Platinum-Temperature Sensors

INNOVATIVE SENSOR TECHNOLOGY

Data Sheet for
Platinum Temperature Sensors

General Information:

In many industrial sectors and fields of research, temperature is one of the most important parameters which decides about product quality, security, and reliability. Temperature sensors are manufactured by variable technologies, according to the field of application. In sense of a specified product policy, IST has concentrated its development and manufacturing on high-end thin film temperature sensors. These processes derived from the semiconductor industry allow to manufacture sensors in very small dimensions. Because of their low thermic mass thin film temperature sensors exhibit a very short response time. Furthermore, thin film sensors combine the good features of traditional wire wound platinum sensors such as accuracy, long-term stability, repeatability, interchangeability and wide temperature range, with the advantages of mass-production, which contributes to their optimal price/performance ratio.

Sensor Construction:

The temperature sensor consists of a photo-lithographically structured, high-purity platinum coating arranged in the shape of a meander. The platinum thin film structures are laser trimmed to form resistive paths with very precisely defined basic value of the resistivity. The sensors are covered with a glass passivation layer; to protect the sensor against mechanical and chemical damage. The bonded leadwires which are additionally covered with a drop of glass make electrical contacts to the resistive structure.

Typical Features:

- brief response time
- excellent long-term stability
- low self-heating rate
- simple interchangeability
- small dimensions
- resistant against vibration and temperature shocks
- high reliability

Response Time:

The response time $T_{0.63}$ is the time the sensors need to respond to 63% of the change in temperature. The response time depends on the sensor dimensions.

Long-Term Stability:

The change of ohmage after 1,000 hrs at maximum operating temperature amounts to less than 0.03%.

Self Heating:

To measure the resistance an electric current has to flow through the element, which will generate heat energy resulting in errors of measurement. To minimize the error the testing current should be kept low (approximately 1 mA for pt-100).
Temperature error $\Delta t = RI^2 / E$; with E = self-heating coefficient in mW/K
R = resistance in kΩ, I = measuring current in mA

Nominal values:

The nominal or rated value of the sensor is the target value of the sensor resistance at 0°C. The temperature coefficient α is defined as $\alpha = \frac{R_{100} - R_0}{100 \cdot R_0}$ [K^{-1}] and has the numerical value of 0.00385 K^{-1}.
In practice, a value multiplied by 10^6 is often entered: $TCR = 10^6 \frac{R_{100} - R_0}{100 \cdot R_0}$ [ppm/K].
In this case, the numerical value is 3850 ppm/K.

Temperature Dependence of Resistivity:

The characteristic temperature curve determines the depencence of the electrical resistivity on the temperature. The following definition of the temperature curve according to the DIN EN 60751 standard applies:
-200 at 0°C $R(t) = R_0 (1 + At + Bt^2 + C\,[t-100] \cdot t^3)$
0 at 850°C $R(t) = R_0 (1 + At + Bt^2)$
$A = 3 \cdot 9083 \times 10^{-3} \cdot °C^{-1}$; $B = -5.775 \cdot 10^{-7}\ °C^{-2}$; $C = -4 \cdot 183 \cdot 10^{-12}\ °C^{-4}$
R_0 = resistance value in ohm at 0°C
t = temperature in accordance with ITS90