

Document title Climate control, basic function

Document number gf8300p9901a

Model all (CAR)

Overview

This document contains information on:

- General
- Function requirements
- Recording and evaluation of variables
- Actuation of air conditioning components

General

The climate control system is controlled according to the following criteria:

- Settings on the air conditioning control panel or the multimedia system control

- Variables (registered by various sensors)

The climate control controller regulates the following properties:

- Air temperature (heating/cooling)
- Air humidity (humidify/dry)
- Air components (filtering/exchange)
- Air speed (blower control)

Recording and evaluation of variables

The climate control controller registers the following variables and evaluates them:

- Interior temperature

The vehicle interior temperature is registered by a temperature sensor in the overhead control panel or in the instrument panel and is transmitted to the climate control controller.

- Outside temperature

The outside temperature is registered by the outside temperature sensor and is transmitted to the climate control controller.

i If the vehicle is stationary, the measured temperature can differ considerably from the actual outside temperature. The outside temperature is only incorporated into the interior temperature regulation, when the vehicle speed is more than 20 km/h. At speeds below 20 km/h and when the ignition is switched off and on, the climate control controller uses the last measured temperature value.

- Temperature at the air outlets in the vehicle

The climate control controller receives the information from the outlet air temperature sensors and uses it to regulate the outlet air temperature.

- Temperature and moisture on windshield

In the rain and light sensor with additional functions, the relative air humidity is registered directly at the windshield. If the probability of window fogging is high, the climate control controller increases the blower setting. If automatic engine start/stop is active, the climate control controller can prevent an automatic engine stop. In the case of impending window fogging during an engine stop phase, the climate control controller can cause the engine to start and activate the refrigerant compressor.

- Coolant temperature

The combustion engine control unit calculates the coolant temperature and transmits a corresponding signal to the climate control controller. In hybrid or electric vehicles, the coolant temperature is registered in the high-voltage PTC heater and read in by the climate control controller. The coolant temperature is used to control the air mixing flaps and to actuate the coolant circulation pump.

Actuation of air conditioning components

The climate control system actuates the following climate control components:

- Electronic blower motor

The electronic blower motor drives a radial blower in the air conditioner housing. It is actuated according to the respective settings on the air conditioning control panel.

Depending on the vehicle model, the climate control system is controlled via various control units:

- Climate control control unit
- Central controller unit (SAM)

The climate control controller is networked with the on-board electronics. This means it can incorporate relevant influences for the control. The control quality is therefore improved and energy consumption is reduced.

The tasks of the climate control controller are:

- Recording and evaluation of variables
- Actuation of air conditioning components
- Switch point adjustment with transmission 725 (not in hybrid vehicles)
- Control of operating modes (e.g. fresh air/air-recirculation mode, evaporator drying, etc.)

Function requirements

- Circuit 15 on (not for residual heat utilization or heating mode request from stationary heater)

- Climate control switched on

Only for cooling mode:

- Refrigerant compressor switched on (A/C function)
- Engine running (for vehicles with mechanical refrigerant compressor).

- Evaporator temperature

The climate control controller receives the information from the evaporator temperature sensor. If the evaporator temperature drops to approx. 2°C, the refrigerant compressor shuts down. This prevents the evaporator from icing up. As of an evaporator temperature of 2.5°C, the refrigerant compressor cuts in again.

- Refrigerant pressure

The climate control controller receives the value from the refrigerant pressure sensor and compares it with a stored temperature/pressure curve. At a refrigerant pressure below or above predetermined values, the refrigerant compressor switches off or does not switch on.

- Solar radiation (equipment specific)

The climate control controller receives the information from the rain and light sensor with additional functions and regulates the interior temperature accordingly. In the sun is shining in on one side, it sets an adequate temperature difference between the left and the right specified control temperatures.

If the sun is shining into the vehicle from the side or from the rear and also at an acute angle, the sun sensor provides imprecise values. This is why a sun sensor is virtually realized in the rear passenger compartment. In addition, the multimedia system control sends time and location information (with the aid of the GPS signal) to the climate control system. The climate control system references the values from the sun sensor at the windshield and adapts the temperature control accordingly.

- Vehicle speed

The ESP® control unit transmits the speed signal to the climate control controller. The vehicle speed is used to regulate the ram air and for the internal calculation of the outside temperature, e.g. while stationary.

- Engine speed

The combustion engine control unit determines the engine speed and transmits the information to the climate control controller. It is used among other things for controlling the refrigerant compressor.

- Door status, position of side windows and sliding roof

The corresponding control units register the information and transmit it to the climate control controller.

When a door, the windows or the sliding roof is open, the climate control controller references the values of the interior temperature sensor and adjusts the temperature control accordingly. This prevents any unnecessary readjustment in the event of high temperature differences between the inside and outside air.

- Air quality (depending on equipment)

The climate control controller receives the information from the air quality sensor. If the concentration of pollutant gas is high, air-recirculation mode activated.

- Actuation of the actuator motors for the respective air flaps:

- Air distribution flaps
- Fresh air/recirculated air flap
- Air mixing flaps (temperature control)

In the equipment variant with air quality package, the climate control system also actuates the following climate control components:

- Electronic booster blower (vehicle and equipment specific)
The electronic booster blower improves ventilation of the rear compartment. Actuation takes place depending on the settings made at the rear air conditioning operating unit.
- Refrigerant compressor
Via the regulation valve, the climate control controller regulates the refrigerant compressor steplessly up to 100 %.
The climate control controller also transmits the calculated torque of the refrigerant compressor to the combustion engine control unit. This keeps the idle speed constant in accordance with the additional load that occurs when the refrigerant compressor is switched on.
- Actuation of fan motor (engine fan)
The climate control controller calculates the target fan speed depending on the refrigerant pressure and transmits this information to the combustion engine control unit.
- Actuation of PTC heater booster (with certain engines and equipment features)
The climate control controller activates the PTC heater booster as required. This heats up the vehicle interior up more quickly.
- Actuation of high-voltage PTC heater (in hybrid or electric vehicles)
The climate control controller activates the high-voltage PTC heater booster as required. This heats up the vehicle interior up more quickly.
- Actuation of the coolant circulation pump (for certain engines and equipment features)
To guarantee the heat output at low engine speeds or when the engine has stopped, the coolant circulation pump is also actuated.

- Driver side air vent ionizer
- Perfume atomizer generator

Actuation by other systems

The A/C components can also be actuated via the revitalization.

	Further basic function		
	Multimedia system, basic function		GF82.85-P-9900A
	Function schematics		
	Function schematic for actuating blower motor	Model 118, 177, 247 Model 167 Model 293	PE83.10-P-2502-97A PE83.10-P-2502-97B PE83.10-P-2502-97D
	Function schematic for actuating refrigerant compressor	Model 118, 177, 247 Model 167 Model 293	PE83.55-P-2501-97A PE83.55-P-2501-97B PE83.55-P-2501-97D
	Function schematic for actuating PTC heater booster	Model 118, 177, 247 with engine 608, 654 Model 247 with engine 260, 282 For countries with FMVSS certification Model 167 with engine 264, 274, 654, 656 except code 581 (Automatic air conditioning) Model 167.9 with engine 256 except code 581 (Automatic air conditioning) Model 167 with code 581 (Automatic air conditioning)	PE83.70-P-2502-97A PE83.70-P-2502-97B
	Function schematic for high voltage PTC heater actuation	Model 177, 247 with code ME08 (Hybrid drive 75-84 kW VARIANT (INCLUDING PLUGIN)) Model 167 with code ME05 (HYBRID DRIVE 80KW VARIANT (INCLUDING PLUGIN)) Model 293 with code ME01 (Electric motor)	PE83.70-P-2503-97A PE83.70-P-2503-97B PE83.70-P-2503-97D
	Control units		
	Basic function of signal acquisition and actuation module	Model 118, 177, 247	GF54.21-P-9895A
	Climate control control unit, basic function	Model 167, 293	GF83.40-P-9890A
	Components		
	Air conditioner housing, basic function		GF83.40-P-2015A
	A/C operating unit, basic function		GF83.40-P-2016A
	Expansion valve, basic function		GF83.40-P-2018A
	Outlet air temperature sensor, basic function		GF83.40-P-2019A
	Circulation pump, basic function		GF83.40-P-2020A
	Refrigerant pressure sensor, basic function		GF83.40-P-2021A
	Air quality sensor, basic function	Model all (CAR) with code 581 (Automatic air conditioning) Model all (CAR) with code 830 (China version)	GF83.40-P-2022A
	Fine particle sensor, basic function	Model all (CAR) with code 830 (China version) with code P53 (Air cleaning package)	GF83.40-P-2023A
	Electric refrigerant compressor, basic function		GF83.55-P-2000A
	Mechanical refrigerant compressor, basic function		GF83.55-P-2001A
	PTC heater, basic function	Model 167.1 with engine 264, 274, 654, 656 except code 581 (Automatic air conditioning) Model 167.1 with code 581 (Automatic air conditioning) Model 177, 247 with engine 608, 654	GF83.70-P-2009A

	High-voltage PTC heater, basic function	Model all (CAR) with code ME01 (Electric motor) Model all (CAR) with code ME05 (HYBRID DRIVE 80KW VARIANT (INCLUDING PLUGIN)) Model all (CAR) with code ME08 (Hybrid drive 75-84 kW VARIANT (INCLUDING PLUGIN))	GF83.70-P-2014A
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