

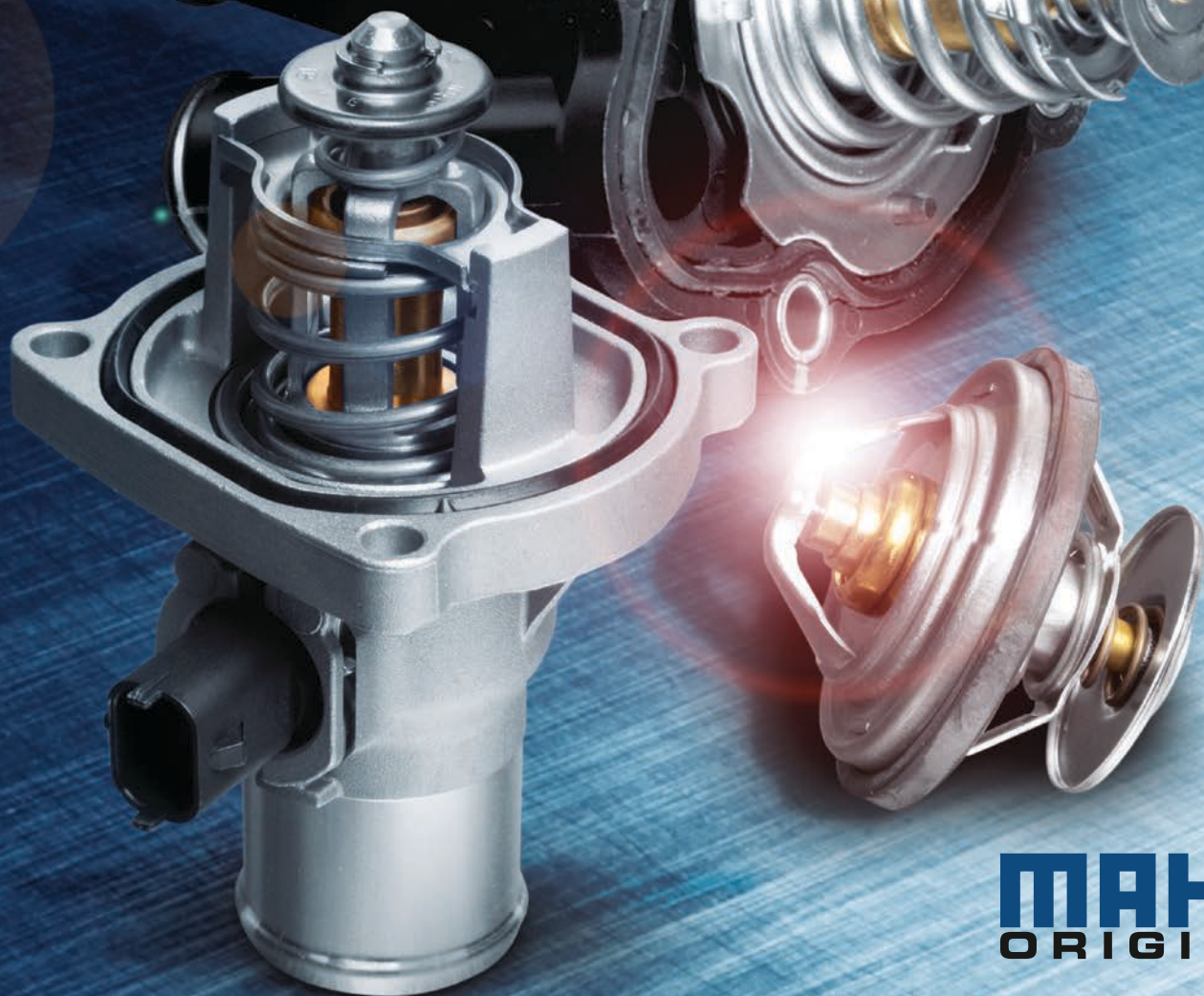
MAHLE

Driven by performance

INNOVATIVE
**TEMPERATURE
MANAGEMENT.**

THERMAL MANAGEMENT CONTROL UNITS

AFTERMARKET



MAHLE[®]
ORIGINAL

WE'VE GOT IT UNDER CONTROL.

MAHLE. The obvious choice.

Your global engine partner.

Our aftermarket portfolio for thermal management, engine parts, turbochargers, mechatronics, electric drives, filtration, and workshop equipment is backed by the comprehensive systems expertise of the MAHLE Group—a leading original equipment manufacturer in the international automotive industry. With a global presence and an excellent sales network in every region, we guarantee ultra-high quality in compliance with vehicle manufacturer specifications and requirements. This, combined with our regional warehouses, ensures your parts are available when and how you need them.

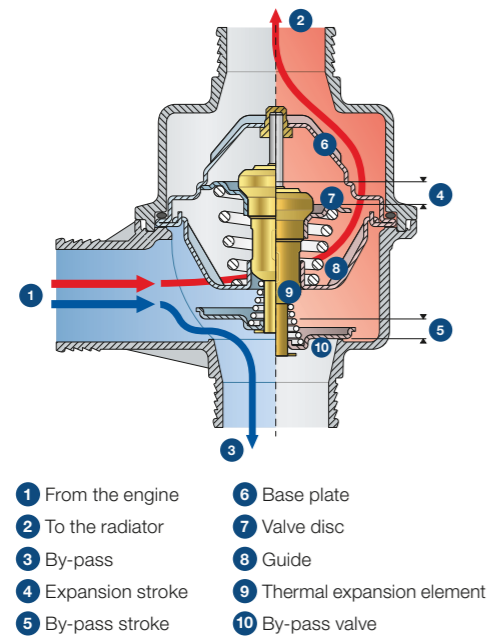
Your benefits. In detail.

As a technology leader in thermal management, we are continuously advancing our products and expanding our range. The result is an extensive inventory for passenger cars and commercial vehicles. Case in point: since acquiring Behr Thermot-tronik GmbH (BTT) in 2013, we have increased our passenger car coverage in Europe from 60% to over 80% (as of 2016). Working closely with every major automobile manufacturer, we deliver top-notch quality and innovative solutions to every customer, every time. This includes protection against counterfeits and product piracy through VeoMark security labels and regular market monitoring. All our expertise is directed at one goal: providing you with the best, highest-quality products and the best service to meet your needs. Your single source, straight from the experts.

Whether you're looking for passenger car or commercial vehicle options, MAHLE Aftermarket offers thermostats, thermal switches, and thermocouples for a wide range of applications.



Thermostat design



- 1 From the engine
- 2 To the radiator
- 3 By-pass
- 4 Expansion stroke
- 5 By-pass stroke
- 6 Base plate
- 7 Valve disc
- 8 Guide
- 9 Thermal expansion element
- 10 By-pass valve

Fig. 1
Thermostat insert with thermal expansion element

Thermostats. Managers of the cooling circuit.

Engines and auxiliary components are only energy-efficient and low-wearing at certain operating temperatures. Smart control of the coolant flow ensures that the optimal temperature is reached more quickly and held constant. This process is regulated by coolant thermostats—featuring a thermal expansion element in the thermostat insert at their core (Fig. 1). As the temperature changes, a built-in wax element changes volume, thus acting as a regulator. When the engine is cold, the coolant circuit remains closed, and the engine components warm up more quickly. Instead of flowing through the radiator, the coolant flows through a smaller circuit known as the by-pass loop (Fig. 2). Heat from the engine warms the coolant up to a defined temperature. Just before the optimum temperature level is reached, the thermostat opens the flow inlet to the radiator (Fig. 3). If the temperature rises too sharply, all the coolant circulates through the radiator whilst the by-pass loop closes to prevent the engine overheating (Fig. 4). The cooling circuit of the auxiliary components can be controlled separately according to this mechanism of action, in the same manner as the engine's primary cooling circuit.

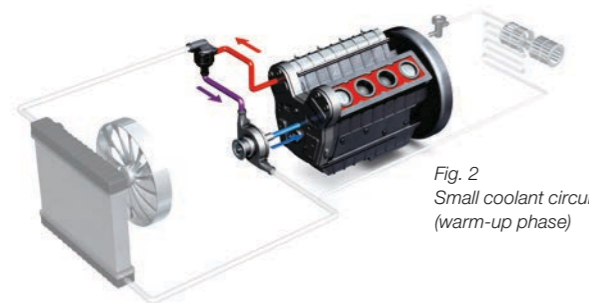


Fig. 2
Small coolant circuit
(warm-up phase)

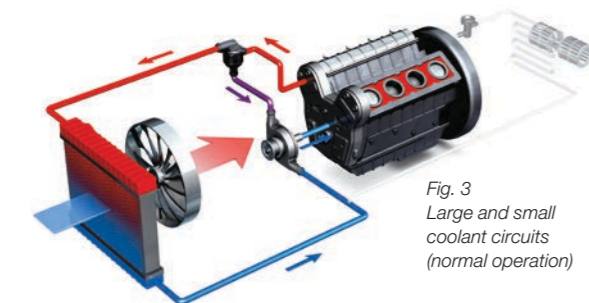


Fig. 3
Large and small
coolant circuits
(normal operation)

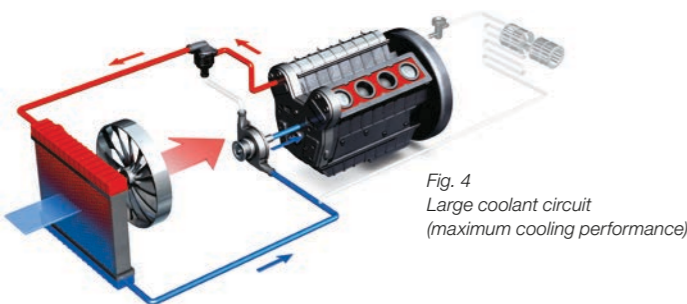


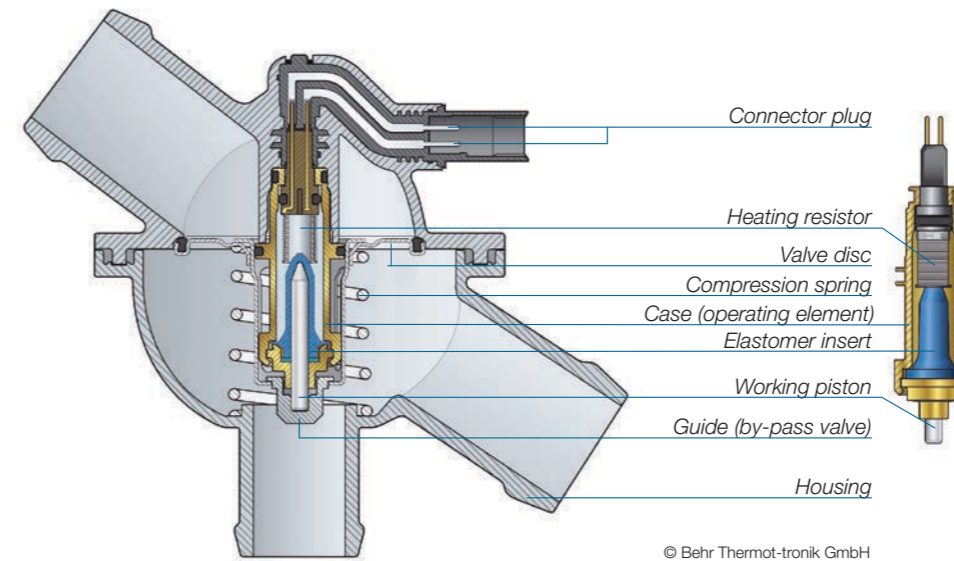
Fig. 4
Large coolant circuit
(maximum cooling performance)

The safe choice for greater efficiency.

The map-controlled thermostat.

This thermostat technology makes it possible to safely raise the operating temperature of passenger car engines to a constant higher level, thus optimising combustion and all accompanying parameters. An integrated heating element is activated electronically on demand, shortening control times compared with conventional wax elements. As a result, the map-controlled thermostat controls the engine temperature more quickly and more precisely—in different load and operating conditions, and always in the optimal range.

Map-controlled thermostat design



Advantages:

- Improved combustion due to increased wall and component temperatures
- Lower fuel consumption due to increased viscosity of the engine oil and reduced frictional loss
- Fewer pollutant emissions
- Improved power output at full load due to reduced coolant temperature
- More comfort thanks to improved cabin heating performance

The operating map is a dataset in the engine control unit. Depending on the operating condition, it provides optimal values for the temperature and mode of the cooling circuits. In addition, the engine control unit analyses the current output profile to determine, for instance, whether the driver is calling on the engine to perform at a high or low level. The cooling is controlled accordingly, so that the engine always remains within the optimal temperature range—operating efficiently, with low emissions.

Causes of failures and defects.

A thermostat malfunction can have various causes:

- Working piston jamming
- Component corrosion
- Defective thermostat housing or damaged gasket
- Foreign matter in the cooling system
- Faulty electric actuation of map-controlled thermostats

This can result in the following defects:

- Engine overheating to the point of engine damage
- Greater wear and inefficient operation due to improper operating temperature
- Insufficient cabin heating
- Malfunctioning of the climate control system
- Non-compliance with emissions standards
- Increased fuel consumption
- Loss of coolant

Optimal operating conditions. In every part of the vehicle.

Our thermal management control units at a glance.

Coolant thermostats



**TX
Thermostat insert**

Precise regulation of the coolant circuit to approx. 20 m³/h. For passenger cars, commercial vehicles, stationary engines, and construction and agricultural machinery.



**THD
Sleeve valve thermostats**

Regulation of coolant circuits over 20 m³/h. For large passenger cars, commercial vehicles, ships, and railway vehicles.



**TH
Housing thermostat**

Integrated mixing chamber in the thermostat housing, linked to the coolant circuit by a flange or hose connectors.



**TI
Integral thermostat**

Thermostat insert, cover, connection, and gasket in one product. Enables direct flange mounting on the engine block.



**TM
Map-controlled thermostat**

Electronic actuation by means of an integrated heating resistor. Load-dependent regulation of the temperature level allows for optimal engine temperatures, enhanced efficiency, and fuel savings of up to 2%.

Oil thermostats

**TO
Oil temperature controllers and inserts**

For automatic transmissions. A regulated oil temperature shortens warm-up times, maintains the ideal operating temperature, and optimises shifting comfort while reducing wear and providing fuel savings of up to 1%.



Exhaust gas regulation

**TE
EGR thermostats**

Regulation of coolant flow in the EGR cooler. An optimised EGR temperature reduces pollutant emissions.



Thermal switches and thermal sensors

**TSW
Thermal switches**

Reliable protection against engine overheating. At a defined coolant temperature, the circuit opens, activating the radiator fan.



**TSE
Thermal sensors**

These provide real-time temperature data from various parts of the engine the electronic engine control unit.



We're here to help.

As our customer, you can benefit from a comprehensive range of information, advice, and services relating to thermal management control units: technical posters and newsletters, catalogues in print and in digital form, sales support materials, animations, and promotional gifts—always tailored to your needs. We also offer theoretical and practical training. And we've provided a full range of information for you online—just visit www.mahle-aftermarket-com.



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