Engine all (CAR)

Overview

This document contains information on:

- General
- Function requirements
- Cooling by airstream
- Cooling by fan
- Cooling air control via radiator trim flaps

General

The cooling air flow regulates the exchange of heat between the vehicle and its surroundings.

Function requirements

- Engine management ON (circuit 87M)
- Engine runs
- Function requirements for delayed fan switch off
- Ignition OFF (circuit 15)

Cooling air flow due to airstream

When there is a cooling air flow due to an airstream, the heat to be dissipated is released from the surfaces of the components to be cooled, such as the charge air cooler or oil pan, directly into the circulating ambient air. The cooled air is routed directly to the corresponding component parts via air inlet grilles, plates and channels for guiding the air through the body.

Cooling by fan

In order to achieve the necessary cooling outputs, the radiator for the high- and low-temperature circuit is ventilated by one or multiple fans. For low speeds and high outside temperatures, cooling by airstream is not sufficient.

The powertrain control unit actuates the fan via a pulse width modulated signal. The fan speed is specified by the combustion engine control unit and transmitted to the powertrain control unit. The duty cycle of the pulse width signal is 10 to 90 %.

The following functions can be derived from defined duty cycles:

- 0 % \rightarrow fan motor OFF
- 10 % \rightarrow fan motor ON, minimum rotational speed
- 90 % \rightarrow fan motor ON, maximum rotational speed

Delayed fan switch off

If the coolant or engine oil temperatures have exceeded the specified maximum values, the fan motor can continue to run for up to five minutes with the ignition OFF. The duty cycle of the pulse width modulated signal for delayed fan switch off is a maximum of 40 %. If the battery voltage falls below a defined limit, the delayed fan switch off is suppressed.

Fan emergency operation

In the case of a fault in the signal line (loss of frequency) by the powertrain control unit, the fan motor switches itself to the maximum rotational speed.

Cooling air control via radiator trim flaps



P20.40-2301-75

View of the radiator trim (for code 5U3 AIRPANEL)

1 Radiator trim flap actuator motor

View of the radiator shown from the rear on engine 276.9

- 1 Blower housing
- 2 Vacuum fitting
- 3 Vacuum unit
- 4 Radiator trim flap actuator
- 5 Fan motor
- 6 Radiator shutters



P20.20-2662-76

Depending on the amount of cooled air required, the rate of air flow to the radiator can be controlled via the radiator trim flap actuator motor in the front area. The radiator trim flap actuator motor is actuated by the powertrain control unit after engine start and opens and closes the radiator trim.

The radiator trim flaps open in the following cases:

- Coolant temperature > 106 °C
- Intake air temperature > 34 °C
- Vehicle speed > 180 km/h
- Transmission oil temperature > 100 °C
- Fan output> 30 %

- Coolant temperature during diesel particulate filter regeneration > 100 °C
- There is no fault message from the fan motor
- The radiator trim flaps close in the following cases:
- Coolant temperature < 94 °C
- Engine does not run:
- Coolant temperature during diesel particulate filter regeneration < 94 °C

If the radiator trim is closed, the coefficient of drag improves and so does fuel consumption as a result. At the same time, this causes reduced engine compartment cooling off and a dampening of external engine noise emissions.

Control units	
Powertrain control unit, basic function	GF54.21-P-9894A