

You will be familiar with the refrigerant circuit of an air conditioning system from the manual air conditioning of the FELICIA and OCTAVIA. The fundamental design of an air conditioning system was explained in Self Study Programme No. 10, while Self Study Programme No. 11 presented the specific air conditioning system in the FELICIA.

The technical perfection of an air conditioning system is the Climatronic. The main highlight of this version is the electronic control, which performs the task of blending the cooled and heated air to the desired comfort temperature, a task which is performed manually on the conventional air conditioning system.

This also is why the system is called Climatronic.

The principal parameters of the electronic control are the constant comparison of the temperature between set and actual for the purpose of automatically regulating the temperature of the air flowing in, of the air volume and the distribution.



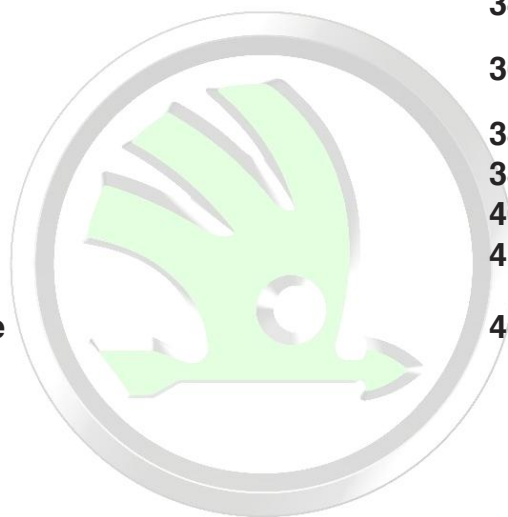
This fully automatic air conditioning system is presented to you in this Self Study Programme.

It provides you with information regarding the controls, the operation and self-diagnosis.

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You will find notes on inspection and maintenance, setting and repair instructions in the Workshop Manual.



Components

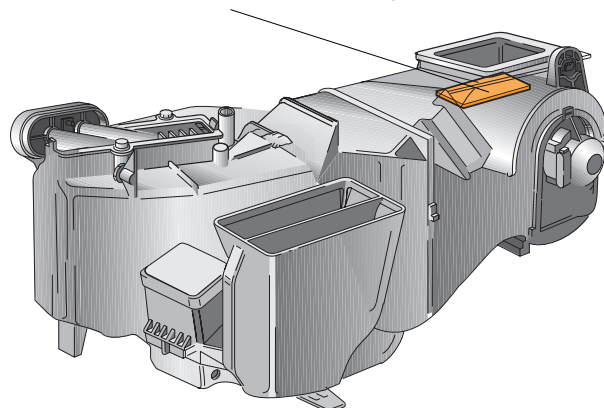
The manual air conditioning

The manual air conditioning and the heater unit are described in Self Study Programme 15 - SKODA OCTAVIA.

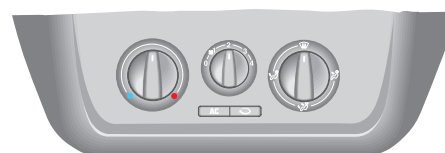
A comparison with the Climatronic as a reminder:

- The comfort level in the vehicle is controlled manually by the driver.
- The flaps for the air flow, the temperature flap, the central flap, the footwell/Defrost flap, are adjusted by bowden cables.
- The fresh air/recirculated air flap is operated electrically.
- The recirculated air mode is limited mechanically to certain positions of the rotary switches.

Fresh air/recirculated air flap



SP25-60



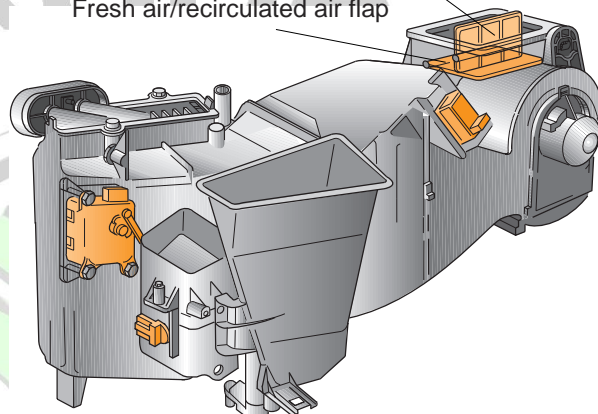
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The Climatronic

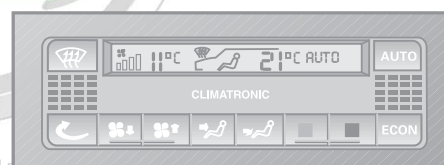
- The comfort level (climate in the interior of the car) is regulated automatically by the control unit (regulation of temperature and control of the air volume).
- This is achieved by integrating the appropriate sensors and positioning motors (actuators) at the air conditioning unit.
- The fresh air/recirculated air mode and also the ram air pressure flap are operated by a common electric motor.
- The central flap is operated electrically.
- The system has a self-diagnosis capability.

Ram air pressure flap

Fresh air/recirculated air flap



SP25-30



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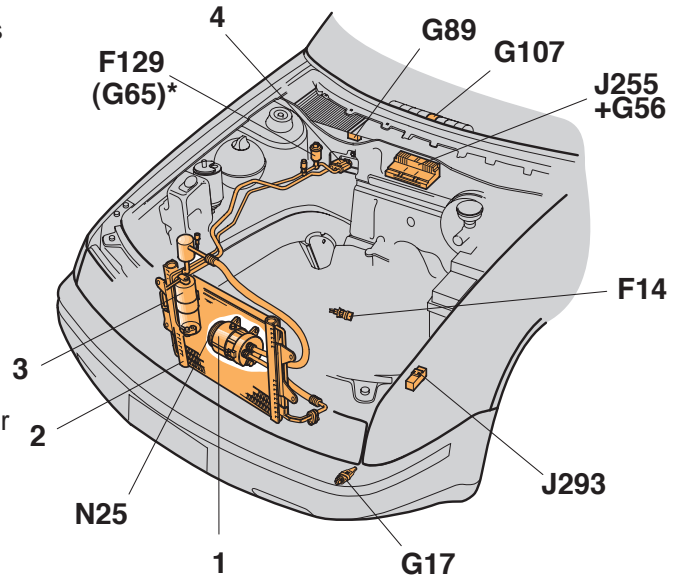
SP25-1

Location of Climatronic components (with refrigerant circuit)

This general view indicates the installation points in the engine compartment or interior:

1	Compressor
2	Condenser
3	Receiver/drier
4	Expansion valve
F14	Coolant temperature warning switch (overheating)
F129	Air conditioning pressure switch
G17	Ambient temperature sensor
G56	Dash panel temperature sensor
G89	Fresh air intake duct temperature sensor
G107	Sunlight penetration photo sensor
J255	Climatronic control unit
J293	Radiator fan control unit
N25	Air conditioning magnetic clutch

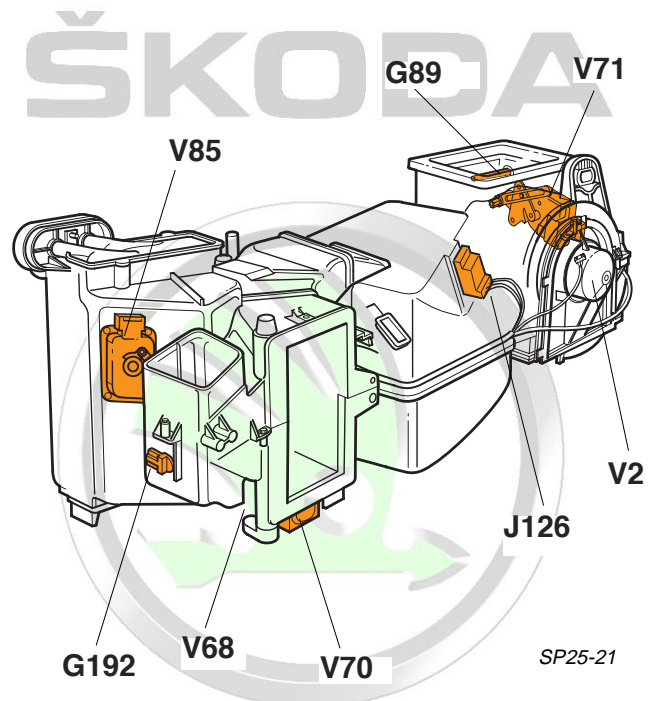
(G65)* High-pressure sensor (only with new system control, then replaces F129)



SP25-20

This general view shows the components located at the AC unit:

G89	Fresh air intake duct temperature sensor
G192	Footwell vent temperature sensor
J126	Fresh air blower control unit
V2	Fresh air blower
V68	Temperature flap positioning motor
V70	Central flap positioning motor
V71	Ram air flow flap and recirculated air flap positioning motor
V85	Footwell/Defroster flap positioning motor

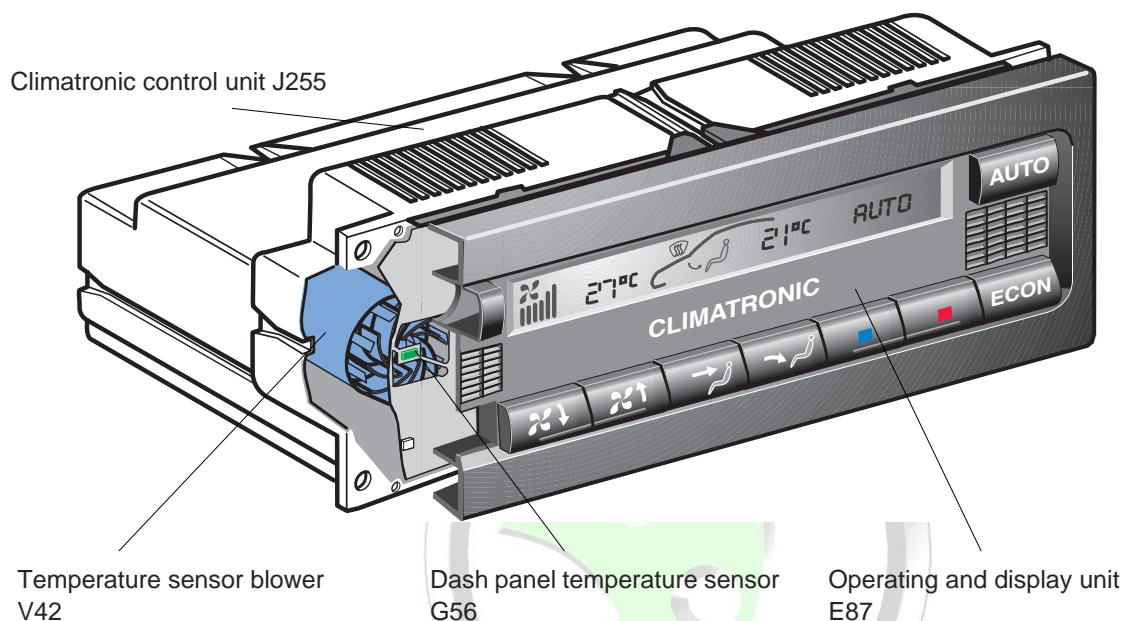


SP25-21

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Control Unit

Control unit with operating and display unit



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Function

The Climatronic control unit is supplied with information from the electrical and electronic components (sensors). This information is processed in accordance with the set values stored in the control unit. The output signals of the control unit then operate the electrical components (actuators).

The Climatronic control unit J255 is located directly at the operating and display unit E87. Both units form a single component which cannot be disassembled.

The temperature sensor for the interior temperature of the car is known as the "dash panel temperature sensor" and is integrated in the control unit.

A blower for extracting the air inside the control unit is located directly at the temperature sensor.

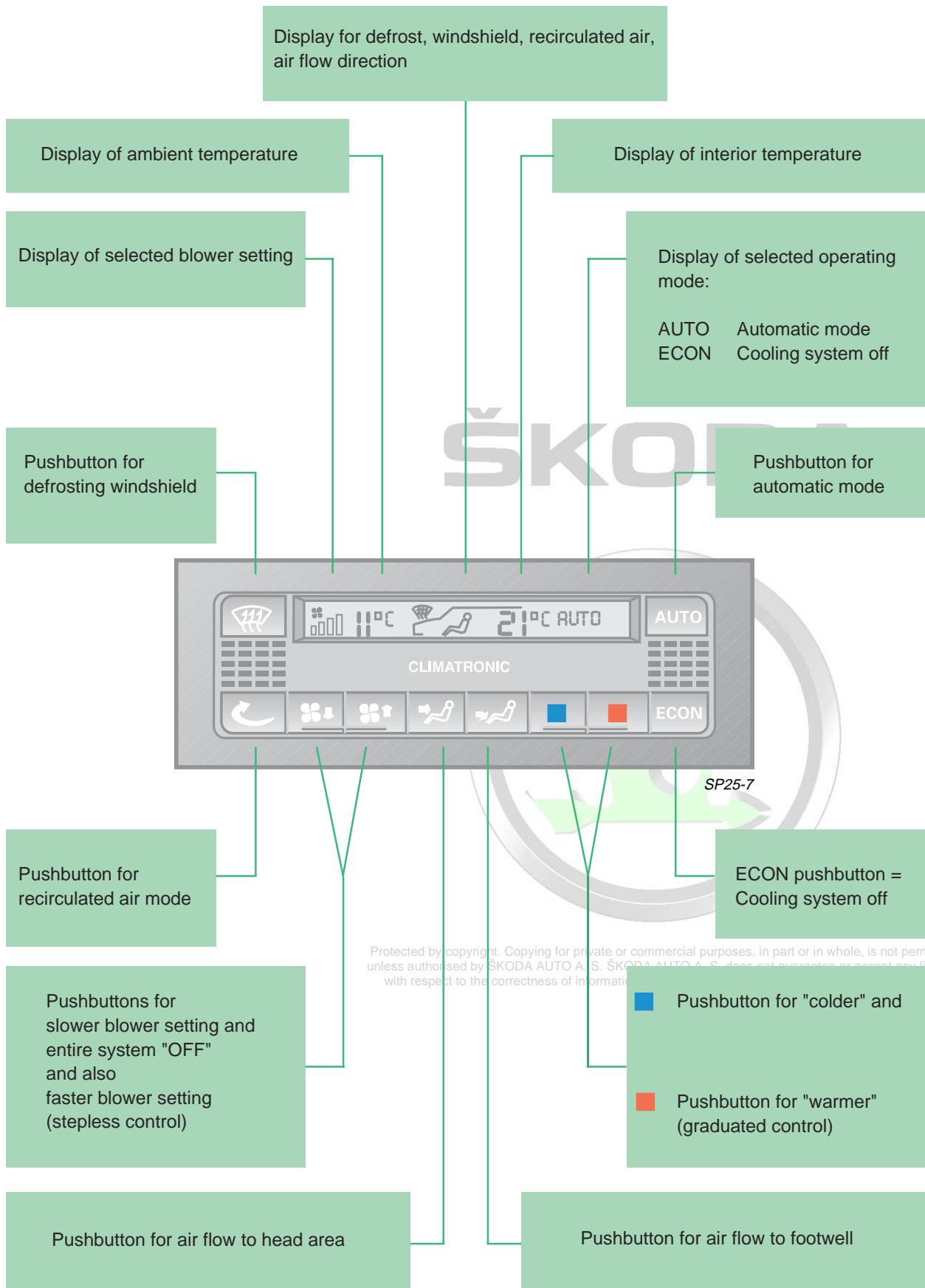
The temperature sensor is positioned in the air flow of the blower in order to avoid incorrect measurements.

The control unit features a fault memory. This makes it possible to rapidly determine whether a component has failed or whether an open circuit exists, by means of the self-diagnosis facility.

A fault which has a sustained effect on the operation of the Climatronic, is stored and displayed. The fault is displayed when the ignition is switched on by the entire display of the display unit flashing for about 15 seconds.

No matter what type of fault occurs, the Climatronic control unit maintains the set operation in the emergency mode.

Control Panel



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Control Panel

Climatronic functions

The pushbuttons can be pressed either to alter the desired interior temperature or to override the Automatic mode in order to switch off the air flow, the air volume, the cooling system or the entire air conditioning system.

Knowledge of the special features of how the system operates is important for conducting specific service measures.

This is also important in discussions with the customer regarding operation of the system.

Automatic mode



SP25-8

When the ignition is switched on, the Climatronic operates in the automatic mode.

The selected interior temperature is regulated fully automatically by altering the flow of air into the interior of the car, as well as the blower speed and the air distribution. It is possible to vary the automatic control by means of the pushbuttons.

ECON mode



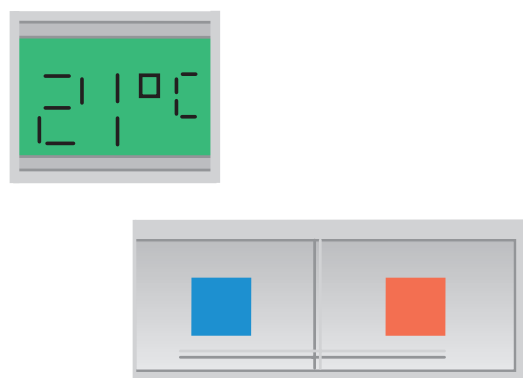
SP25-9

If the ECON button is pressed, the cooling system is switched off. In this case, only the heating system is controlled automatically, without the air being cooled. The desired interior temperature is rapidly reached and maintained at a constant level.

The desired interior temperature, however, can never be lower than the ambient temperature.

The ECON mode switches off automatically if the pushbutton for defrosting the windshield is pressed. To reactivate the ECON mode, once again press the ECON button. The ECON mode is also switched off when the AUTO mode is switched on.

Selected interior temperature



SP25-10

The interior temperature can be selected to any desired temperature using the "colder" and "warmer" pushbuttons. The temperature selected remains stored until a different setting is made.

The interior temperature can be set within the range of +18 °C to +29 °C.

The system is controlled automatically within this range.



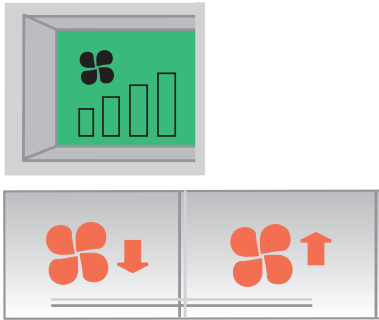
Note:

The system is not controlled automatically if a temperature below 18 °C or higher than 29 °C is selected.

In these limit settings, the Climatronic operates constantly at its maximum cooling or heating capacity.

These limit ranges appear in the display panel as "LO" (below 18 °C) or "HI" (higher than 29 °C).

Blower speed



SP25-11

It is possible to override the automatic control and to vary the blower speed in all the programme settings.

The current blower speed is displayed by means of a bar chart.

By varying the blower speed, the air flow supplied to the interior of the car is practically increased or reduced.

Switching off the system



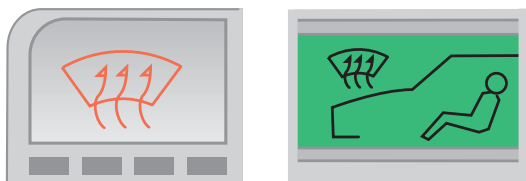
SP25-12

The entire system is switched off by repeatedly pressing the "lower blower speed" pushbutton until the end of the display.

In this case the readout "OFF" appears in the display.

This function should only be used in exceptional cases, for example if there is a fault in the air conditioning system.

Defrost setting



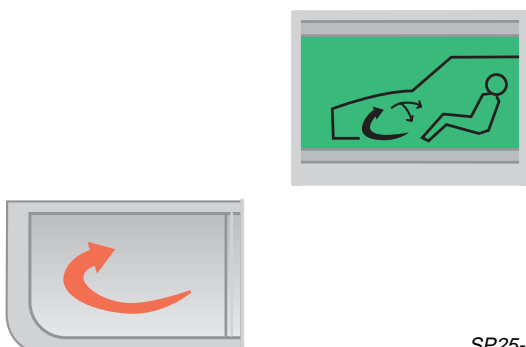
SP25-13

If the pushbutton for defrosting the windshield is pressed, the same symbol as on the pushbutton appears in the display.

The ECON mode is switched off automatically in this switch position.

This setting is used for defrosting the windshield or preventing it from misting up. This also provides a means of boosting the demisting and defrosting effect for the windshield, for example, before setting off if persons wearing damp clothing get into the car.

Recirculated air setting



SP25-14

To activate the recirculated air mode, press the recirculated air pushbutton. The same symbol as on the pushbutton appears in the display.

When this mode is activated, air is extracted from the interior of the car without any supply of fresh air from the outside, in the same way as with the conventional heating/ventilation and manual air conditioning system.

The recirculated air mode is switched off by once again pressing the same pushbutton.

Survey of Systems

Sensors

Sunlight penetration photo sensor
G107

Dash panel temperature
sensor G56 with temperature
sensor blower V42

Ambient air temperature
sensor G17

Fresh air intake duct
temperature sensor G89

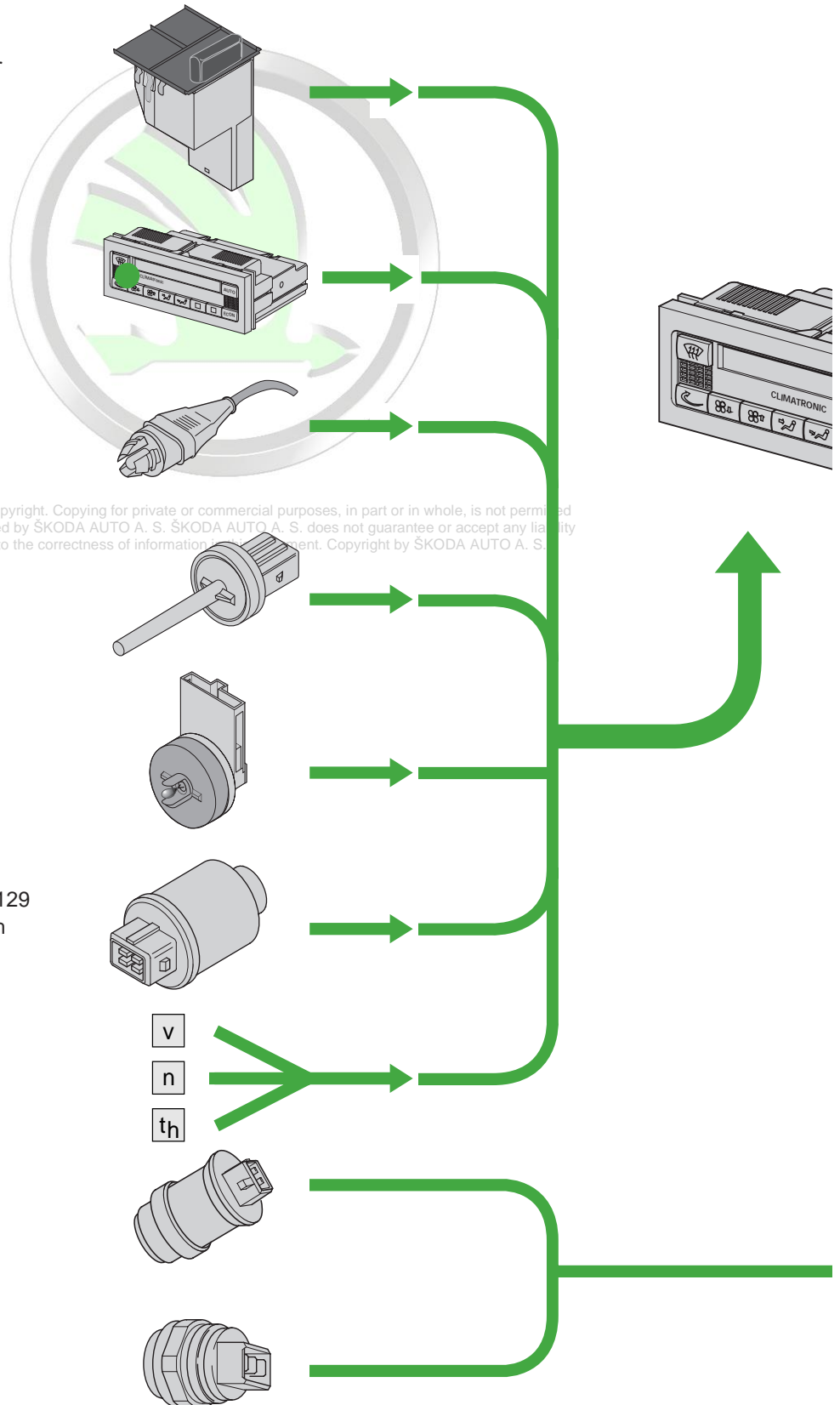
Footwell vent temperature
sensor G192

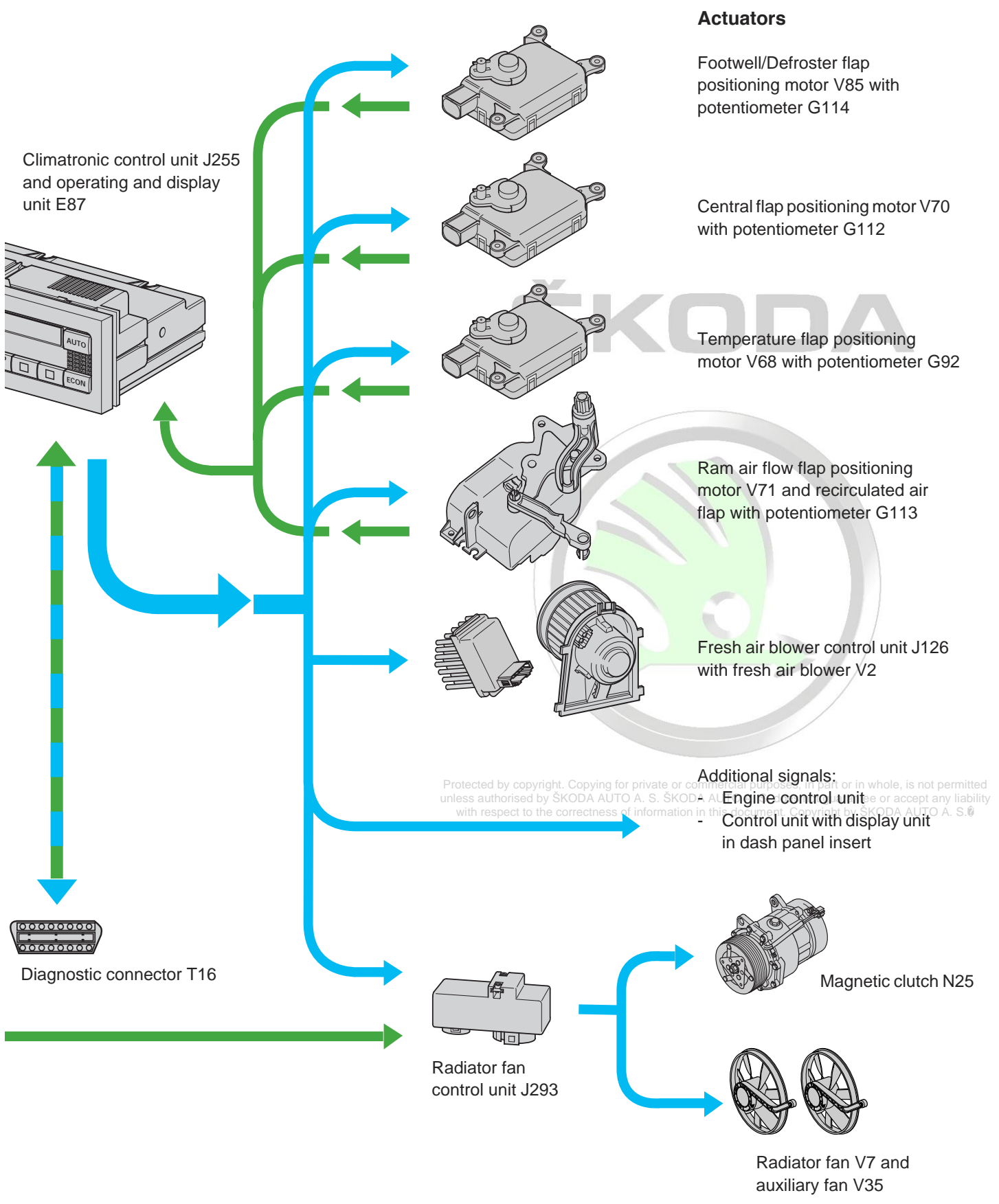
Air conditioning pressure switch F129
or high-pressure sensor G65 (with
new system control)

Additional signals:
- Vehicle speed signal
- Engine speed signal
- Stationary time signal

Coolant temperature warning
switch (overheating) F14

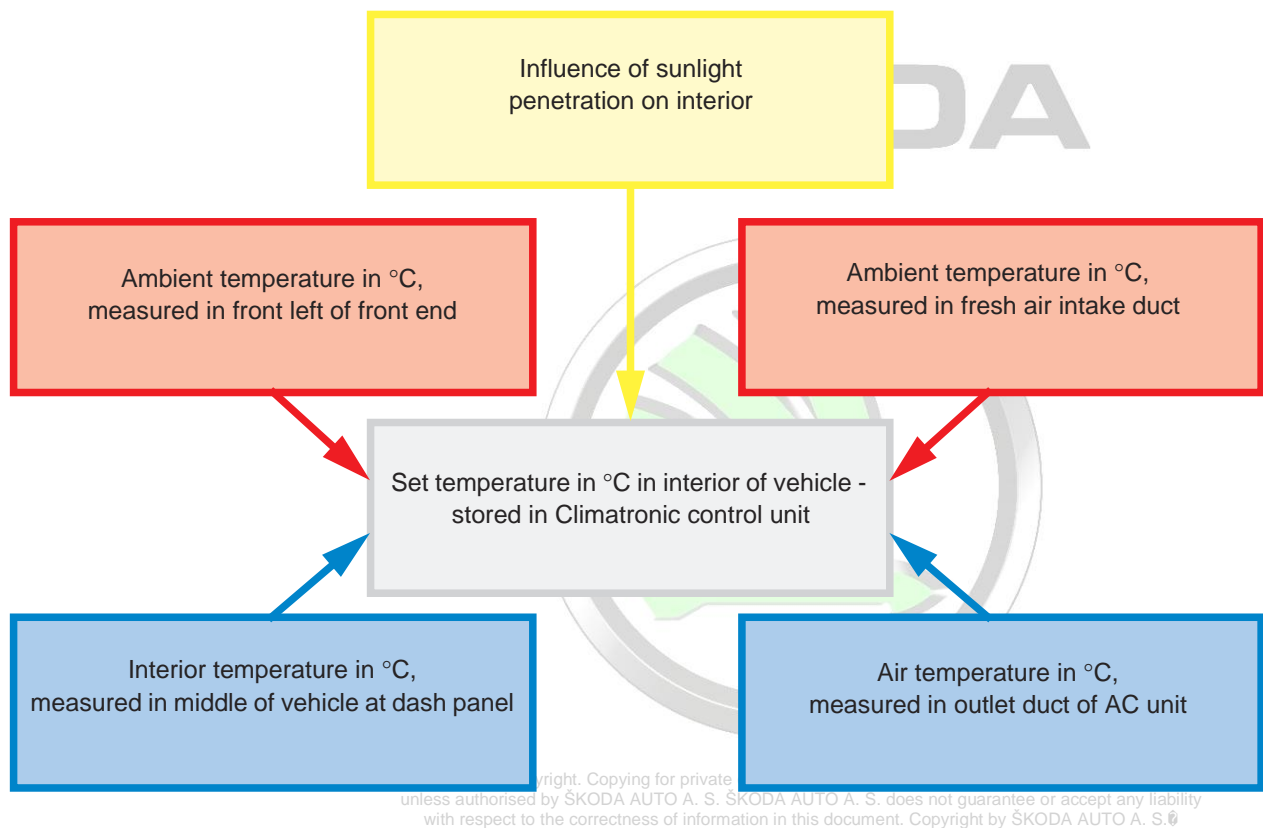
Radiator fan thermostwitch F18





Temperature Control

Temperature output values



Automatic temperature control

When the Climatronic system is operated, different temperature conditions and driving states are taken into account.

In addition to the various control variables of the air conditioning, the system of course also compares the actual temperatures with the desired set temperature.

There are two measuring points for the actual temperatures (both on the inside as well as on the outside) and these are located at different points.

It is possible to vary the control of the system in line with individual wishes in respect of temperature, air flow, blower speed.

Ambient temperature sensors

The ambient temperature is one of the basic parameters for controlling the temperature of the system.

The ambient temperature is detected constantly at two measuring points, independent of each other.

The temperature/resistance characteristics of both temperature sensors is identical.

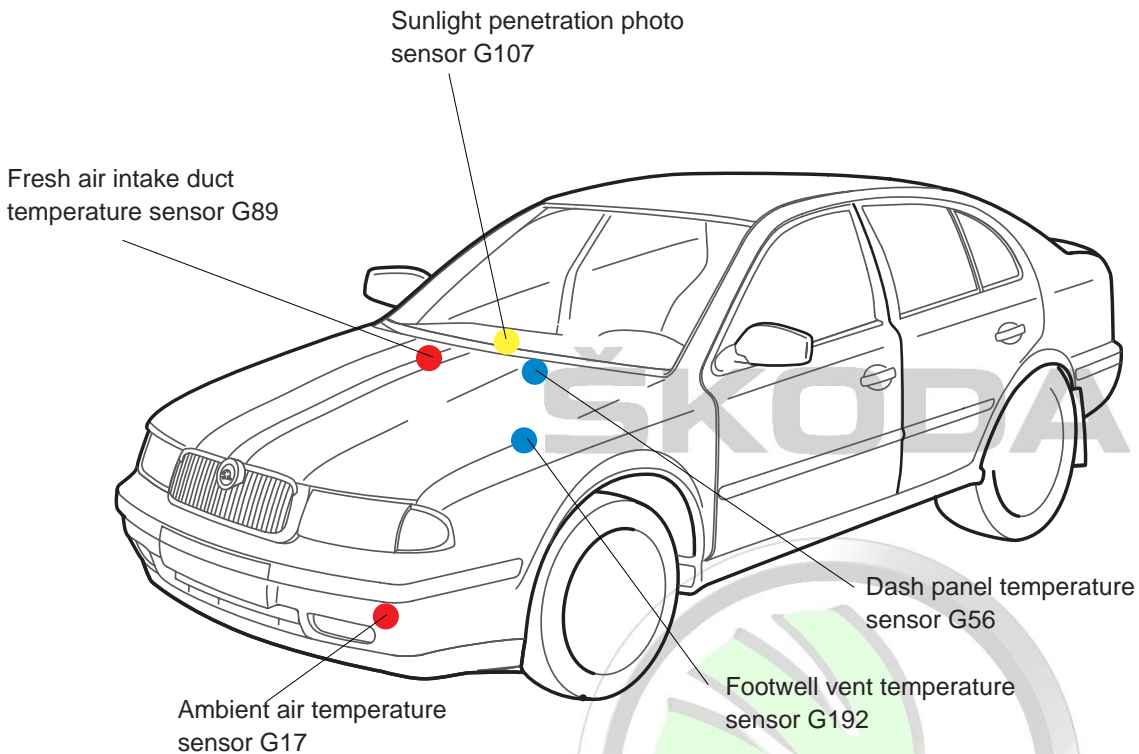
The Climatronic control unit analyses the results of the measurements supplied by the two ambient temperature sensors.

The lower of the two temperatures measured is used for the temperature control.

If one of the sensors fails, the remaining temperature supplied is used as the control variable.

If both temperature sensors fail, a fixed temperature is adopted by the system.

Location of the temperature sensors



Interior temperature sensors

The interior temperatures selected and measured are further basic parameters for automatic control of the temperature.

The temperature inside the car is detected by two separate interior temperature sensors.

It is the sensors which supply the information to the Climatronic control unit regarding the actual temperature in the interior of the car, while an additional sensor detects the temperature of the air flowing out of the heating/air conditioning unit.

If one of the sensors fails, a fixed value is adopted as the control variable.

The air conditioning system continues to operate.

Sunlight penetration as a control variable

In addition to the ambient temperature, the level of comfort felt by the occupants of the car is also influenced by the heat created inside the car by the direct penetration of the sun's rays.

The light striking a photo sensor is analysed in the Climatronic control unit and the temperature control is varied accordingly.

Sensors

Dash panel temperature sensor G56 with blower temperature sensor V42

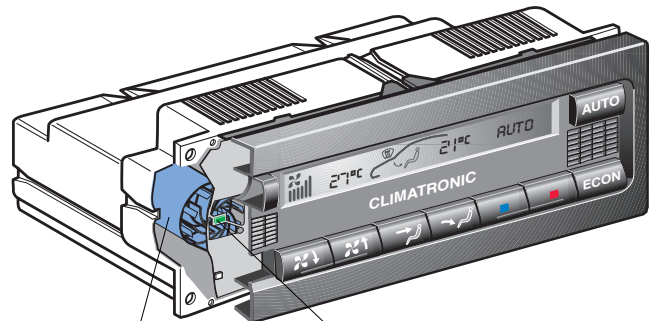
The temperature sensor is integrated directly in the control unit and supplies the actual interior temperature to the Climatronic control unit. It is located in the air flow of the blower for extracting the interior air.

The blower is operated by the operating and display unit. It extracts the interior air in order to avoid any incorrect measurements at the temperature sensor.

Use of signal

The measured value is used for a comparison with the set value.

The temperature flap and the fresh air blower are controlled accordingly.



Dash panel temperature sensor G56 SP25-6

Blower temperature sensor V42

Effects in the event of signal failure

If the signal is not received, a substitute value of +24 °C is adopted. The air conditioning system continues to operate.

The temperature sensor has a self-diagnosis capability.

Footwell vent temperature sensor G192

What is measured is the temperature of the air which flows out of the heating/air conditioning unit (and flows into the interior). The temperature is detected by means of a temperature-responsive (negative temperature coefficient) resistor. When the temperature drops, the electrical resistance increases.

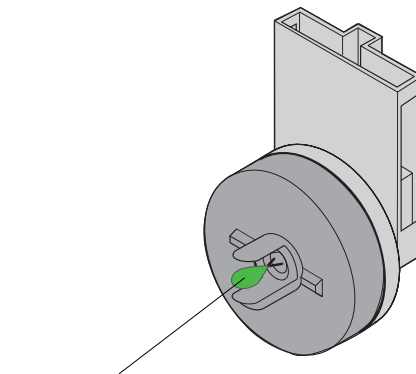
Use of signal

The signal is analysed in the Climatronic control unit. It is used for controlling the defrost/footwell air flow and the air delivery of the fresh air blower.

Effects in the event of signal failure

In the event of a signal failure, the control unit calculates a substitute value of +80 °C.

The air conditioning system continues to operate. The temperature sensor has a self-diagnosis capability.



NTC resistor

SP25-26

Ambient temperature sensor G17

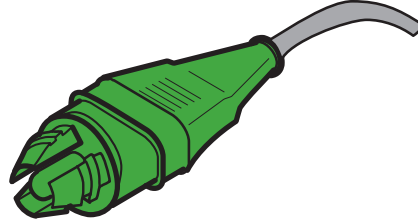
The temperature sensor is positioned in the front end of the vehicle.
It detects the actual temperature of the outside air (ambient temperature).

Use of signal

The Climatronic control unit varies the position of the temperature flap and the speed of the fresh air blower in line with the temperature measured.

Effects in the event of signal failure

In the event of a signal failure, the temperature supplied by the fresh air intake duct temperature sensor G89 is used as a substitute.
If this temperature sensor also fails, the system continues operating by adopting a substitute temperature of +10 °C. No recirculated air mode is possible in this case.
The temperature sensor has a self-diagnosis capability.



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Fresh air intake duct temperature sensor G89

The temperature sensor is positioned directly in the fresh air intake duct.
It is the second measuring point for the actual outside air temperature (ambient temperature).

Use of signal

The Climatronic control unit varies the position of the temperature flap and the speed of the fresh air blower in line with the temperature measured.

Effects in the event of signal failure

In the event of a signal failure, the temperature measured by the ambient air temperature sensor G17 is used as a substitute.
The temperature sensor has a self-diagnosis capability.



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Sensors

Sunlight penetration photo sensor G107

The temperature control of the air conditioning system is influenced with the aid of the sunlight penetration photo sensor.

This sensor detects the direct penetration of the sun's rays on the vehicle occupants.

Function

The sunlight passes through a filter and an optical element before striking a photo diode. The filter has the same effect as sun glasses and prevents the sunlight damaging the photo diode.

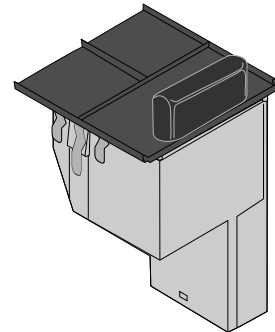
The photo diode is a light-sensitive semiconductor element. If no sunlight penetrates as far as the photo diode, only a slight current is able to flow through the diode.

If the sunlight penetration intensifies, the flow of current increases. The greater the sunlight penetration, the higher is the current which flows through the diode.

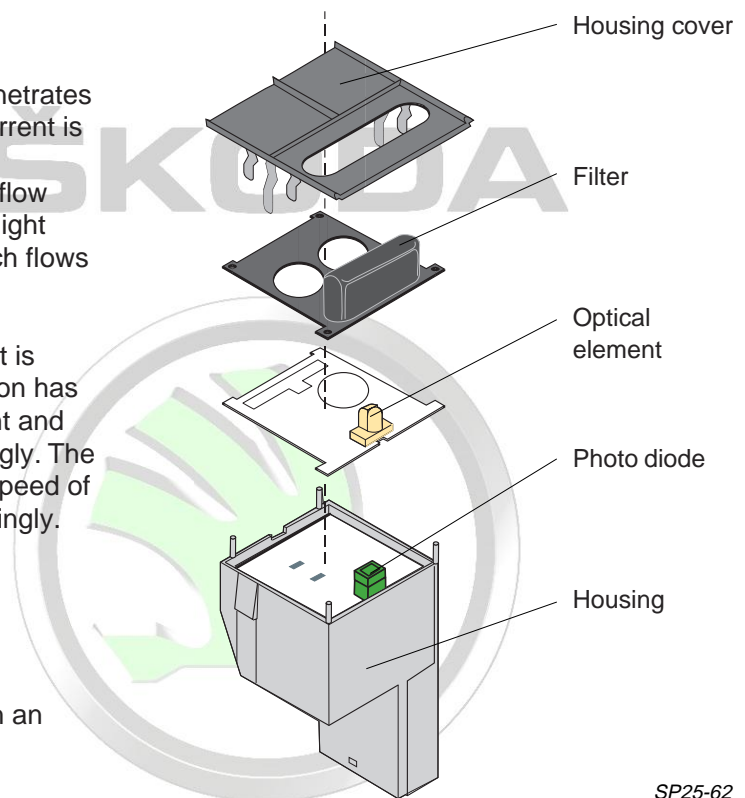
Consequently, the Climatronic control unit is able to deduce that the sunlight penetration has intensified from the increase in the current and can vary the interior temperature accordingly. The position of the temperature flap and the speed of the fresh air blower are controlled accordingly.

Effects in the event of signal failure

The Climatronic control unit operates with an assumed fixed value.



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Self-diagnosis/Fault message

Open circuit/short circuit to positive.
Short circuit to earth.

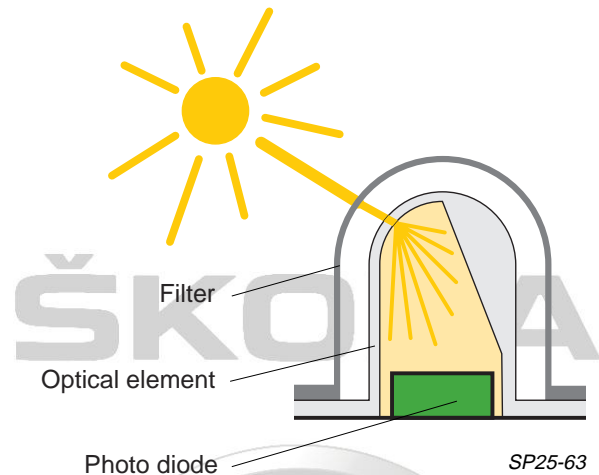
Compensating for position of sun

Function if sunlight is striking vehicle at an oblique angle

The occupants' sense of heat is increased particularly if the sunlight penetrates the vehicle from the front at an angle and thus is shining directly on the occupants of the vehicle.

The optical element ensures that a greater portion of the sunlight is deflected onto the photo diode if the light penetrates the vehicle at an angle.

The cooling capacity of the system is increased in order to compensate for the greater effect of heat on the body.

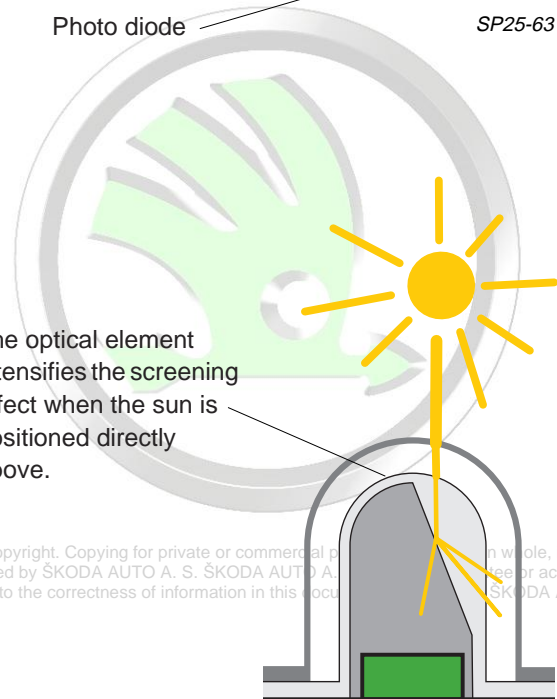


Function if sunlight is striking vehicle directly from above

The roof of the car acts as a shield when the sunlight strikes the vehicle directly from above.

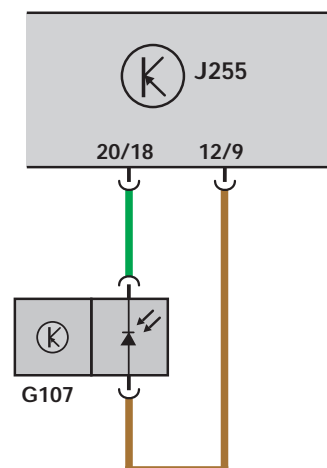
The optical element deflects less light to the photo diode. It is possible to reduce the cooling capacity of the air conditioning system as the occupants of the car are not exposed to the direct sun's rays.

The optical element intensifies the screening effect when the sun is positioned directly above.



Electric circuit

J225	Climatronic control unit
G107	Sunlight penetration photo sensor
Pin 9	Signal earth
Pin 18	Signal



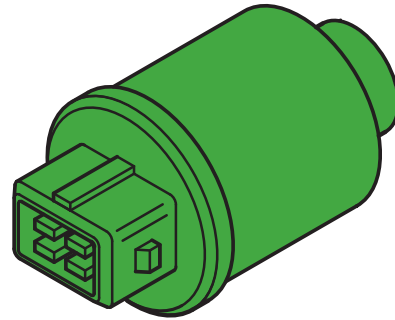
SP25-23

Sensors

Air conditioning pressure switch F129

The air conditioning pressure switch constantly monitors the pressures in the refrigerant circuit of the Climatronic system. It is a triple switch.

Its functions are required for safety reasons (a similar type of switch is also fitted to the manual air conditioning system).



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Tasks and function

- The switch closes if the rising pressure is greater than 1.6 MPa (16 bar). The radiator fan is switched to the next higher stage by the radiator fan control unit in order to achieve an optimum condenser efficiency.
- The switch opens if the pressure is too high (e.g. if engine cooling is inadequate) from a pressure of 3.2 MPa (32 bar). The air conditioning system is then switched off.
- The switch opens if the pressure is too low, below 0.2 MPa (2 bar) - e.g. in the event of a loss of coolant. The air conditioning system is switched off.

It is possible to remove the pressure switch from the refrigerant circuit without first of all having to extract the refrigerant.

Self-diagnosis

The 0.2 MPa/3.2 MPa (2 bar/32 bar) operating part of the pressure switch is tested in the self-diagnosis in function 02 - Interrogating fault memory.

The 1.6 MPa (16 bar) operating part is not included.

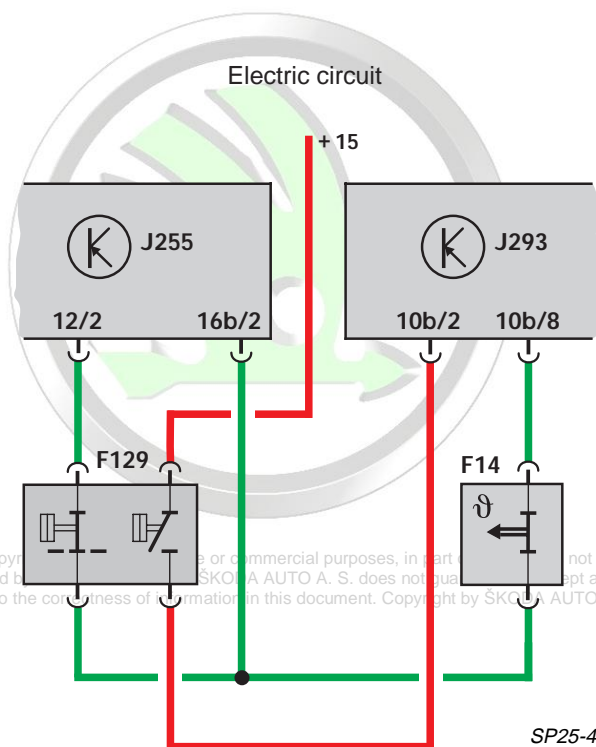


Note:

The coolant temperature warning switch F14 is also incorporated in the safety circuit for switching off the air conditioning system.

The air conditioning system is switched off by this component if the coolant temperature rises to 119 °C, and is switched on again once the temperature has dropped to 112 °C.

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- F14 Coolant temperature warning switch (overheating)
- F129 Air conditioning pressure switch
- J255 Climatronic control unit
- J293 Radiator fan control unit

Additional signals: stationary-time signal

The Climatronic control unit J255 is supplied with information regarding the "stationary time of the vehicle" from the control unit with display unit J285 (in dash panel insert).

Stationary time = ignition off until engine is restarted

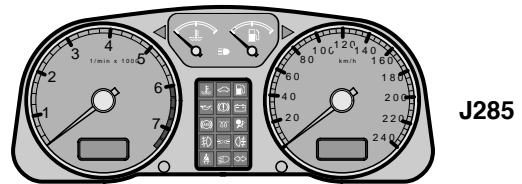
This information is always provided when the "restart" event occurs.

Why is this information needed?

When the vehicle is stationary, the temperatures measured by the ambient air temperature sensor G17 and by the fresh air intake duct temperature sensor G89 are influenced to a greater or less extent by the heat radiated in line with the time during which the vehicle is stationary. The result is that the actual ambient temperature of the vehicle may be falsified.

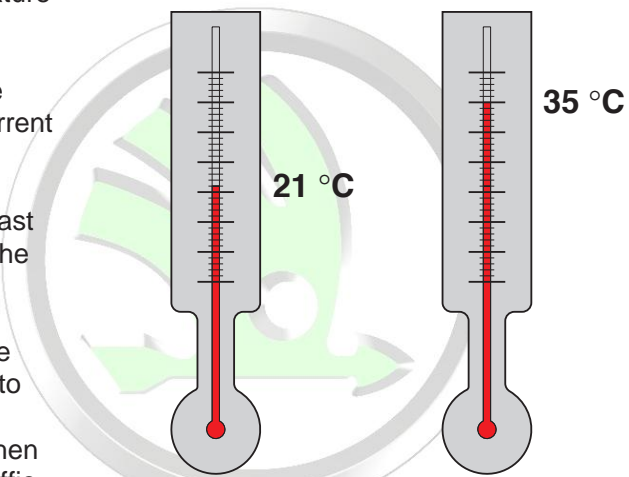
Consequently, the analysis electronics of the Climatronic control unit does not use the "current falsified" temperature measurements for the temperature control, but the temperature measurements which were detected during last operation of the Climatronic system, before the engine was switched off.

This makes it possible for the system to more rapidly reach the "comfort temperature" and to prevent any risk of undercooling. This signal is also important, for example, when driving in slow moving traffic or when in a traffic jam if the engine is switched off.



SP25-4

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SP25-5

Temperature measured at ignition off Temperature measured at restart as a result of radiated heat

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Sensors

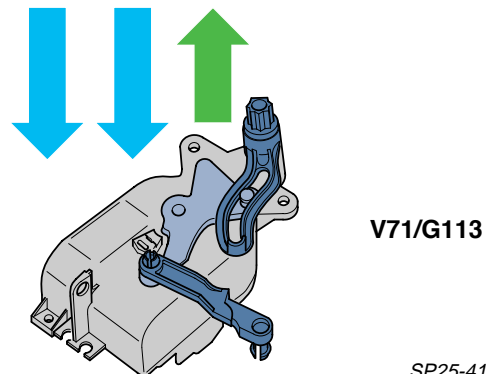
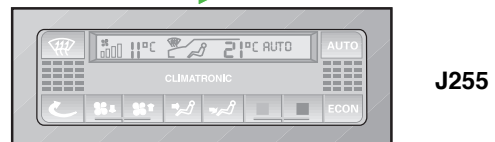
Additional signal: vehicle speed "v"

The current signal of the vehicle speed is required in order to control the ram air flow flap.

The signal used is that supplied by the speedometer sensor G22 in the gearbox, which also exists at the control unit with display J285 where it is converted for controlling the temperature. The signal passes along a direct signal wire to the ram air flow flap positioning motor V71.

The vehicle speed signal is also tested by the self-diagnosis capability.

Faults are only detected if no vehicle speed signal is measured within 4 minutes after the engine is started during 5 driving cycles (start, driving at a speed of more than 15 km/h, switching off engine).



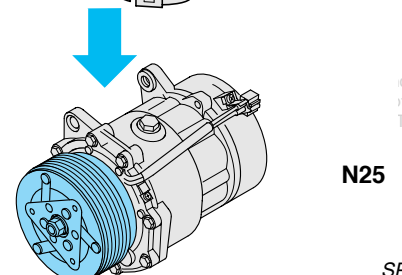
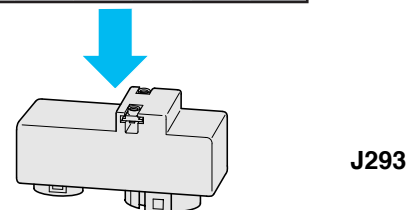
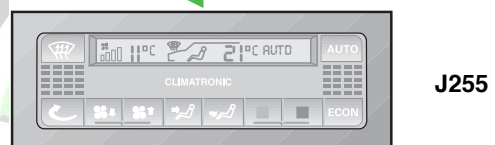
Additional signal: engine speed "n"

The Climatronic control unit has to be provided with information regarding the current engine speed.

The engine speed is detected from the signal which is supplied by the control unit with display J285.

The air conditioning magnetic clutch N25 is thereupon operated by the radiator fan control unit, e.g. no engine speed signal = engine not running, AC compressor is switched off.

The engine speed signal is displayed in the self-diagnosis in function 08 - Reading measured value block.



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Fresh air blower V2 and fresh air blower control unit J126

Task

The interior of the vehicle is supplied with the necessary quantity of air by the fresh air blower.

The fresh air blower can be steplessly controlled.

The control voltage for the fresh air blower is computed in the Climatronic control unit. The fresh air blower is operated and controlled by the fresh air blower control unit in line with this voltage:

- stabilised voltage at earth side
- unstabilised voltage at positive side.

The actual voltage at the fresh air blower is fed back to the Climatronic control unit. The blower speed is constantly adjusted by the fresh air blower control unit in line with this information.

The fresh air blower control unit features heat sinks.

The air flow upstream of the evaporator constantly flows around these heat sinks, which has the effect of cooling the power components in the control unit.

The current blower speed is shown in the display of the operating and display unit in the form of a bar chart.

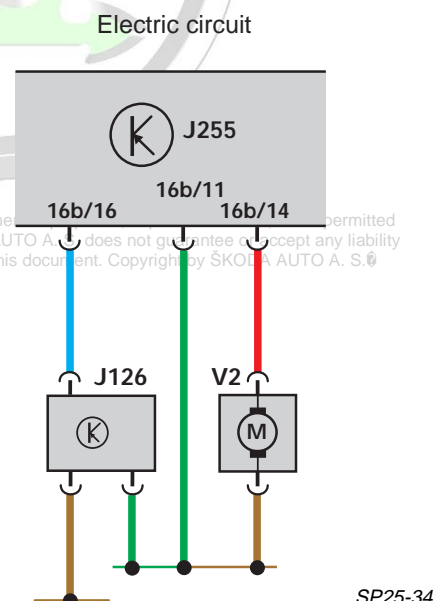
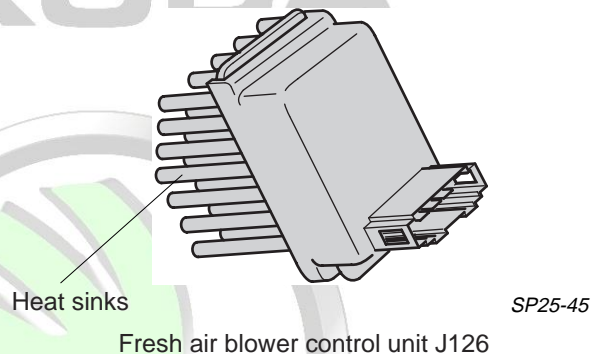
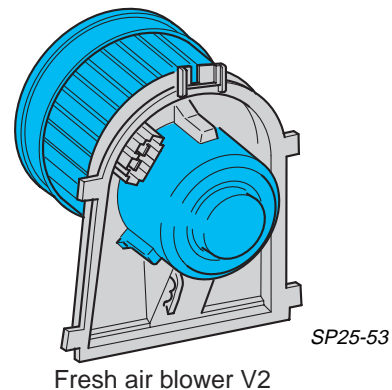
Substitute function

No substitute function.

In the event of damage to the blower or control unit, the compressor is switched off.

Self-diagnosis

The fresh air blower and the control unit are integrated in the self-diagnosis.



Actuators

Positioning motors for temperature flap V68 for central flap V70 for footwell/defrost V85 with potentiometer

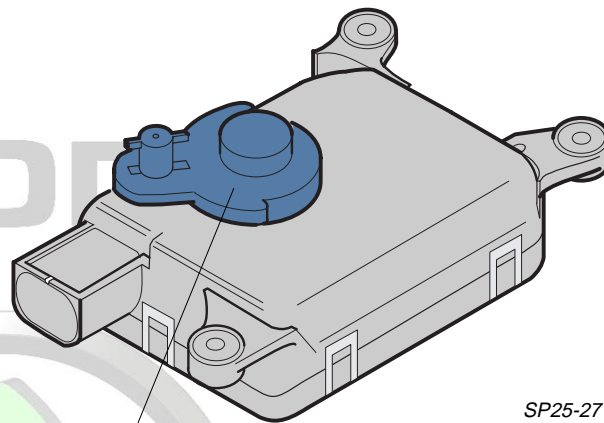
Task

The positioning motor for the temperature flap is operated in line with the selected interior temperature while the positioning motors for the central flap and defrost are operated in line with the selected air flow, and these in turn alter the position of the flaps.

The motors are located close to the particular shaft of the flap at the heating/air conditioning unit.

All the motors are supplied with the appropriate control signals by the Climatronic control unit.

Each motor features a potentiometer. This signals the position of the flap to the control unit by means of a feedback value.



SP25-27

Crank of positioning motor

Self-diagnosis

All the positioning motors are integrated in the self-diagnosis.

The end positions are adaptive.

What this means is that you have to perform function 04 - Basic setting after installing a new motor.

When you this, the motors move to the end positions and the system "learns" these positions.

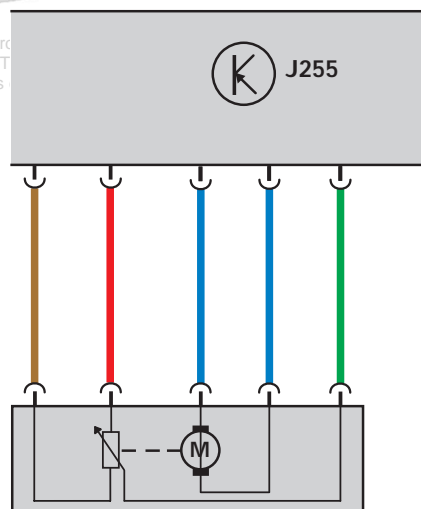


Note:

The mechanism for altering position of the flaps varies (arrangement of crank) and is matched to the rotating angle of individual flaps.

You should note this point when replacing the positioning motors.

Electric circuit



V68/G92
V70/G112
V85/G114

SP25-33

Ram air flow flap positioning motor V71

The positioning motor is located at the heating/air conditioning unit next to the fresh air intake duct.

Task

The positioning motor alters the position of the ram air flow flap and of the fresh air/recirculated air flap.

This combined movement of the flaps is performed by a drive plate by means of two guide points.

The positioning motor is operated by the Climatronic control unit as a function of vehicle speed and fan speed.

The ram air flow flap is used to reduce the flow cross-section in the intake duct at higher vehicle speeds.

When this is done, the flow of fresh air remains practically constant.

It is thus possible to more easily maintain the interior temperature at a constant level.

The potentiometer (G113) in the positioning motor signals the position of the ram air flow flap to the Climatronic control unit by means of a feedback value.

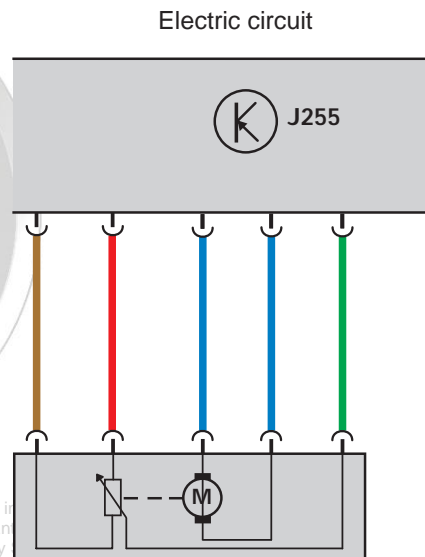
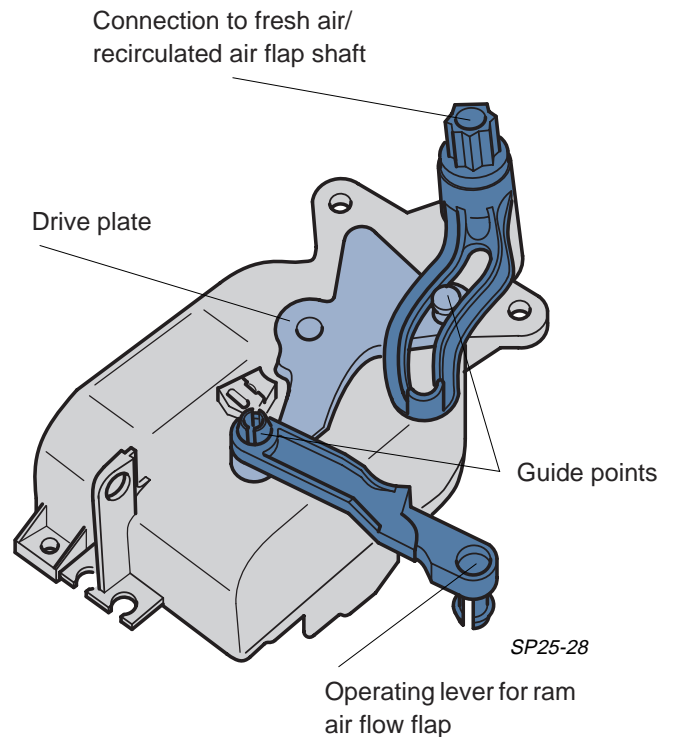
Self-diagnosis

The positioning motor is integrated in the self-diagnosis.

The end position is adaptive.

What this means is that you have to perform function 04 - Basic setting after installing a new motor.

When you do this, the motors move to the end positions and the system "learns" these positions.



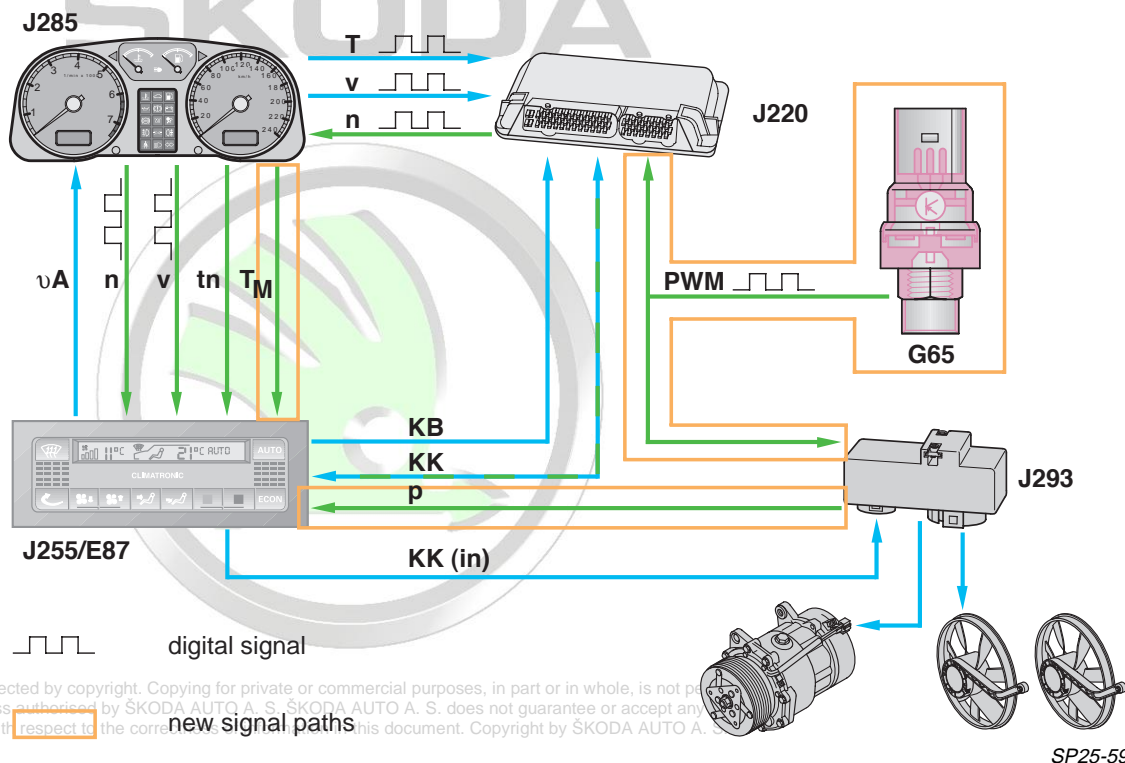
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New System Control

On vehicles fitted with the 1.6-ltr./74 kW engine and the 1.4-ltr./44 kW engine, the system for monitoring the refrigerant circuit has been

technically modified with effect from Model Year 1999.

It is also envisaged for further engines in this form.



The technical highlights:

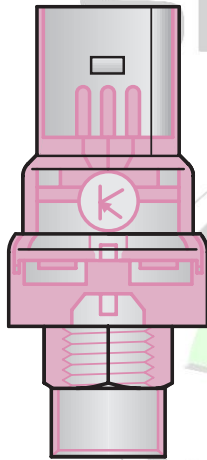
- Coolant temperature warning switch F14 discontinued.
- The coolant temperature signal T_M is supplied by the combination processor J218 in the dash panel insert.
- The air conditioning pressure switch F129 is discontinued. The new high-pressure sensor G65 is used in its place.
- The radiator fan control unit J293 has undergone further technical development and has been matched in functional terms to the new high-pressure sensor. It is installed together with the high-pressure sensor. Distinguishing feature: modified connector terminals

- The radiator fan control unit and the engine control unit analyse a pulse width-modulated (PWM) signal supplied by the new high-pressure sensor.

List of range of signals

ϑA	Ambient temperature (data message) to ambient temperature display in instrument cluster
n	Engine speed (frequency-modulated)
v	Vehicle speed (frequency-modulated)
tn	Stationary signal (data message)
KB	AC standby mode
KK	AC compressor ON/OFF (bi-directional)
KK (in)	AC compressor on
T	Kühlmitteltemperatur
T_M	Coolant temperature
	Coolant temperature warning lamp (overheating)
p	Pressure
	o.k. = positive signal
	not o.k. = no signal

High-pressure sensor G65



A new generation for monitoring the refrigerant circuit.

The high-pressure sensor is an electronic pressure sensor and is installed in the high-pressure line.

It detects the refrigerant pressure and converts the physical quantity of pressure into an electric signal.

In contrast to the air conditioning pressure switch, it is not only that the defined pressure thresholds are detected, but the refrigerant pressure is also monitored throughout the entire operating cycle.

Use of signal
in engine control unit and
in radiator fan control unit

The signals are analysed to detect the engine load resulting from the air conditioning system and the pressure conditions in the refrigerant circuit.

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The next higher stage of the radiator fan and of the compressor magnetic clutch are switched on and off by the radiator fan control unit.

Substitute function

If the radiator fan control unit detects that no signals have been received, the compressor is switched off for safety reasons.

Advantages

- This enables the engine speed within the idling range to be exactly matched to the particular power consumption of the compressor.
- The different radiator fan stages are switched on and off offset by a brief time delay. Consequently, any change in speed in the radiator fan is scarcely felt when the engine is idling.

Self-diagnosis "fault message"

Any fault at the high-pressure sensor is stored in memory of the engine electronics.

**e.g.: 00819 High-pressure sensor G65
"Signal too small"**

New System Control

Function of high-pressure sensor

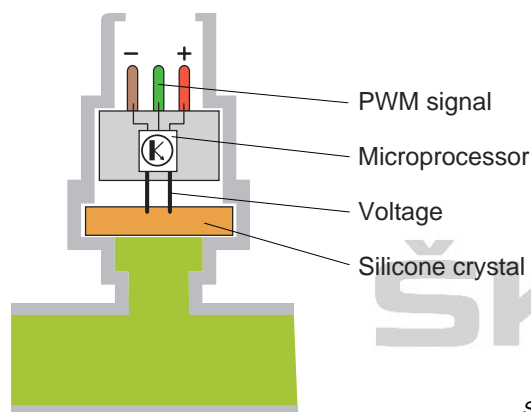
The refrigerant pressure is directed to a silicone crystal. Depending on the pressure level, the crystal is "misshapen" to a greater or lesser extent.

A property of the silicone crystal is that its electrical resistance changes when it undergoes a change in shape. Consequently, any voltage supplied to the silicone crystal also varies in line with the pressure pattern.

This change in voltage is passed on at the high-pressure sensor to a microprocessor (integrated in the high-pressure sensor) and converted into a pulse width-modulated (PWM) signal.

At a low pressure the change in shape of the crystal is only slight. Consequently, the voltage applied to the crystal is matched only by a low electrical resistance.

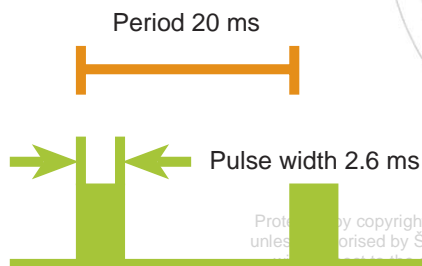
Low pressure



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SP25-66

PWM signal



The microprocessor of the high-pressure sensor outputs a slight pulse width when the pressure is low.

The PWM signals are generated with a frequency of 50 Hz. This corresponds to a period of 20 ms = 100 %.

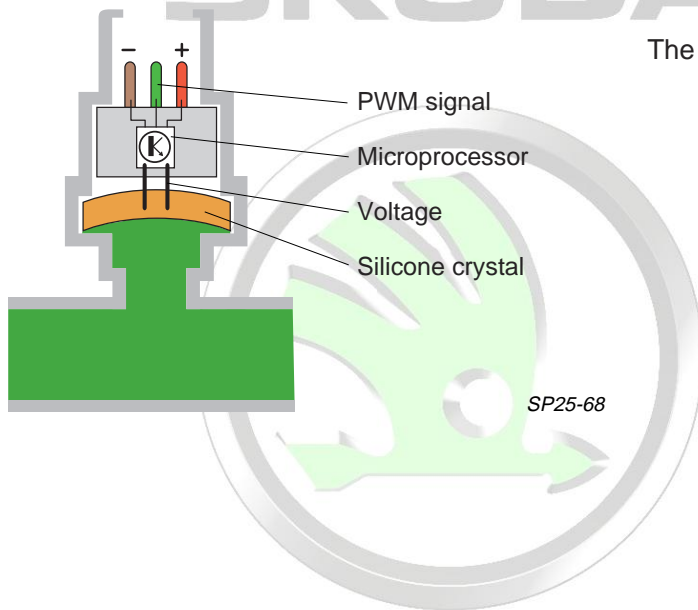
At a low pressure of 0.24 MPa, the pulse width is 2.6 ms.

This corresponds to 13 % of the period.

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SP25-67

High pressure (rising)

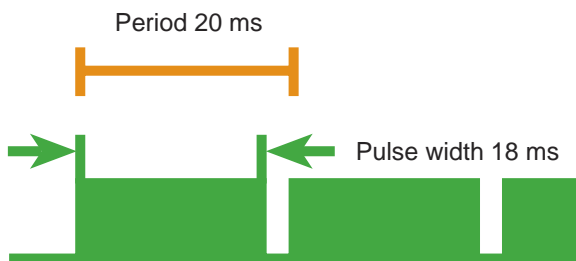


At a high (rising) pressure, the shape of the crystal alters to a greater extent, which in turn results in an increase in the electrical resistance.

The voltage is reduced by the same ratio.

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PWM signal



The pulse width increases in the same ratio to the increasing pressure.

At a high pressure of 0.37 MPa the pulse width is 18 ms. This corresponds to 90 % of the period.

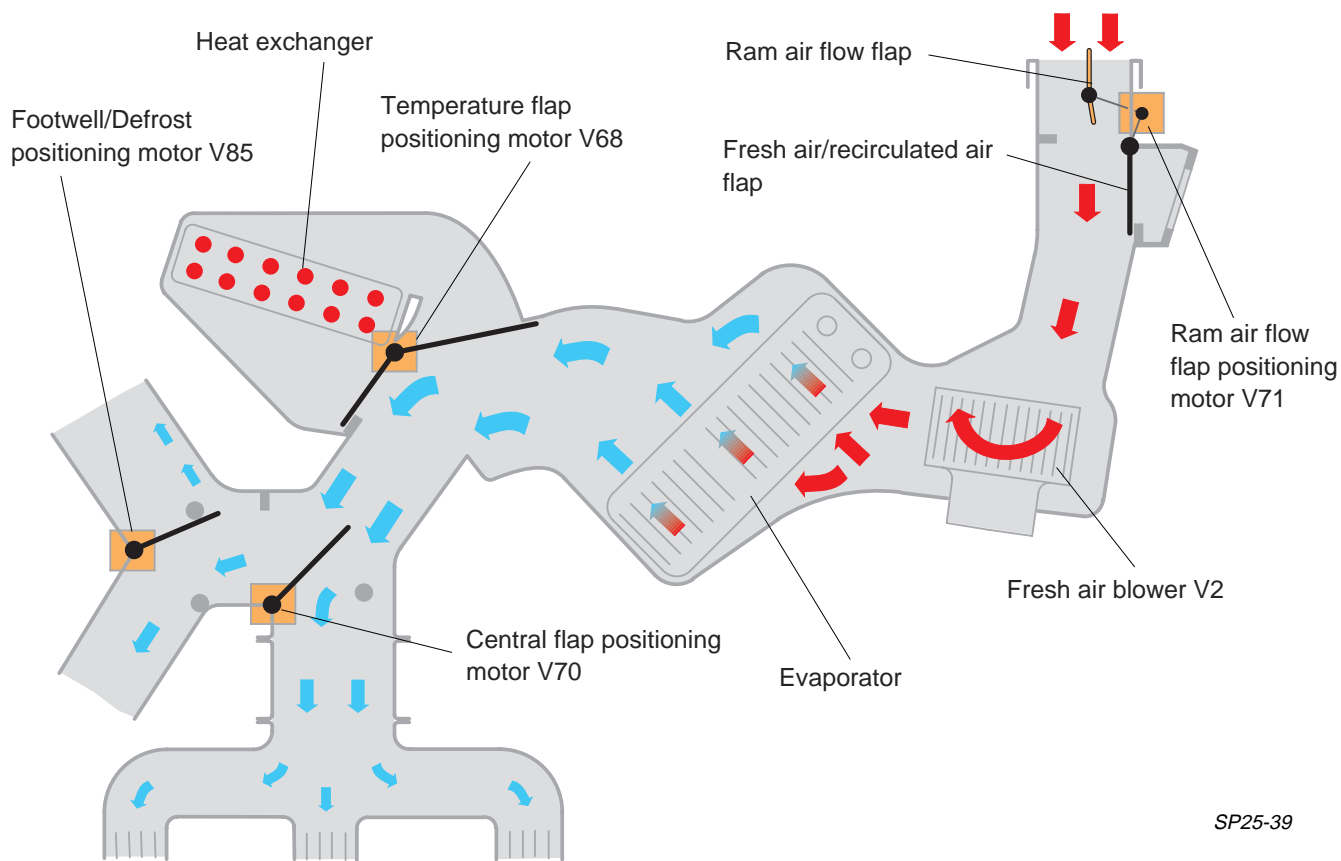
SP25-69



Note:

It is possible to visualise the PWM signal with the digital memory oscilloscope of the new vehicle diagnosis system VAS 5051.

Air Flow



SP25-39

Air flow

The air flow as well as the function of the blower and the recirculated air mode of the Climatronic are similar in design to the manual air conditioning system of the OCTAVIA.

You can find a function description of this in Self Study Programme No. 15 of the SKODA OCTAVIA.

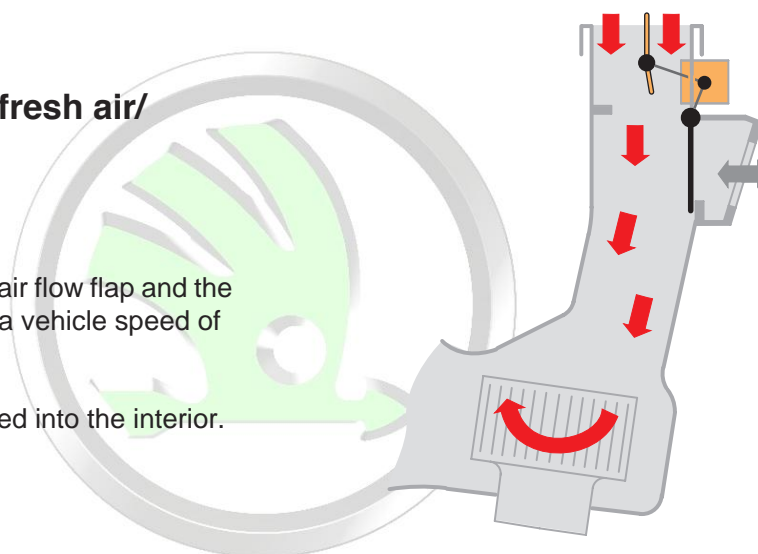
A new feature of this system are the positioning motors for each flap and for the ram air flow flap. They are operated jointly with the fresh air/recirculated air flap by a positioning motor.

Ram air flow flap and fresh air/recirculated air flap

Fresh air mode

In the fresh air mode, the ram air flow flap and the fresh air flap are fully open at a vehicle speed of less than 20 km/h.

The fresh air flows unobstructed into the interior.



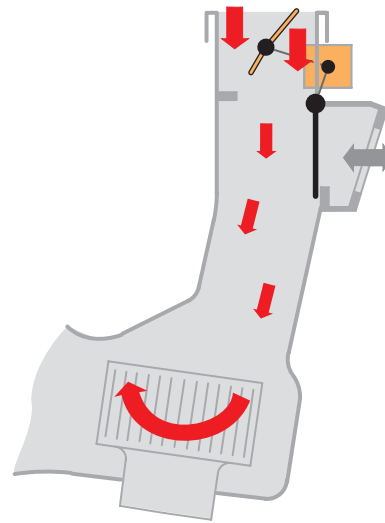
SP25-35

Ram air flow mode

When the car is travelling at higher speeds, the ram air flow prevents too much air flowing into the passenger compartment.

The ram air flow flap is opened and closed in line with the speed of the vehicle according to a defined map.

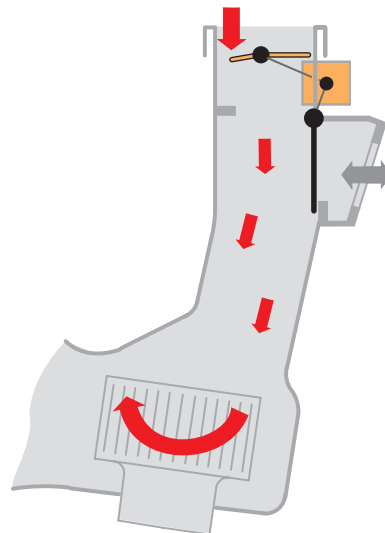
The position of the ram air flow flap is also influenced by the difference between the set and actual temperatures in the passenger compartment. If the temperature difference is extremely high, the opening cross-section remains open even when vehicle speed rises in order to more rapidly attain the desired temperature.



SP25-36

The ram air flow flap is closed in accordance with the map from a defined vehicle speed.

Only a small portion of fresh air flows through the remaining narrow gap to the fresh air duct and into the passenger compartment, the fresh air flow, however, remains practically constant. This makes it possible to more easily maintain the interior temperature at a constant level.



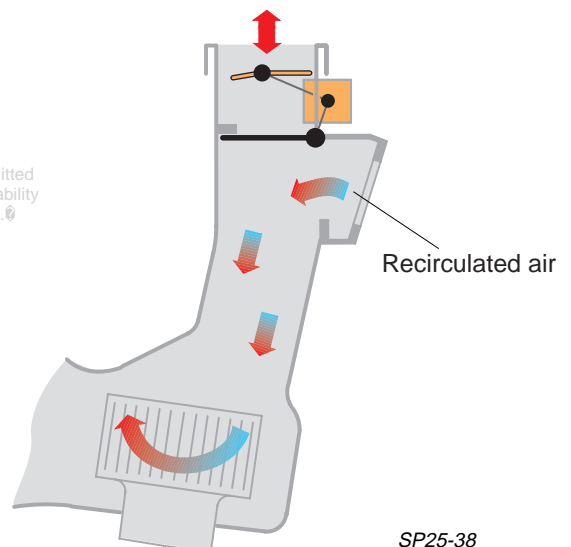
SP25-37

Recirculated air mode

Both flaps are closed in the recirculated air mode.

The fresh air supply is shut off.

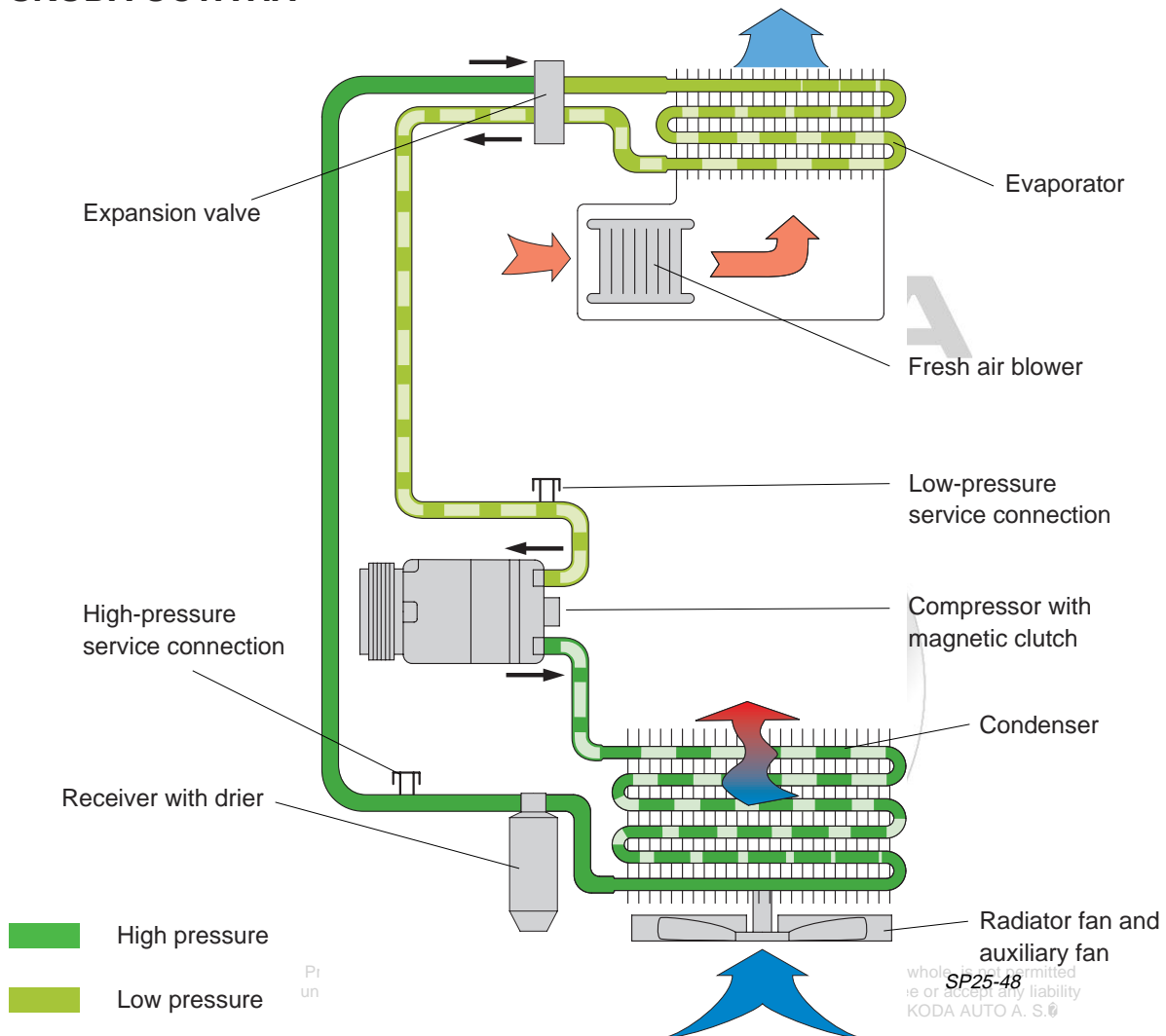
In this mode, air is only extracted from the passenger compartment.



SP25-38

Diagram of Refrigerant Circuit

Diagram of refrigerant circuit of the SKODA OCTAVIA



You will be familiar with the basic operating principle of an air conditioning system from Self Study Programme No. 10.

The Climatronic fitted to the OCTAVIA has the same basic design of the refrigerant circuit:

- Self-regulating compressor
- Receiver with drier
- Expansion valve
- Condenser
- Evaporator (in heating/AC unit)
- 1 service connection each in high-pressure and in low-pressure part of the refrigerant circuit
- System filled with environmentally-compatible refrigerant R134a

The radiator fan and an auxiliary fan ensure proper cooling of the engine in the engine cooling circuit and of the condenser in the refrigerant circuit when the air conditioning system is operating.

Protective circuits (mechanical/electrical) are provided for protecting the entire operation of the air conditioning system and of the vehicle engine.

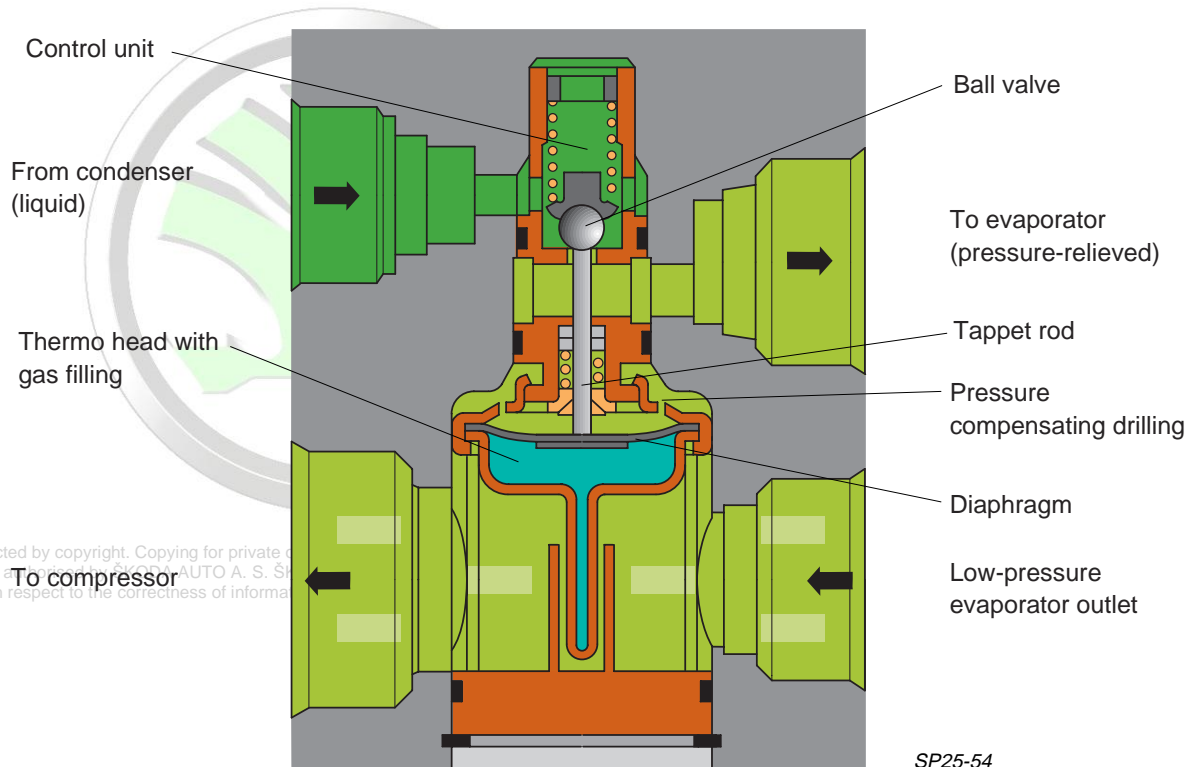
All the safety precautions regarding carrying out work on vehicles fitted with air conditioning and on handling refrigerants apply in full to the refrigerant circuit of the Climatronic system.

Expansion valve with internal thermo head

The expansion valve is located directly upstream of the evaporator between the high-pressure and low-pressure sides of the refrigerant circuit, exactly as on the FELICIA air conditioning system.

The control unit is a compact design. All of the refrigerant flowing back from the evaporator to the condenser flows around the thermo head with its gas filling.

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Operating principle

The flow of liquid refrigerant is atomised at the valve, the stress is released and it cools down.

The valve regulates the refrigerant flow in such a way that the vapour does not become gaseous until it reaches the evaporator, in line with the heat flow.

The expansion valve is controlled thermostatically for this purpose.

It features the control unit with thermo head and ball valve for this purpose.

The thermo head contains a special gas filling on the one side of the diaphragm.

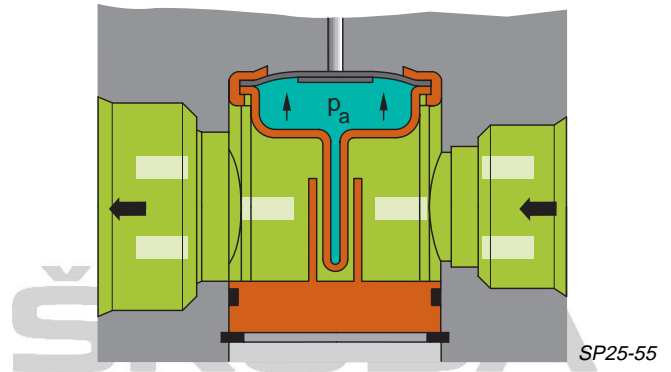
The opposite side is connected by means of pressure compensating drillings to the evaporator outlet (low-pressure side).

The ball valve is operated by a tappet rod.

Diagram of Refrigerant Circuit

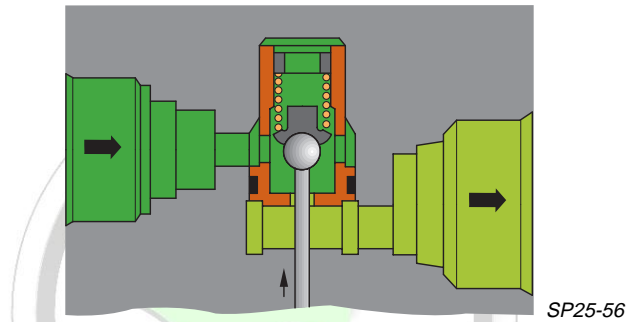
The variable valve opening (depending on the evaporator temperature which exists) makes it possible to achieve an alternating cross section of the expansion valve.

Increase in cooling load results in - higher temperature at evaporator outlet
consequently
Pressure rise (p_a) of gas filling in thermo head



The cross section at the ball valve is enlarged by means of the diaphragm and tappet rod.

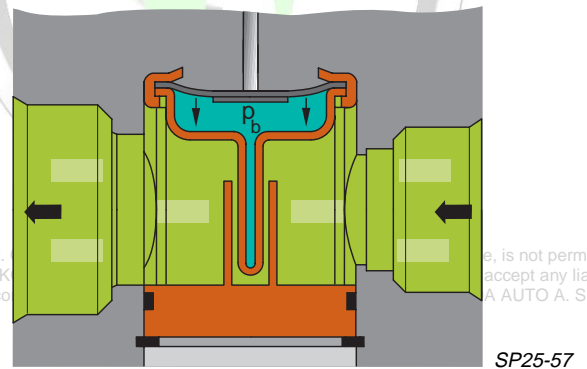
A greater quantity of refrigerant flows to evaporator and absorbs heat as it passes from the high-pressure to the low-pressure side.



The air flowing through is cooled down in the evaporator.

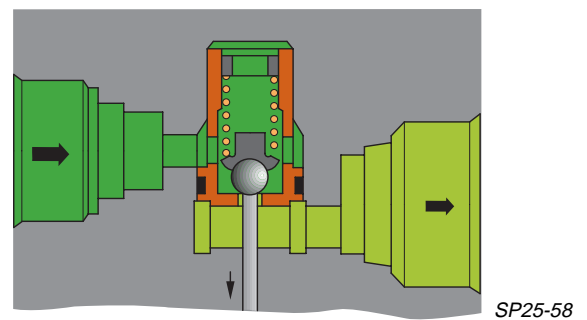
If the temperature of the refrigerant at the evaporator outlet drops, this results in a pressure drop (p_b) in the thermo head

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The cross section at the ball valve and thus the flow to the evaporator are reduced; a smaller quantity of the refrigerant flows to the evaporator.



Radiator Fan Circuit

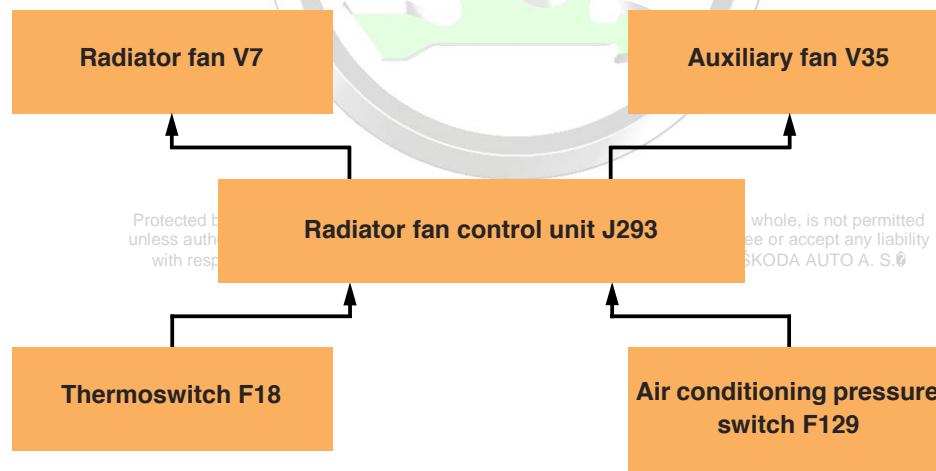
Circuit of the fan for cooling the engine/condenser

Operation of the fan is a basic condition for proper function of the Climatronic system (refrigerant circuit) and of the engine (coolant circuit).

To ensure adequate cooling capacity, the auxiliary fan V35 also runs when the air conditioning is in operation. Radiator fan V7 and auxiliary fan V35 ensure an adequate flow of fresh air at the radiator and at the condenser.

The fan is controlled by the radiator fan control unit J293.

Both fans are controlled in line with the temperature of the coolant and with the pressure in the refrigerant circuit.



Monitoring functions

- **Coolant temperature**
The signal sensor is the radiator fan thermoswitch F18.
The thermoswitch is located in the vehicle radiator. Radiator fan without operation of AC

1st stage	on	92 ... 97 °C
	off	84 ... 91 °C
2nd stage	on	99 ... 105 °C
	off	91 ... 98 °C
- **Pressure in refrigerant circuit**
The signal sensor is the air conditioning pressure switch F129
at a pressure greater than 1.6 MPa (16 bar) both fans operate in stage 2
at a pressure greater than 3.2 MPa (32 bar) the air conditioning is switched off
at a pressure less than 0.2 MPa (2 bar) the air conditioning is switched off

Operating combinations

- Air conditioning is switched on, consequently compressor also switched on and pressure in refrigerant circuit greater than 0.2 MPa (2 bar) = both fans operate in stage 1
- High pressure in refrigerant circuit greater than 1.6 MPa (16 bar) and/or coolant temperature greater than 99 °C = both fans operate in stage 2
- If pressure in refrigerant circuit drops below 1.6 MPa (16 bar) and coolant temperature is below 99 °C = both fans again operate in stage 1
- Only the radiator fan operates when engine is running with air conditioning off.

Compressor Control

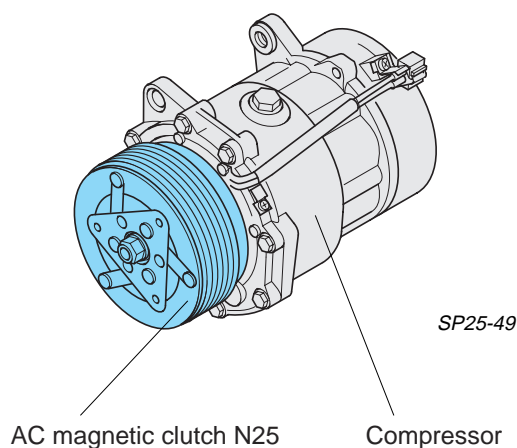
Air conditioning magnetic clutch N25

The magnetic clutch is operated by the Climatronic control unit through the radiator fan control unit.

It switches the compressor on or off.

In order to protect the engine (effect on engine cooling) and the air conditioning system, the compressor control not only integrates the control components of the Climatronic system but also the additional components of the coolant temperature warning switch (overheating) F14 and the air conditioning pressure switch F129.

In addition, on a vehicle fitted with an automatic gearbox, the kickdown signal is used for switching the compressor off and on. There are a number of switch-off conditions with which it is important to be familiar for performing service work.



Compressor switch-off conditions

- Safety switch-off (through F129) if excessively high pressure in refrigerant circuit
- Safety switch-off (through F129) if excessively low pressure in refrigerant circuit
- No engine speed signal
- Air conditioning mode switched off with the "minus" button for fresh air blower speed (through E87)
- ECON mode (cooling system switched off manually through E87)
- Ambient temperature below approx. 3 °C
- Automatic gearbox control unit (kickdown function)
- Insufficiently low supply voltage (below 9.5 V)
- Safety switch-off (through F14) if excessively high coolant temperature (disengaged at 119 °C, re-engaged at 112 °C)
- AC compressor switched off by engine control unit (through Climatronic control unit)
- AC compressor switched off by automatic gearbox control unit (through Climatronic control unit)
- Safety switch-off if fresh air blower V2 or fresh air blower control unit is faulty



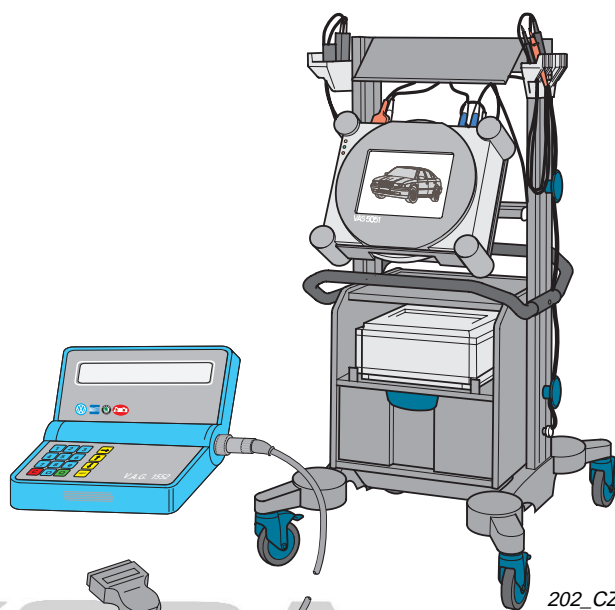
Note:
Most of these switch-off conditions can be tested by using the self-diagnosis, function 08 - Reading measured value block.

Self Diagnosis

The Climatronic control unit features a fault memory to enable any failure of the component in the Climatronic system or an open circuit in the wiring to be rapidly detected.

Self-diagnosis can be performed using the vehicle system tester V.A.G 1552, the fault reader V.A.G 1551 or with the vehicle diagnosis, measurement and information system VAS 5051.

If faults occur in the sensors or components monitored, the faults are stored in the fault memory (permanent memory) with an indication of the type of fault.



202_CZ_002

ŠKODA SP17-29

If a fault which has a continuous influence on the operation of the Climatronic system is stored, all the symbols in the display panel of the operating and display unit E87 flash for about 15 seconds after the ignition is switched on.



SP25-46

The address word for self-diagnosis of the Climatronic system is:

08 - AC/heating electronics

The following functions are possible:

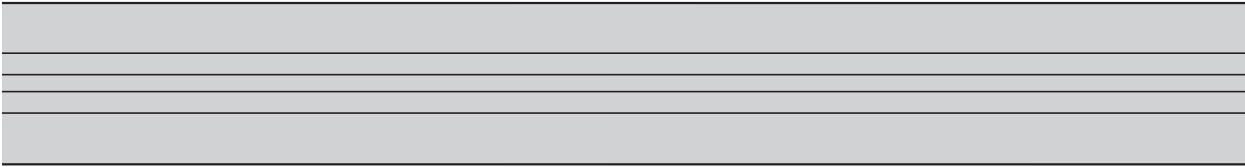
- 01 - Interrogating control unit version
- 02 - Interrogating fault memory
- 03 - Final control diagnosis
- 04 - Basic setting
- 05 - Erasing fault memory
- 06 - Ending output
- 07 - Coding control unit
- 08 - Reading measured value block

It is necessary to code the Climatronic control unit each time it is installed.

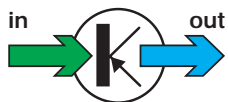
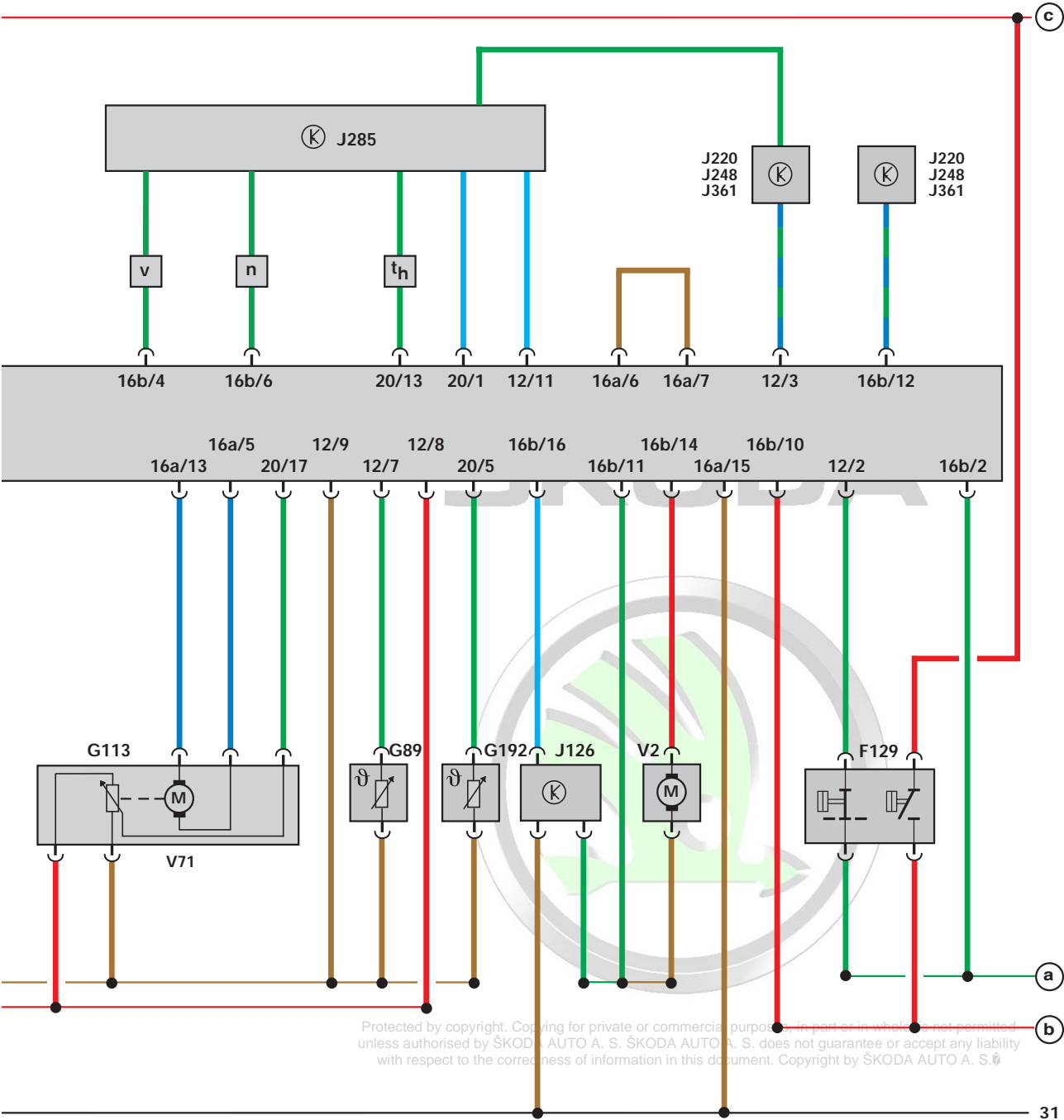
The coding varies according to the particular country.

In addition, it is also necessary to initiate function 04 - Basic setting each time the positioning motors are replaced.

This is done by moving the positioning motors into the end positions. The Climatronic control unit then stores the values of the potentiometers of the positioning motors and thus adopts their basic setting.



30
15
X
31

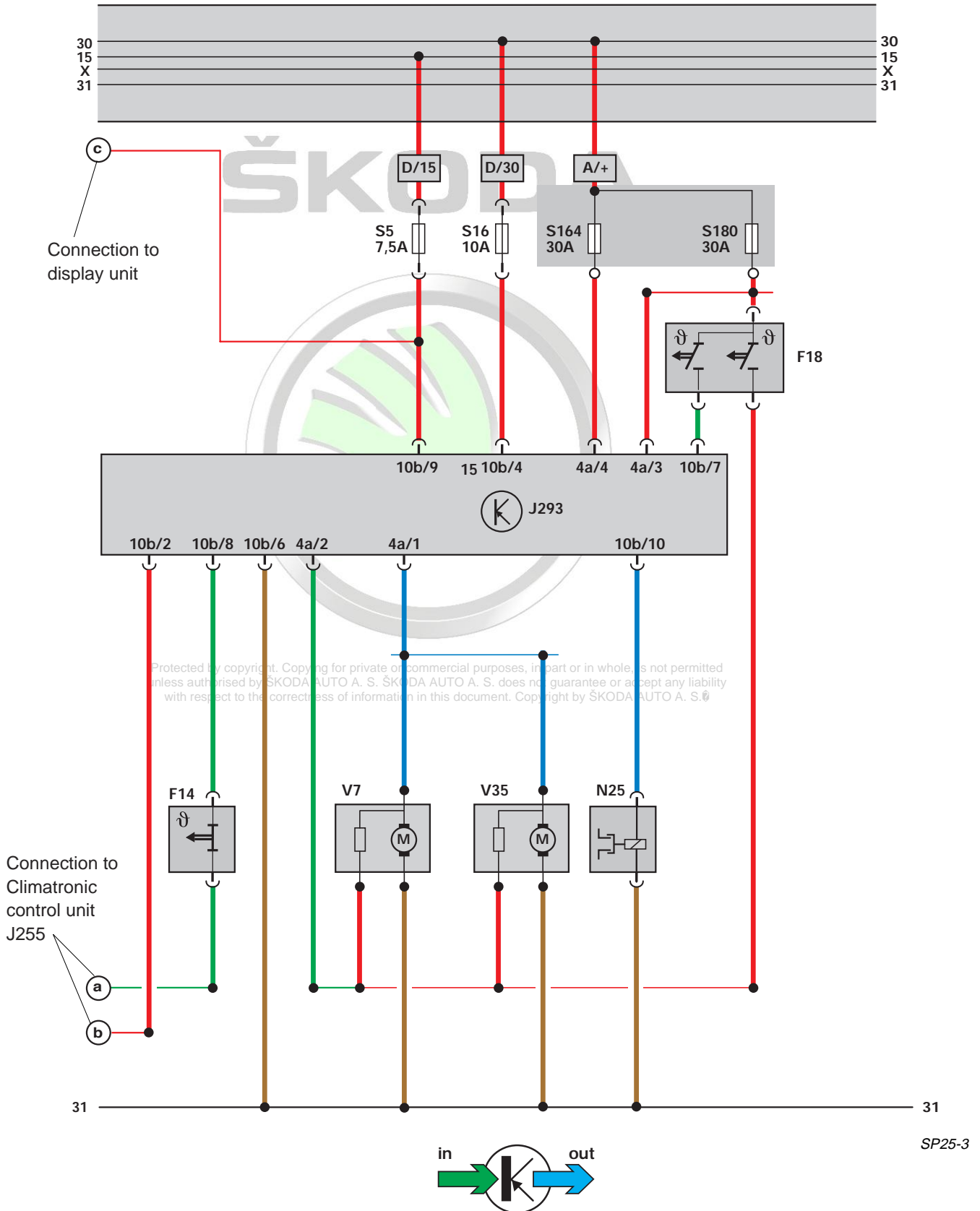


Refer to page 37 for the designation of the components

SP25-2

Function Diagram

Radiator fan control






Legend of function diagram






The function diagram represents a simplified current flow diagram.

It shows all the links of the Climatronic system components including the radiator fan control unit.

Additional signals

	Vehicle speed signal
	Engine speed signal
	Stationary time signal

Colour coding

	Input signal
	Output signal
	Positive
	Earth
	K diagnosis wire

Components

A	Battery +
D	Ignition/starter switch terminal 30 or terminal 15
E87	Climatronic operating and display unit
F14	Coolant temperature warning switch (overheating)
F18	Radiator fan thermostwitch
F129	Air conditioning pressure switch
G17	Ambient air temperature sensor
G56	Dash panel temperature sensor
G89	Fresh air intake duct temperature sensor
G92	Potentiometer of temperature flap positioning motor V68
G107	Sunlight penetration photo sensor
G112	Potentiometer of central flap positioning motor V70
G113	Potentiometer of ram air flow flap positioning motor V71
G114	Potentiometer of footwell/defrost flap positioning motor V85
G192	Footwell vent temperature sensor
J126	Fresh air blower control unit
J220	Motronic control unit
J248	Diesel direct injection system control unit
J255	Climatronic control unit
J285	Control unit with display in dash panel insert
J293	Radiator fan control unit
J361	Simos control unit
L75	Digital display illumination
L76	Pushbutton illumination
N25	Air conditioning magnetic clutch
S...	Fuse with number
V2	Fresh air blower
V7	Radiator fan
V35	Right coolant fan (auxiliary fan)
V42	Temperature sensor blower
V68	Temperature flap positioning motor
V70	Central flap positioning motor
V71	Ram air flow flap positioning motor
V85	Footwell/defrost flap positioning motor

Test Your Knowledge

Which answers are correct?
Sometimes only one.
Perhaps also more than one - or all!



1. Which of the following statements regarding the Climatronic system are correct?
 - A. The temperature is regulated electronically.
 - B. The electronics system is not able to take into account individual wishes.
 - C. The temperature control is not able to compensate for the effect of the sun's rays.
2. A recirculated air mode can be individually selected on the manually regulated air conditioning system.
 - A. The Climatronic system does not have a recirculated air mode; a ram air pressure flap is provided instead.
 - B. A recirculated air mode can be achieved on the Climatronic system by a combination of the air flow and defrost settings.
 - C. A recirculated air mode can also be selected individually with the Climatronic system.
3. The ram air flow flap is used for
 - A. shortening the response time of the air conditioning control
 - B. avoiding wind noises in the AC unit at high speeds
 - C. reducing the flow cross section in the intake duct of the fresh air at high speeds.
4. What is the task of the dash panel temperature sensor?
 - A. Providing information to the Climatronic control unit regarding the temperature of the air which is flowing through the dash panel vent.
 - B. Providing information to the Climatronic control unit regarding the intensity of the sunlight above the dash panel.
 - C. Providing information regarding the interior temperature measured in the vehicle.
5. The temperature control takes into account the signals supplied by several temperature sensors. Which answers are not correct?
 - A. Sunlight penetration photo sensor G107
 - B. Thermoswitch F18
 - C. Ambient air temperature sensor G17
 - D. Footwell vent temperature sensor G192

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6. The fresh air blower V2
- A. is also operated by the radiator fan control unit
 - B. is operated and controlled by the fresh air blower control unit in line with the calculated control voltage
 - C. can be also set individually to any desired setting, in addition to the automatic control.
7. What are the operating conditions in which the radiator fan operates in stage 2?
- A. Coolant temperature higher than 99 °C
 - B. High pressure in refrigerant circuit greater than 1.6 MPa (16 bar)
 - C. Coolant temperature warning switch (overheating) F14 operates
8. The Climatronic control unit is linked to form a single unit
- A. with the radiator fan control unit
 - B. with the fresh air blower control unit
 - C. with the operating and display unit
 - D. with the dash panel temperature sensor.
9. Most of the Climatronic components have a self-diagnosis capability.
- A. The Climatronic control unit features a fault memory for this purpose.
 - B. If a fault exists which has a continuous effect on operation of the Climatronic system, the symbols in the display unit come on and remain on.
 - C. If a fault exists which has a continuous effect on operation of the Climatronic system, the symbols in the display unit come on for 15 seconds after the ignition is switched on.
10. In certain environmental conditions, the Climatronic system may be switched off even though there is no fault in the system.
- A. Ambient temperature higher than 40 °C
 - B. Ambient temperature lower than 3 °C
 - C. Coolant temperature of engine higher than 119 °C

1. A.; 2. C.; 3. C.; 4. C.; 5. B.; 6. B.; C.;
7. A.; B.; 8. C.; D.; 9. A.; C.; 10. B.; C.

Answers



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