

# SHEATH RESISTANCE THERMOMETER WITH FOUR WIRE CONNECTION M12



Ordering No. 502144  
CON-MANTE-PT100



## Characteristic features

- ▶ Model PT100 or PT1000
- ▶ Measuring range -70 ... +500 °C
- ▶ High accuracy DIN class 1/3 B
- ▶ Fast response behaviour
- ▶ Four wire connection
- ▶ Mechanically stable, flexible
- ▶ Robust construction, stainless steel
- ▶ Gas tight, hermetically sealed
- ▶ Pressure and vacuum suitable
- ▶ Simple mounting, 1/8" threads
- ▶ Industrial M12 plug, IP 67

## Typical areas of application

- ▶ Laboratory systems, science and research
- ▶ Demanding industrial applications
- ▶ Cryogenics and cooling systems
- ▶ Plant manufacture

## Features

Jacketed resistance thermometers combine the accuracy of PT sensors with the advantages of well proven jacketed thermocouples. The probe is suitable for temperature range between -70... +500 °C and is the most optimum design with respect to highest possible accuracy together with a robust protected construction.

Mineral insulated jacketed cable is used as the lead wire to sensor element. The lead wires are embedded in a compact insulation of MgO and enclosed in a metal jacket of high grade alloy non rusting steel (material No. : 1.4541 or INCONEL). The compact insulation completely consolidates the wire so that no damage can occur either due to vibration or by bending pressure. The minimum bending radius is around 15 mm.

The platinum sensor is placed at the tip of the assembly in a protection sleeve which is hermetically tight sealed with the jacket lead wire. Therefore, the model is very well suitable for critical applications, for example, in the cryogenics. The temperature sensitive length at the tip is 35 mm. The protection sleeve is filled with MgO powder, through which it has an extremely fast conversation behaviour with optimum protection to the sensor, for example in case of vibration.

The mounting in the installation is either done through the 1/8 " threads or 6mm clamping set.

The connection to M12 plug connector is through a four wire system. The plug connector has a protection type IP67. The scope of supply is without connection cable; if required, please separately include with the order!



## Technical data

Transducer module	CON-MANTE
Measuring range	-70 ... +500 °C
Sensor element	Platinum thin film sensor
Accuracy	DIN Class 1/3 B from 0 ... +100 °C
Response time t90	8 seconds (in oil)
Resistance characteristics	PT100 or PT 1000 as per DIN EN 60751
Connection	Four wire connection
Probe tube	Length 100 mm, hermetically sealed jacket tube, stainless steel grade 1.4541
Minimum bending radius	15 mm
Gland	Stainless steel 1.4305
Dimensions	SW 14 x 148 mm
Internal threads	1/8" with built in gasket
Gasket	DIN G1/8" x 10
Connection plug	M12 connection plug, 4-pin (IP67)
Temperature at plug	-20 ... +80 °C
Further models with modified jacket tube length or other sensor elements are available on enquiry.	
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For further information, please visit our website:

[www.hygrosens.com](http://www.hygrosens.com)

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## Evaluation

The evaluation of the sensor resistance usually takes place through the voltage drop measured at the sensor because of a constant measuring current flowing through it. Hence, the change in voltage  $\Delta U$  is approximately proportional to the change in resistance  $\Delta R$ . For selection of the measuring current, there must be a trade-off between the achievable useful signal, which rises with the measuring current which in turn also increases the measuring error because of self heating of the sensor.

## Resistance characteristics

The hot resistance  $R$  of a platinum temperature sensor at a given temperature  $T$  with the nominal resistance  $R_0$  can be calculated as per the following equations:

For temperature range between 0 and 100 °C, the linear function (1st order polynomial) is approximately valid where temperature is  $T$  (in °C):

$$R = R_0 \cdot (1 + a \cdot T)$$

$$a = 3.85 \cdot 10^{-3} / K$$

In the range up to 850°C, or with higher accuracy requirements, also in the range between 0 and 100 °C, one uses a quadratic function for linearisation (2nd order polynomial):

$$R = R_0 \cdot (1 + a \cdot T + b \cdot T^2)$$

$$a = 3.9083 \cdot 10^{-3} / K$$

$$b = -5.775 \cdot 10^{-7} / K^2$$

In the range below 0°C, one has to use a polynomial of 4. level:

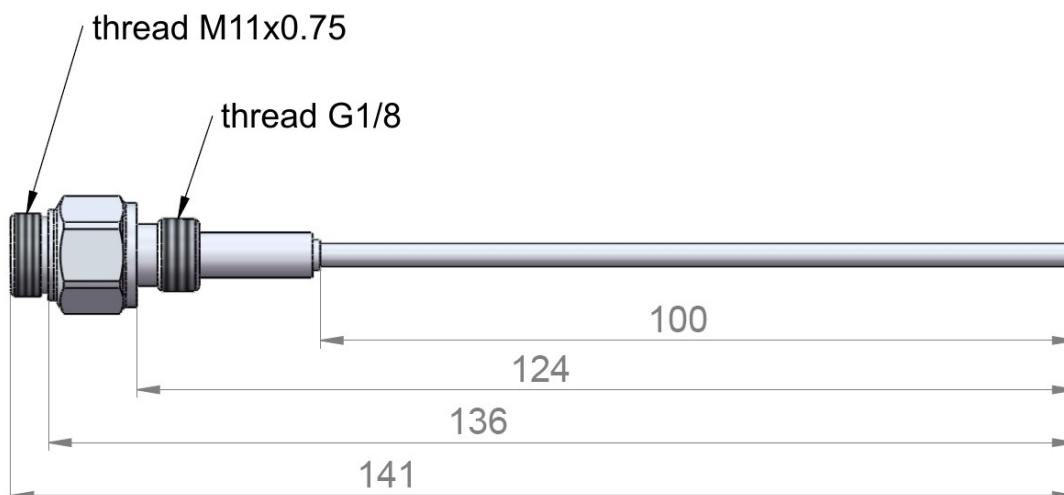
$$R = R_0 (1 + a T + b T^2 + c (T - 100 \text{ °C}) \cdot T^3)$$

$$a = 3.9083 \cdot 10^{-3} / K$$

$$b = -5.775 \cdot 10^{-7} / K^2$$

$$c = -4.183 \cdot 10^{-12} / K^4$$

## Dimensional Drawing



## Accuracy class

Due to the manufacturing tolerances, platinum temperature sensors are divided into A and B classes. These specify the dependence of allowable temperature error  $\Delta T$  of the real temperature  $T$ . Error limits of class in °C:

$$\text{Class A: } \Delta T = \pm (0.15 \text{ °C} + 0.002 \cdot T)$$

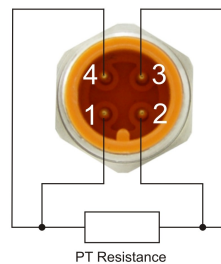
$$\text{Class B: } \Delta T = \pm (0.30 \text{ °C} + 0.005 \cdot T)$$

$$1/3 \text{ Class B: } \Delta T = \pm (1/3 \cdot (0.30 \text{ °C} + 0.005 \cdot T))$$

$$1/10 \text{ Class B: } \Delta T = \pm (1/10 \cdot (0.30 \text{ °C} + 0.005 \cdot T))$$

For the 1/3 DIN and 1/10 DIN Class B laboratory grade resistance, the applicable temperature range is defined for the higher specified accuracy. This differs from the normally possible application temperature range.

## Connection layout



## Ordering number format

CON - MANTE - PT100	
- PT100	with PT100 Sensor
- PT1000	with PT1000 Sensor
Jacket resistance thermometer with four wire connection	
Accessories	Ordering No.
Connection cable 2M	KAB-M12-2M
Connection cable 5M	KAB-M12-5M
M12-Connection socket	STEK M12