



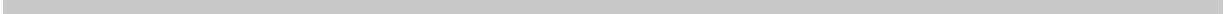
Anton Paar

Measure,
what is measurable,
and make measurable
that which is not.

Galileo Galilei (1564-1642)

Sensors for MKT 50





Sensors for MKT 50

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1 Sensors for MKT 50

You can connect to MKT 50 any platinum resistance thermometer that meets the requirements of DIN IEC 60751 and has a nominal value of 100 Ω (R_0).

DIN IEC 60751 specifies tolerances for the temperature range from -200 °C to $+850$ °C. These tolerances, in turn, range from several tenths to several °C, dependent on the temperature value. MKT 50 allows to determine the resistance of a sensor with a measuring uncertainty of 1 ppm. To make full use of MKT 50's accuracy, you should definitely use a sensor that is delivered with a calibration certificate. This enables you to measure temperatures across a wide range with very low measuring uncertainty. System measuring uncertainties below 10 mK are possible. The contribution of MKT 50 to this measuring uncertainty is usually negligible.

It is also possible to use ITS-90 for Pt 100 thermometers. But the spectral purity of the platinum and sufficient stability are essential requirements for this.

Find more information in the sensor producer's statements and/or the sensor manual.

TIP *The instrument and sensor have been carefully calibrated and adjusted before shipment. Since thermal stress on the sensor and/or the minor drift of MKT 50's reference resistor cause changes to your measuring system, be absolutely sure to check the temperature measuring device before each major measurement. In most cases a test using freezing point calibrators or water triple point cells is sufficient.*

2 Sensors in Stainless Steel Tube

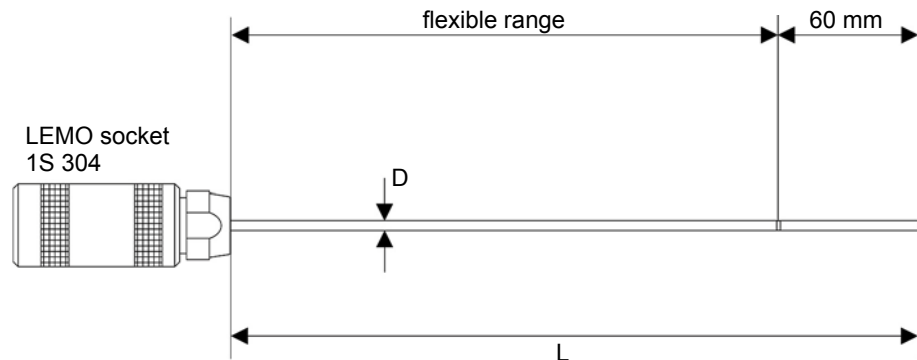


Fig. 2 - 1 MPMI sensor

2.1 Technical data

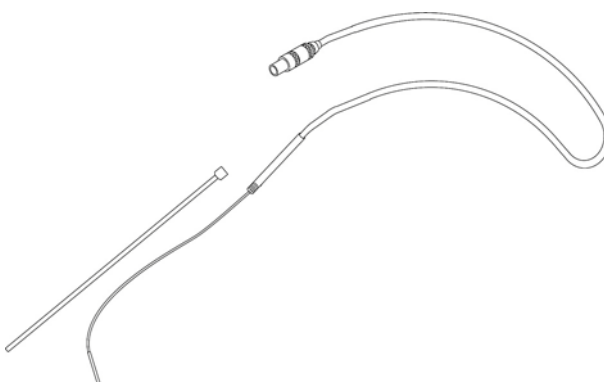
Protective cover:	Stainless steel 1.4571
Connection wires:	4 wires insulated with aluminium oxide
Sensor:	Pt 100, 1/10 DIN IEC 60751, class B, pre-aged, stabilized
Connection:	LEMO Socket 1S 304

2.2 Calibration certificate

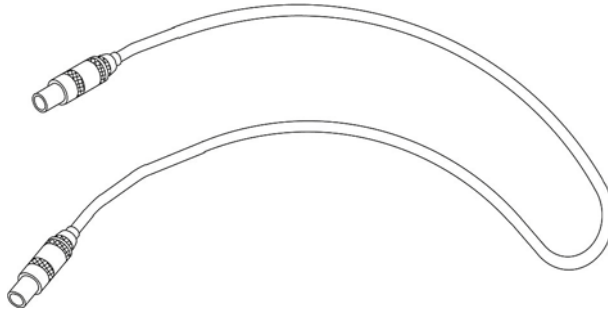
The sensors are available with diverse calibration certificates which certify a variety of values measured or calculated during the calibration procedure. See the examples below.

- The sensor is measured at 0 °C (or 0.0100 °C) and two or more additional temperatures within the calibration range of interest. The resulting three or more temperature/resistance data pairs are specified with their respective measuring uncertainties.
- The measuring data are used to calculate the coefficients R_0 , A, and B according to DIN IEC 60751.
- Plausibility check: The sensor is tested at yet another temperature. The difference between the value measured at this temperature and the value calculated from the previously determined coefficients has to lie within the stated measuring uncertainty.
- For temperatures below 0 °C, the sensor is additionally measured at the triple point of mercury (approximately -38 °C). This gives a third coefficient C. Sensors calibrated in this way can be used for temperatures down to -50 °C.

3 Sensors, Cables, Calibrations

Mat. no.	Item
	Pt 100 sensor for temperature calibration of e.g. DMA, SVM, MCP, LOVIS
74557	PT 100 TEMPERATURE SENSOR for temperature calibration DMA/SVM diameter 1.8 mm, total length 1500 mm incl. sensor cable and factory certificate 0 °C to 100 °C, uncertainty: 10 mK Possible DKD/DAkkS calibrations: 75127, 143498
	
	Pt 100 sensors MPMI, minerally insulated, stainless steel sheath, L=300 mm
69281	RESISTANCE THERMOMETER D=2 mm, L=300 mm, uncalibrated tolerance class: 1/10 DIN-IEC 751 B, temperature range: –100 °C to 220 °C LEMO socket, 4 contacts, without sensor cable
69279	RESISTANCE THERMOMETER D=4 mm, L=300 mm, uncalibrated tolerance class: 1/10 DIN-IEC 751 B, temperature range: –100 °C to 220 °C LEMO socket, 4 contacts, without sensor cable
	Possible DKD/DAkkS calibrations: 75127, 143498, 135253, 135254
	Pt 100 sensors MPMI, minerally insulated, stainless steel sheath, L=500 mm
69280	RESISTANCE THERMOMETER D=2 mm, L=500 mm, uncalibrated tolerance class: 1/10 DIN-IEC 751 B, temperature range: –100 °C to 450 °C LEMO socket, 4 contacts, without sensor cable
69278	RESISTANCE THERMOMETER D=4 mm, L=500 mm, uncalibrated tolerance class: 1/10 DIN-IEC 751 B, temperature range: –100 °C to 450 °C LEMO socket, 4 contacts, without sensor cable
	Possible DKD/DAkkS calibrations: 75127, 143498, 135253, 135254, 135255, 135256

Mat. no.	Item
	Sensor cables for MPMI sensors
	Sensor cable for all types of MPMI, PTFE-insulated leads, maximum temperature 250 °C, 2 plugs type LEMO size 1S
69276	SENSOR CABLE MPMI 4-wire 1.5 m PTFE
95464	SENSOR CABLE MPMI 4-wire 3 m PTFE
95468	SENSOR CABLE MPMI 4-wire 5 m PTFE



	DKD/DAkKS calibrations (R_0, A, B, and C of IEC 751 are provided)
75127	DAkKS CALIBRATION 0 °C to 100 °C, measurement uncertainty: 10 mK
143498	DAkKS CALIBRATION 0 °C to 150 °C, measurement uncertainty: 10 mK
135253	DAkKS CALIBRATION 0 °C to 200 °C, measurement uncertainty: 10 mK
135254	DAkKS CALIBRATION –50 °C to 200 °C, measurement uncertainty: 10 mK
135255	DAkKS CALIBRATION 0 °C to 420 °C, measurement uncertainty 0–200 °C: 15 mK, 200–420 °C: 25 mK
135256	DAkKS CALIBRATION –50 °C to 420 °C, measurement uncertainty –50 – 200 °C: 15 mK, 200–420 °C: 25 mK
	If MKT 50 and sensor shall be calibrated together as a measuring chain, indicate this on your PO: "MKT + Sensor as measuring chain." Then you will receive only one certificate valid for exactly this MKT 50 and this sensor.

If these sensors do not meet your requirements, or if you have questions about measuring applications, contact your Anton Paar representative.

4 SPRT Sensors for Highest Precision, e.g. for National Primary Calibration Labs

SPRTs like the Q100 or T100 are primary calibration lab standard thermometers that need to be handled extremely careful. It is possible to calibrate an SPRT to extremely high accuracies (e.g. 2 mK at water triple point 0.01 °C) but in return the SPRT is much more fragile and vulnerable to mechanical shocks than our 10 mK working thermometers (MPMI). An SPRT, e.g., **never** must be dropped from even 1 cm height onto the top of the table. This would already damage its calibration. Normally SPRTs are only used for primary calibration using fixed point cells as a reference, not for secondary calibration like comparison calibration using liquid baths or dry block calibrators. For secondary calibrations, we recommend to use our MPMI sensors.

The sensors are delivered ready-made with cable and connector in a carrying case. The sensors can be connected directly to the MKT 50.

4.1 Technical data

Measuring range:	T100: –200 °C to +165 °C Q100: –200 °C to +550 °C
Nominal sensitivity:	0.4 Ω/°C
Recommended max. current:	0.5 mA
Resistance ratio:	$W_{ga} > 1.11807$ as required by ITS-90
Self-heating:	1 mK/25 μW
Calibration certificate:	Included, giving R_{TPW} and W_{ga} Option: UKAS calibration certificate
Sensor:	Pt 100, pre-aged, stabilized, sealed with dry oxygen/argon mix
Sheath:	T100: metal Q100: quartz
Internal leads:	4-wire platinum
External leads:	Silver plated multi-strand wires in a low-loss insulation cable (2 m) terminating in a LEMO 1S 304 plug
Connection:	LEMO 1S 304 plug

4.2 Ordering information

Mat. no.	Item
SPRT quartz glass sensor for highest precision measurement	
95469	ANTON PAAR Q100, SPRT 100 Ohm, uncalibrated quartz sheath, D=7.5 mm, L=480 mm, -200 °C to 550 °C incl. traceable certificate at R_{TPW} and W_{ga} , carrying case, and sensor cable Possible UKAS calibrations: 95471, 95472, 95473
SPRT metal sensor for highest precision measurement	
95470	ANTON PAAR T100, SPRT 100 Ohm, uncalibrated metal sheath, D=6 mm, L=480 mm, -200 °C to 165 °C incl. traceable certificate at R_{TPW} and W_{ga} , carrying case, and sensor cable Optimized for low temperatures, less stem conduction due to internal construction Possible UKAS calibrations: 95471



UKAS calibrations for SPRT sensors	
95471	UKAS CALIBRATION -38 °C to 156 °C -38 °C: 2 mK 0.01 °C: 1 mK 156 °C: 3 mK For T100 and Q100
95472	UKAS CALIBRATION -38 °C to 420 °C -38 °C: 2 mK 0.01 °C: 2 mK 232 °C: 3.5 mK 420 °C: 3.5 mK For Q100
95473	UKAS CALIBRATION -38 °C to 550 °C -38 °C: 5 mK 0.01 °C: 5 mK 232 °C: 5 mK 420 °C: 5 mK 550 °C: comparison calibration 40 mK For Q100