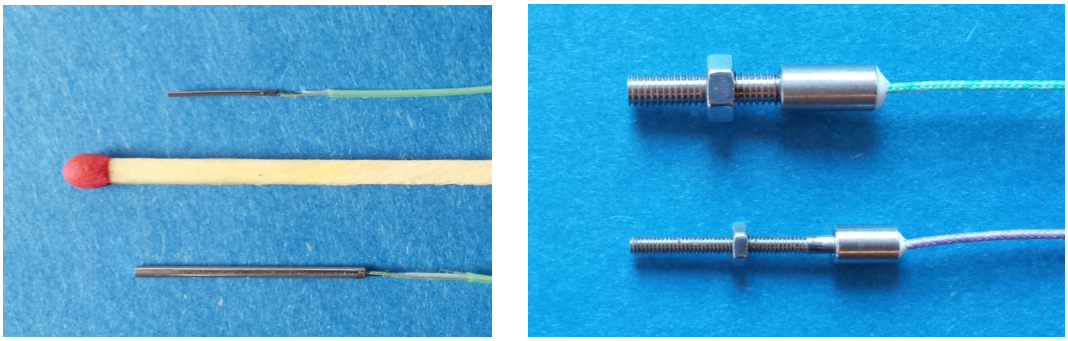
Müller Temperature Sensors MT

For Dynamic and Continuous Measurements in Combustion Engines

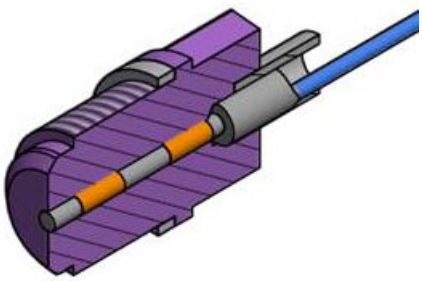
These thermocouples make it possible to determine dynamic surface temperature changes and heat flows. With their low response time and extreme robustness, they can be used universally.



Temperature Sensor MT 047 and MT 092 as well as MT 19 and 36 with Thread

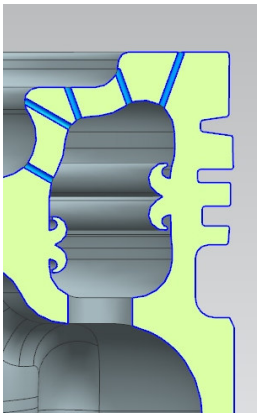
For years, these sensors have been increasingly used in the automotive industry, where they are used to measure surface temperatures, for example in a diesel injection chamber or directly in the combustion chamber of an internal combustion engine. After the diesel affair, almost all car manufacturers are working on processes to improve combustion.

MT temperature sensors can be installed in the surface of the piston as well as in the cylinder walls and in the cylinder head. In driving mode, the dynamic temperature distribution in the combustion chamber is then determined with high local and temporal resolution. Many well-known automobile manufacturers use our sensors to optimize fuel consumption and thus reduce harmful emissions. Some of the manufacturers also use the sensors for testing their Formula 1 engines.



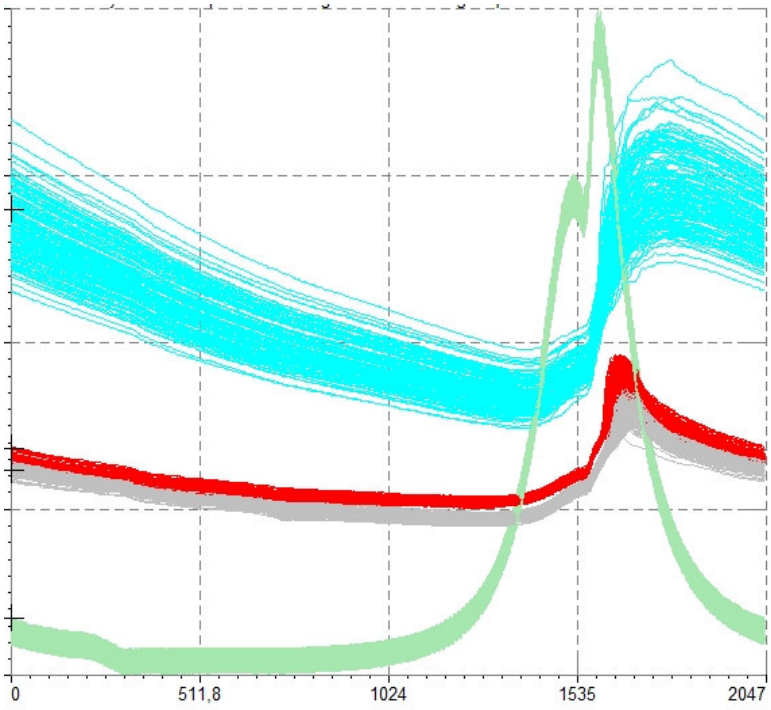
We offer sensors of different sizes for installation in the motors, depending on the motor and local resolution. With the MT 36 as type K with M3.5 thread, marine engines and with the smaller sensors MT 092, type K with 0.92 mm diameter Formula 1 engines can be analyzed. Further the MT 092 is electrically insulated against the engine by a ceramic surface coating.

However, the use of Type E sensors with 0.47 or 1.9 mm diameter is also conceivable, since the temperature in the combustion chamber is usually not so high at a maximum of approx. 600°C. The sensors can



be glued either with special adapters, see picture above, or directly e.g. in the piston surface. The small sensors are usually fixed in position without threads with heat-resistant ceramic adhesive and ground into the surface. Thanks to the grinding process, the sensors can follow any surface shape and thus disappear into the surface. The cables are routed through the crankcase to the amplifier.
The initial uncertainty as to whether the thermocouples will withstand long-term exposure to elevated temperatures without rapid corrosion, and whether it would not be better to coat them with nickel at the tip, has proved unfounded. When used at MAN in marine diesel engines, the measuring time after approx. 2 days in continuous operation was not limited by corrosion but by deposits of combustion residues on the sensors. A full day measurement was also possible for FEV in smaller car systems. In the event of deposits or corrosion, it is sufficient to clean and regrind the thermocouples in the component. It is best to use 180 to 240 grit sandpaper.

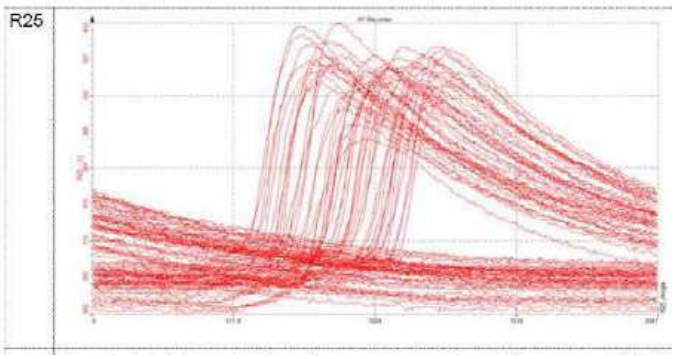
In addition, we learned from FEV tests that a DCL coating we applied to the MT 092 thermocouples offers advantages. The idea behind this was to electrically isolate the thermocouples from the motor housing in order to avoid additional ground loops. This facilitates the sometimes complex task of producing a noise-free output signal close to 0 mV together with the amplifiers. Our voltage amplifier MVA 10 together with 1 MHz filter is also a good prerequisite for this.

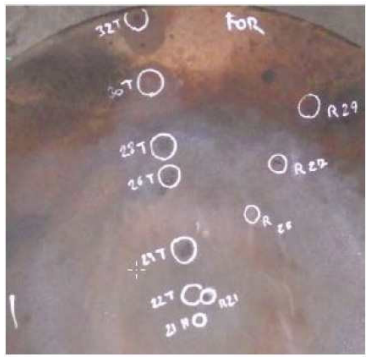


The figure above shows the surface temperature of a piston in the running test engine as a function of one crankshaft revolution. You can see that the temperature follows without delay.

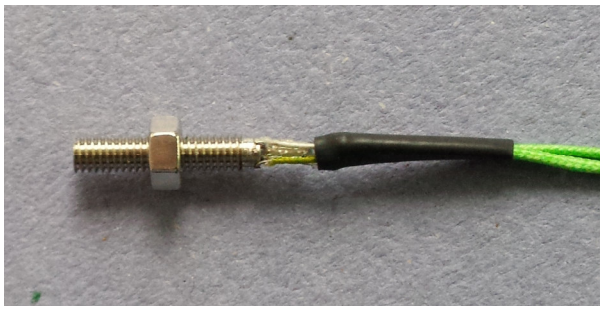
As a result of numerous built-in thermocouples, as in the example in the ship's diesel, a whole array of curves is obtained, which represent the local and temporal temperature distribution. The temperature distribution can then be determined at any time from these measurement results.

Since the sensors do not show a signal at room temperature, the current outdoor temperature must be added to the measured temperatures in order to determine the absolute temperature on the combustion chamber surface.





If the dynamic and continuous heat flow through the surface is of interest, it can be determined with the aid of our special Müller double-head temperature probe



MDT with measurement on both sides. This double-head thermocouple with diameters of 1.9 or 3.6 mm makes it possible to measure the surface temperature on the hot and simultaneously on the rear side of the thermocouple. This principle is subject to the laws of simple heat conduction. This can be used to determine the dynamic, continuous heat flow.

Our calculation program "Heat Flux Calculator" HFC facilitates this determination considerably.

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