

## Thermostat

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### Function

The thermostat is an important component in liquid cooling. It ensures that the combustion engine reaches its ideal operating temperature as quickly as possible and then maintains this temperature in all operating conditions. This is an important prerequisite allowing the combustion engine to achieve optimum performance under all load conditions and emit low levels of harmful substances.

### Designs

Depending on the application and technology of the combustion engine, thermostats have to exhibit different functional characteristics and ways of functioning. The following designs are used:

- Cartridge thermostats (wax thermostats)

Cartridge thermostats are individual components inside a housing. They regulate the temperature precisely, are hard-wearing, maintenance-free and have been proving their worth for decades.

- Housing thermostats (wax thermostats)

Housing thermostats comprise the cartridge and the housing. These modules are fully integrated into the engine.

- Electrically heated thermostats (map thermostats)

The cooling power in performance-optimised modern passenger car combustion engines requires thermostats with a wider working range than that of conventional wax thermostats. The electrically heated thermostat was developed to meet this requirement. Electrically heated thermostats are characterised by a wider working range.

Thanks to additional control via the engine management, the engine temperature can be adjusted more effectively and in response to demand. This improves consumption values and reduces harmful substance emissions.

### Function

- Cartridge thermostats and housing thermostats (wax thermostats)

The work element is the linchpin of the wax thermostat. It is a pressure-resistant housing which is filled

with a special wax. After the engine starts up, the coolant heats up the work element. When a predefined temperature is reached, the wax in the work element liquefies. It expands and acts on a pin in the housing which functions as a working piston. The working piston is pushed out of the housing and opens the flow of coolant to the radiator via a poppet valve so that the engine can be kept in the ideal temperature range. If the coolant falls back below the predefined opening temperature, a spring pushes the poppet and the pin back to their original position. The flow of coolant to the radiator is thus interrupted.

- Electrically heated thermostats (map thermostats)

In an electrically heated thermostat, the wax in the work element is heated up both by the coolant and by means of electric heating. Thanks to this combination, the engine temperature can be regulated specifically according to load requirement. The electrical heating of the work element is controlled using various parameters from the electronic engine management.

The electrical heating of the thermostat causes the premature opening of the coolant circuit in situations where increased performance is required. Depending on the default setting, the engine can thus run in the partial load range at approx. 100°C – 110°C, for example, i.e. hotter than has previously been usual. This reduces consumption by between 1 and 2%. At full load, the temperature is reduced to approx. 80°C, allowing the power and specifically the torque to increase measurably by between 2 and 3%.

Almost as a side-effect, the change in the temperature of the coolant enables the air conditioning to operate in a more favourable temperature range, thus improving climate control in the passenger compartment.

## Safety

In the closed state, a faulty or blocked thermostat can cause the engine to overheat. This in turn leads to the pressure in the cooling system increasing. This can cause consequential damage to the cylinder head, the entire cooling system or even the engine mechanics. In the open state, a faulty or blocked thermostat can prevent the engine from reaching its operating temperature. Whether the thermostat is open or closed, the engine is no longer able to reach its ideal operating temperature. As a result, the fuel consumption of the engine increases and optimum combustion of the fuel/air mixture can no longer be assured. Most motor vehicles on the market have a scale indicator which informs the driver the temperature of the coolant. If the temperature reaches too high a level, the driver is warned by a symbol lighting up on the instrument cluster accordingly.

## Depreciation

The thermostat is maintenance-free. It is designed to last the entire service life of the vehicle. It safeguards the low-wear and thus reliable operation of the engine. However, impurities in the coolant circuit, e.g. caused by a faulty water pump or a faulty cylinder head seal, can cause the thermostat to malfunction. Therefore, should the cooling system sustain damage resulting in impurities, as a precaution, the thermostat should always be replaced along with the associated seal.

## Environmental protection

Permanent regulation of the thermostat keeps the engine in an optimum temperature range at all times. It is in this range that the combustion of the fuel/air mixture will be at its best. Fuel consumption decreases and emissions of harmful substances are low. This ultimately protects both resources and the environment.

## Bilder



## Hersteller

**MAHLE**

MAHLE

**Valeo**

Valeo\_EN

BORGWARNER

BorgWarner

**febi**  
bilstein

Febi\_EN



HELLA

**HERTH+BUSS**

Herth+Bus



Magneti Marelli\_EN

Quelle:

<http://www.my-cardictionary.comhttps://www.my-cardictionary.com/cardictionary/hybrid/products/thermostat.html>