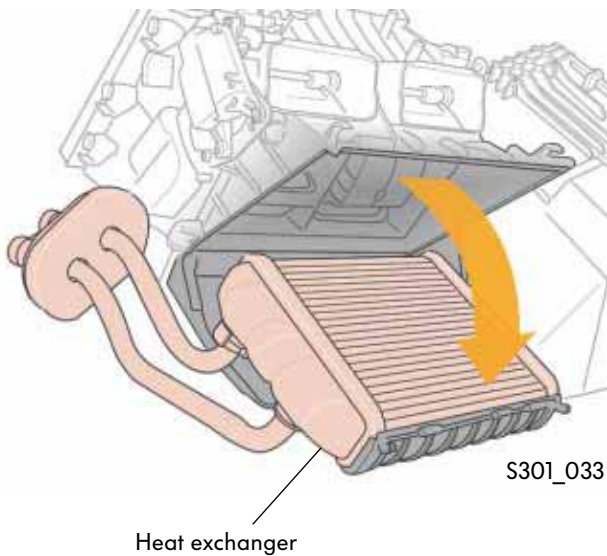


Heat exchanger

The heat exchanger provides temperature control on the air-side.

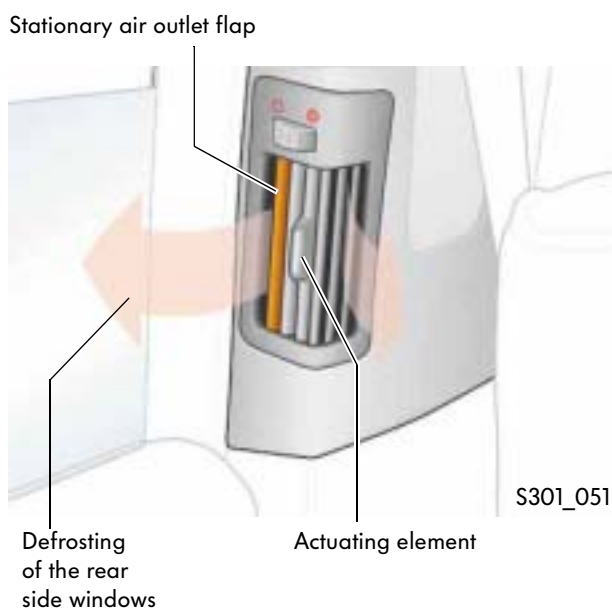
This means that the coolant from the engine circulation always flows through the heat exchanger.

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

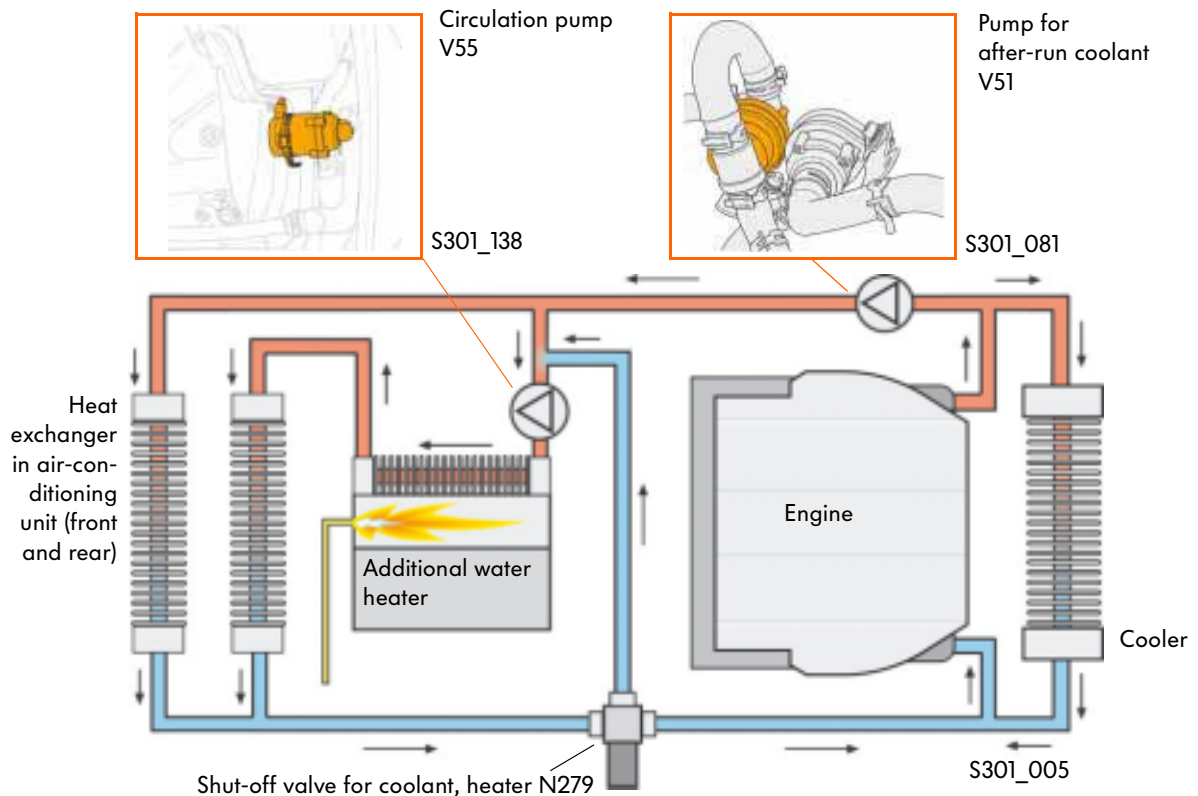


Residual heat function

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.

	V6 engine		V8 engine, W12 engine,		V10-TDI engine*		R5-TDI engine*	
	with AWH	without AWH	with AWH	without AWH	with AWH	without AWH	with AWH	without AWH
Coolant after-run (CAR)								
Heater support (HS)								
Residual heat - function (RH)								
Additional water heater* (AWH)								
Auxiliary heater* (AH)								



Water pump V36



Circulation pump V55



Pump for coolant after-run V51

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

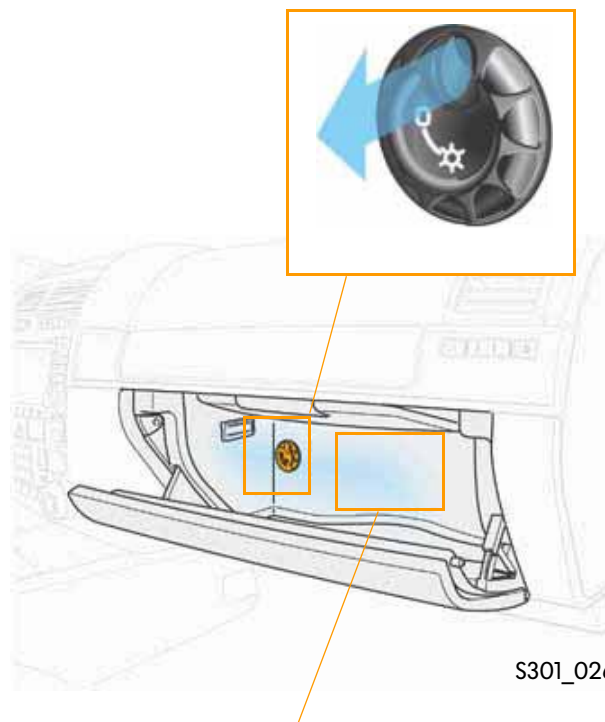


Shared constructional features

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.

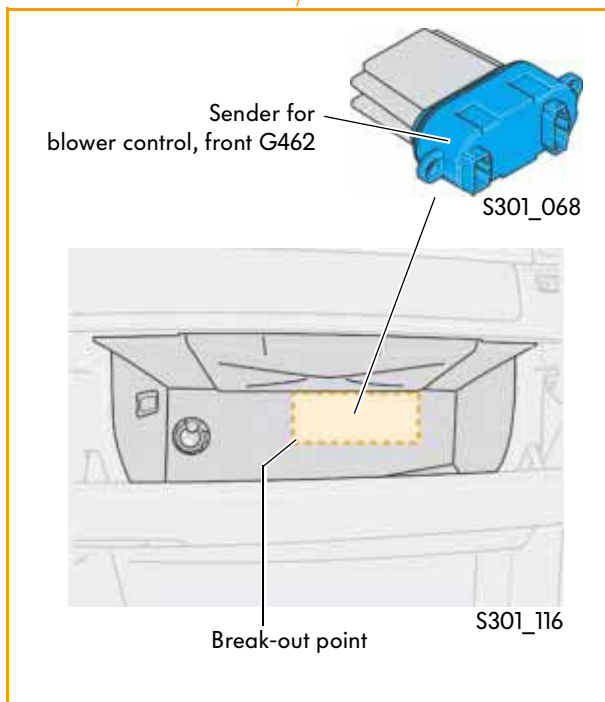
The supply of cold air in the glove compartment can be set manually using a rotary knob with an air outlet opening.



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.

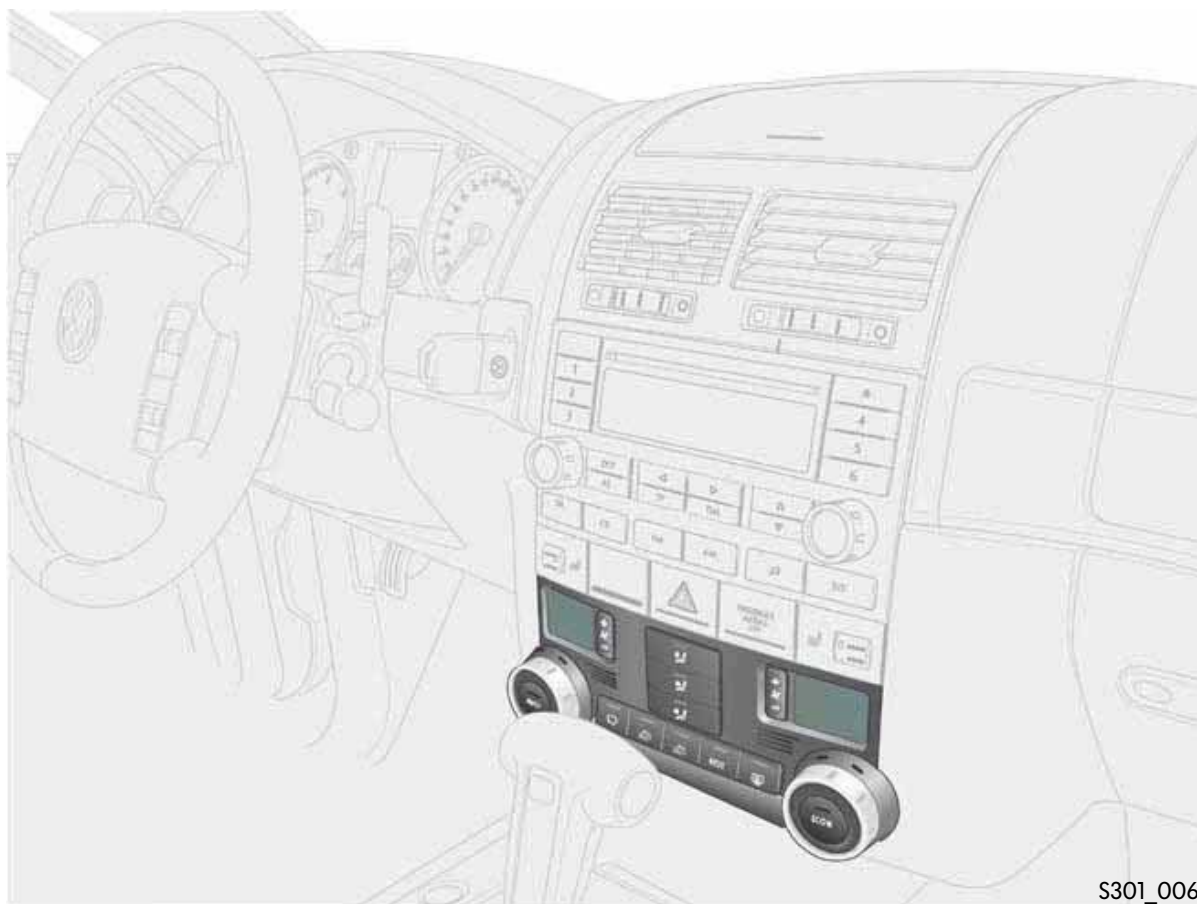


Shared functional features

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



S301_006



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.

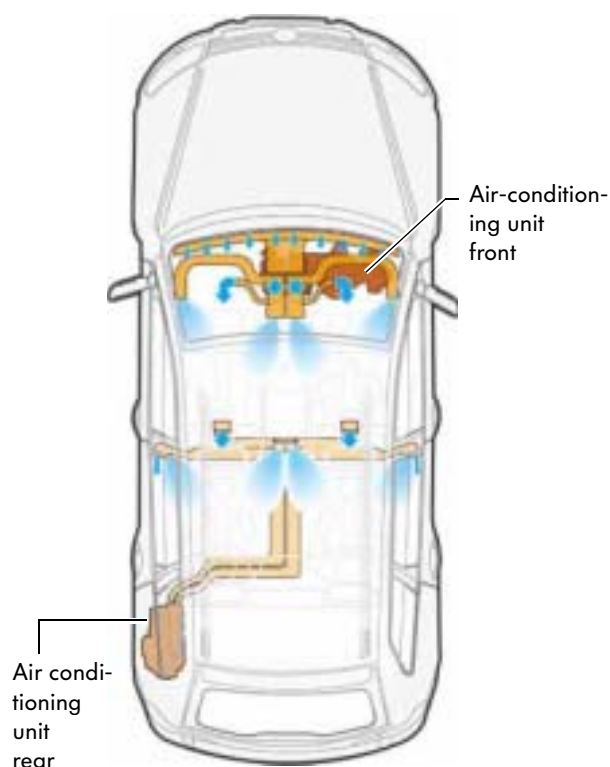
Air distribution

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.



S301_007



S301_008

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



S301_009

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



S301_055

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.

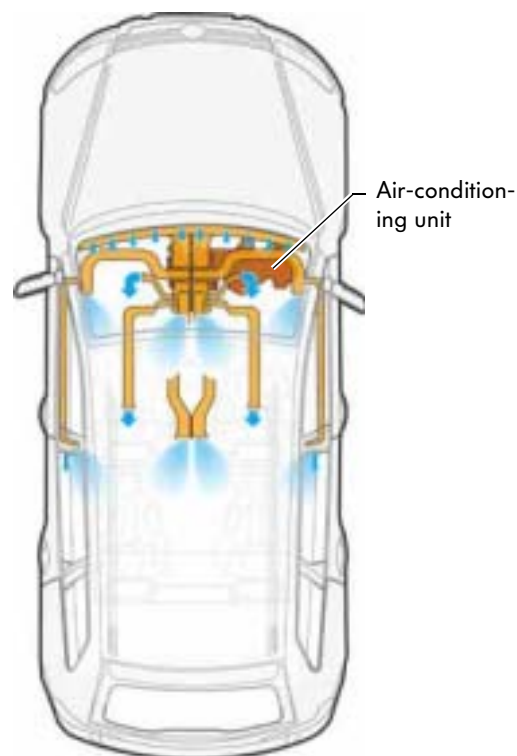


S301_010

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.



S301_012

Functions of the operating and display unit



S301_013

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.

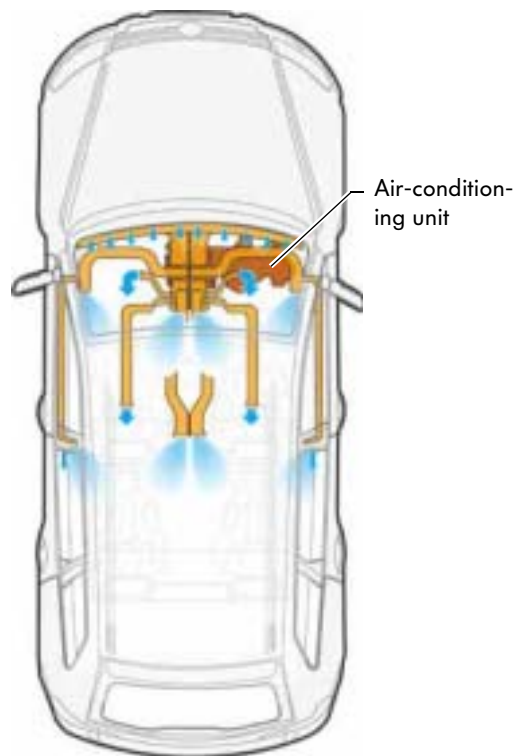
The air quantity and distribution for the individual seats are set mechanically on each air outlet.



S301_011

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.



S301_012

Functions of the operating unit



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.

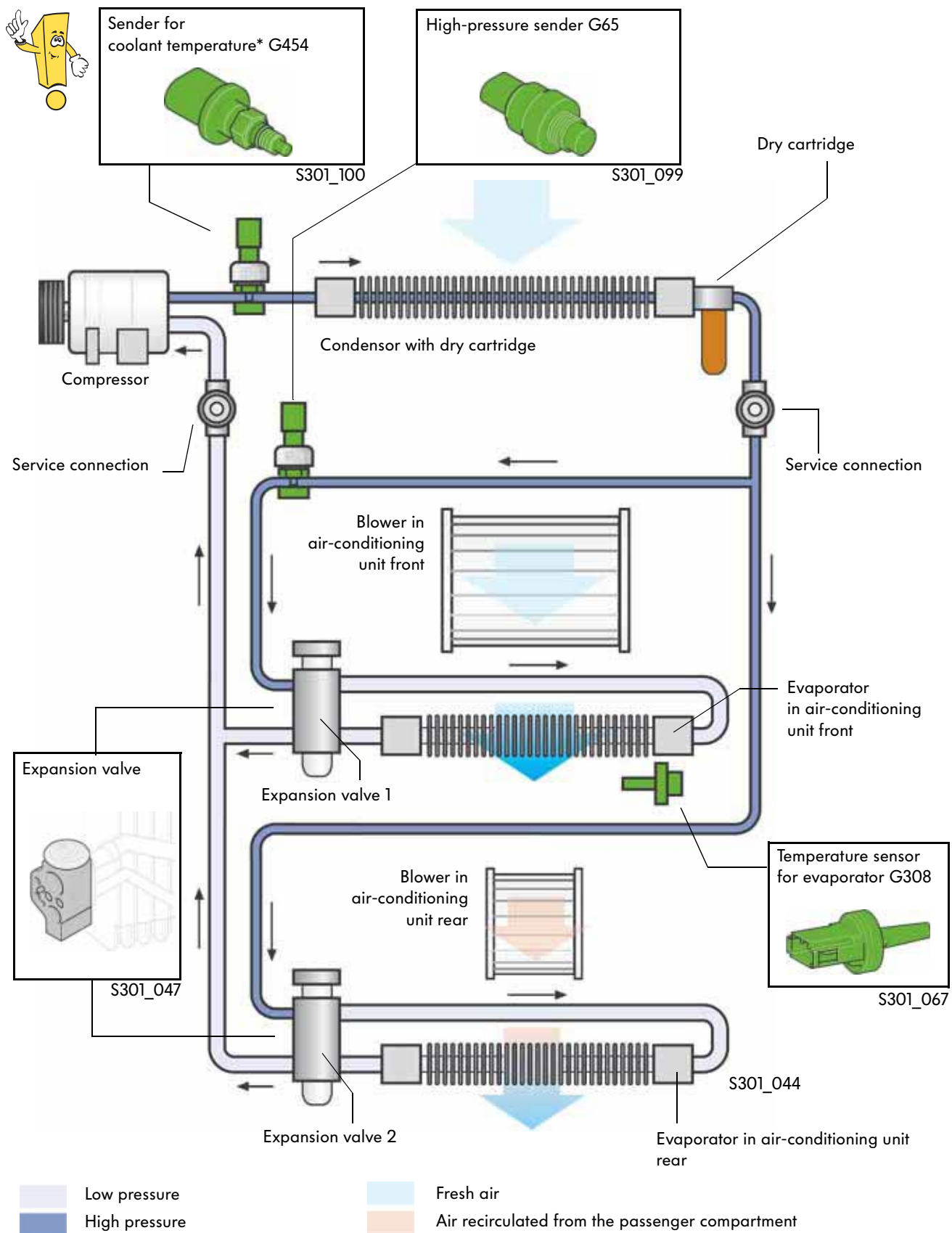
The drive of the compressor depends on the engine type. For petrol engines, the air-conditioning compressor runs directly in the belt drive. For diesel engines V10-TDI and R5-TDI, the drive operates together with the power steering pump via the gearwheel drive.

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.



* 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.

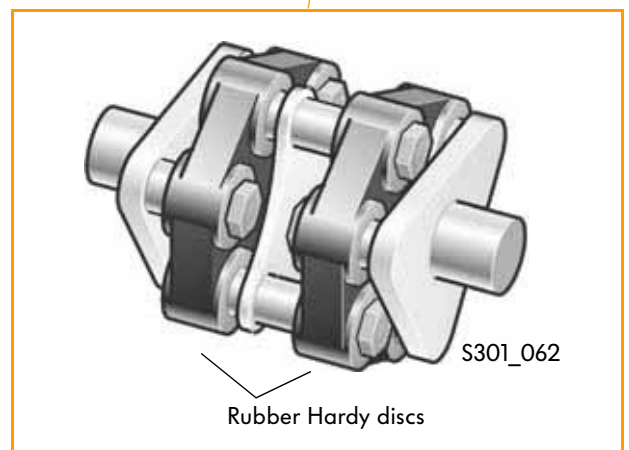
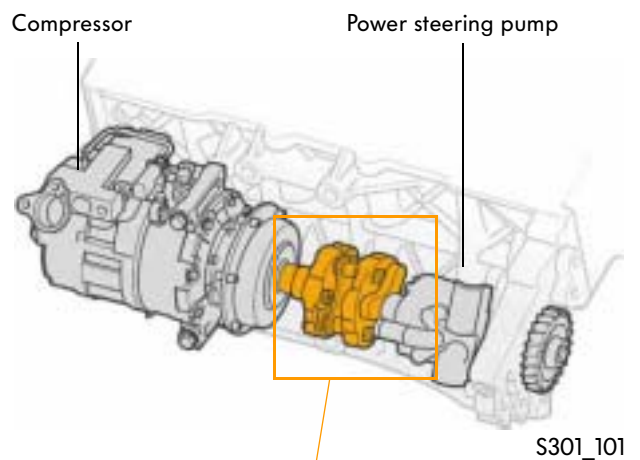
Currently, two different couplings are used for diesel engines V10-TDI and R5-TDI.

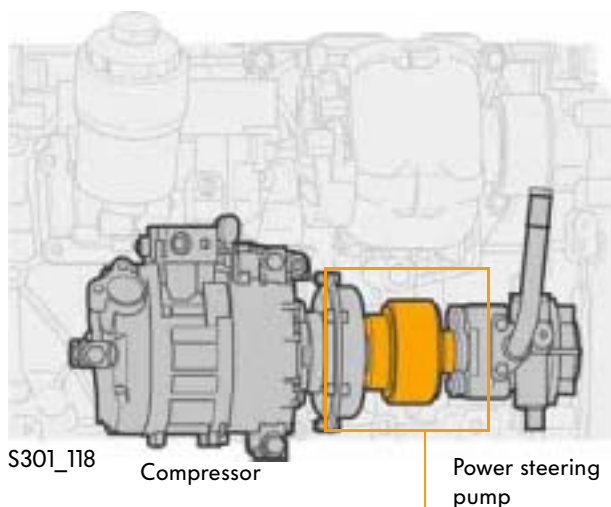
Drive for the V10-TDI engine

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.

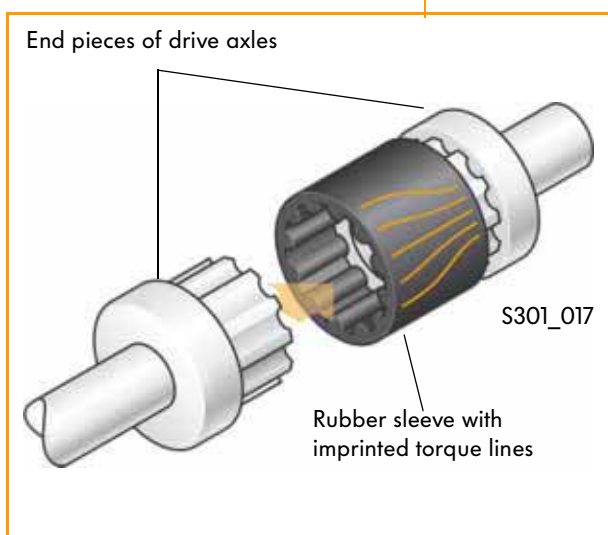
The rubber elements can be used to compensate for torque fluctuations that may occur.



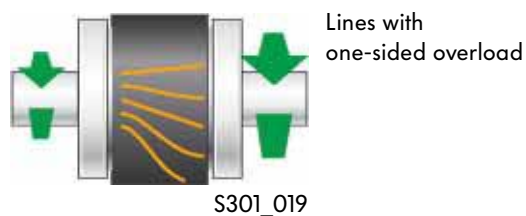
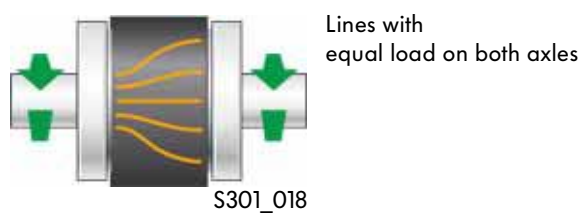


Drive for the R5-TDI engine

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".

4C-Climatronic

Air distribution in the front passenger compartment

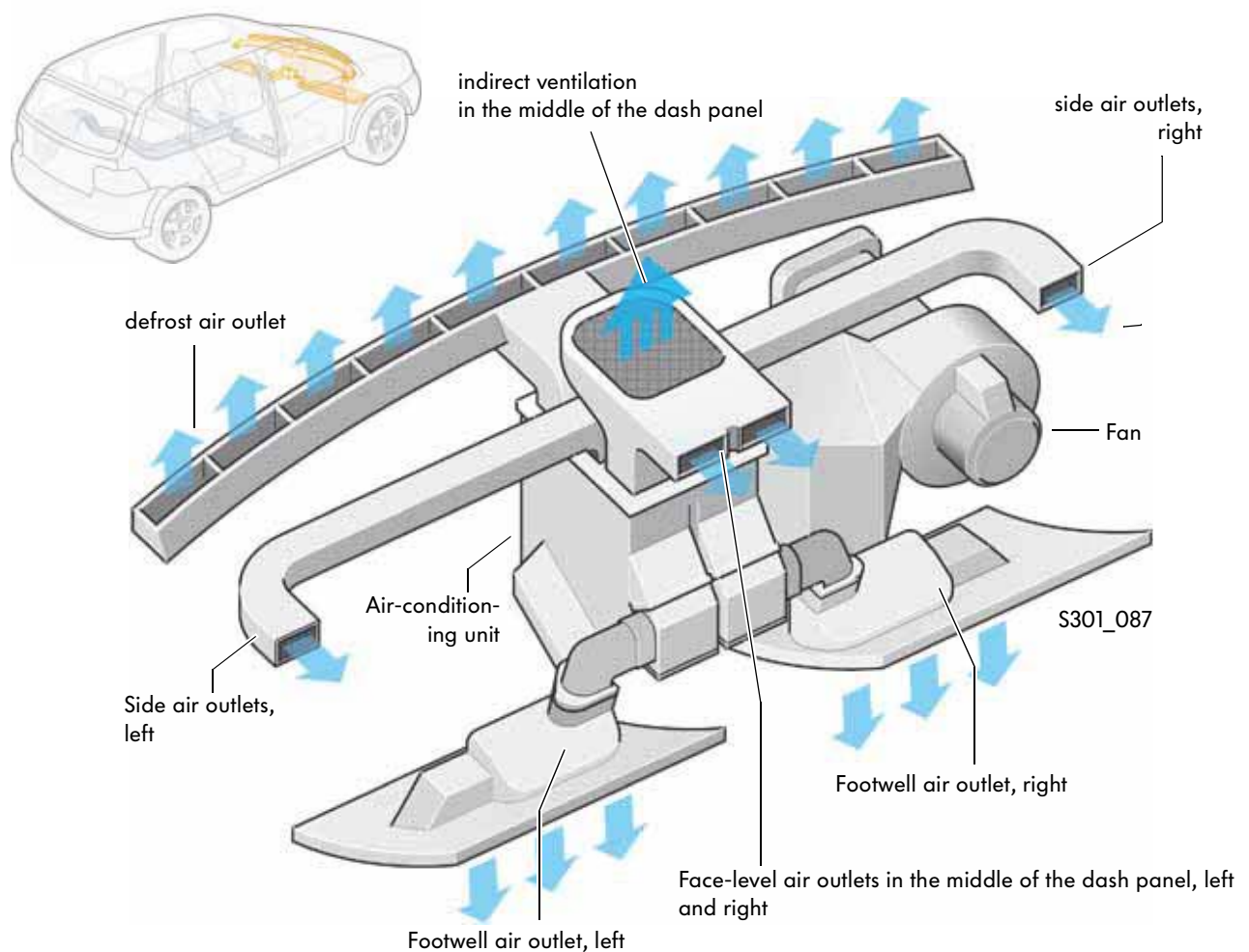
Fresh air enters the entry opening of the air-conditioning system in the plenum chamber on the right-hand side of the vehicle.

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.

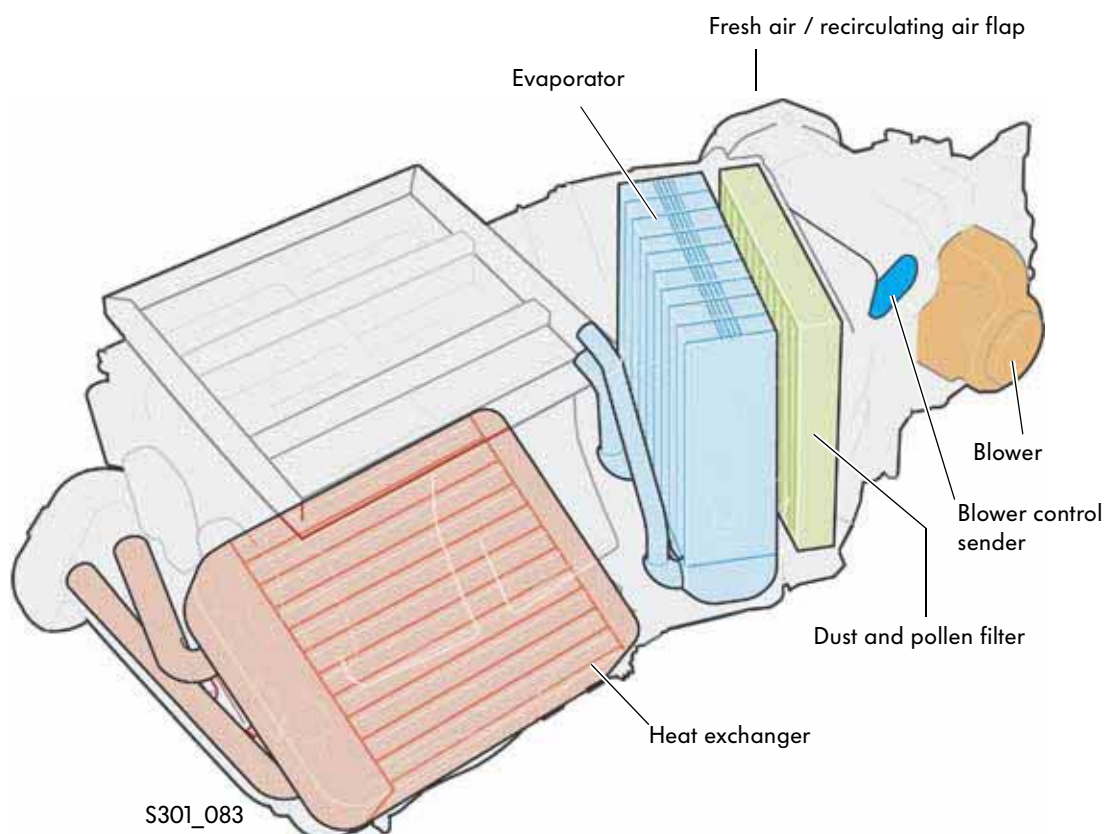
There is no connection to the rear air outlets. The openings provided for air distribution of the rear passenger compartment on the underside of the dash display and on the air-conditioning unit in the 2C and the manual system are blocked in the 4C system by specially shaped plastic elements.



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.

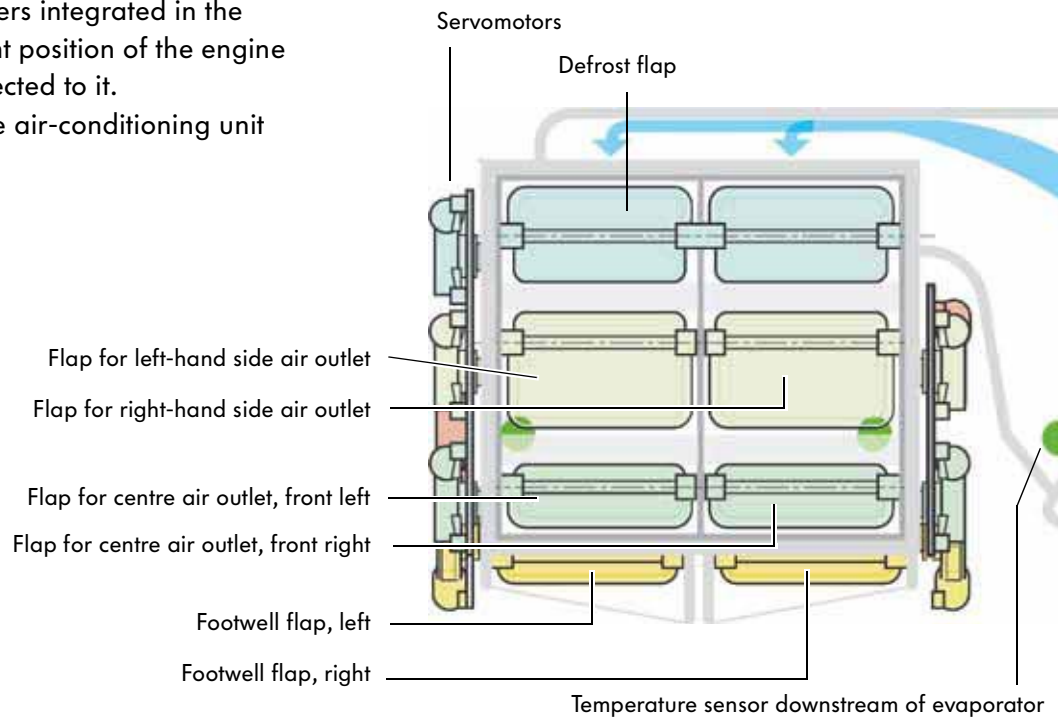
4C Climatronic

- Flaps, servomotors and temperature sensors on the front air-conditioning unit

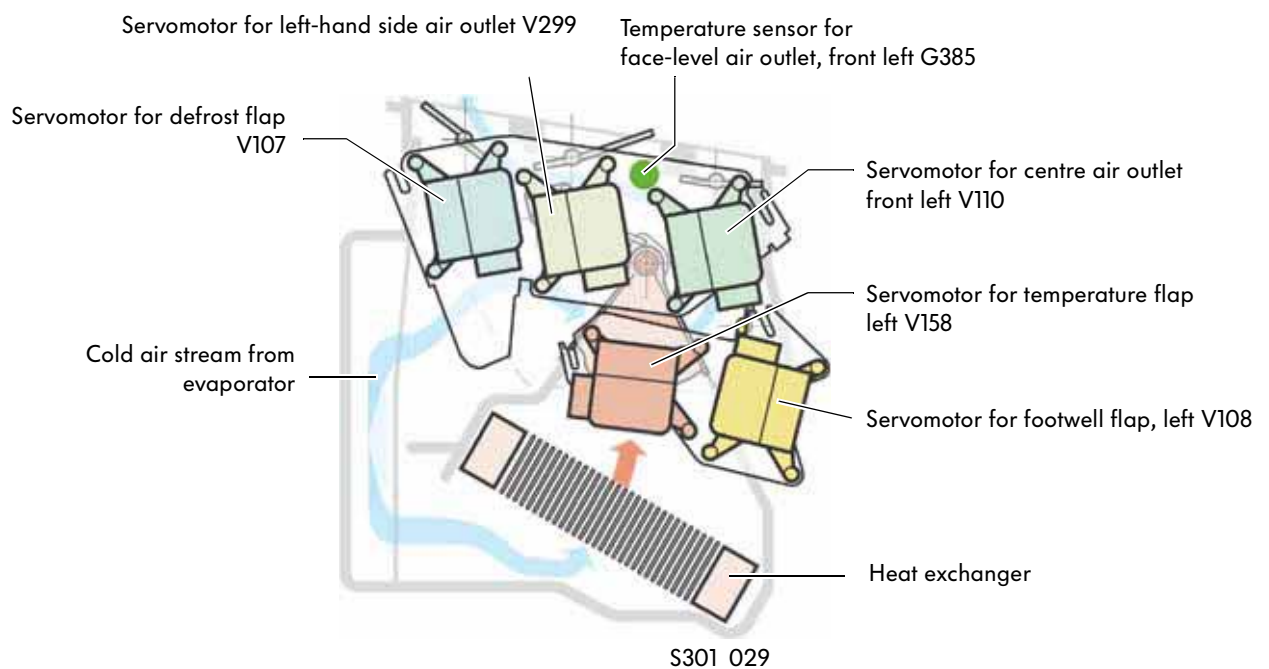
All the flaps of the air-conditioning unit are driven electromechanically by direct current servomotors. Potentiometers integrated in the engines record the current position of the engine and the flap that is connected to it. In the 4C-Climatronic, the air-conditioning unit has 10 servomotors.



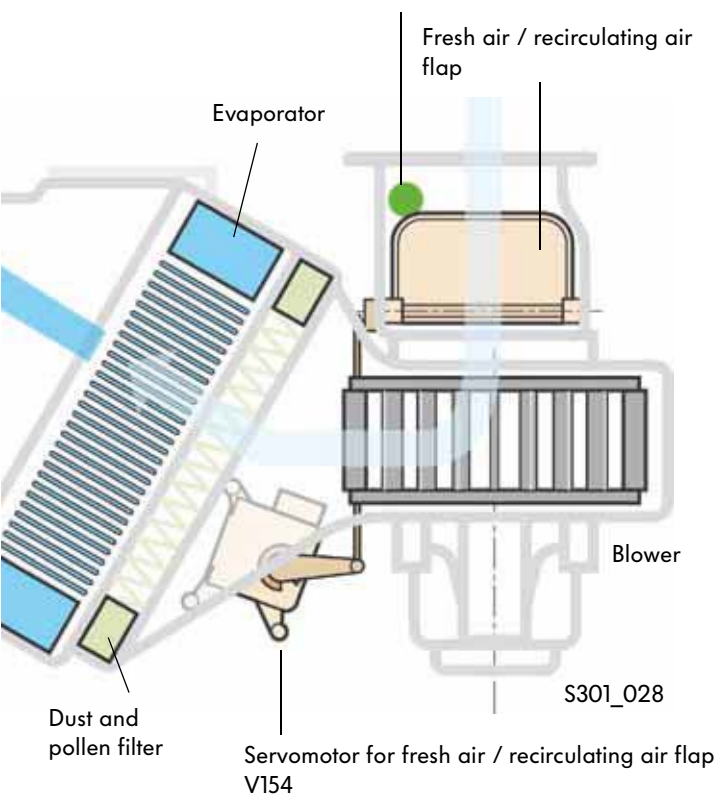
Air-conditioning unit, plan view



Side view, left



Temperature sensor – fresh air suction duct G89

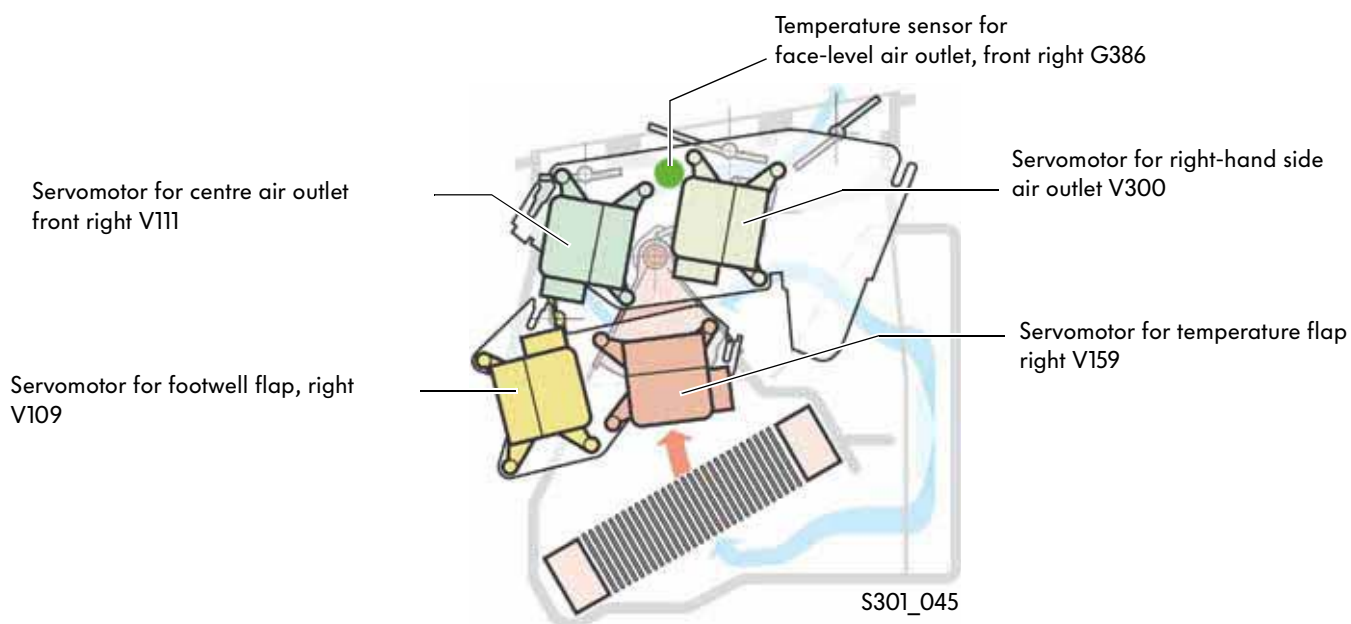


To permit temperature control, the 4C-Climatronic in this design has 6 temperature sensors:

- 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)



Side view, right

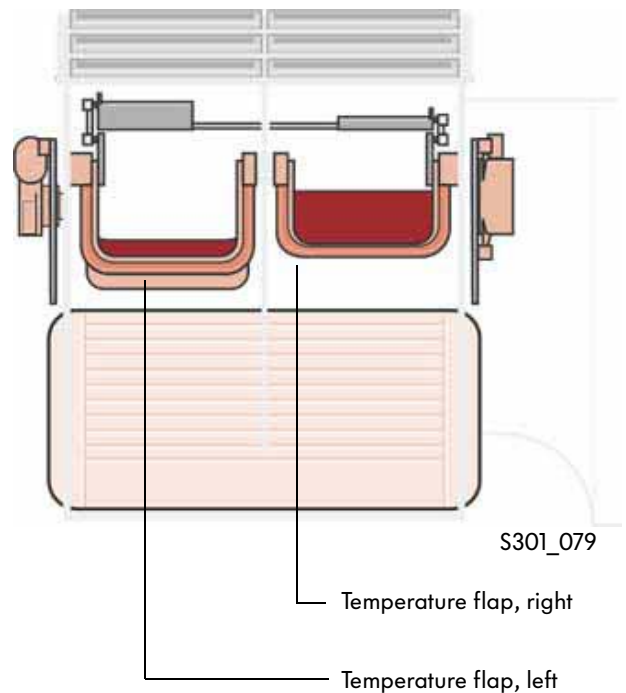


4C Climatronic

- Function of the temperature flaps

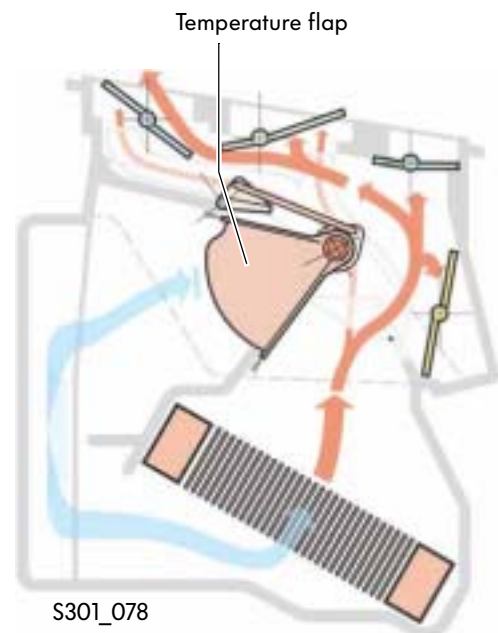
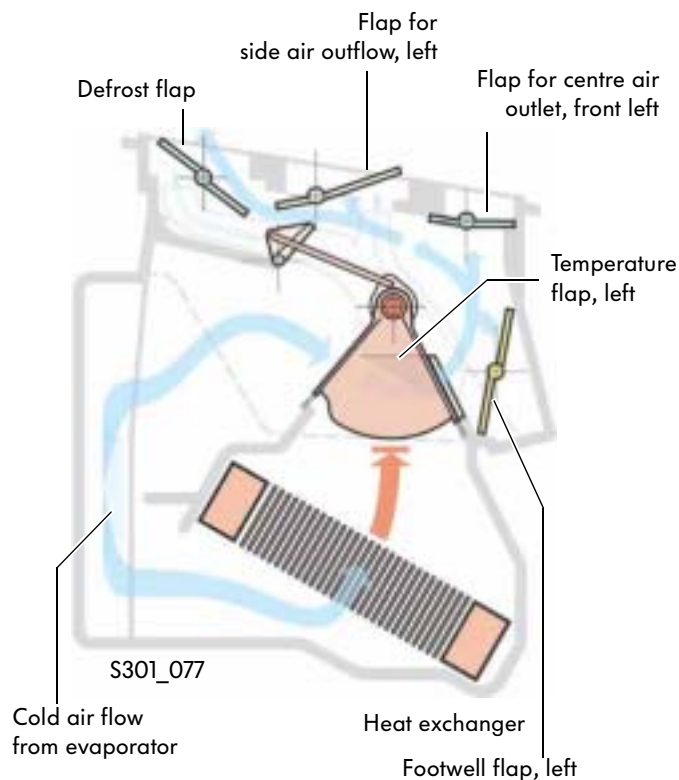
It is possible to maintain independent temperatures for the two front climate zones by using independent temperature flaps (left and right).

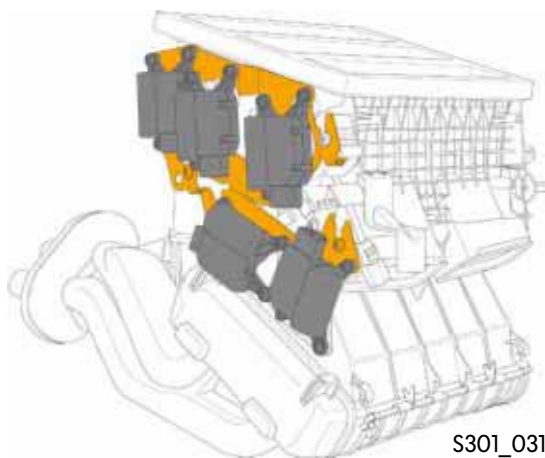
The position of each temperature flap determines in which quantitative proportion the cold air from the evaporator is to be mixed with the warm air from the heat exchanger for the climate zones in order to attain the desired air outflow temperature.



Temperature flap, right in "cold" position

Temperature flap, right in "warm" position





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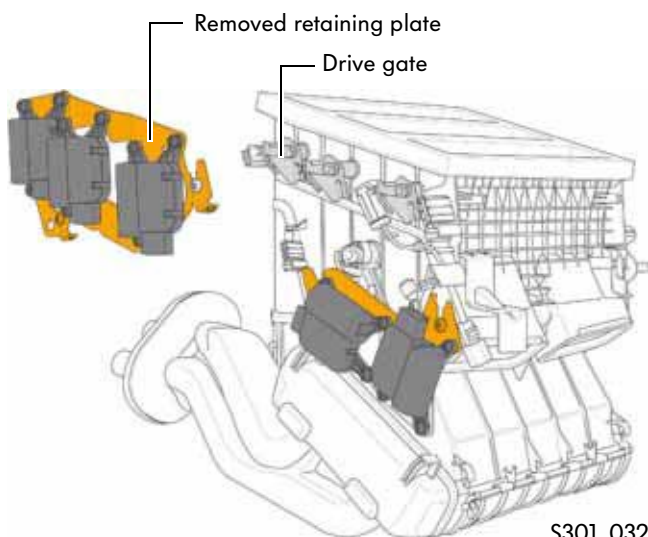
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● Servomotor retaining plates

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".



S301_032

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.



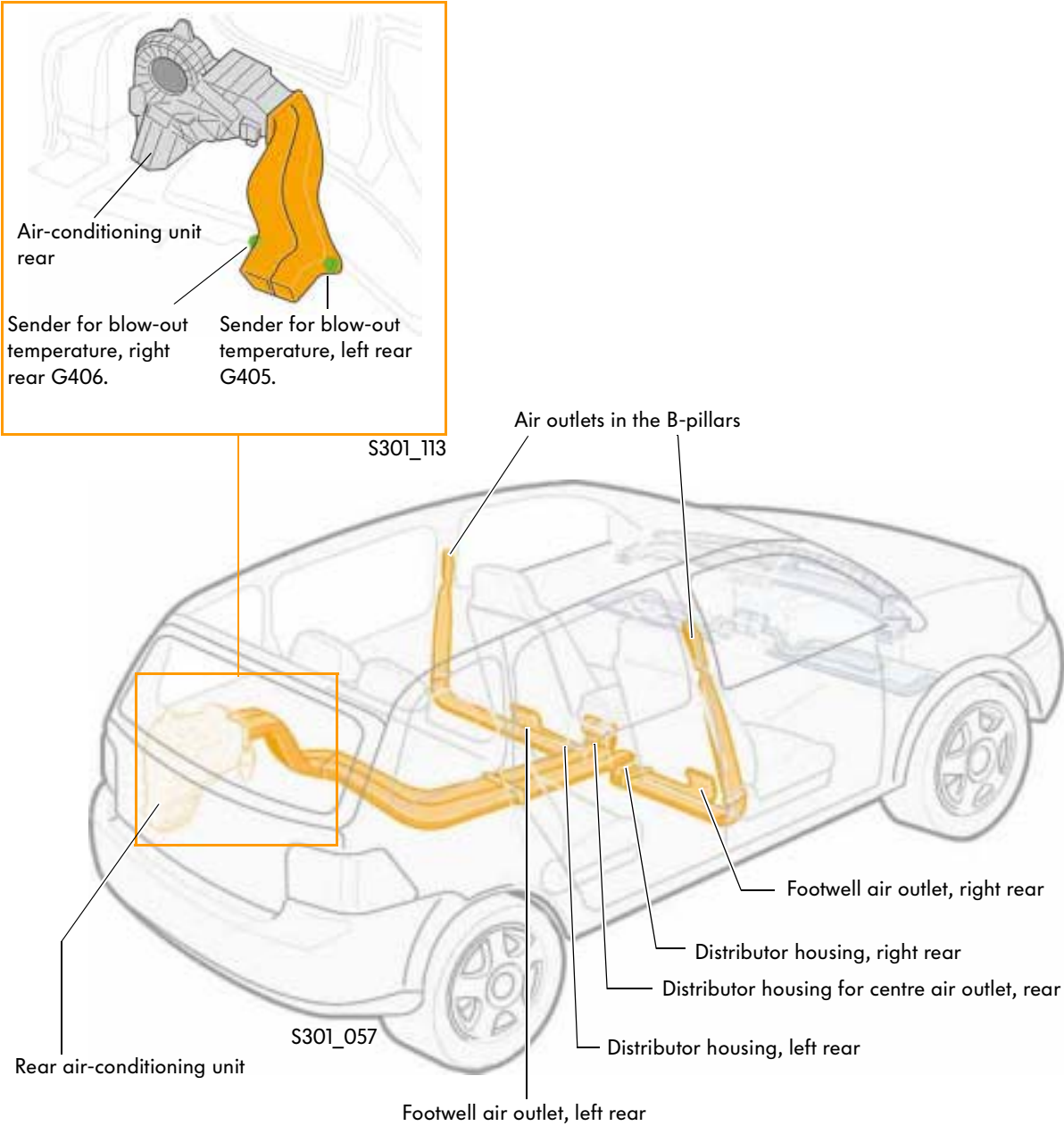
When working on the air-conditioning unit, pay attention to the working steps listed in the repair guidelines.

4C-Climatronic

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.



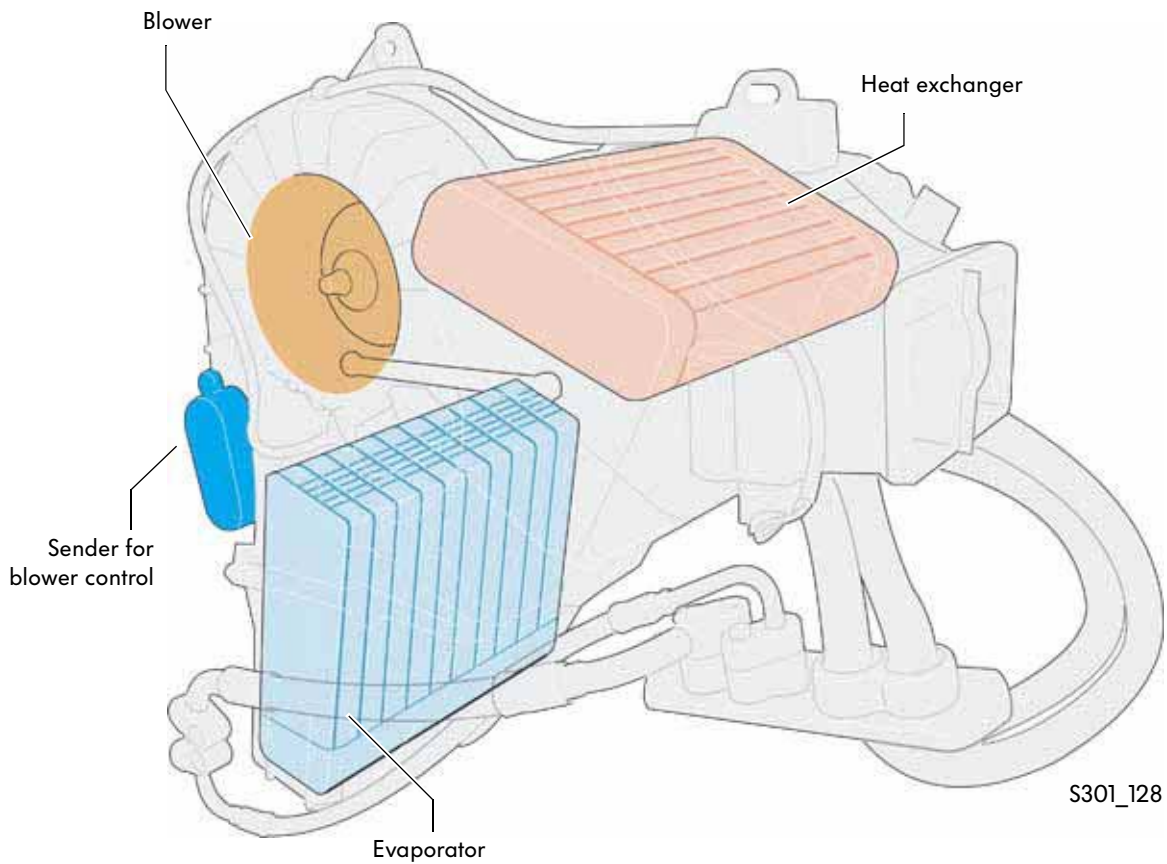
Rear air-conditioning unit

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

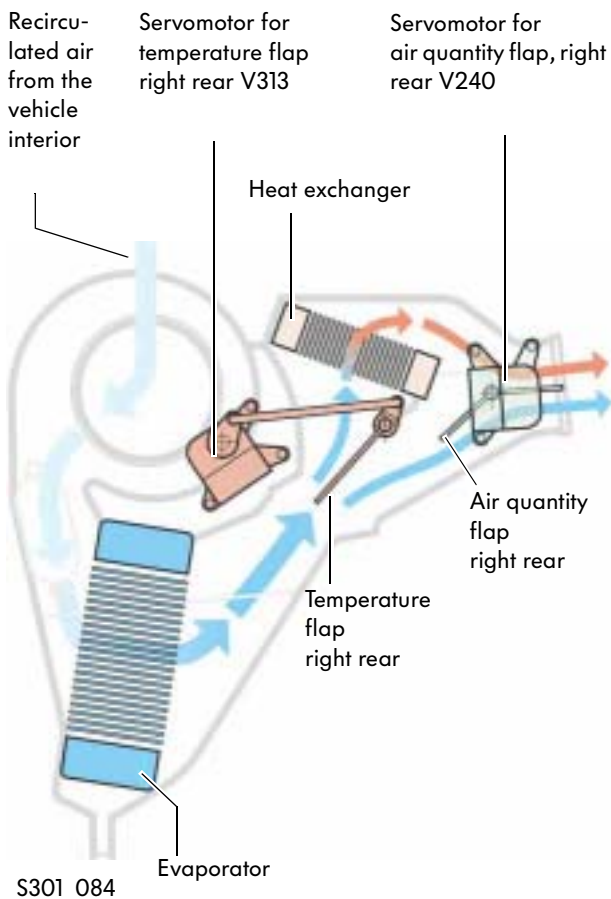
The rear air-conditioning unit has two temperature flaps and two air quantity flaps. One temperature and one air quantity flap each supply a rear climate zone with an air current that is limited by the air quantity flap. Additional air distribution flaps are located in the distributor housing for the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

● Servomotors

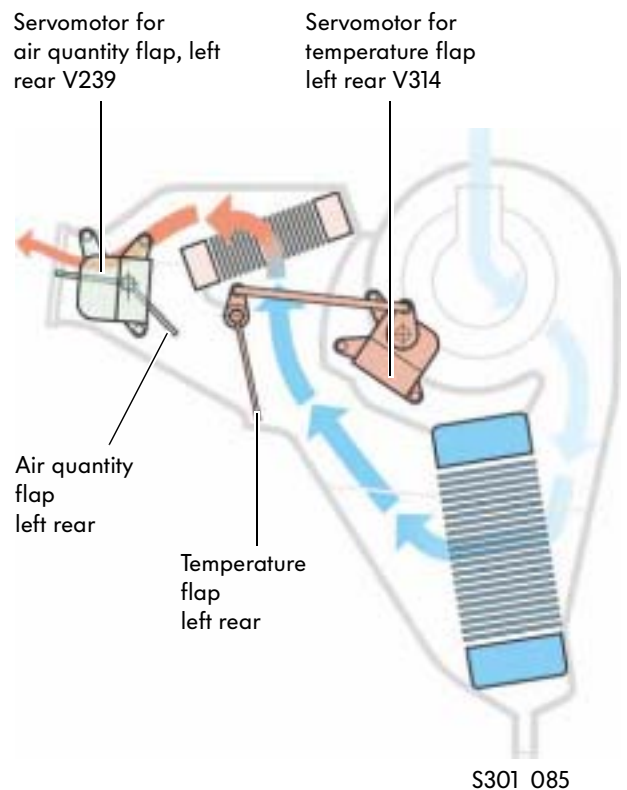
The rear air-conditioning unit has four servomotors, which, as is the case for two motors of the front air-conditioning unit, are equipped with internal potentiometers.

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.

Right side view, rear air-conditioning unit



Left side view, rear air-conditioning unit

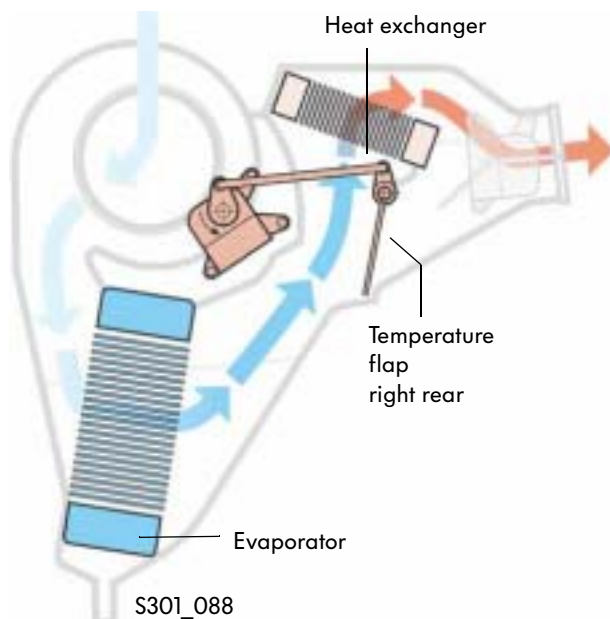


- Temperature flaps

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.

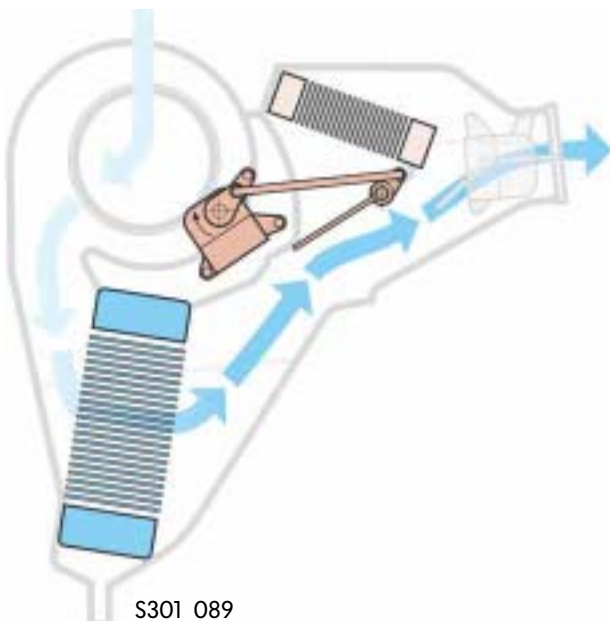


Temperature flap, right rear in "warm" position



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.

Temperature flap, right rear in "cold" position

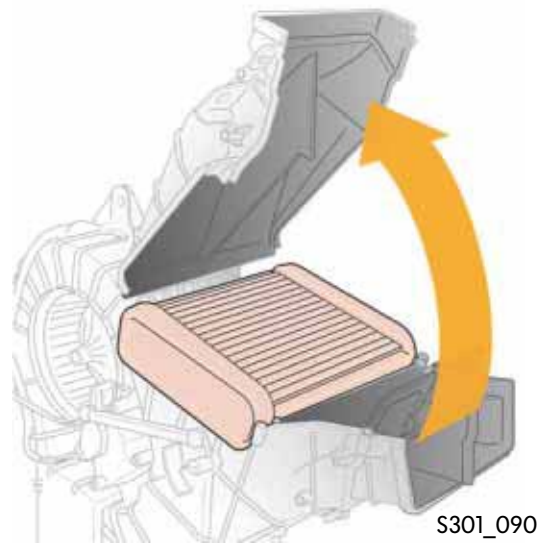


If cold air is desired at the air outlets, the temperature flap closes the access to the heat exchanger.

4C-Climatronic

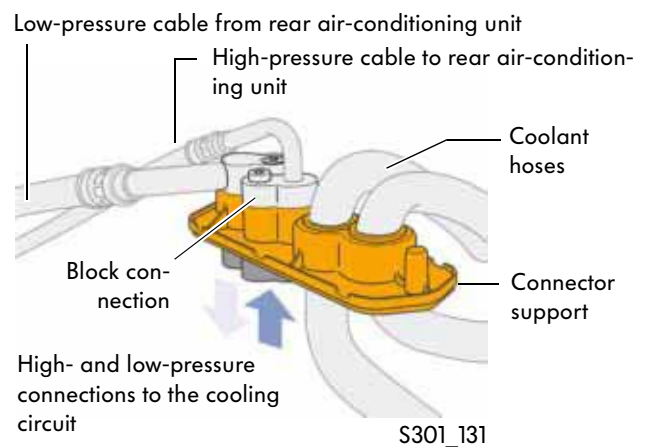
- Heat exchanger

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.



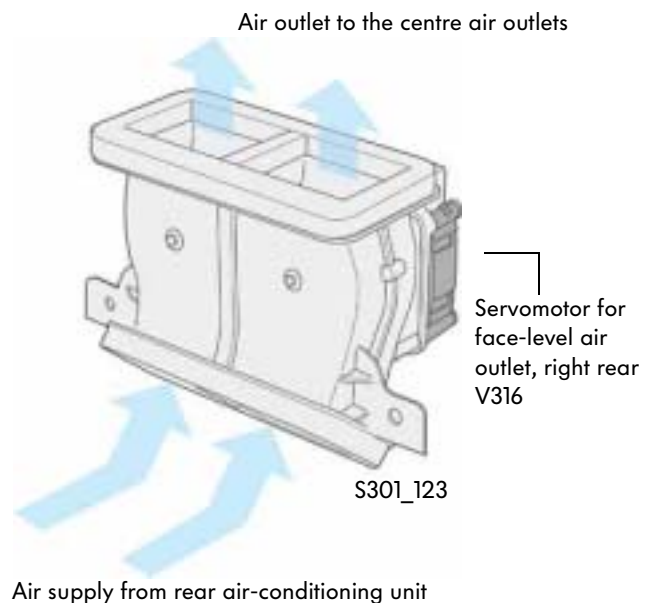
- Block connections for the rear air-conditioning unit

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.

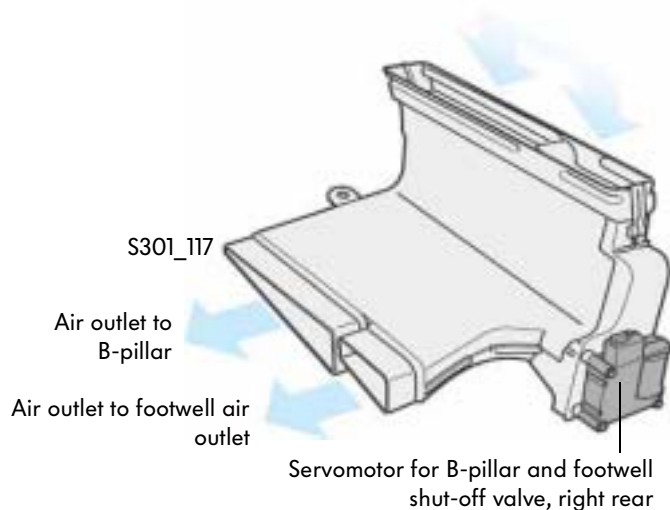


Distributor housing for the rear centre air outlet

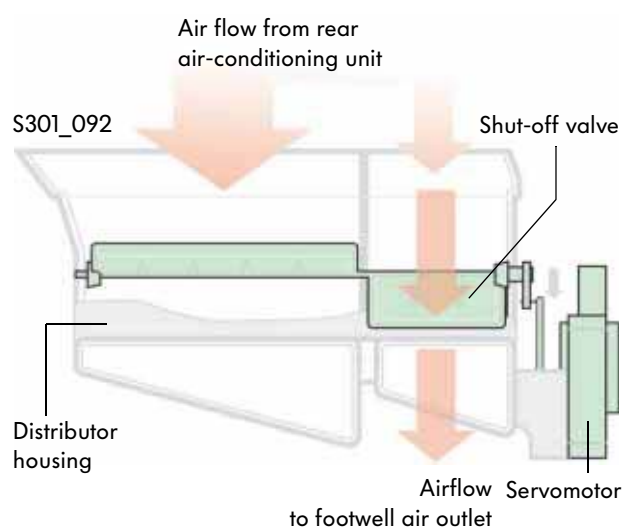
Each flap that transports/blocks the air flow to/from the rear centre air outlets in the centre console is driven by a servomotor. Both servomotors for the left and right rear face-level air outlets (V315 and V316) are located in a shared housing that is connected to the bottom of the centre air outlet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



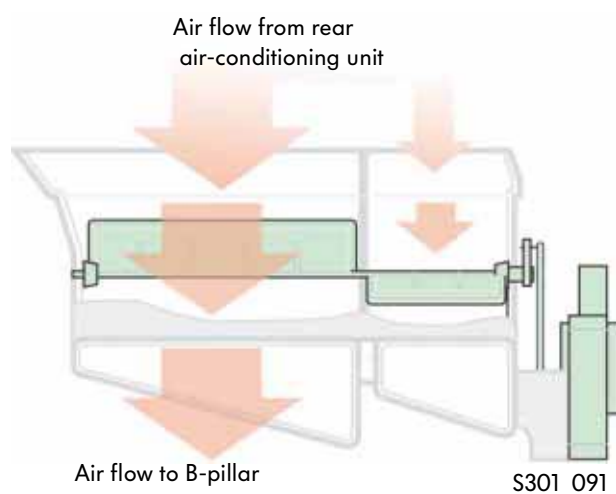
Air supply from rear air-conditioning unit



Shut-off valve in "footwell air outlet" position



Shut-off valve in "B-pillar" position



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.

4C-Climatronic

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**

Temperature controller, driver's side

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.

Temperature sensor, dash panel

Econ

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



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.

Defrost function

Rear window heater

Manual recirculating air function

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



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.

Residual

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.

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.



S301_142

Manual and automatic recirculating air function

Electric windscreen heater

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.



4C Climatronic

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.



The left rear display

shows the temperature and blower strength

Auto button

Automatic climate regulation left rear

Temperature controller, left rear

Setting the blower strength for the left rear passenger compartment

Buttons for air distribution upwards, to the side windows and the centre or downwards



S301_055

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"

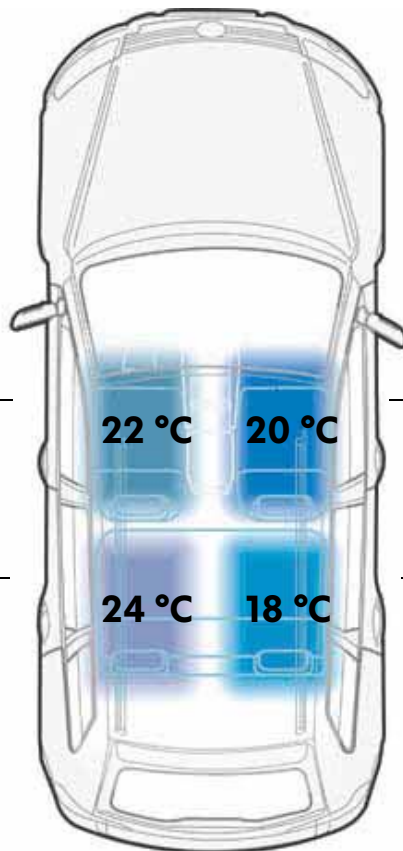
He selects a temperature of 20 °C and prefers that the air flows directly out of the central air outlets and the right front face-level air outlets.

Climate zone "left rear passenger"

This person set 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.



S301_129

4C-Climatronic

Climate zone "driver"



S301_103

● 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.

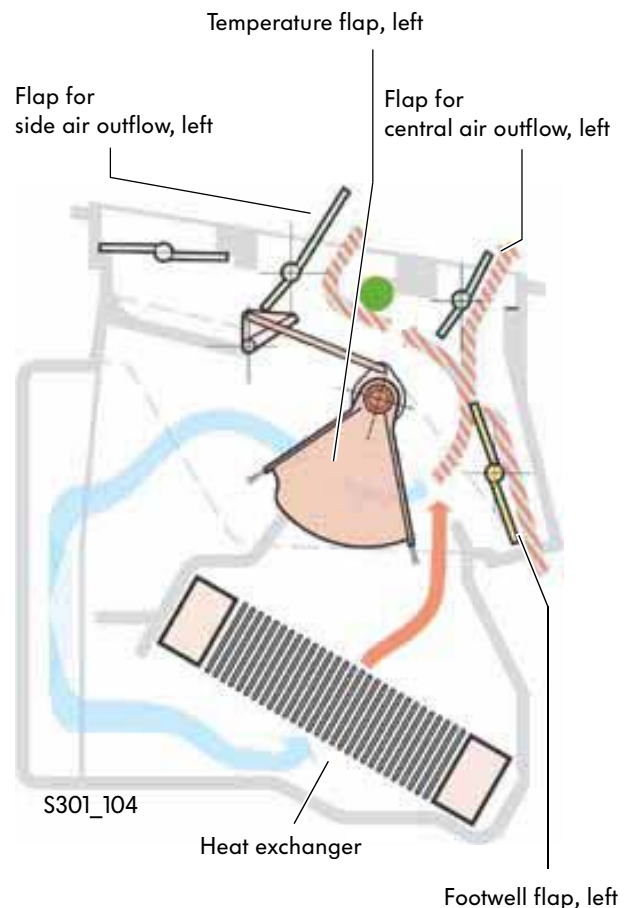


S301_040

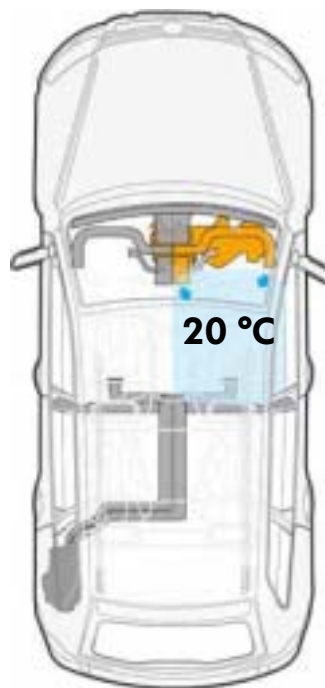
● Function

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.



S301_104



S301_041

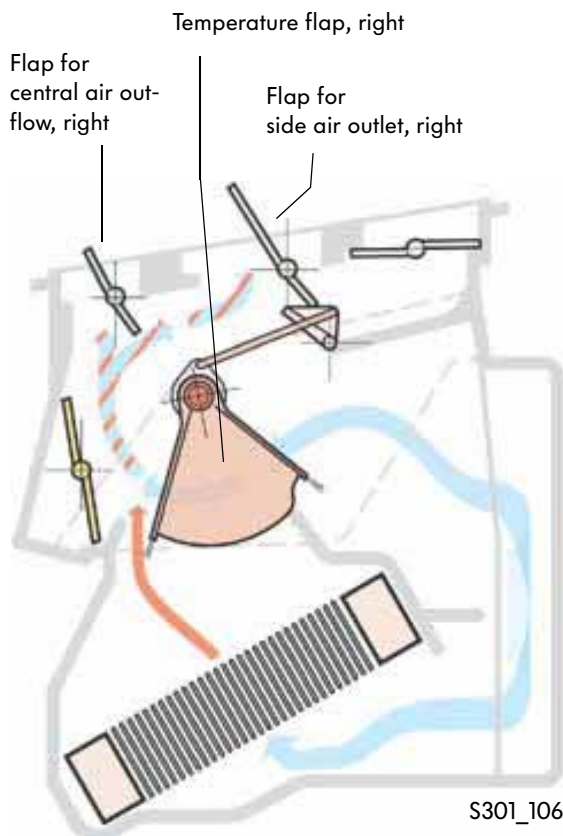
Climate zone "right front passenger"



S301_105

● 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.



S301_106

● 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

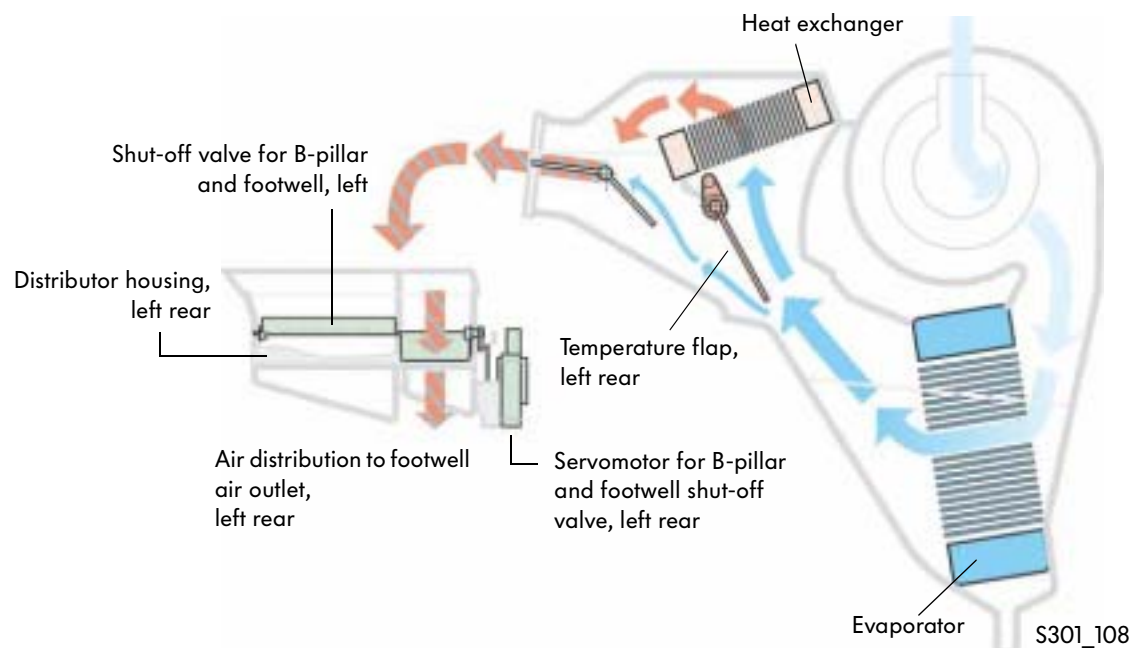
The passenger behind the driver presses the button for air distribution in the footwell and sets the desired temperature using the rotary knob of the rear operating and display unit of the 4C air-conditioning system.



● 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.





S301_043

● Function

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.

Climate zone "right rear passenger"

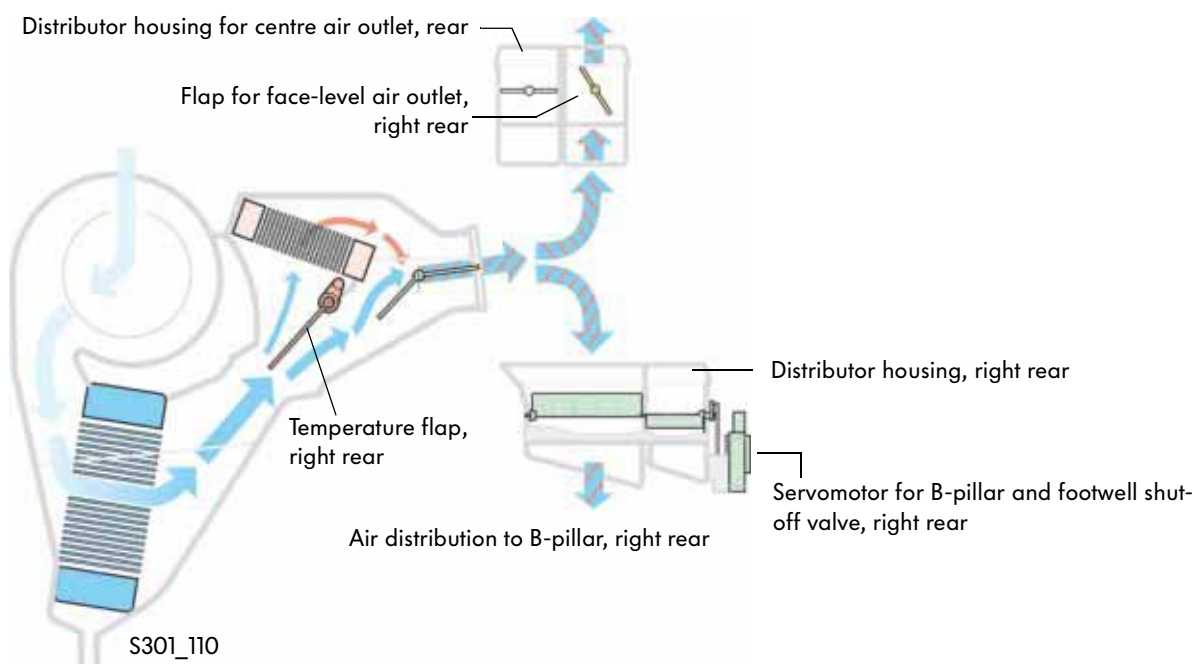


S301_109

● Operation

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.

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.



S301_110

4C-Climatronic

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)

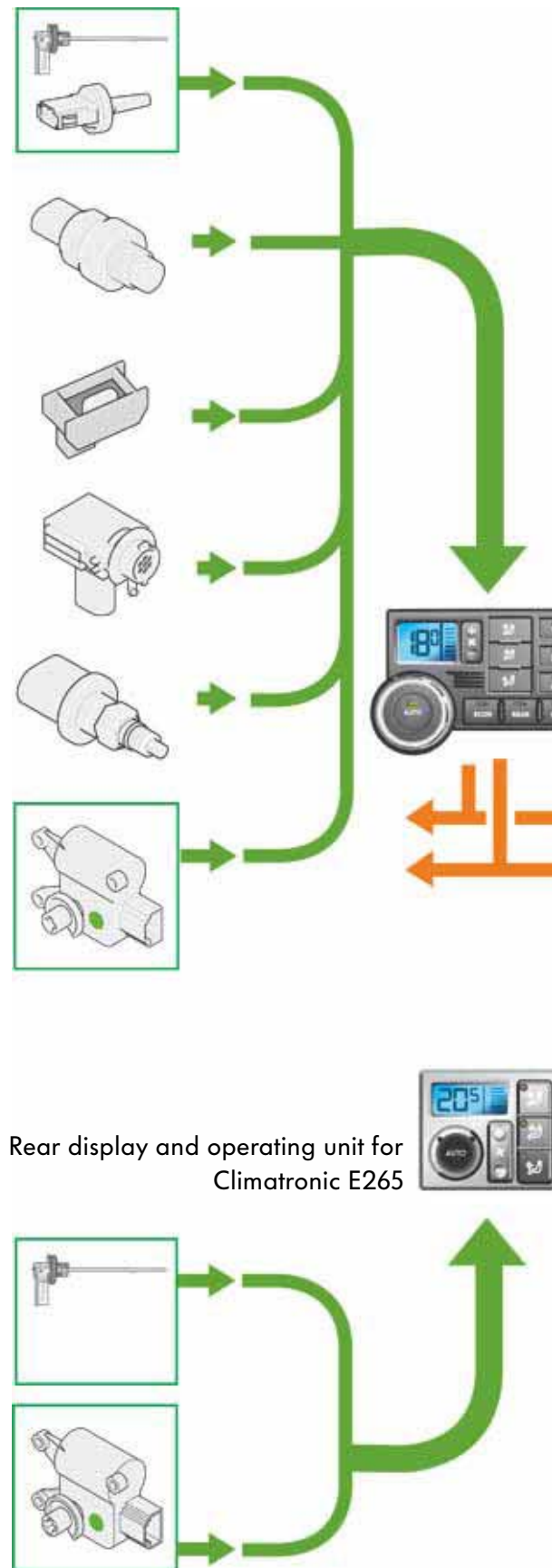
Potentiometer in servomotors of air distribution, front
(For list, see page 44)

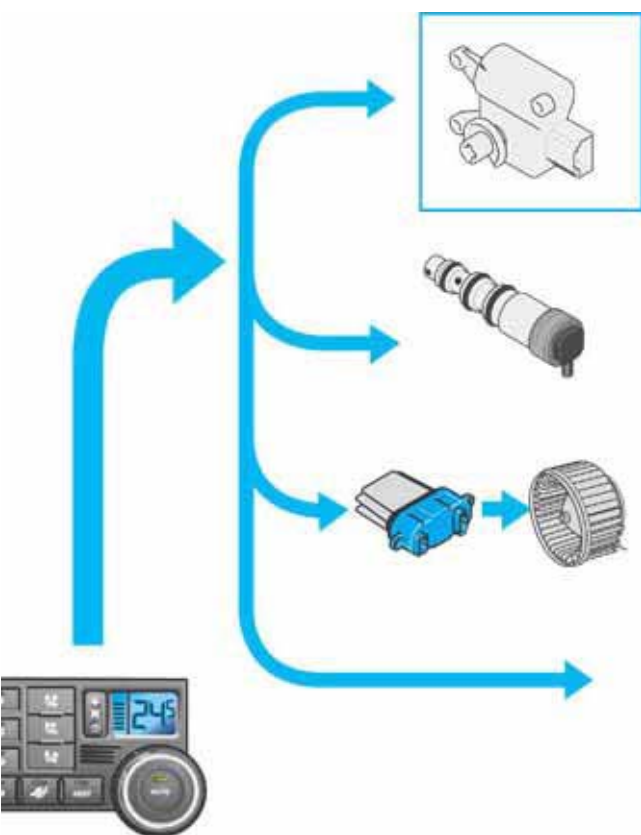


A defective potentiometer is not separately recorded by the diagnostics; instead it is displayed as a faulty servomotor.

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

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



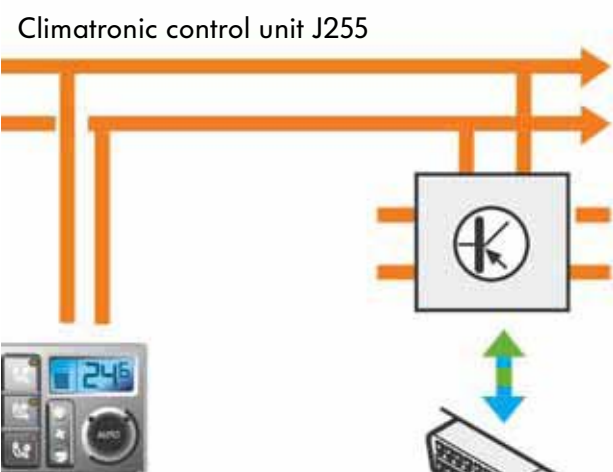


Servomotors for air distribution, front
(For list, see page 45)

Control valve for compressor, air-conditioning system
N280

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

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)

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

S301_076



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

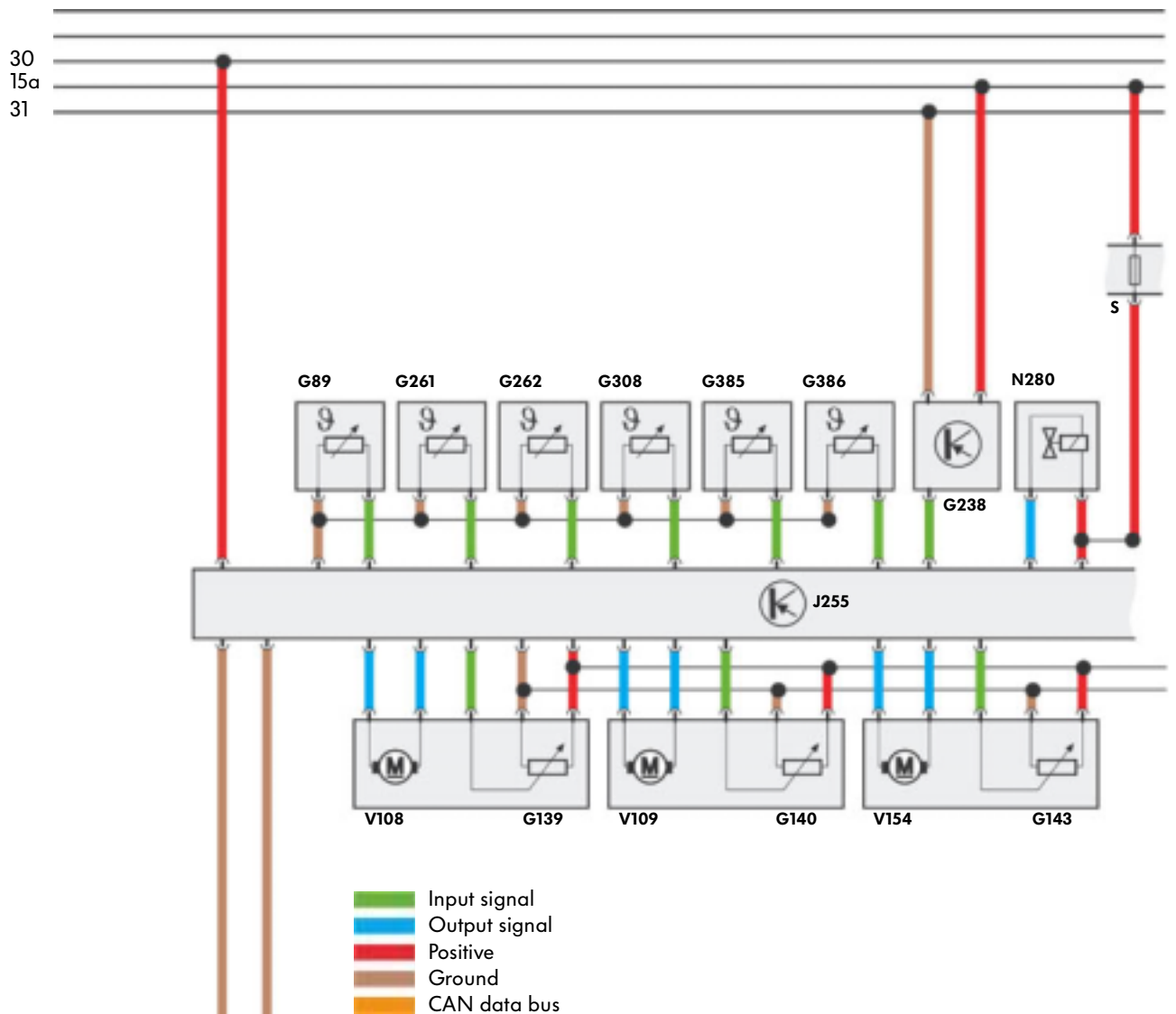
Servomotor for defrost flap V107
Servomotor for footwell flap, left V108
Servomotor for footwell flap, right V109
Servomotor for centre air outlet, left V110
Servomotor for centre air outlet, right V111
Servomotor for fresh air / recirculating air flap V154
Servomotor for temperature flap, left V158
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



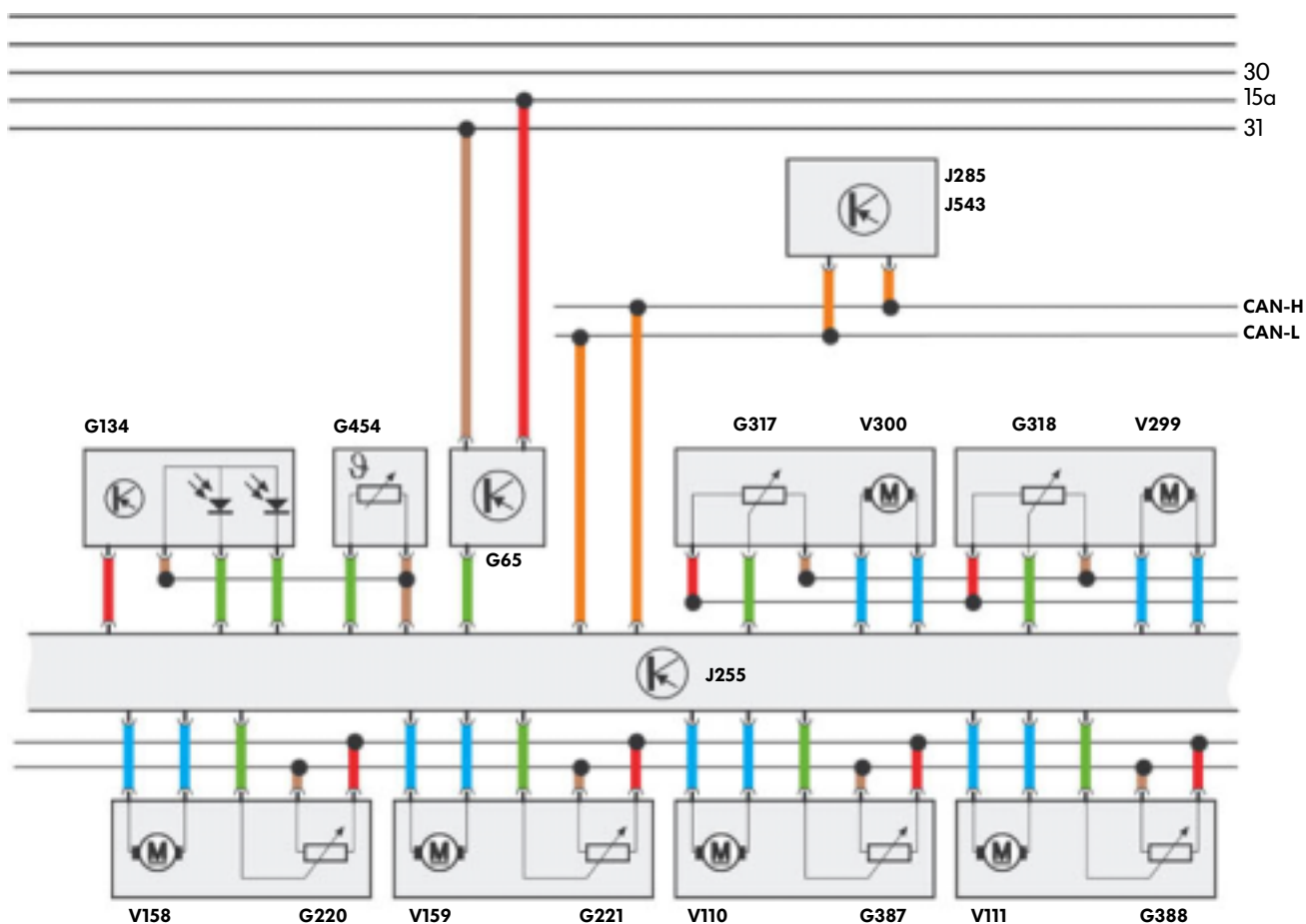
Operational diagram



S301_063

- 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

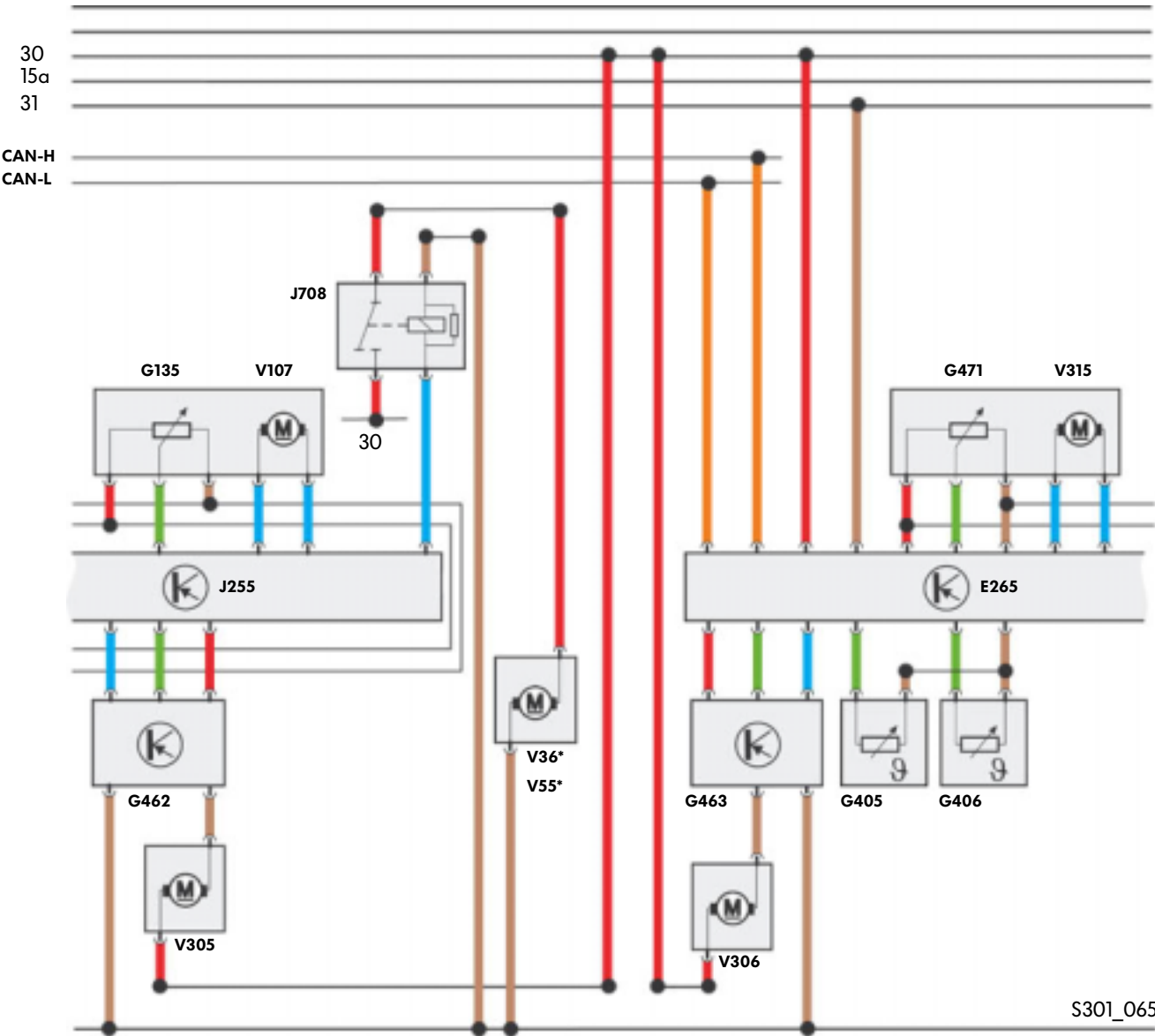


S301_064

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

4C-Climatronic

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
- 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

- J255

Climatronic control unit
- J708

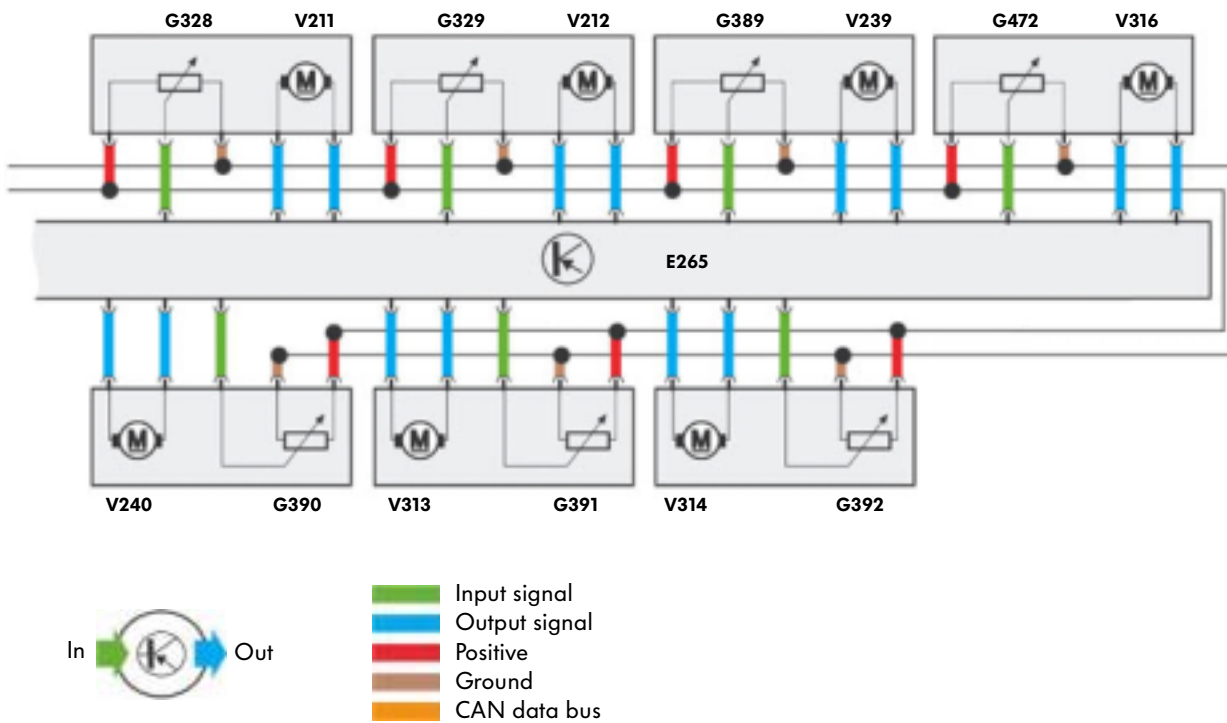
relay for residual heat



Also see the table on page 10



30
15a
31



S301_066

- E265** 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

2C-Climatronic

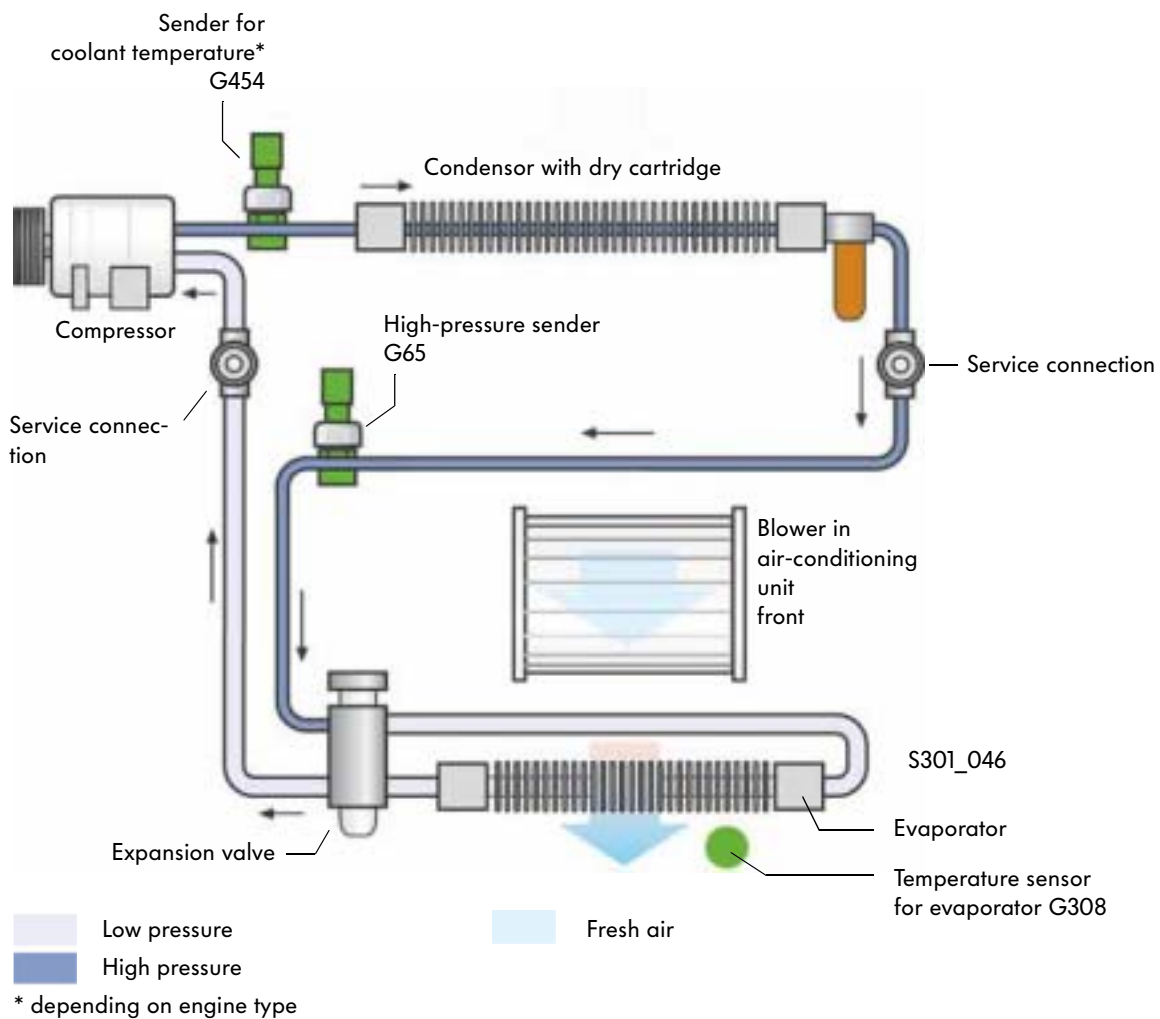
Structural features

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.

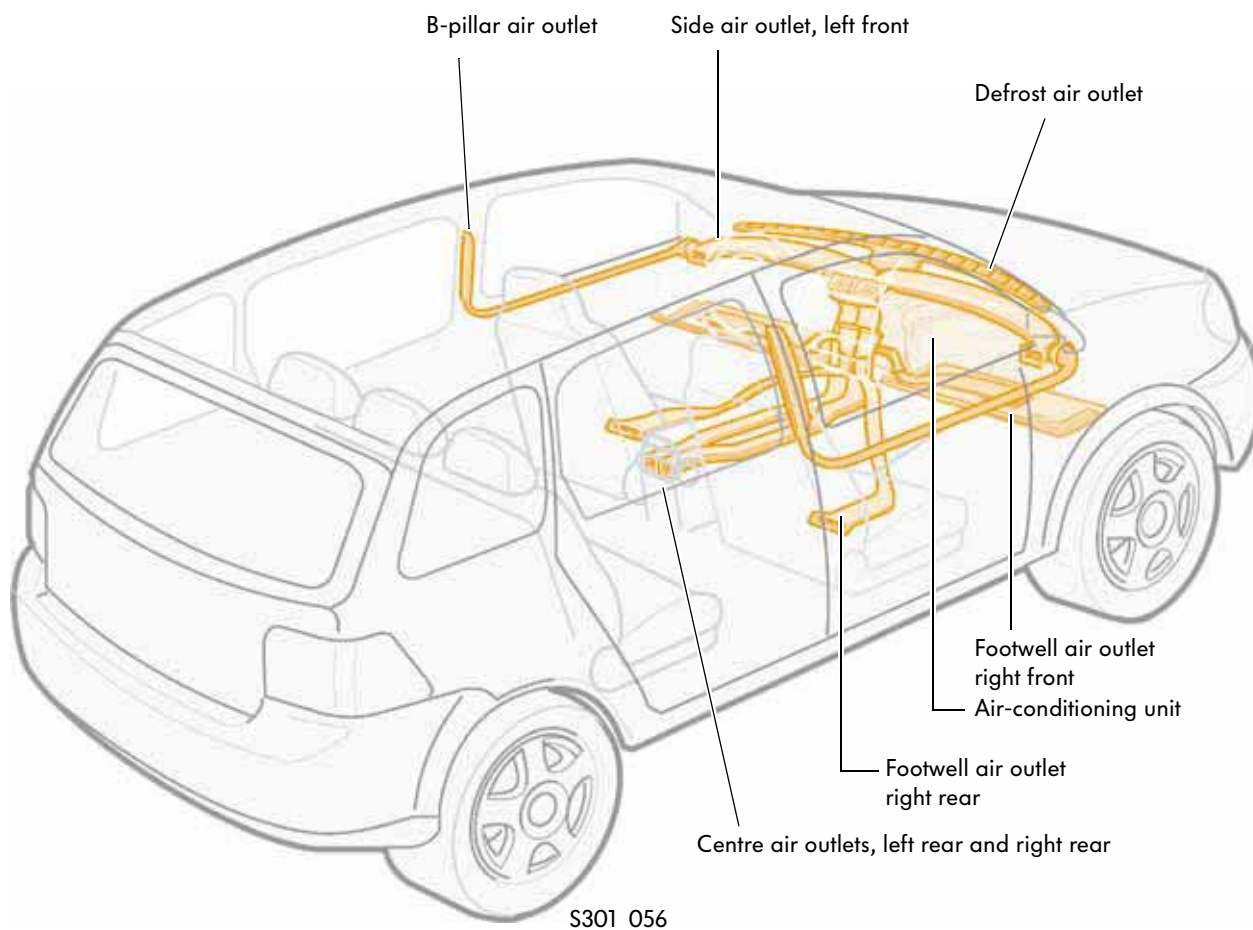


Air distribution in the passenger compartment

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

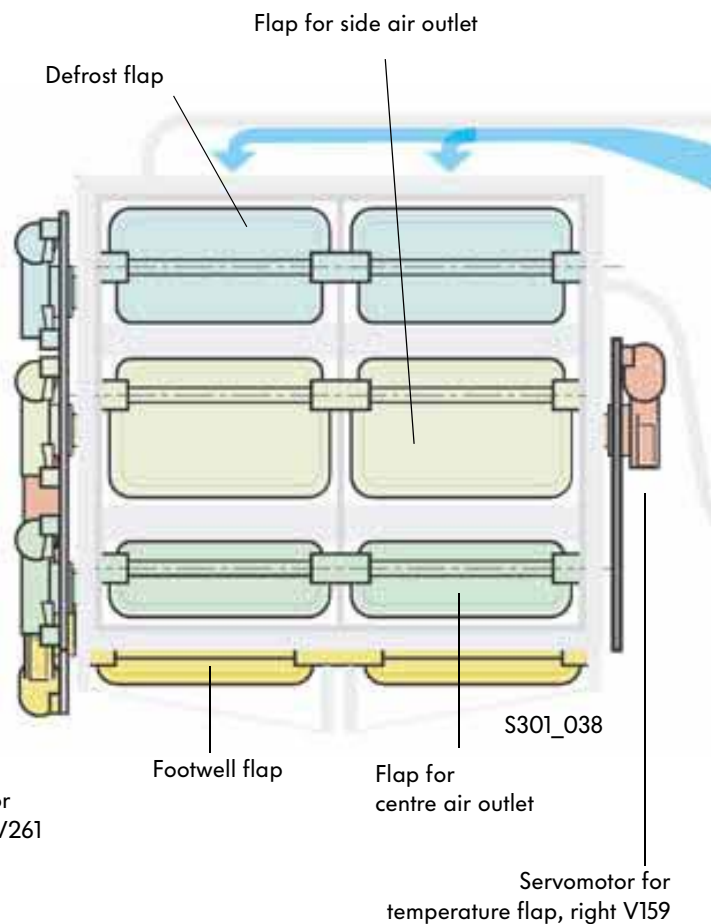
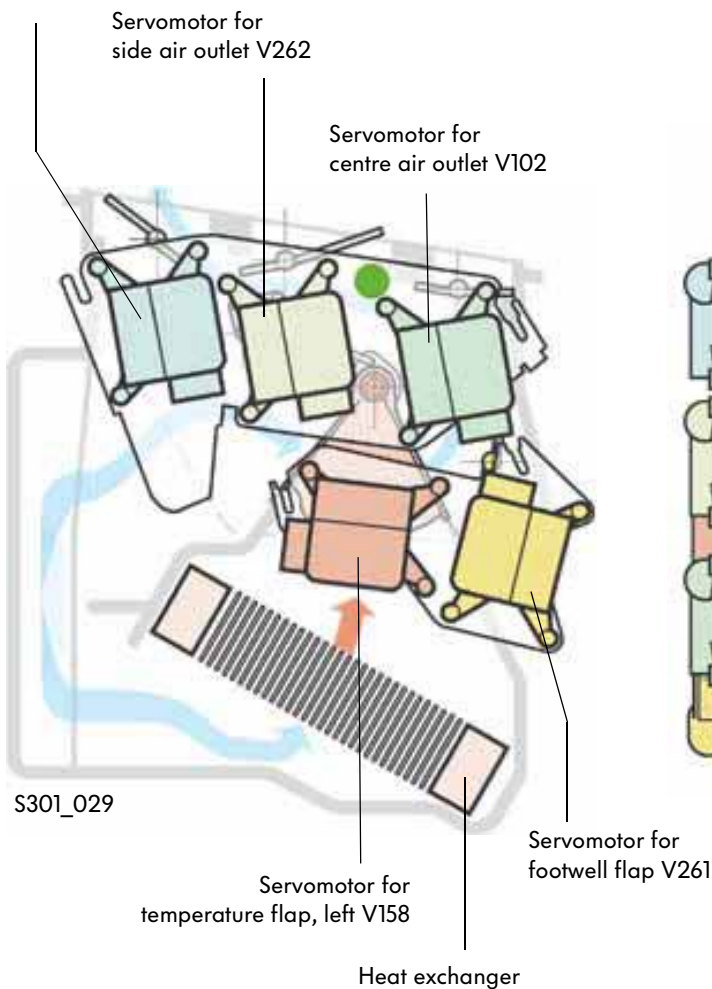
Air-conditioning unit

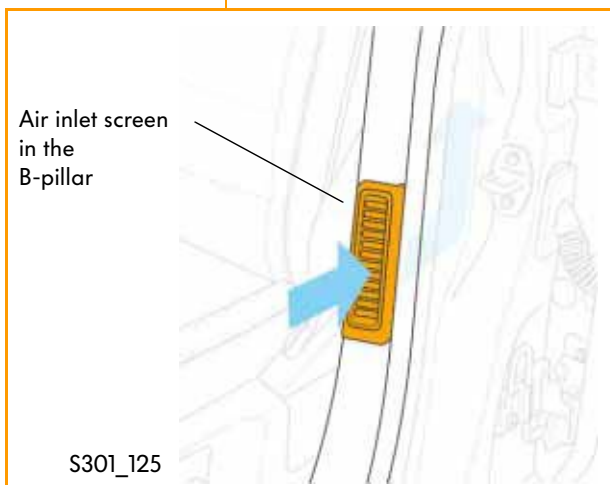
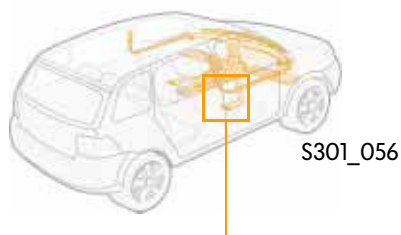
As the flaps for the side, centre and footwell air outlets for the left-hand and right-hand sides are mechanically connected in the 2C-Climatronic air-conditioning unit, the air-conditioning unit has a total of 7 servomotors.

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

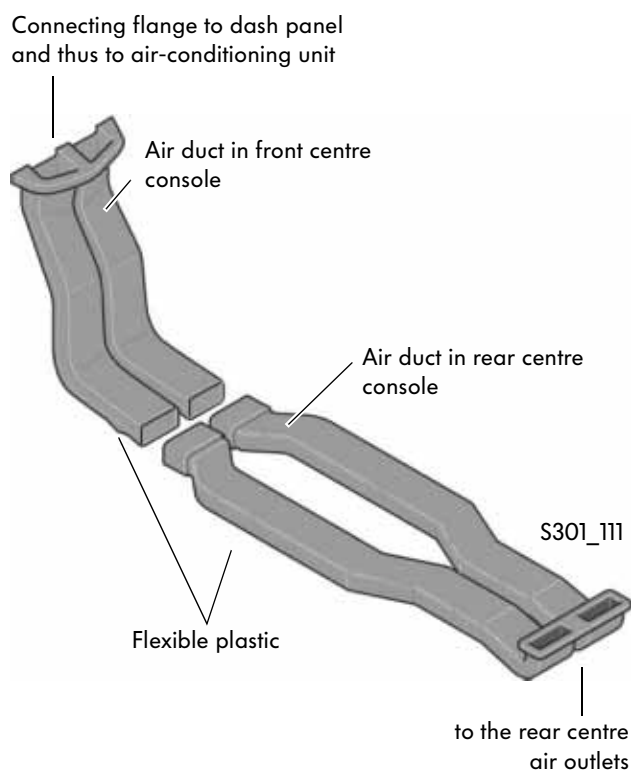




Air ducts of the front air distribution system

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.



Electric windscreen heater Manual and automatic recirculating air function

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.

Operating and display unit



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.

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

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

— Distributes the air flow to the **footwell air outlets**



Econ

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



Residual

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

2C-Climatronic

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

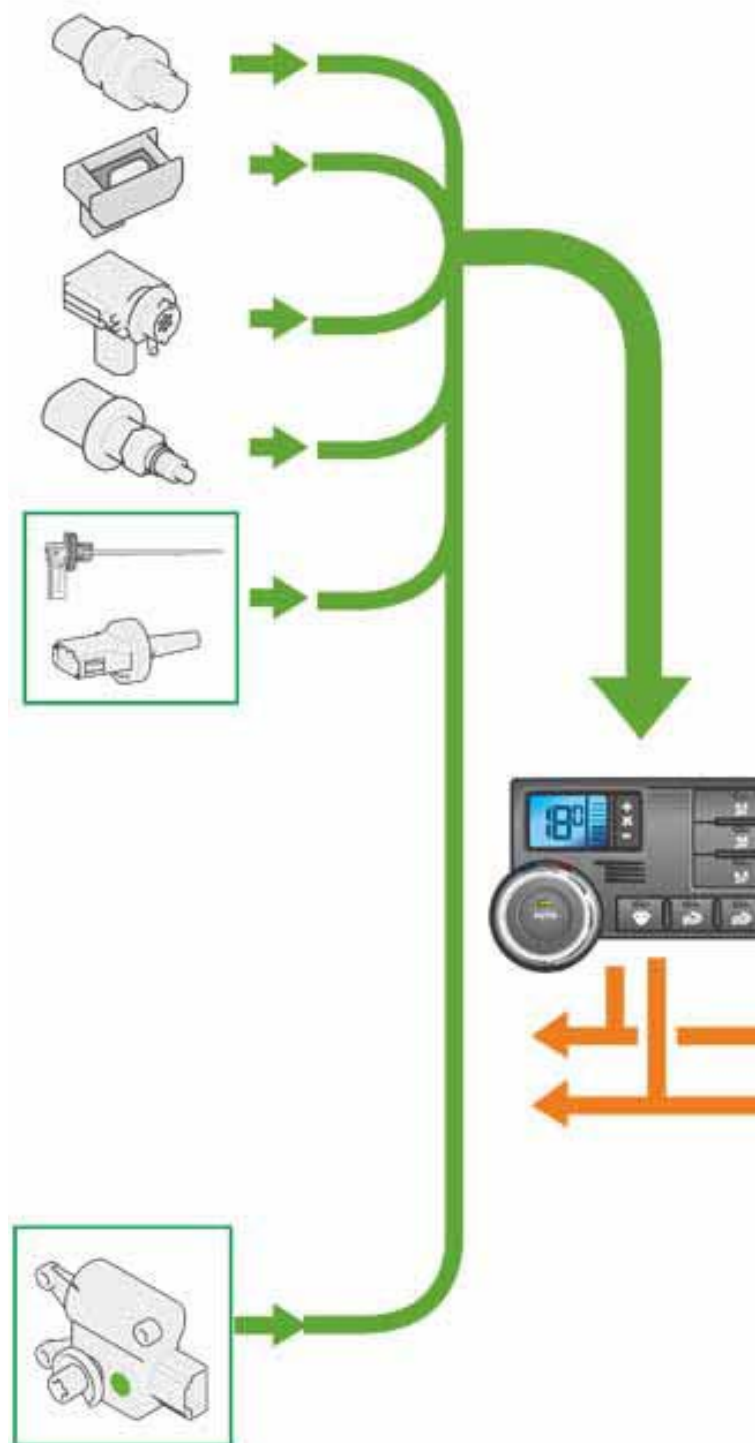
Potentiometer - servomotor for temperature flap,
left G220

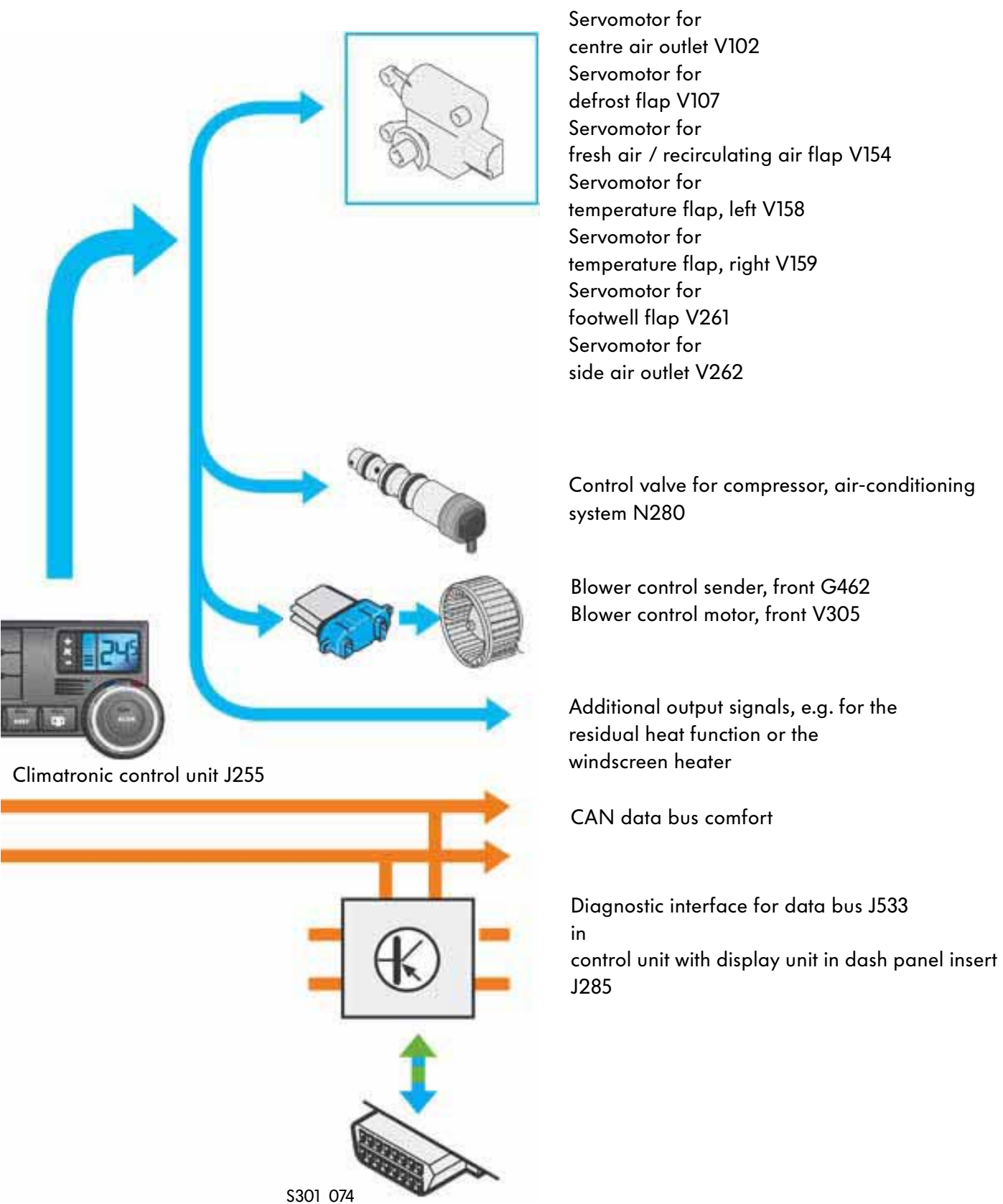
Potentiometer - servomotor for temperature flap,
right G221

Potentiometer - servomotor for centre
air outlet G467

Potentiometer - servomotor for side
air outlet G469

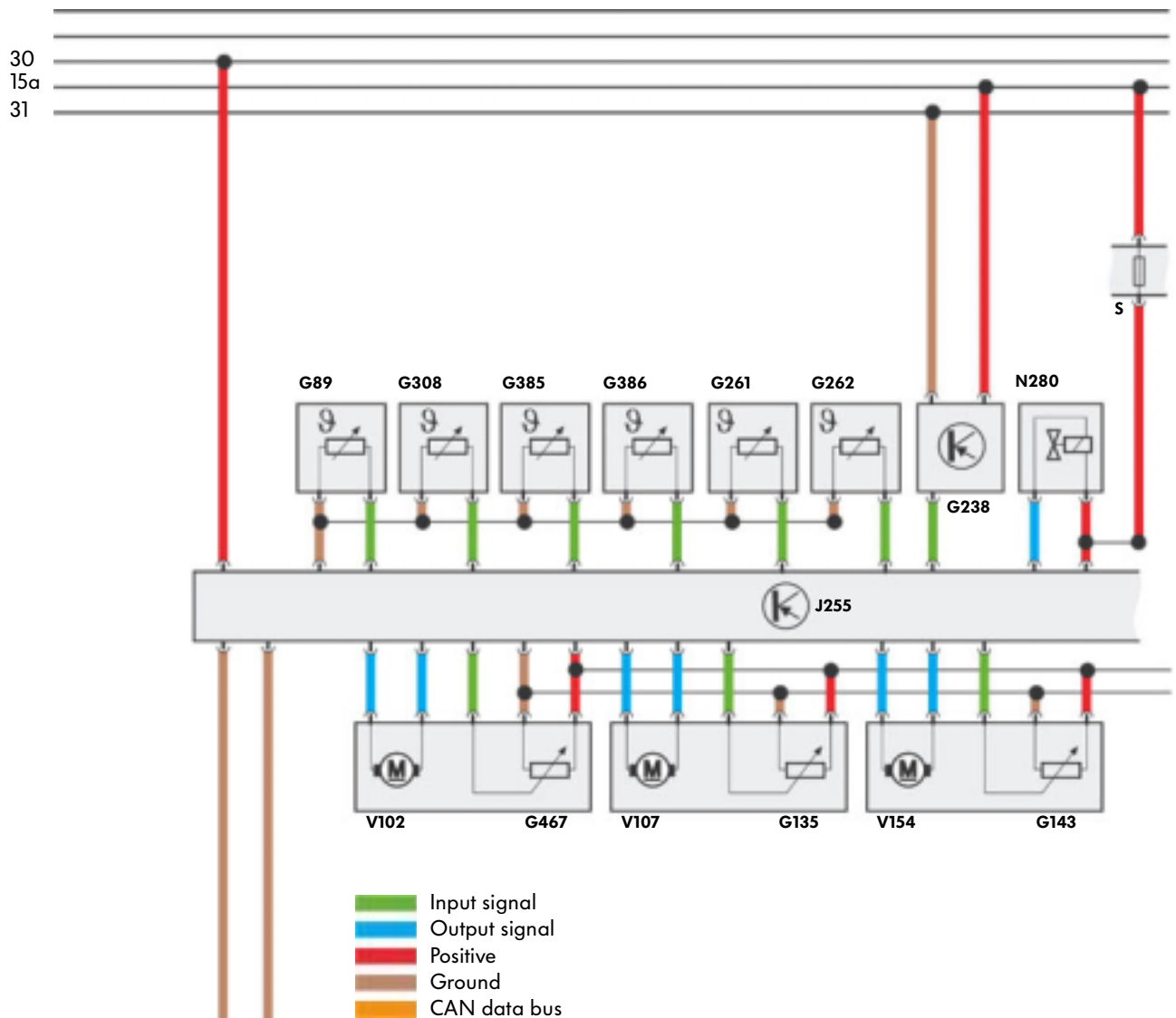
Potentiometer - servomotor for footwell
flap G468





S301_074

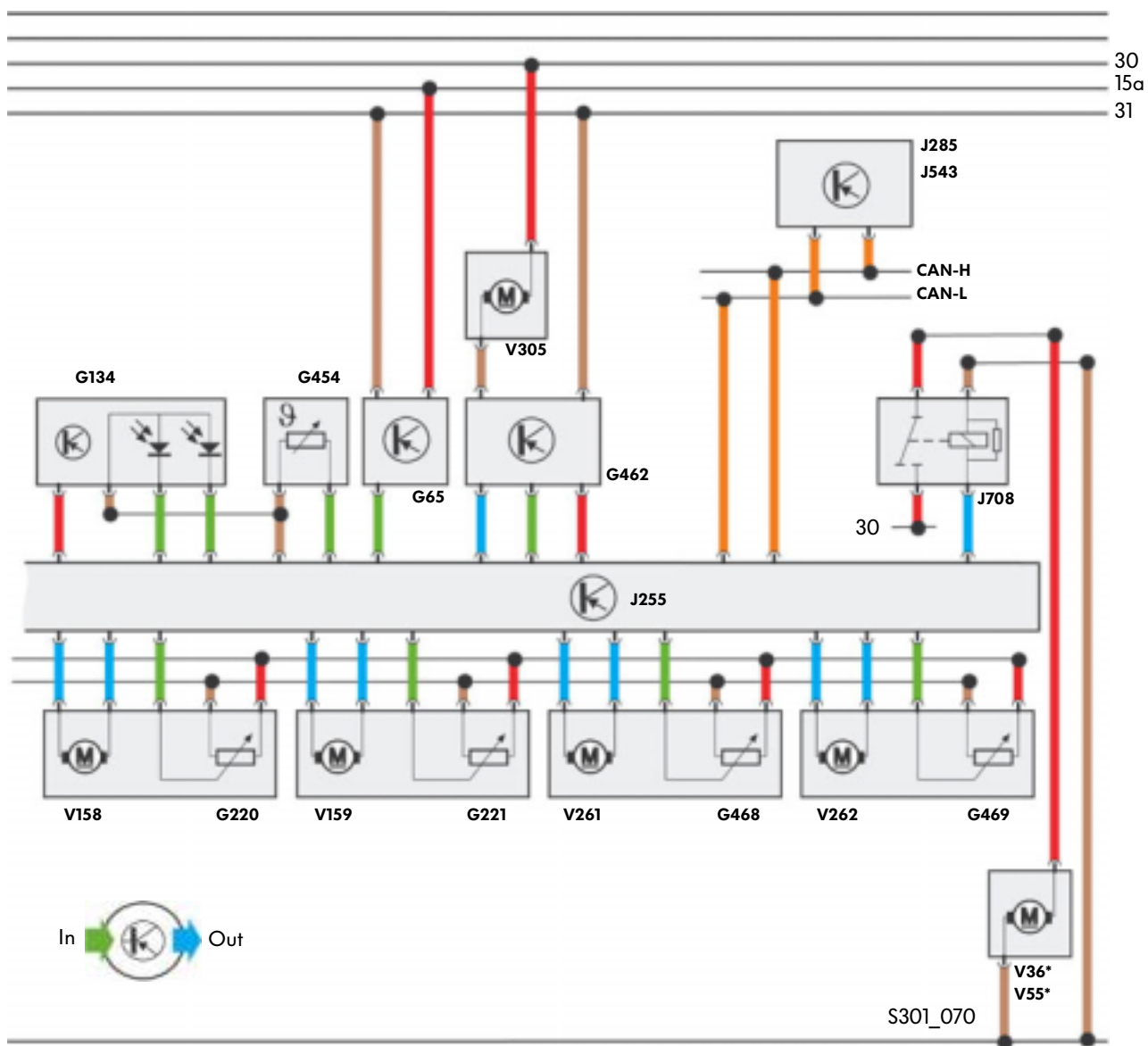
Operational diagram



S301_069

- 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,
G468 potentiometer for 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



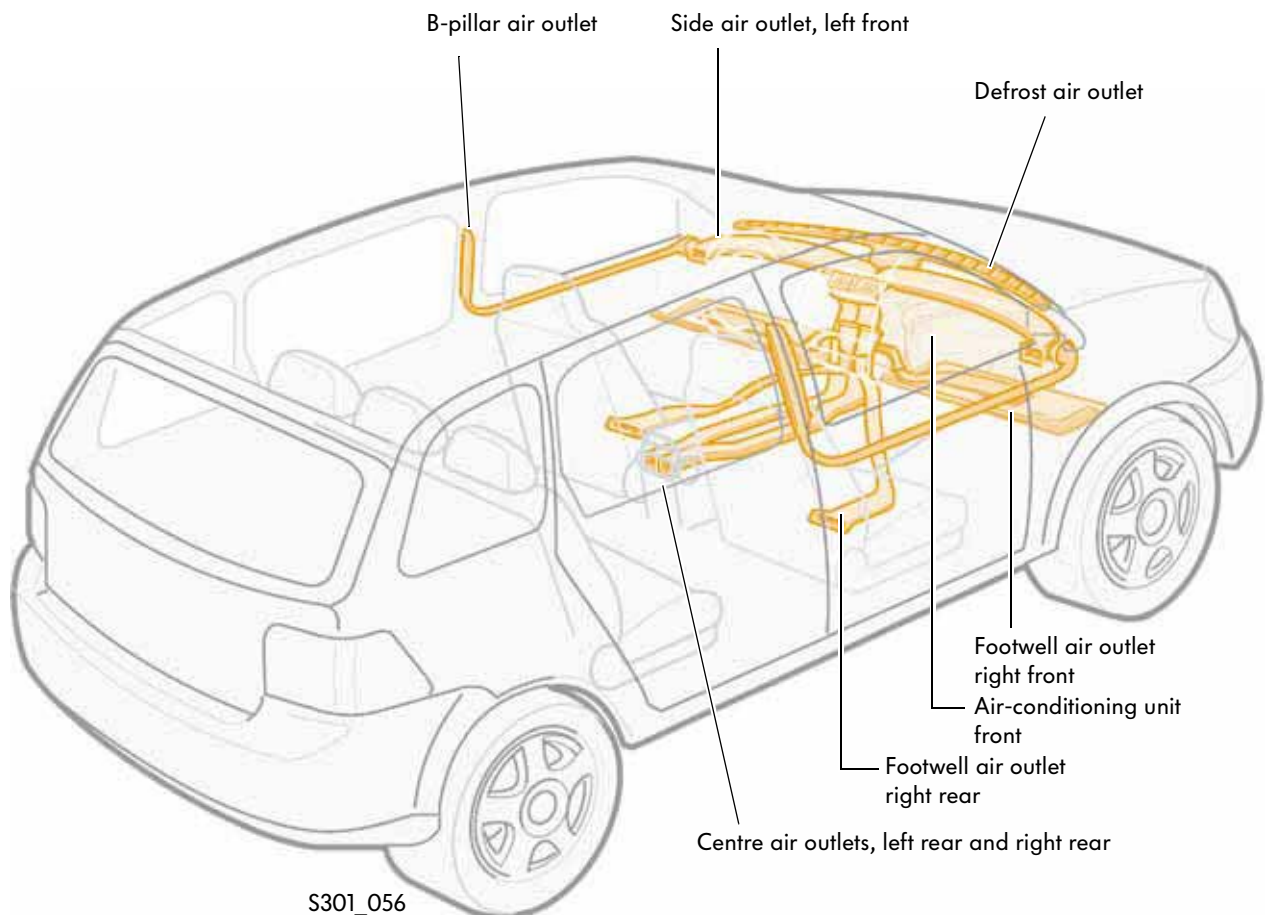
Manual air-conditioning system

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.



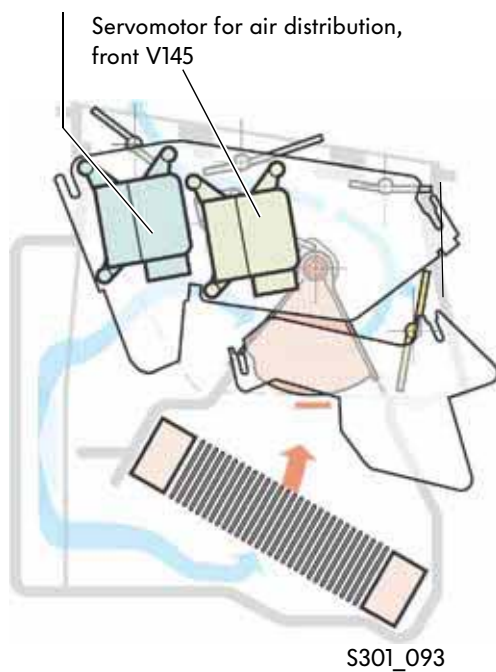
Air-conditioning unit

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

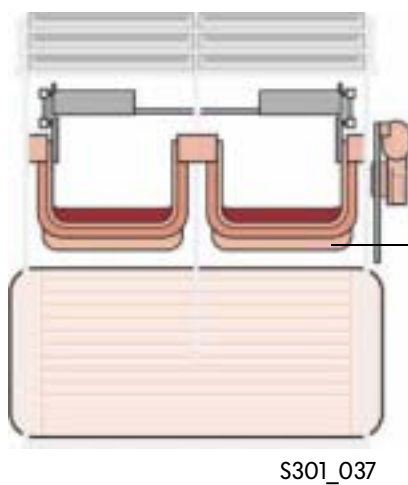
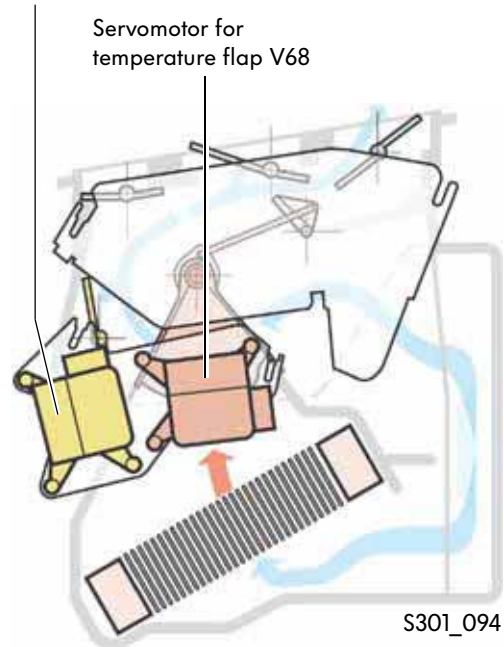
- The flap for the centre air outlets is driven together with the flap for side air outlets by the servomotor for front air distribution V145.
- The two temperature flaps are permanently connected to one another and are operated by a motor via a shared axis.

● Flaps and servomotors on the air-conditioning unit

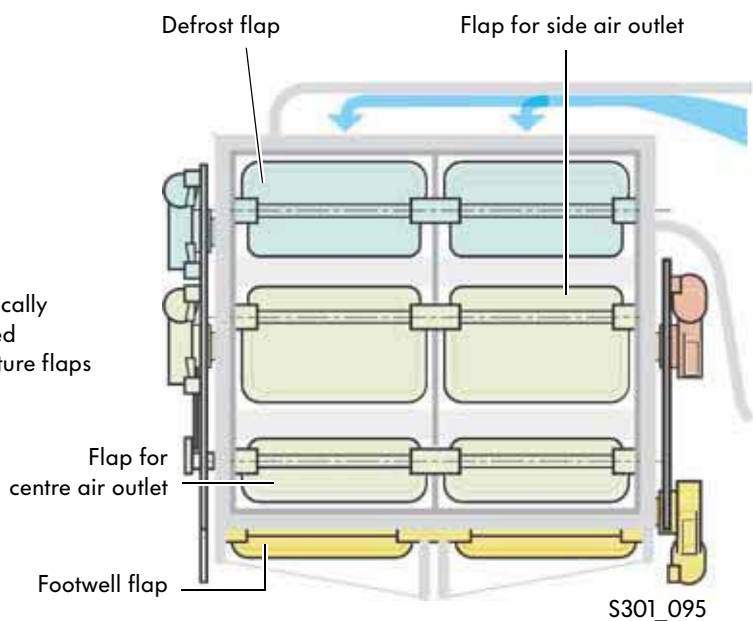
Servomotor for defrost flap V107



Servomotor for footwell flap V261



Mechanically connected temperature flaps



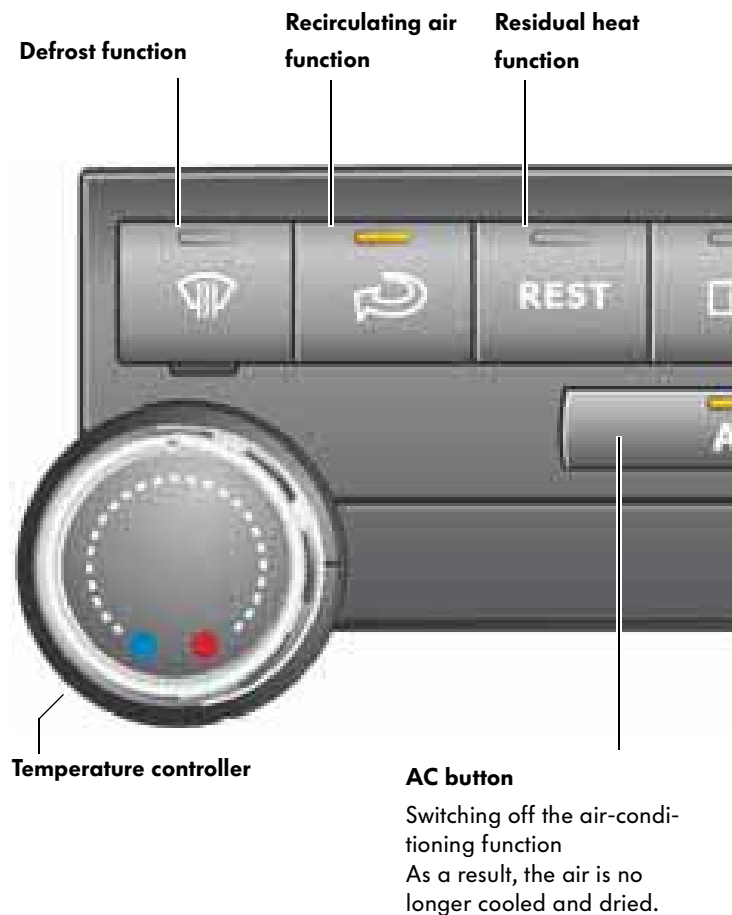
Manual air-conditioning system

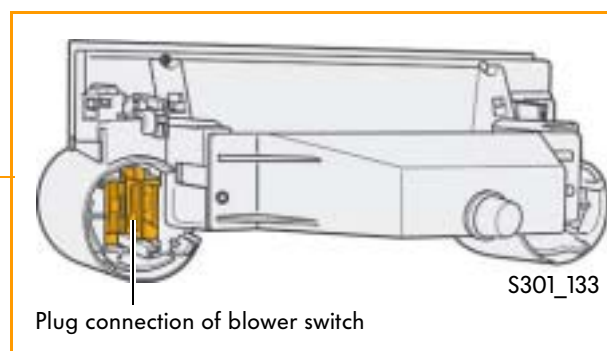
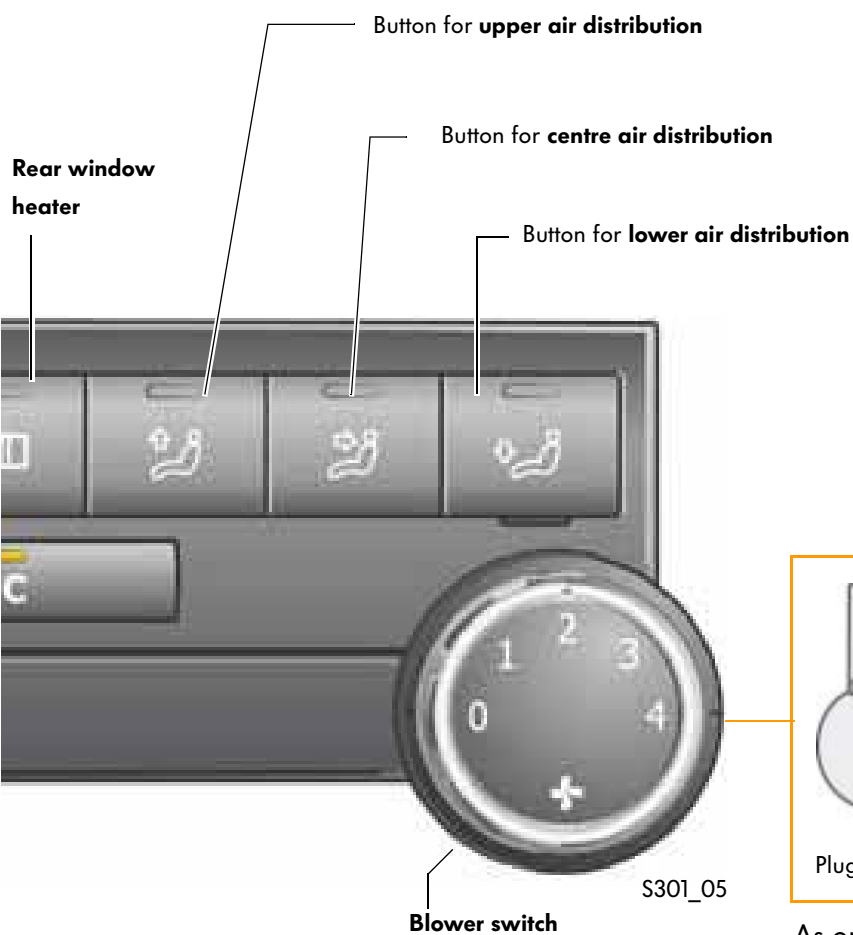
Functional features

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





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

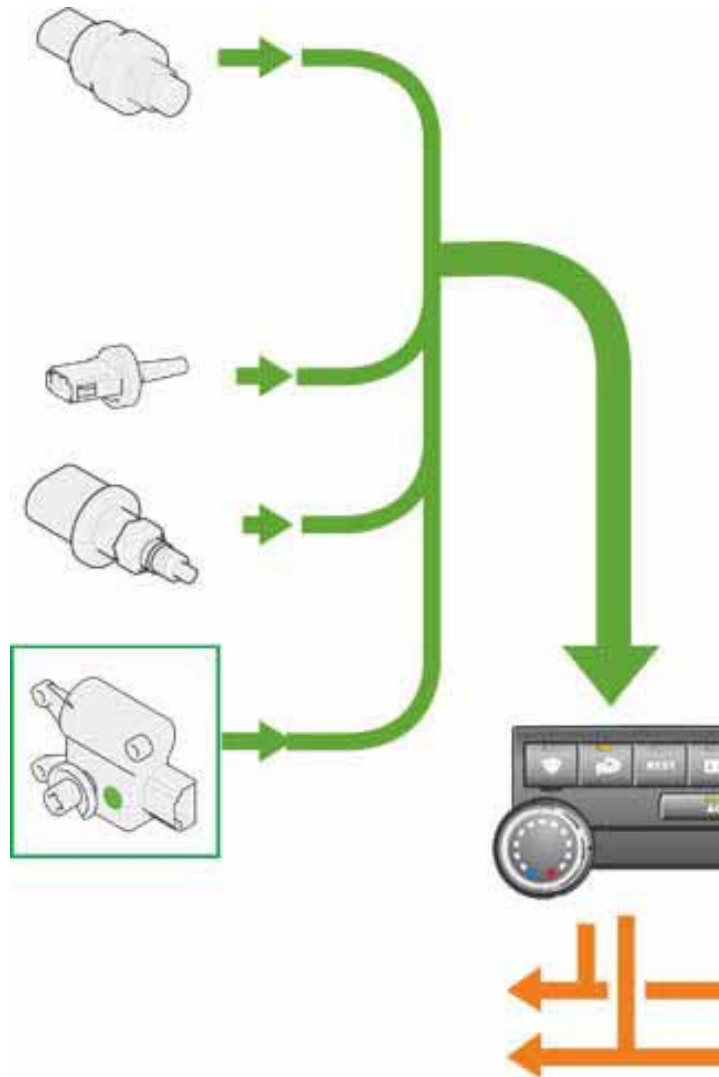
System overview

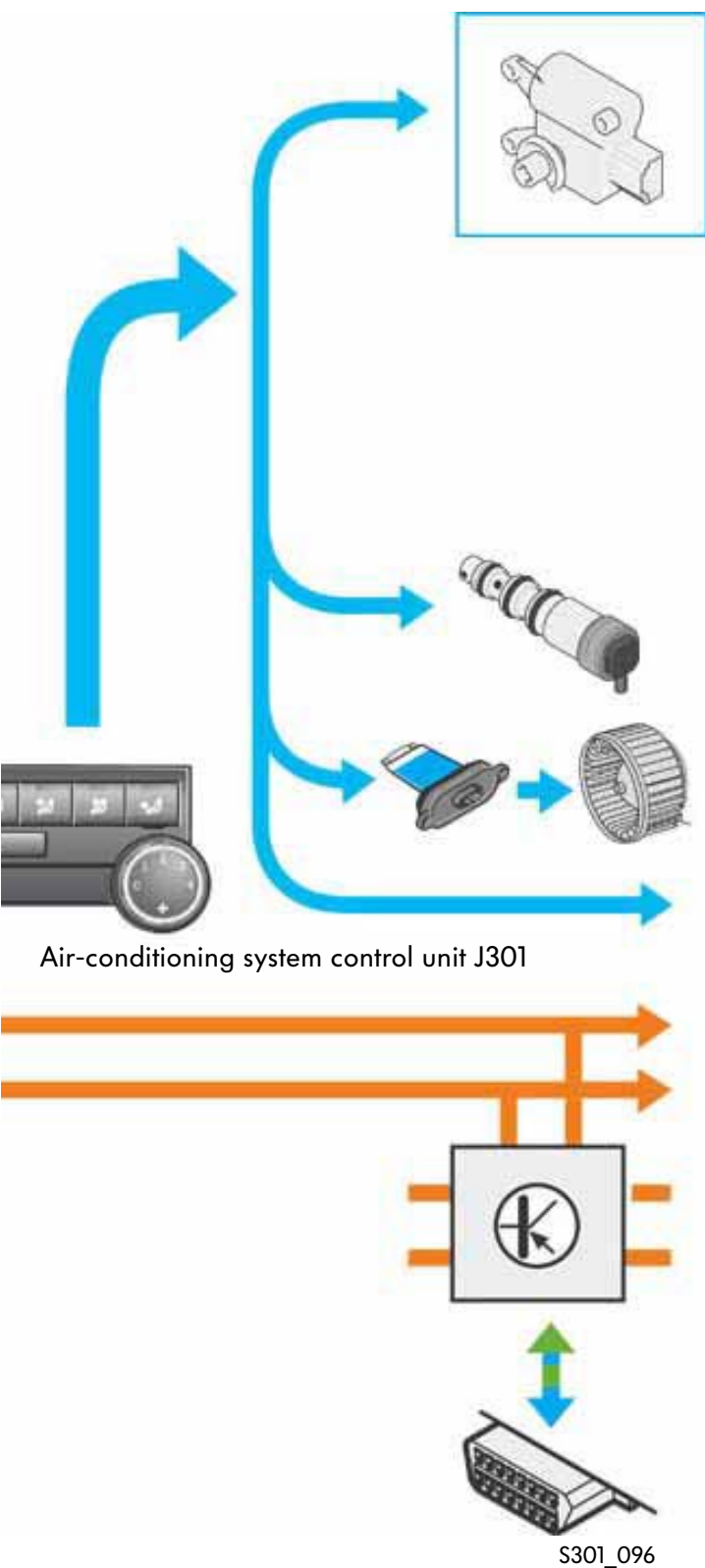
High-pressure sender G65

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





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

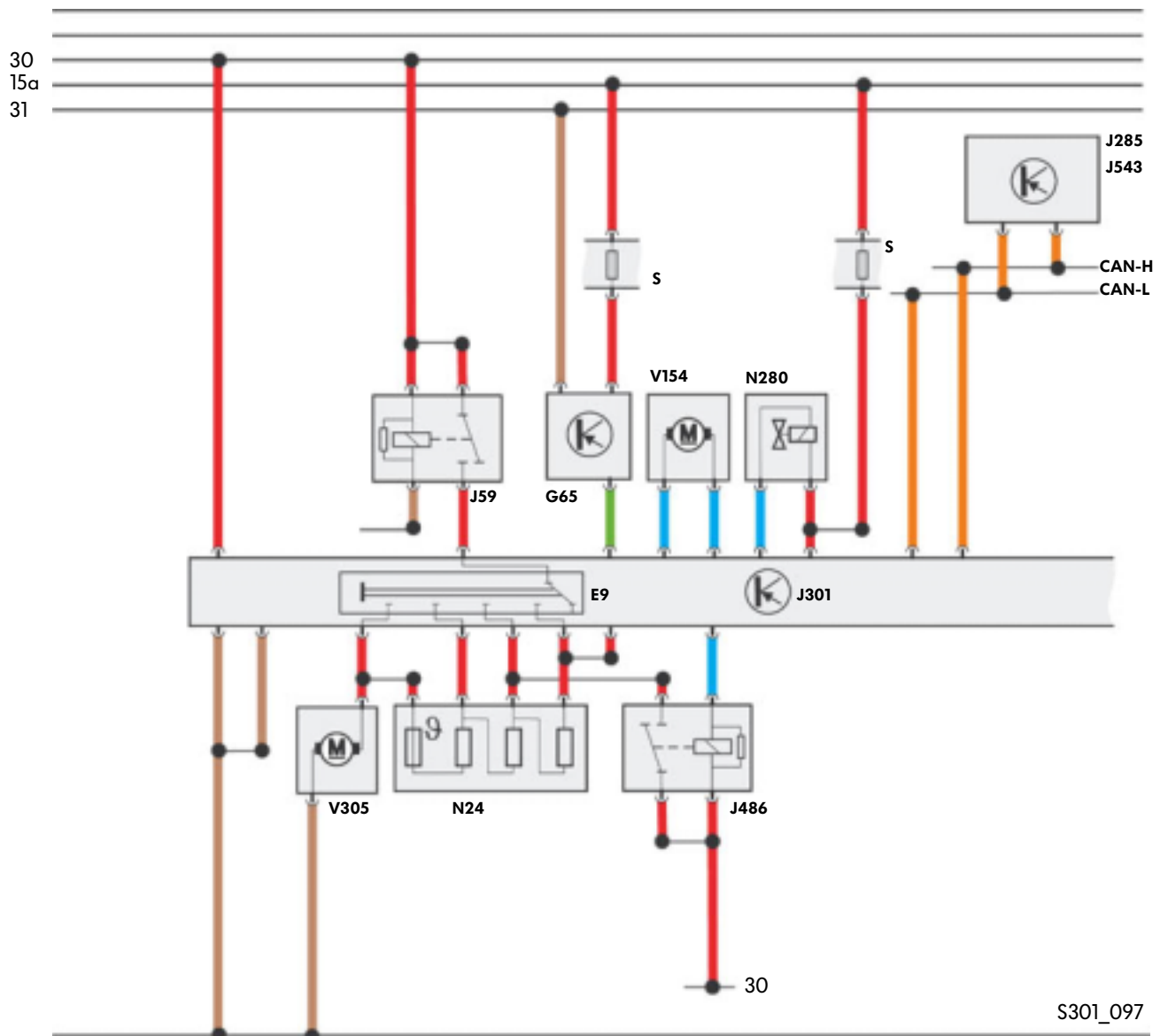
CAN data bus comfort

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



Manual air-conditioning system

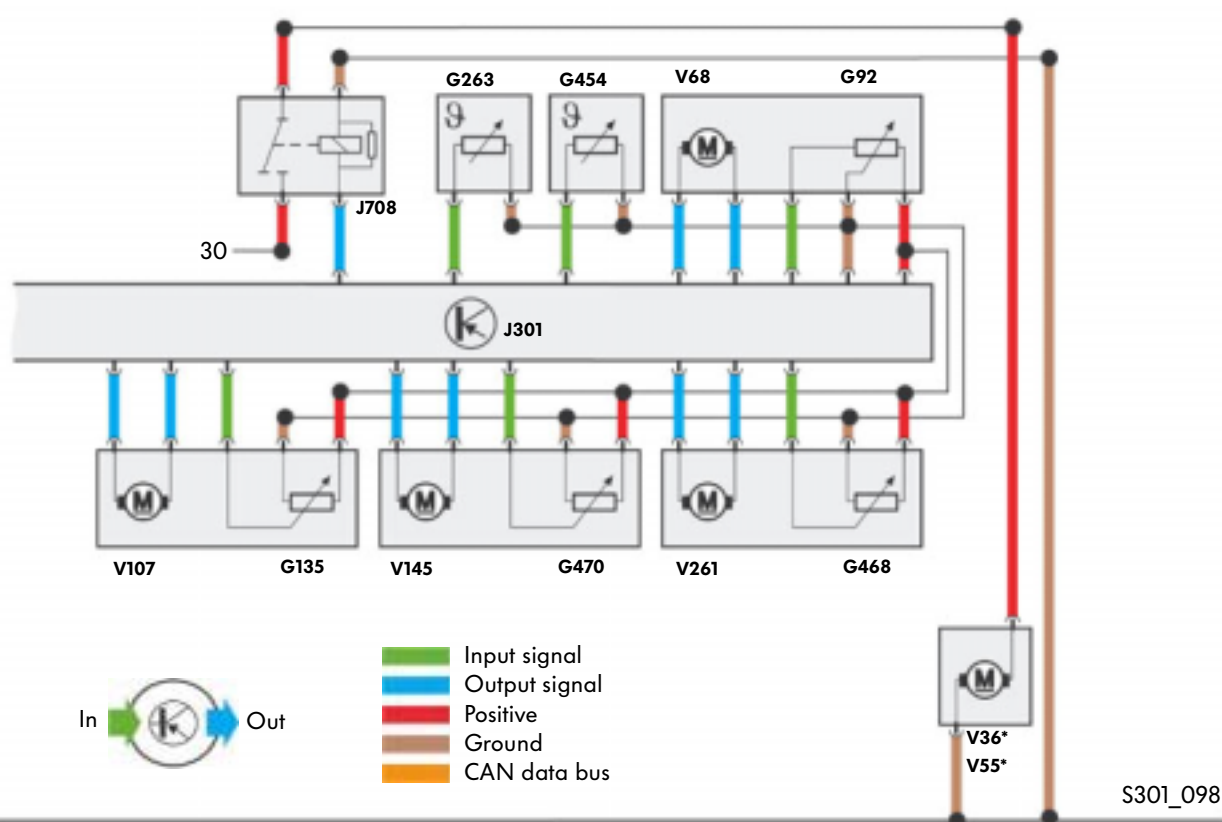
Operational diagram



S301_097

- | | | | |
|-------------|--|-------------|---|
| E9 | switch for fresh air blower | S | fuse |
| G65 | high-pressure sender | V68 | servomotor for temperature flap |
| G92 | potentiometer - servomotor for temperature flap | V305 | blower control motor, front |
| G263 | sender for blow-out temperature, evaporator | V154 | servomotor for fresh air / recirculating air flap |
| 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 | | |

	30
	15a
	31



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



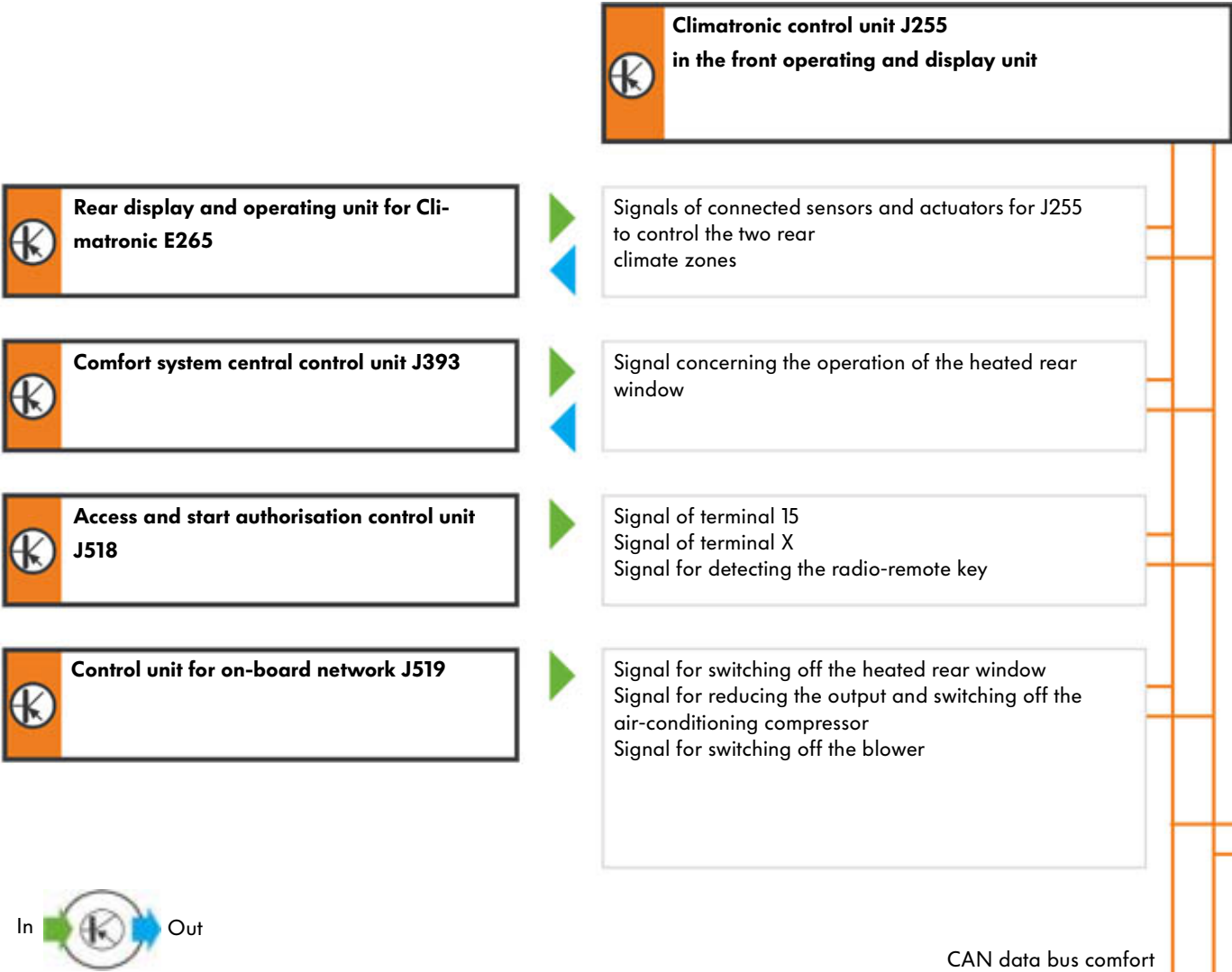
* Also see the table
on page 10



CAN data bus network

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.



S301_114

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



Control unit for wiper motor J400

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



Control unit for the auxiliary water heater J604*

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

e.g.
Velocity signal
Coolant temperature sender

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



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



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



Engine control unit J...

S301_115

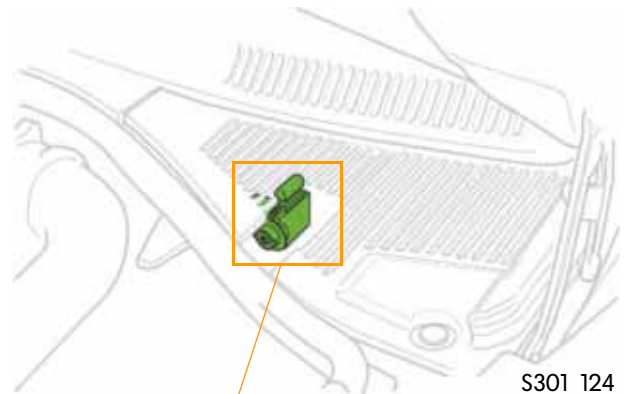


CAN data bus drive

Sensors and actuators

Air-quality sensor G238

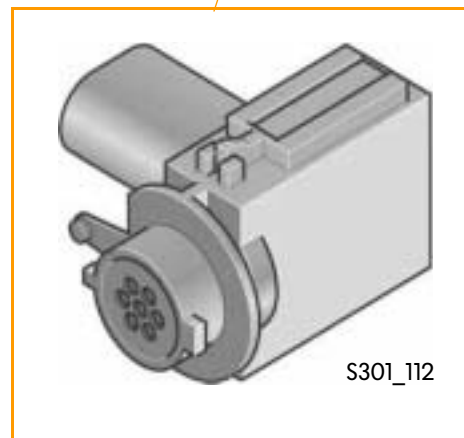
This is installed in the plenum chamber on the left-hand side; its purpose is to check the fresh air that is supplied to the air-conditioning unit for pollutants.



S301_124

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.



S301_112

Signal utilisation

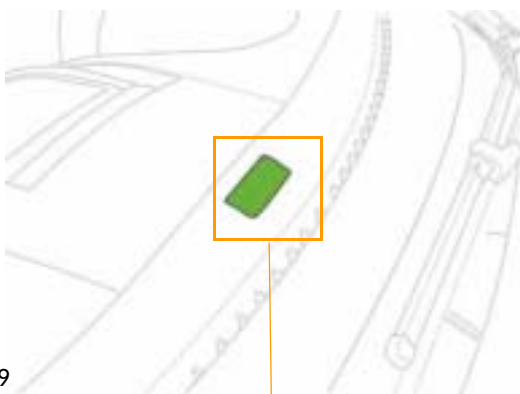
The signal is used for the automatic air recirculation function.

Effect of drop-out

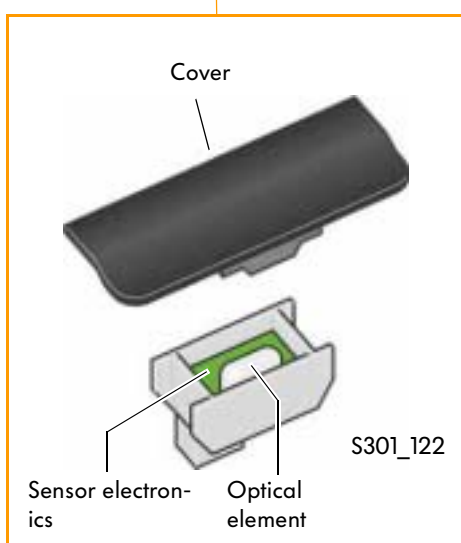
If the air-quality sensors drop out, the automatic recirculating air function is highly restricted.



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



S301_139



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.



S301_120

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.

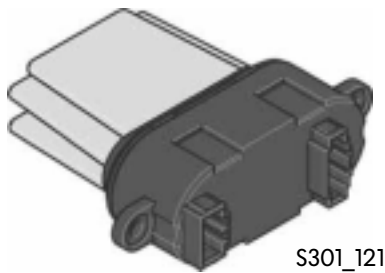
Signal utilisation

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.





S301_121

Function

The sender for blower control is activated by the Climatronic control unit using a pulse width-modulated signal (PWM).

Power is supplied to the control by the Climatronic control unit J255.

According to its demands, the sender regulates the blower motor in the air-conditioning unit.

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

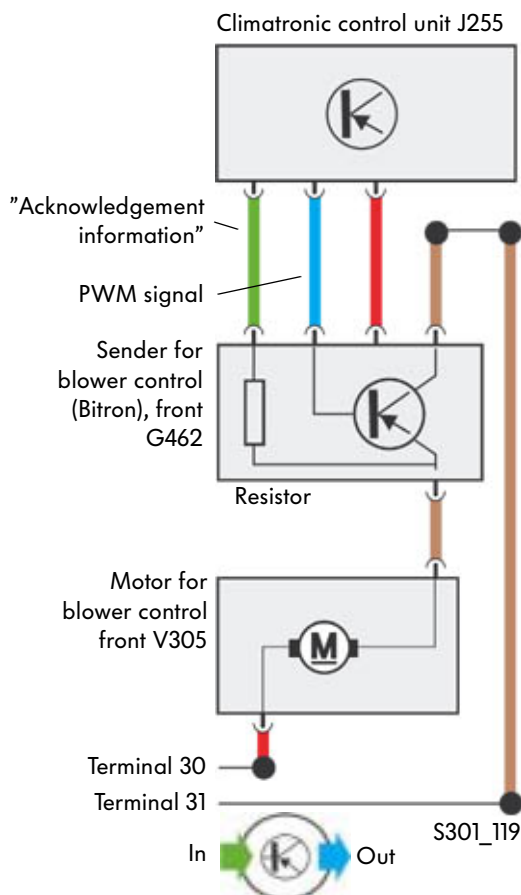
If a blower is defective, the entire heating and cooling function of the air-conditioning system fails.

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.

	Component	4C-Climatronic	2C-Climatronic	Manual air-conditioning system
a)	Rear operating and display unit			
b)	Air-quality sensor			
c)	Photosensor 2 for solar irradiation			
d)	Sender for air humidity			
e)	Sender for air outflow temperature of evaporator / temperature sensor of evaporator			
f)	Blower control sender			
g)	Protective resistor for fresh air blower			


Solutions:
 1. a, b, d, e, 2. a, b, c, d, 3. a, c, d, e, 4. a, b, c, d, e, f, g



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