



Pt100/500/1000 Elements, Temperature Sensor

Pt100/500/1000 elements to IEC751 Class A/B

For use from -200°C to $+650^{\circ}\text{C}$

Thin film construction

Suitable for surface & immersion applications where protected

Vibration resistant

Specifications

Sensor type:	Pt100/500/1000 (100/500/1000 Ohms @ 0°C)
Insulation resistance:	Exceed 100M ohm at 500V DC (@Room Temp.)
Operation Temperature range:	-200°C to $+650^{\circ}\text{C}$
Resistance Tolerance (at 0°C):	Class A / Class B = 0.06Ω / 0.12Ω
Temperature coefficient:	TCR ppm/ $^{\circ}\text{C}$ 3850
Insulation resistance :	$> 100\text{ M}$ at 20°C ; $> 2\text{ M}$ at 500°C
Self-heating:	$<0.4\text{C/mW}$ at 0°C (in Air, 1m/Sec)
Thermal response time (90%):	10 Sec. Max. (in Air, 1m/Sec)
Measuring current 100 :	0.5 to 2.0 mA (self-heating has to be considered)
Response time	water current ($v = 0.4\text{ m/s}$): $t_{0.5} = 0.06\text{ s}$ $t_{0.9} = 0.20\text{ s}$ air stream ($v = 2\text{ m/s}$): $t_{0.5} = 3.0\text{ s}$ $t_{0.9} = 13.0\text{ s}$

Reliability test

- ◆ High temperature test
Keep the Pt sensors in $+650^{\circ}\text{C}$ for 1000 hours.
- ◆ Low temperature test
Keep the Pt sensors in -200°C for 1000 hours.
- ◆ Humidity test
Keep the Pt sensors in 60°C and 90°C to 95% HR for 1000 hours.
- ◆ Thermal shock test
Keep the Pt sensors in 0°C ice water for at least to 15sec., then within 10sec.
Directly put into 100°C hot water for least to 15sec, the above process should be proceeded for least 10 cycles.
After each item test, valuation of item 1-1 should be within 0.12% and item 1-3

Should exceed 100M at 500V DC.

Characteristics

1-1 Electrical

1-1-1 Insulation Resistance

1000M ohm or more

The Pt-SMD shall be cramped in the metallic block and tested, as shown below.

Test Voltage: 100V DC for 1 minute at room temperature.

The resistance of a platinum wire with temperature to measure the change in temperature.

The equation for such a change is:

$$R_{\theta} = R_0(1 + \alpha\theta + \beta\theta^2)$$

where θ is the temperature change and α and β are constants, β being much smaller than α .

We therefore ignore the term β^2 and assume that the resistance of the wire varies uniformly with temperature: α is the temperature coefficient of resistance of the material.

For platinum $\alpha = 3.8 \times 10^{-4} \text{ } ^\circ\text{C}^{-1}$.

A simple form of the platinum resistance thermometer is shown in Figure 1. It consists of a platinum wire wound non-inductively on a mica former and held in a glass tube by silica spacers.

The resistance of the wire is measured with a Wheatstone bridge network and to allow for the change in resistance of the leads a set of dummy leads are included in the opposite arm of the bridge (see Figure 2).

This type of thermometer has a large range, from $-200 \text{ } ^\circ\text{C}$ to $+1100 \text{ } ^\circ\text{C}$ and this can be extended by the use of different wires. Bronze has a range starting at $-260 \text{ } ^\circ\text{C}$ and using carbon temperatures as low as $-270 \text{ } ^\circ\text{C}$ can be measured.

The advantages of the resistance thermometer are its convenient size, wide range and high sensitivity ($0.00005 \text{ } ^\circ\text{C}$). It can only be used for steady readings, however, and is not direct-reading.

Relationship of temperature with Resistance

When $t \geq t_0$

$$R_t = R_0(1 + At + Bt^2)$$

$$A = 3.9083 \times 10^{-3}$$

$$B = -5.7750 \times 10^{-7}$$

$$C = -4.1830 \times 10^{-12}$$

When $t < 0^\circ\text{C}$

$$R_t = R_0[1 + At + Bt^2 + C(t-100)t^3]$$

$$B = 3.9083 \times 10^{-3}$$

$$B = -5.7750 \times 10^{-7}$$

$$R_0 = 1.000 \times 10^2$$

Ordering Information

Order Map

UJK

100



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Series Code

Resistance

Res. Class

Leads Gauge

AWG Number

Wire Lengths

Exp : 400: 400 mm