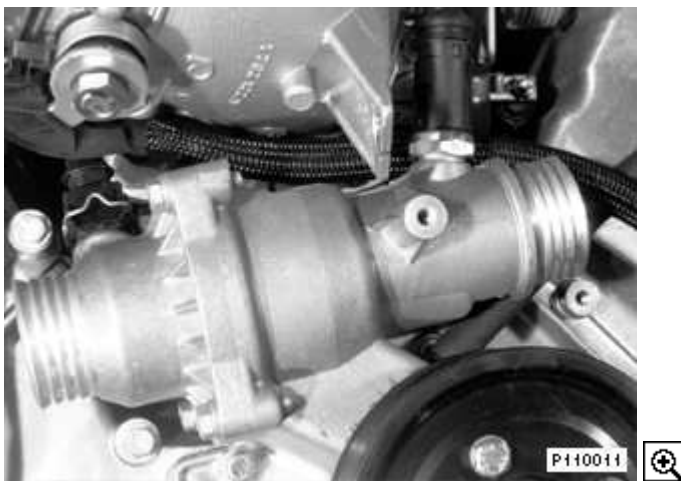

VIN:	Vehicle: 3' / E46 / - / - / - / - / EUR / - / -
System version: 2.33.7	Data version: 2.33.0

Water pump

The housing is made of die cast aluminum or plastic and is screw-mounted on the timing case cover. The dual temperature sensor for the coolant is installed in the water pump housing. This dual temperature sensor is located at the point where the coolant flows out of the engine.



Detail view of water pump with dual temperature sensor

Radiator

An engine oil cooler is additionally fitted for specific country variants.

Function of a conventional thermostat

The control of the engine cooling system with a conventional thermostat is determined by the coolant temperature only. This control system can be subdivided into three operating ranges:

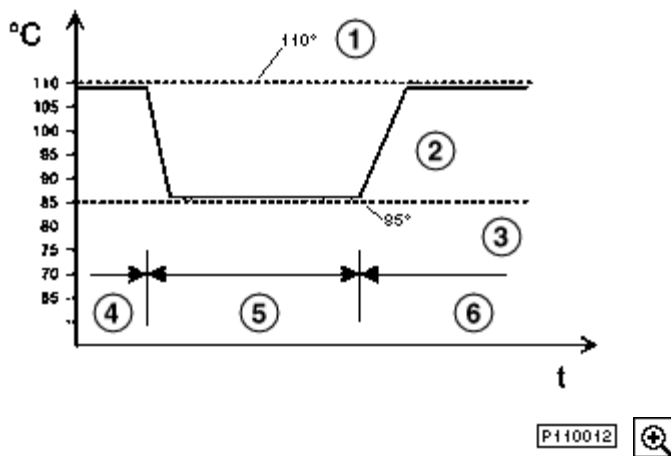
- Thermostat closed: The coolant only flows in the engine. The radiator circuit is closed.
- Thermostat open: The entire volume of coolant flows via the radiator. This ensures the maximum cooling capacity available is utilized.
- Thermostat control range: A part of the coolant volume flows via the radiator. The thermostat sets a constant engine inlet temperature within the control range.

With the aid of the characteristic map thermostat, the coolant temperature can now be influenced specifically within this operating range (thermostat control range).

In this way it is possible to set a higher coolant temperature in the partial load range of the engine. Higher operating temperatures in the partial load range achieve improved combustion, reflected in lower fuel consumption and pollutant emission.

However, higher operating temperatures in the full load range would involve specific disadvantages (ignition

timing (angle) reduction due to knocking). For this reason, lower coolant temperatures are set specifically in the full load range with the aid of the characteristic map thermostat.



Control characteristics of characteristic map cooling	
1	Characteristic curve of a 110 °C thermostat
2	Characteristic curve of a characteristic map thermostat
3	Characteristic curve of an 85 °C thermostat
4	Partial load range
5	Full load range
6	Partial load range

With the aid of this thermostat it is possible to specifically increase the coolant temperature in the partial load range. By increasing the coolant temperature under these engine operating conditions, it is possible to reduce fuel consumption. This characteristic map thermostat is controlled by the engine control module dependent on a characteristic map.

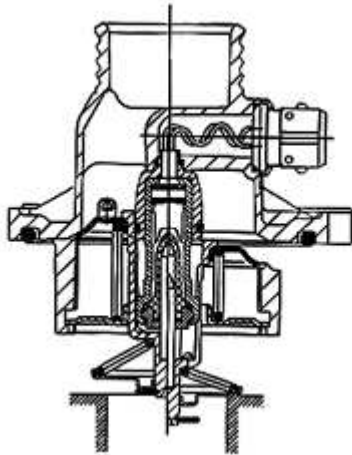
This characteristic map is determined by the following factors:

- Engine load
- Engine speed
- Vehicle speed
- Intake temperature
- Coolant temperature

Design of the characteristic map thermostat

The characteristic map thermostat is an integral thermostat, i.e. the thermostat and thermostat cover make up one unit.

The principle mechanical design of the characteristic map thermostat corresponds to that of a conventional thermostat. However, a heating element is additionally integrated in the expansion element (wax element).



P110013



Cross sectional view of the characteristic map thermostat

The cover of the characteristic map thermostat is made of an aluminum die casting. The electrical connection for the heating element linked to the expansion element of the characteristic map thermostat is integrated in the thermostat cover.



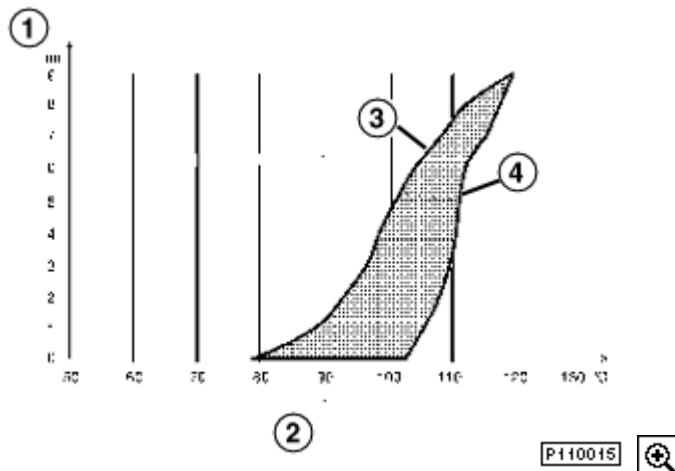
P110014



Characteristic map thermostat with electrical connection for heating element

Function of the characteristic map thermostat

The characteristic map thermostat is designed such that it opens (engine inlet) at a coolant temperature at the thermostat of 103°C without intervention of the integrated heating system. Due to the coolant heating up in the engine, a temperature of approx. 110°C is measured at the point the coolant flows out of the engine (installation location of coolant temperature sensor for DME and instrument cluster gauge). This is the operating temperature of the engine, at which the characteristic map thermostat begins to open without control intervention. In the event of control intervention by the DME control module, power (12 V) is applied to the heating element integrated in the thermostat. Heating the expansion element means that the thermostat now opens at lower coolant temperatures than would be the case without the additional heating function (thermostat control range: approx. 80°C - 103°C).



- | | |
|---|---|
| 1 | Opening path of the thermostat |
| 2 | Coolant temperature |
| 3 | Activation of heating element with 12 V |
| 4 | Activation of heating element with 0 V |

If the coolant temperature exceeds 113°C at the engine outlet, the heating of the characteristic map thermostat is activated by the DME irrespective of the other parameters.

Diagnosis

The line connection and the function of the characteristic map thermostat are monitored by the diagnosis function in the DME control module. Any faults are stored in the fault code memory of the DME control module.

Coolant temperature gauge

The indicator characteristics of the coolant temperature gauge in the instrument cluster have been adapted to the higher temperature level of the engine due to the use of the characteristic map thermostat.

The pointer of the coolant temperature gauge in the instrument cluster is located in the mid-position at coolant temperatures of

75°C - 113 °C

in center position.