

## Heat Flux Thermocouple MCT

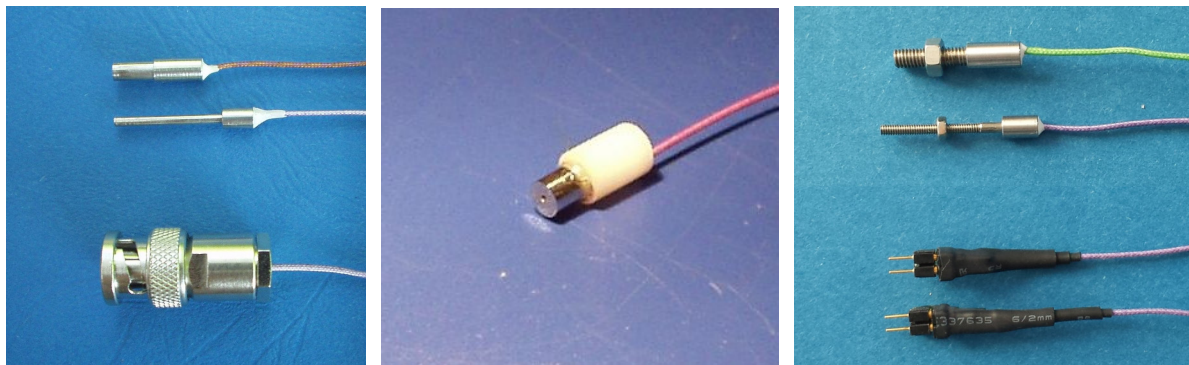
### Micro Thermocouples for High Frequency Surface Temperature Measurements and Heat Flux Calculations -Adaptable to any Surface Shapes

#### Typical Applications

These special thermocouples are ideal for very fast measurements of temperature changes on the surface of a body. This can be the piston or cylinder wall surface in a running engine as well as the measurements during a short individual event. In the latter case, these measurements can be used to calculate the heat flux into the surface. From the signal of the surface temperature change, the convective heat flow into the wall can be determined. The thermocouple can be seen as a half-infinite body. The max. measuring time ends when the rear part of the sensor starts to warm up after approx. 40 to 100 ms. Then the heat flux calculation basis is lost.

To calculate the heat flux we offer the program Heat Flux Calculator HFC. It calculates the heat flow in a simple manner using the temperature and material data of the sensor.

The sensor is small enough to accommodate in each contour e.g. of a motor piston surface. In addition, its sensitive end can be completely fitted into the surface by grinding. Alternatively, the end of the probe can also be coated with a metal coating. This offers the advantage of a longer service life at higher temperatures, but has the disadvantage of a fixed geometry.

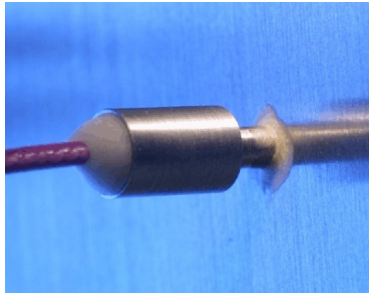


Thermocouple MCT 19, 36 and MCTB 48 with central hole for pressure measurement. As an alternative to the fixation in the wall by glue we offer threads with counter nut. In this case the 20 cm short cable with extension makes screwing much easier.

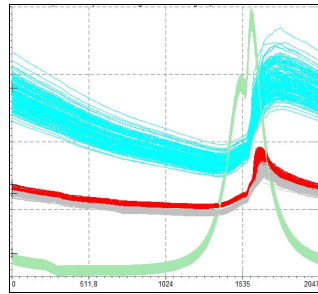
The MCTB 48 model offers the unique possibility of measuring changes in temperature and pressures at one and the same position. In this thermocouple a coaxial pressure sensor with 1.9 to 3 mm in diameter, like our probe M60-1L-M3, can be fixed.

If the experiments take place at constantly high temperatures, the surface begins to oxidize after some time and the signal disappears. The duration of the measurement for type E is about 35 minutes at temperatures of 615 °C and about 8 minutes at 715 °C. In these cases, the thermocouple can be refurbished by regrinding the sensor surface. This leads to a almost unlimited durability.

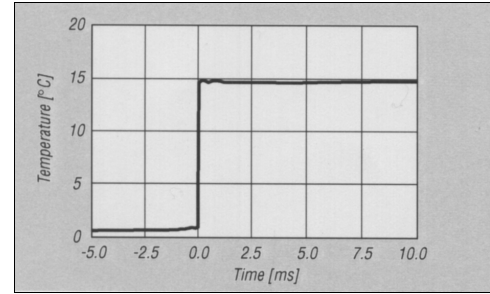
To amplify the low signals of the thermocouple we recommend a voltage amplifier with 1 MHz bandwidth, like our MVA 10 with 1 MHz filter.



MCT 19 fixed by glue



Temperature change on a motor piston surface



Temperature jump by diving into hot water

## Technical Data

Type of thermocouple:	Type E (Type K as a special design)
Material:	Chromel - Constantan, coaxial
Temperature range:	- 200 to 900 °C
Smallest temperature change:	0.5 K
Heat flux:	20 KW/m <sup>2</sup> to 20 MW/m <sup>2</sup>
Response time:	3 μs
$\sqrt{\rho c k}$	About 9500 W $\sqrt{s/m^2K}$
Diameter:	0.47, 0.92, 1.9, 3.6 and 4.8 mm
Size:	MCT 19: d = 1.9 x 26 mm MCT 36: d = 3.6 mm x 17 mm MCTB 48: d = 4.8 x 25 mm Sensor MCT 19, 36 and 48 can be shortened in the area of their diameter.
Sensitivity:	About 63 μV/K for type E, 39.9 μV/K for type K (s. IEC-584 T1)
Calibration:	Calibrated by the University of Aachen
Tip:	Can be individually shaped by the user.
Specials:	For the thermocouple with an outer diameter of 4.8 mm a coaxial borehole with d = 0.8 mm for connecting a pressure probe with a diameter of 1.9 to 3 mm is possible (e.g. M60-1L-M3)
Connection:	Via 2 m temperature resistance (400°C) coaxial cable with BNC pos.
Amplification:	Amplifier is needed. We recommend our MFA 1000 or MVA 10 with 1 MHz filter
Article-No. 100-001-1:	MCT 19, diameter 1.9 mm
Article-No. 100-001-2:	MCT 36, diameter. 3.6 mm
Article-No. 100-001-3:	MCTB 48, diameter 4.8 mm with coaxial borehole for pressure probe.
Article-No. 100-001-4:	Special Thermocouple MCT 0.47 with D = 0.47 mm, Type E
Article-No. 100-001-5:	Special Thermocouple MCT 0.92 with D = 0.92 mm, Type E
Article-No. 100-001-6:	Surcharge for metallic surface
Article-No. 100-001-7:	Surcharge for a short 20 cm cable plus connection to a 2 m extension cable
Article-No. 100-001-8:	Surcharge for thread for easier mount with M2, M3 and M5 with counter nut
Article-No. 100-001-9:	Surcharge for Typ K