

## Thin Film Thermometer MTFT

### Measuring Highly Transient Temperatures

#### Application

Thin film thermometers consist on a ceramic substrate of zirconium oxide on which a thin film of nickel is deposited. This sensor is a magnitude more sensitive than our thermocouples. Temperature changes of only 0.1 K can be measured. The gauges can measure static to high transient surface temperatures with response times in the range of microseconds.

Due to the open metal film these sensors are quite sensitive but also delicate. Therefore for measurements in clean conditions and moderate heat fluxes the Thin Film Thermometer are recommended, whereas in harsh environmental conditions or high heat fluxes our Coaxial Thermocouples MCT is the better choice.

The MTFT are powered by a constant current source. The change of the film resistance leads to voltage changes proportional to the temperature change. The temperature change corresponds to

$$\Delta T = (R - R_0) / R \cdot \alpha$$

For transient temperature changes the Thin Film Thermometer may be connected to our MFA 1000 Amplifier and power supply. This device has a bridge amplifier and offers constant current and voltage. Alternatily any other bridge amplifier could be used.

To mount the sensor we recommend gluing the gauge into the wall. Alternatively we provide a wall mount adapter for easy reuse. As an advantage to competitive thin film sensors we pass two platinum wires through the substrate soldered to the film. These embedded connections eliminate the challenge of connecting wires to the thin leads and makes the wall mount much easier. Further these two wires are extended with four cables, two for current supply, and two for measuring.



Thin Film Thermometer with connecting wires and cables

There are multiple applications for this type of sensor. The gauges are suitable for measuring constant temperature over time, but transient measurements as well.

#### Technical Data

<b>Thin film material:</b>	<b>Nickel</b>
<b>Substrate:</b>	<b>Zirconium Oxide</b>
<b>Smallest measurable temperature change:</b>	<b>0.1 K</b>
<b>Responds time:</b>	<b>&lt; 10 <math>\mu</math>s</b>
<b>Resistance:</b>	<b>25 to 50 Ohm</b>
<b>Sensitivity:</b>	<b><math>\alpha = 0.002</math> to <math>0.0025/K</math></b>
<b><math>\sqrt{\rho c k}</math></b>	<b>About <math>0.35 \text{ J}/(K \text{ cm}^2 \sqrt{s})</math></b>
<b>Power supply:</b>	<b>Constant current 7 – 10 mAh</b>
<b>Diameter:</b>	<b>2.3 mm <math>\pm</math> 0.1 mm</b>
<b>Length:</b>	<b>3.3 mm</b>
<b>Calibration:</b>	<b>Delivered calibrated by University Aachen</b>
<b>Periphery:</b>	<b>The thin film thermometer needs a constant current source and an amplifier. The type of periphery depends on the application.</b>

In case of transient measurements with high bandwidth we recommend our MFA 1000, which provides the constant current source and a bridge amplifier in one device with 1 MHz bandwidth

#### Article-No.:

<b>100-002-1:</b>	<b>Thin Film Thermometer MTFT with soldered platinum wires</b>
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