PLATINUM THIN FILM TEMPERATURE SENSORS

PDTS

Characteristic features

- Resistance characteristics as per DIN EN 60751
- Measuring range -70 ... +500 °C
- 100 / 1000 / 10k Ohm nominal resistance
- High accuracy up to DIN Class 1/10 B
- Fast response behaviour
- Excellent long term stability
- Simple interchangeability
- Small dimensions
- Resistant against vibration and temperature shock
- Simple linearisation

Typical areas of application

- Automotive industry
- Household appliances
- Air conditioning and Heating systems
- Process industry, equipment manufacture
- Medical systems
- Cryogenics and refrigeration systems
- Temperature compensation

Features

Platinum resistance thermometer is the industry standard method for accurate measurement of temperature in a wide temperature range of -200 ... +800 °C. Because of standardised characteristics as per DIN EN 60751, the sensor elements are interchangeable with the need of re-calibrating the measuring circuit. Unlike the earlier wound type designs, the sensors in thin film technology certainly has small dimensions and hence offer a fast response behaviour. The sensor element is of optimum design, with respect to high precision at an optimum price performance ratio.

Designs

The wired components are suitable for manufacture of measuring probes, from metal sheath resistance elements or also for glueing and moulding. The connecting wires are solderable, but however for taking advantage of the full temperature measuring range, these should be brazed.

The SMD-sensors are meant for direct mounting on circuit boards or other carrier substrates. The components are very cost effective in bulk quantities and with automatic placement for assembly, there is also a cost advantage in the assembly process. Typical applications for the SMD components are in the room probes or temperature compensation circuits. The components have RoHs conformance.

Technical data

Platinum-Temperature sensors PDTS	
Measuring principle	PT-thin film measuring resistance
Nominal resistance	As per model: 100 /1000/10000 Ohm
Temperature co-efficient	3850 ppm/K
Characteristics	DIN EN 60751
Tolerance class	As per model: DIN B, 1/3 DIN B or 1/10 DIN B
Temperature range	As per model: -200 ... +600 °C
Connection	As per model: NiPt Metal sheath wired, 10 mm CuAg PTFE-insulated, 25 mm SMD Soldering points, RoHs conformance
Rights reserved for change in technical data due to technological advancements!	
Special designs are available on enquiry !	

Further information on our website:

www.hygrosens.com

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Models

Thin film sensors are manufactured in mass production. On a ceramic carrier as basic substrate, a thin platinum layer is vapour deposited. which is structured in a meander shape with photo lithographic process. The desired value is adjusted through laser trimming.

PT100: With 100 Ohm base resistance, the liability is high at the instrument amplifier. The measurement should be done in three wire or four wire circuit. The measuring current should be below 1 mA, in order to restrict the error to a low value due to self heating.

PT1000: This design with 1000 ohm resistance is circuit wise simple to evaluate and hence is being used more and more often. Normally the connection takes place in two wire circuit, because of which the lead resistance should also be compensated for larger connection length.

PT10000: Because of the high nominal resistance of the sensor, the resistance of the connection lead can be normally neglected. As the resistance variation is very large, often no additional amplifier is required.

Connecting wires: For the high temperature range, normally Ni-Pt metal sheath wired type are used. Our models with Teflon insulated Ag-Cu wires are mechanically more robust and therefore are suitable, for example for measuring probes where sensors are cantilever mounted.

Evaluation

The evaluation of the sensor resistance usually takes place by the voltage drop due a constant measuring current flowing through the sensor. Hence, the change in voltage ΔU is approximately proportional to the change in resistance ΔR. The selection of the measuring current should be such that there is a trade off between the level of useful signal which rises with the measuring current and with that the increasing measurement error due to self heating of the sensors.

Accuracy classes

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

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

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

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

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

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.

Resistance characteristics

The hot resistance R of a platinum temperature sensor at a given temperature T with the nominal resistance R0 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):

$R = R0 \cdot (1 + a \cdot T)$

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

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):

$R = R0 \cdot (1 + a \cdot T + b \cdot T2)$

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

$b = -5.775 \cdot 10^{-7} / K2$

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

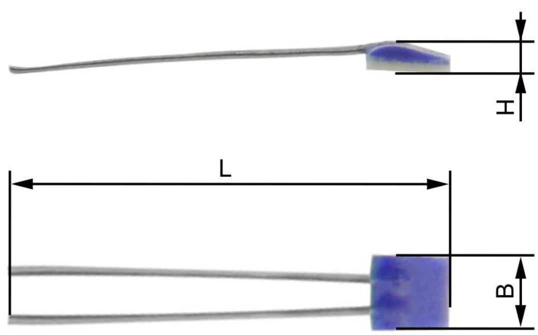
$R = R0\ (1 + a\ \ T + b\ \ T2 + c\ (T - 100\ °C) \cdot T3)$

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

$b = -5.775 \cdot 10^{-7} / K2$

$c = -4.183 \cdot 10^{-12} / K4$

Drawing



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Type Classes

Platinum Temperature sensors PDTS				
Ordering Number	Model	Resistance	Tolerance Class	Dimensions (L x B x H)
PDTS-DRA-PT100-B	wired	PT100	DIN B	3.2 x 1.65 x 0.6 mm
PDTS-DRA-PT1000-B	wired	PT1000	DIN B	2.0 x 2.2 x 0.2 mm
PDTS-DRA-P1K0	wired	PT1000	DIN B	2.3 x 2.0 x 1.3 mm
PDTS-DRA-10000-D	wired	PT10000	DIN B	5.0 x 2.0 x 1.05 mm
PDTS-DRA-PT100-B1/3	wired	PT100	1/3 DIN B	2.3 x 2.1 x 0.9 mm
PDTS-DRA-PT1000-B1/3	wired	PT1000	1/3 DIN B	3.9 x 2.2 x 0.6 mm
PDTS-DRA-PT100-B1/10	wired	PT100	1/10 DIN B	2.0 x 2.0 x 1.3 mm
PDTS-SMD1206-PT100	SMD	PT100	DIN B	3.2 x 1.65 x 0.6 mm
PDTS-SMD1206-PT1000	SMD	PT1000	DIN B	3.2 x 1.65 x 0.6 mm
PDTS-SMD0805-PT100	SMD	PT100	DIN B	2.3 x 1.4 x 0.5 mm
PDTS-SMD0805-PT1000	SMD	PT1000	DIN B	2.3 x 1.4 x 0.5 mm

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