ND1K0.520.2FW.B.007

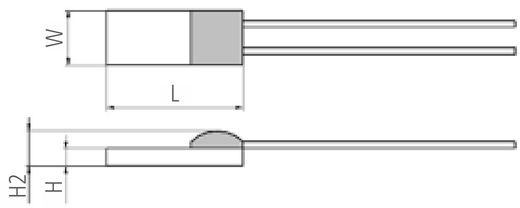
Nickel sensor with wires

For medium temperatures

Benefits & Characteristics

- Excellent long-term stability
- Connections remain in shape
- Easy interchangeability
- Simple linearization
- Vibration and temperature shock resistant

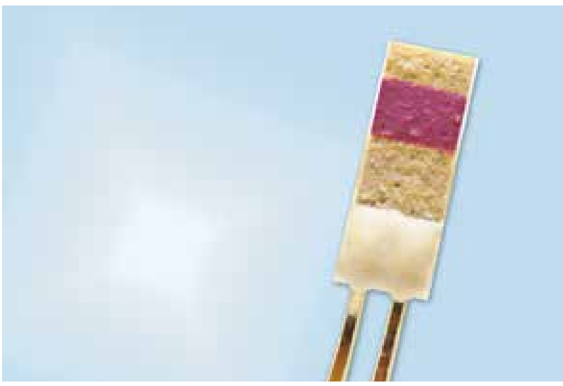
Illustration[1)]



Technical Data

Operating temperature range:	-60 °C to +200 °C
Nominal resistance:	1000 Ω at 0 °C
Characteristics curve:	6180 ppm/K (Nickel ND)
Long-term stability:	< 0.1 % at 1000 h at maximal operating temperature
Tolerance class (dependent on temperature range):	T > 0 °C 0.4 + 0.007 x |t| — IST AG reference B
Connection:	Ni/Au-flat wire, 0.2 x 0.4 mm (solderable, weldable, crimpable), 7 mm long
Dimensions:	5.0 x 2.0 x 0.65 / 1.3
Tolerance (chip):	L ±0.2 mm, W ±0.2 mm,H ±0.1 mm, H2 ±0.3 mm

Product Photo



Order Information

Description:	Item number:	Former main reference:
ND1K0.520.2FW.B.007	103172	020.00348

Application Note
RTD Nickel Sensor

General Information

In many sectors, temperature measurement is one of the most important physically defined parameter to determine product quality, security and reliability. Temperature sensors are produced with different technologies to fit specific application requirements. To this end, IST AG has concentrated the development, manufacturing processes and materials to produce high-end thin-film temperature sensors. This know-how, partially derived from the semiconductor industry, allows IST AG to manufacture sensors in very small dimensions. Thin-film temperature sensors exhibit a very short response time due to their low thermal mass. The technologies and processes of IST AG thin-film sensors combines the positive attributes of traditional wire-wound nickel sensors - accuracy, long-term stability, repeatability and interchangeability within a wide temperature range. The advantages of thin-film mass-production create an optimal price/performance-ratio.

Construction

The temperature sensor consists of a photolithographically structured nickel meander on a ceramic substrate. The resistivity is laser-trimmed and precisely adjusted to the final value. The resistive structure is covered with a polymer or glass passivation layer protecting the sensor against mechanical damages. The welded wires are covered with an additional fixation layer.

Nominal Value and Temperature Coefficient

The nominal value of the sensor is the defined value of the sensor resistance at 0 °C. The temperature coefficient α (TCR) is defined as:

α = [K^{-1}] according to the DIN 43760 (formerly) numerical value of 0.00618 K^{-1}.

Generally, the value is defined in ppm/K.

R_0 = resistance value in Ω at 0 °C
R_{100} = resistance value in Ω at +100 °C

Long-term Stability

The change in ohmic value after 1,000 h at maximum operating temperature amounts to less than 0.1 %.

Temperature Characteristic Curve[1)]

The characteristic curve is defined with a polynomial:

$$R(T) = R_0 (1 + A * T + B * T^2 + C * T^3 + D * T^4 + E * T^5 + F * T^6)$$

	Nickel ND (6180 ppm/K)	Nickel NL (5000 ppm/K)	Nickel NJ (6370 ppm/K)	Nickel NA (6720 ppm/K)
A	$5.485 * 10^{-3}$ [°C^{-1}]	$4.427 * 10^{-3}$ [°C^{-1}]	$5.64742 * 10^{-3}$ [°C^{-1}]	$5.88025 * 10^{-3}$ [°C^{-1}]
B	$6.65 * 10^{-6}$ [°C^{-2}]	$5.172 * 10^{-6}$ [°C^{-2}]	$6.69504 * 10^{-6}$ [°C^{-2}]	$8.28385 * 10^{-6}$ [°C^{-2}]
C	0	$5.585 * 10^{-9}$ [°C^{-3}]	$5.68816 * 10^{-9}$ [°C^{-3}]	0
D	$2.805 * 10^{-11}$ [°C^{-4}]	0	0	$7.67175 * 10^{-12}$ [°C^{-4}]
E	0	0	0	0
F	$-2 * 10^{-17}$ [°C^{-6}]	0	0	$-1.5 * 10^{-16}$ [°C^{-6}]

R_0 = resistance value in Ω at 0°C

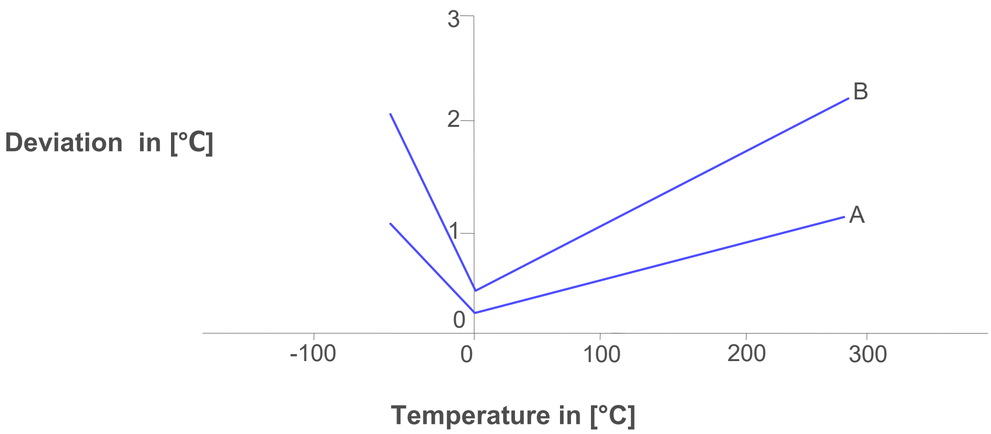
T = temperature at ITS 90

1) customer-specific characteristic curve (e.g. Balco) available

Tolerance classes formerly DIN 43760

Class	± limit deviations in °C		IST AG reference
	T < 0 °C	T > 0 °C	
1/2 DIN 43760	0.2 + 0.014 x |T|	0.2 + 0.0035 x |T|	A
DIN 43760	0.4 + 0.028 x |T|	0.4 + 0.007 x |T|	B

|T| is the numerical value of the temperature in °C without taking leading signs into account. The tolerances are only guaranteed up to +260 °C.



Applied Current

The current applied is highly dependent on the application and leads to self-heating effects and temperature measuring errors is ΔT= P/E (see self-heating). Depending on the thermal transfer from the sensor into the application, the current can be increased. There is no bottom current limit for nickel thin-film sensors.

Recommended current supplies:

100 Ω	500 Ω	1000 Ω	2000 Ω	10000 Ω
1 mA	0.5 mA	0.3 mA	0.2 mA	0.1 mA

Self-heating

To measure the resistance, electric current must run through the element. The current generates heat energy, resulting in errors of measurement. To minimize the error, caused by self-heating, the current should be kept as low as possible. Temperature error $\Delta T = P/E = R \times I^2/E$.

E = the self-heating coefficient in mW/K, R = resistance in kΩ, I = measured current in mA, P = Power in mW

Response Time

The response time is defined as the time in seconds the sensor needs to detect the change in temperature. $t_{0.63}$ describes the time in seconds the sensor needs to measure 63 % of the temperature change. The response time is depending on the sensor dimensions, the thermal contact resistance and the surrounding medium.