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Platinum-chip temperature sensors with connecting wires to EN 60 751

- **for temperatures from -70 to +600 °C**
- **standardized nominal values and tolerances**
- **resistance values from 20 to 5000 Ω**
- **linear characteristic**
- **fast response**
- **highly resistant to shock and vibration**
- **low price level**

Introduction

Platinum-chip temperature sensors belong to the category of temperature sensors that incorporate thin-film techniques. They are produced at JUMO under clean-room conditions using state-of-the-art technology. A platinum layer, which constitutes the active layer, is sputtered onto a ceramic substrate and subsequently formed into a serpentine structure by a photolithographic procedure. Afterwards, a laser trimming process is used for fine calibration. After calibration, a special glass covering layer is fused onto the platinum serpentine, as a protection against external effects and for insulation. The electrical connection is made through contact areas to which the connecting wires are bonded. Depending on the version, the connecting wires may consist of different materials and may, within certain limits, also have varying lengths and diameters. A further glass layer that is applied to the contact area fixes the connecting wires and additionally provides strain relief.

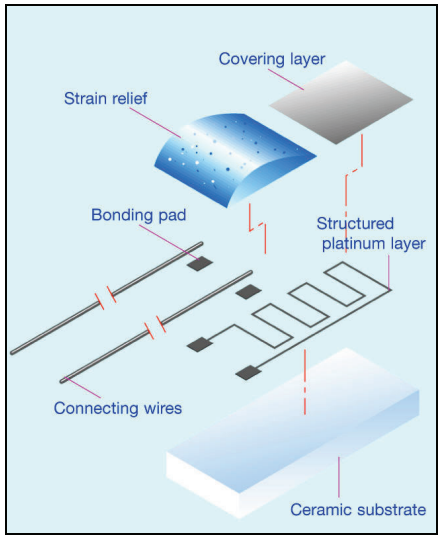
A large variety of PCA style platinum-chip temperature sensors can be supplied ex-stock as Pt100, Pt500 or Pt1000 temperature sensors. Special nominal values can be produced on request. High-resistance platinum-chip temperature sensors in small sizes are also available. And, thanks to their low mass, very fast response times are achieved. Furthermore, they are outstandingly resistant to shock and vibration when installed and fixed. The operating temperature depends on the particular version, but generally covers -70 to +600 °C. However, these platinum-chip temperature sensors can also be used with temperatures far below -70 °C, provided that shifts in the nominal value and hysteresis effects, which may occur within certain limits, can be tolerated.

Most temperature applications in the market make use of platinum-chip temperature sensors as the active component for acquiring temperature. Typical application areas can be found in HVAC, medical and laboratory technology, white goods, automobiles and utility vehicles as well as in machinery construction and industrial engineering.

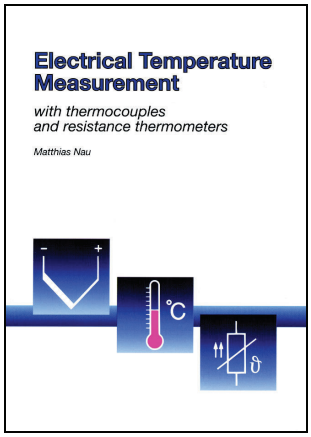
JUMO platinum temperature sensors

Construction and application of platinum temperature sensors	Data Sheet 90.6000
Platinum-glass temperature sensors	Data Sheet 90.6021
Platinum-ceramic temperature sensors	Data Sheet 90.6022
Platinum-foil temperature sensors	Data Sheet 90.6023
Platinum-glass temperature sensors with glass extension	Data Sheet 90.6024
Platinum-chip temperature sensors with connecting wires	Data Sheet 90.6121
Platinum-chip temperature sensors on epoxy card	Data Sheet 90.6122
Platinum-chip temperature sensors with terminal clamps	Data Sheet 90.6123
Platinum-chip temperature sensors in cylindrical style	Data Sheet 90.6124
Platinum-chip temperature sensors in SMD style	Data Sheet 90.6125

PCA style



Technical publication



This revised edition takes account of altered standards and recent developments. The new chapter “Measurement uncertainty” incorporates the basic concept of the internationally recognized ISO guideline “Guide to the expression of uncertainty in measurement” (abbreviated: GUM).
In addition, the chapter on explosion protection for thermometers has been updated in view of the European Directive 94/9/EC, which has been in force since 1st July 2003.

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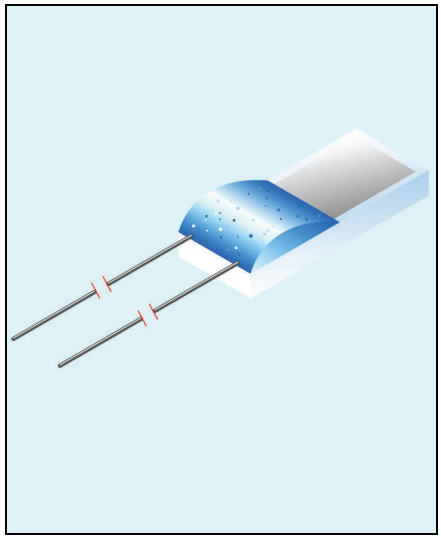
Platinum-chip temperature sensors with connecting wires to EN 60 751

PCA/S style



Brief description

Platinum-chip temperature sensors are based on a temperature-dependent resistance whose development and permissible tolerances are defined in the international standard EN 60 751. They combine the favorable properties of a platinum temperature sensor with the advantages of large-scale production. Their distinctive features are standardization and universal interchangeability, as well as high measurement accuracy, excellent long-term stability and good reproducibility of the electrical properties. Furthermore, prices have fallen considerably in recent years, since these sensors are designed to meet large-quantity requirements. With regard to the price, platinum-chip temperature sensors are therefore a genuine alternative to thermistors, which are based on semiconductors.

Platinum-chip temperature sensors, S version, are mainly used for applications at temperatures above 180 °C. They are particularly suitable for electrical connection through weld/crimp or hard-soldered joints. The connecting wires consist of a solid sheathed platinum wire and exhibit high strength. The application temperature ranges from -70 to +400 °C.

Temperature sensors in blister belt packaging or packed in bags

Temperature sensor						Connecting wire				Sales No. for tolerance class		
Type	R_0/Ω	W	L	H	S	Material	D1	L1	R_L in mΩ/mm	1/3 DIN B	A	B
PCA 1.2003.1S	1x100	2.0	2.5	1.3	0.64	Pt-Ni	0.20	10	2.8	90/00358368T 90/00415816B	90/00358365T 90/00415815B	90/00358363T 90/00415811B
PCA 1.2003.1S	1x100	2.0	2.5	1.3	0.64	Pt-Ni	0.20	13	2.8	90/00373811T on request	on request on request	90/00400734T on request
PCA 1.2005.1S	1x100	2.0	5	1.3	0.64	Pt-Ni	0.20	10	2.8	90/00309664T 90/00415804B	90/00089225T 90/00415803B	90/00089206T 90/00415801B
PCA 1.2005.1S	1x100	2.0	5	1.3	0.64	Pt-Ni	0.20	20	2.8	90/00364145T -	on request -	90/00357968T -
PCA 1.2005.5S	1x500	2.0	5	1.3	0.64	Pt-Ni	0.20	10	2.8	90/00309666T 90/00415807B	90/00089226T 90/00415806B	90/00089207T 90/00415805B
PCA 1.2005.5S	1x500	2.0	5	1.3	0.64	Pt-Ni	0.20	20	2.8	90/00364146T -	on request -	90/00357969T -
PCA 1.2005.10S	1x1000	2.0	5	1.3	0.64	Pt-Ni	0.20	10	2.8	90/00358360T 90/00415810B	90/00358359T 90/00415809B	90/00358358T 90/00415808B
PCA 1.2005.10S	1x1000	2.0	5	1.3	0.64	Pt-Ni	0.20	20	2.8	on request -	on request -	90/00358285T -
PCA 1.2010.1S	1x100	2.0	10	1.3	0.64	Pt-Ni	0.20	10	2.8	90/00309674T 90/00415794B	90/00089222T 90/00415793B	90/00089203T 90/00415792B
PCA 1.2010.1S	1x100	2.0	10	1.3	0.64	Pt-Ni	0.20	20	2.8	on request -	on request -	90/00067265T -
PCA 1.2010.5S	1x500	2.0	10	1.3	0.64	Pt-Ni	0.20	10	2.8	90/00309676T 90/00415797B	90/00089223T 90/00415796B	90/00089204T 90/00415795B
PCA 1.2010.10S	1x1000	2.0	10	1.3	0.64	Pt-Ni	0.20	10	2.8	90/00309681T 90/00415800B	90/00089224T 90/00415799B	90/00089205T 90/00415798B
PCA 1.2010.10S	1x1000	2.0	10	1.3	0.64	Pt-Ni	0.25	50	1.8	on request -	on request -	90/00315095T -
PCA 1.2010.20S	1x2000	2.0	10	1.3	0.64	Pt-Ni	0.20	10	2.8	on request on request	on request on request	90/00417435T 90/00417434B
PCA 1.2010.50S	1x5000	2.0	10	1.3	0.64	Pt-Ni	0.20	10	2.8	on request on request	on request on request	90/00430079T 90/00430075B

Dim. tolerances: ΔB = ±0.2 / ΔL = ±0.5 / ΔH = ±0.2 / ΔS = ±0.1 / ΔD1 = ±0.01 / ΔL1 = ±0.5
Dimensions in mm.

For a definition of the tolerance classes, see Data Sheet 90.6000
T = bag, B = blister belt

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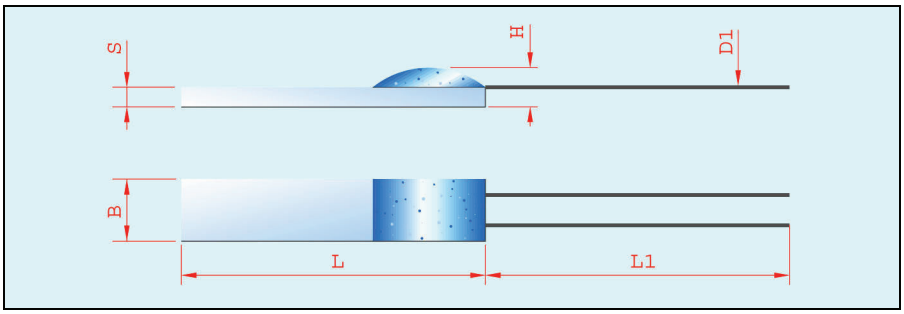
Dimensional drawing



Technical data

Standard	EN 60 751
Temperature coefficient	$\alpha = 3.850 \times 10^{-3} °C^{-1}$ (between 0 and 100 °C)
Temperature range	-70 to +400 °C
Tolerance	Temperature validity range Class 1/3 DIN B: -50 to +200 °C Temperature validity range Class A: -70 to +300 °C Temperature validity range Class B: -70 to +400 °C
Measuring current/maximum current	Pt100 recommended: 1.0 mA maximum: 7 mA Pt500 recommended: 0.7 mA maximum: 3 mA Pt1000 recommended: 0.1 mA maximum: 1 mA Pt2000 recommended: 0.1 mA maximum: 1 mA Pt5000 recommended: 0.1 mA maximum: 1 mA
Operating conditions	Platinum-chip temperature sensors may not be used unprotected in humid ambient conditions or corrosive atmospheres. They must also not be immersed directly in liquids. The user may have to carry out some checks before operation. **Please also refer to the Installation Instructions B 90.6121.4 “Notes on the application of platinum-chip temperature sensors.”**
Connecting wires	These temperature sensors feature connecting wires made from sheathed platinum wire with a nickel core. The connecting wires are suitable for crimp/weld and hard-soldered joints. During further processing, it is essential to ensure that the connections are not subjected to lateral pressures. The horizontal tension on the individual connecting wire must not exceed the maximum value of 10 N. Any unnecessary bending of the connecting wires must be avoided, as this may result in material fatigue and a wire break. Please also refer to section 3 “Connection methods” in our installation instructions. Longer connecting wires up to 300 mm length (in one piece) can optionally be fitted. Alternatively, silver wire or insulated stranded wires of whatever length is required can be used as extensions at a later time. Please note, however, that there may be restrictions on the application temperature.
Measurement point	The nominal value specified refers to the standard connecting wire length L1. The measurement is acquired 2mm from the open end of the wire. If the wire length is altered, changes in resistance will occur which may result in the tolerance class not being met.
Long-term stability	max. R_0 drift 0.05 %/year (see Data Sheet 90.6000 for definitions)
Low-temperature application	Taking into account nominal value drifts and hysteresis effects that may occur within certain limits, temperature measurements down to -200 °C are also possible. Further details can be obtained on request.
Insulation resistance	>10 MΩ at room temperature
Vibration strength	see EN 60 751, Section 4.4.2
Self-heating	$\Delta t = I^2 \times R \times E$ (see Data Sheet 90.6000 for definitions)
Packaging	Blister belt/bag
Storage	In the standard belt packaging, JUMO temperature sensors, PCA/S style, can be stored for at least 12 months under normal ambient conditions. It is not permissible to store the sensors in aggressive atmospheres, corrosive media, or in high humidity.

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Self-heating coefficients and response times

Type	Self-heating coefficient E in °C/mW		Response times in seconds			
	in water (v = 0.2m/sec)	in air (v = 2m/sec)	in water (v = 0.4m/sec)		in air (v = 1m/sec)	
			$t_{0.5}$	$t_{0.9}$	$t_{0.5}$	$t_{0.9}$
PCA 1.2003.1S	0.02	0.2	0.1	0.3	3	9
PCA 1.2005.1S	0.02	0.2	0.1	0.3	3	9
PCA 1.2005.5S	0.02	0.2	0.1	0.3	3	9
PCA 1.2005.10S	0.02	0.2	0.1	0.3	3	9
PCA 1.2010.1S	0.02	0.2	0.1	0.3	3	9
PCA 1.2010.5S	0.01	0.2	0.2	0.4	3	9
PCA 1.2010.10S	0.01	0.2	0.2	0.4	3	9
PCA 1.2010.20S	0.01	0.2	0.2	0.4	3	9
PCA 1.2010.50S	0.01	0.2	0.2	0.4	3	9