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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 5000Ω
- linear characteristic
- fast response
- highly resistant to shock and vibration
- low price level

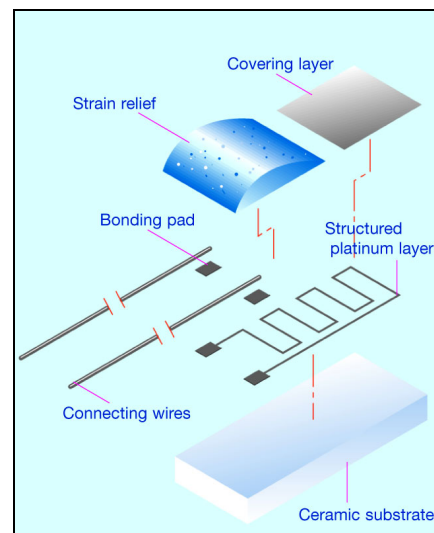
## Introduction

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.

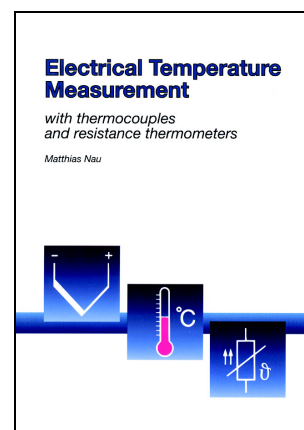
A large variety of PCA style platinum-chip temperature sensors can be supplied ex-stock as Pt100, Pt500 or Pt1000 temperature sensors. Special nominal values can be produced on request. High-resistance platinum-chip temperature sensors in small sizes are also available. And, thanks to their low mass, 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.

## 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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## JUMO platinum temperature sensors

|                                                              |                    |
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| 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 |

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

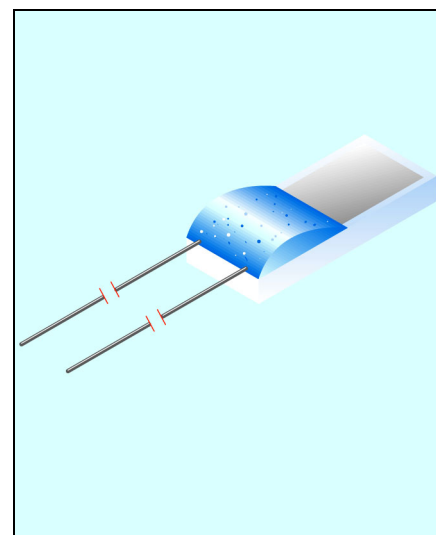
## Brief description

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, L version, are mainly used in the fabrication of various probes with connecting cables. They are particularly suitable for electrical connection through soft-soldered joints. The connecting wires are made from pure silver and are ideal for this purpose.

The application temperature ranges from -70 to +250°C. However, the maximum temperature is +350°C, which opens up additional application possibilities.

## PCA/L style



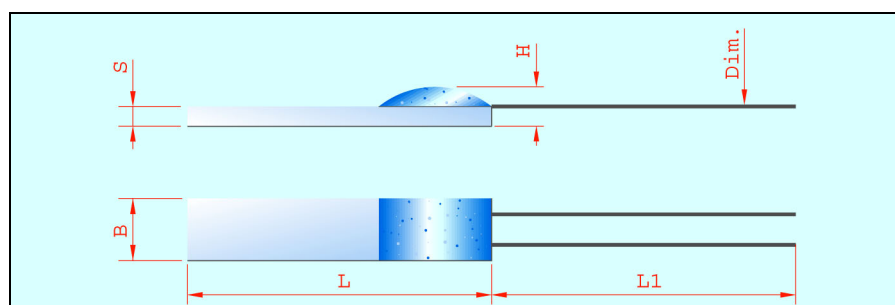
## Temperature sensors in blister belt packaging or packed in bags

| Temperature sensor |                   |     |    |     |      | Connecting wire |           |    |                         | Sales No. for tolerance class |                              |                              |
|--------------------|-------------------|-----|----|-----|------|-----------------|-----------|----|-------------------------|-------------------------------|------------------------------|------------------------------|
| Type               | R <sub>0</sub> /Ω | W   | L  | H   | S    | Material        | Dim.      | L1 | R <sub>L</sub> in mΩ/mm | 1/3 DIN B                     | A                            | B                            |
| PCA 1.2005.1L      | 1x100             | 2.0 | 5  | 1.3 | 0.64 | Ag              | 0.2 x 0.3 | 10 | 0.3                     | 90/00063358T<br>90/00415828B  | 90/00417995T<br>90/00415827B | 90/00063260T<br>90/00415826B |
| PCA 1.2005.5L      | 1x500             | 2.0 | 5  | 1.3 | 0.64 | Ag              | 0.2 x 0.3 | 10 | 0.3                     | 90/00063359T<br>90/00415831B  | 90/00417996T<br>90/00415830B | 90/00063261T<br>90/00415829B |
| PCA 1.2010.1L      | 1x100             | 2.0 | 10 | 1.3 | 0.64 | Ag              | 0.2 x 0.3 | 10 | 0.3                     | 90/00047408T<br>90/00415819B  | 90/00062559T<br>90/00415818B | 90/00044789T<br>90/00415817B |
| PCA 1.2010.1L      | 1x100             | 2.0 | 10 | 1.3 | 0.64 | Ag              | 0.2 x 0.3 | 30 | 0.3                     | on request<br>-               | on request<br>-              | 90/00323380T<br>-            |
| PCA 1.2010.5L      | 1x500             | 2.0 | 10 | 1.3 | 0.64 | Ag              | 0.2 x 0.3 | 10 | 0.3                     | 90/00049133T<br>90/00415822B  | on request<br>90/00415821B   | 90/00048147T<br>90/00415820B |
| PCA 1.2010.10L     | 1x1000            | 2.0 | 10 | 1.3 | 0.64 | Ag              | 0.2 x 0.3 | 10 | 0.3                     | 90/00062567T<br>90/00415825B  | 90/00062566T<br>90/00415824B | 90/00062565T<br>90/00415823B |
| PCA 1.2010.50L     | 1x5000            | 2.0 | 10 | 1.3 | 0.64 | Ag              | 0.2 x 0.3 | 10 | 0.3                     | on request<br>on request      | on request<br>on request     | 90/00430080T<br>90/00430081B |

Dim. tolerances:  $\Delta B = \pm 0.2$  /  $\Delta L = \pm 0.5$  /  $\Delta H = \pm 0.2$  /  $\Delta S = \pm 0.1$  /  $\Delta \text{Dim.} = \text{approx. dim.}$  /  $\Delta L1 = \pm 0.5$   
Dimensions mm.

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

## Dimensional drawing



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## Technical data

|                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                     |               |
|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|---------------|
| <b>Standard</b>                          | EN 60 751                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                     |               |
| <b>Temperature coefficient</b>           | $\alpha = 3.850 \times 10^{-3} \text{ }^{\circ}\text{C}^{-1}$ (between 0 and 100 °C)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                     |               |
| <b>Temperature range</b>                 | -70 to +250 °C (+350 °C)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |               |
| <b>Tolerance</b>                         | Temperature validity range Class 1/3 DIN B: -50 to +200 °C<br>Temperature validity range Class A: -70 to +300 °C<br>Temperature validity range Class B: -70 to +350 °C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                     |               |
| <b>Measuring current/maximum current</b> | Pt100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | recommended: 1.0 mA | maximum: 7 mA |
|                                          | Pt500                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | recommended: 0.7 mA | maximum: 3 mA |
|                                          | Pt1000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | recommended: 0.1 mA | maximum: 1 mA |
|                                          | Pt5000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | recommended: 0.1 mA | maximum: 1 mA |
| <b>Operating conditions</b>              | 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.<br><b>Please also refer to the Installation Instructions B 90.6121.4 "Notes on the application of platinum-chip temperature sensors."</b>                                                                                                                                                                                                                                                                                                                                                                                                                       |                     |               |
| <b>Connecting wires</b>                  | These temperature sensors feature connecting wires that are made from pure silver. The connecting wires are especially suitable for soft-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 5 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, extensions of any length or insulated stranded wires can, on request, be fitted at a later stage. |                     |               |
| <b>Measurement point</b>                 | The nominal value specified refers to the standard connecting wire length L1. The measurement is acquired 2 mm 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                     |               |
| <b>Long-term stability</b>               | max. $R_0$ drift 0.05 %/year (see Data Sheet 90.6000 for definitions)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                     |               |
| <b>Low-temperature application</b>       | 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                     |               |
| <b>Insulation resistance</b>             | >10 MΩ at room temperature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                     |               |
| <b>Vibration strength</b>                | see EN 60 751, Section 4.4.2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                     |               |
| <b>Self-heating</b>                      | $\Delta t = I^2 \times R \times E$ (see Data Sheet 90.6000 for definitions)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                     |               |
| <b>Packaging</b>                         | Blister belt/bag                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                     |               |
| <b>Storage</b>                           | In the standard belt packaging, JUMO temperature sensors, PCA/L 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. Since the connecting wires for this version are made from pure silver, storability is enhanced by air-tight packaging and dark surroundings. If this is not the case, the silver will tend to get tarnished with time, which may lead to difficulties when making the solder joint.                                                                                                                                                                                                                                                         |                     |               |

## Self-heating coefficients and response times

| Type           | Self-heating coefficient E in °C/mW |                         | Response times in seconds   |                  |                         |                  |
|----------------|-------------------------------------|-------------------------|-----------------------------|------------------|-------------------------|------------------|
|                | in water<br>(v = 0.2 m/sec)         | in air<br>(v = 2 m/sec) | in water<br>(v = 0.4 m/sec) |                  | in air<br>(v = 1 m/sec) |                  |
|                |                                     |                         | t <sub>0.5</sub>            | t <sub>0.9</sub> | t <sub>0.5</sub>        | t <sub>0.9</sub> |
| PCA 1.2005.1L  | 0.02                                | 0.2                     | 0.1                         | 0.3              | 4                       | 16               |
| PCA 1.2005.5L  | 0.02                                | 0.2                     | 0.1                         | 0.3              | 4                       | 16               |
| PCA 1.2010.1L  | 0.02                                | 0.2                     | 0.3                         | 0.3              | 7                       | 22               |
| PCA 1.2010.5L  | 0.01                                | 0.2                     | 0.3                         | 0.5              | 7                       | 22               |
| PCA 1.2010.10L | 0.01                                | 0.2                     | 0.3                         | 0.5              | 7                       | 22               |
| PCA 1.2010.50L | 0.01                                | 0.2                     | 0.3                         | 0.5              | 7                       | 22               |

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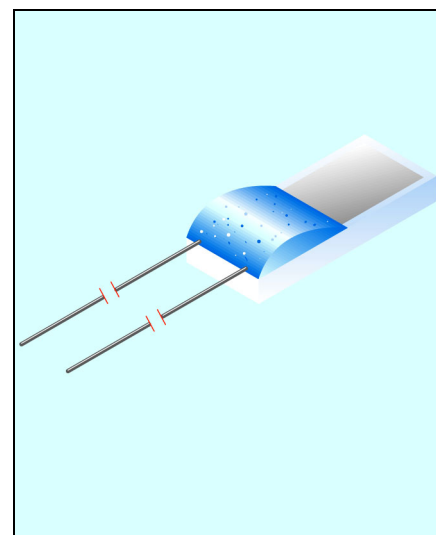
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## Brief description

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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.

## PCA/S style



## Temperature sensors in blister belt packaging or packed in bags

| Temperature sensor |                   |     |     |     |      | Connecting wire |      |    |                         | Sales No. for tolerance class |                              |                              |
|--------------------|-------------------|-----|-----|-----|------|-----------------|------|----|-------------------------|-------------------------------|------------------------------|------------------------------|
| Type               | R <sub>0</sub> /Ω | W   | L   | H   | S    | Material        | D1   | L1 | R <sub>L</sub> 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<br>90/00415816B  | 90/00358365T<br>90/00415815B | 90/00358363T<br>90/00415811B |
| PCA 1.2003.1S      | 1x100             | 2.0 | 2.5 | 1.3 | 0.64 | Pt-Ni           | 0.20 | 13 | 2.8                     | 90/00373811T<br>on request    | on request<br>on request     | 90/00400734T<br>on request   |
| PCA 1.2005.1S      | 1x100             | 2.0 | 5   | 1.3 | 0.64 | Pt-Ni           | 0.20 | 10 | 2.8                     | 90/00309664T<br>90/00415804B  | 90/00089225T<br>90/00415803B | 90/00089206T<br>90/00415801B |
| PCA 1.2005.1S      | 1x100             | 2.0 | 5   | 1.3 | 0.64 | Pt-Ni           | 0.20 | 20 | 2.8                     | 90/00364145T<br>-             | on request<br>-              | 90/00357968T<br>-            |
| PCA 1.2005.5S      | 1x500             | 2.0 | 5   | 1.3 | 0.64 | Pt-Ni           | 0.20 | 10 | 2.8                     | 90/00309666T<br>90/00415807B  | 90/00089226T<br>90/00415806B | 90/00089207T<br>90/00415805B |
| PCA 1.2005.5S      | 1x500             | 2.0 | 5   | 1.3 | 0.64 | Pt-Ni           | 0.20 | 20 | 2.8                     | 90/00364146T<br>-             | on request<br>-              | 90/00357969T<br>-            |
| PCA 1.2005.10S     | 1x1000            | 2.0 | 5   | 1.3 | 0.64 | Pt-Ni           | 0.20 | 10 | 2.8                     | 90/00358360T<br>90/00415810B  | 90/00358359T<br>90/00415809B | 90/00358358T<br>90/00415808B |
| PCA 1.2005.10S     | 1x1000            | 2.0 | 5   | 1.3 | 0.64 | Pt-Ni           | 0.20 | 20 | 2.8                     | on request<br>-               | on request<br>-              | 90/00358285T<br>-            |
| PCA 1.2010.1S      | 1x100             | 2.0 | 10  | 1.3 | 0.64 | Pt-Ni           | 0.20 | 10 | 2.8                     | 90/00309674T<br>90/00415794B  | 90/00089222T<br>90/00415793B | 90/00089203T<br>90/00415792B |
| PCA 1.2010.1S      | 1x100             | 2.0 | 10  | 1.3 | 0.64 | Pt-Ni           | 0.20 | 20 | 2.8                     | on request<br>-               | on request<br>-              | 90/00067265T<br>-            |
| PCA 1.2010.5S      | 1x500             | 2.0 | 10  | 1.3 | 0.64 | Pt-Ni           | 0.20 | 10 | 2.8                     | 90/00309676T<br>90/00415797B  | 90/00089223T<br>90/00415796B | 90/00089204T<br>90/00415795B |
| PCA 1.2010.10S     | 1x1000            | 2.0 | 10  | 1.3 | 0.64 | Pt-Ni           | 0.20 | 10 | 2.8                     | 90/00309681T<br>90/00415800B  | 90/00089224T<br>90/00415799B | 90/00089205T<br>90/00415798B |
| PCA 1.2010.10S     | 1x1000            | 2.0 | 10  | 1.3 | 0.64 | Pt-Ni           | 0.25 | 50 | 1.8                     | on request<br>-               | on request<br>-              | 90/00315095T<br>-            |
| PCA 1.2010.20S     | 1x2000            | 2.0 | 10  | 1.3 | 0.64 | Pt-Ni           | 0.20 | 10 | 2.8                     | on request<br>on request      | on request<br>on request     | 90/00417435T<br>90/00417434B |
| PCA 1.2010.50S     | 1x5000            | 2.0 | 10  | 1.3 | 0.64 | Pt-Ni           | 0.20 | 10 | 2.8                     | on request<br>on request      | on request<br>on request     | 90/00430079T<br>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

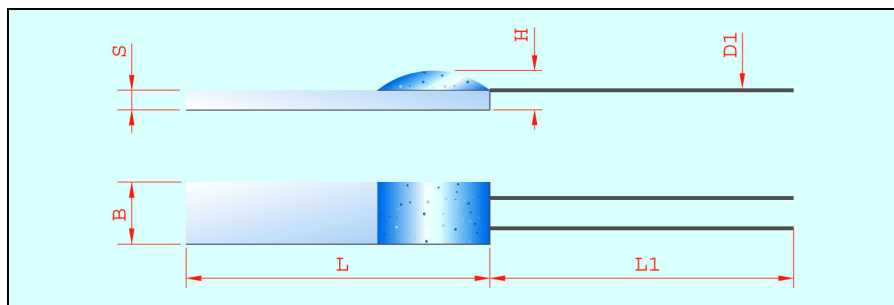
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## Dimensional drawing



## Technical data

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                    |              |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|--------------|
| Standard                          | EN 60 751                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                    |              |
| Temperature coefficient           | $\alpha = 3.850 \times 10^{-3} \text{ } ^\circ\text{C}^{-1}$ (between 0 and 100°C)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                    |              |
| Temperature range                 | -70 to +400°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                    |              |
| Tolerance                         | Temperature validity range Class 1/3 DIN B: -50 to +200°C<br>Temperature validity range Class A: -70 to +300°C<br>Temperature validity range Class B: -70 to +400°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                    |              |
| Measuring current/maximum current | Pt100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | recommended: 1.0mA | maximum: 7mA |
|                                   | Pt500                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | recommended: 0.7mA | maximum: 3mA |
|                                   | Pt1000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | recommended: 0.1mA | maximum: 1mA |
|                                   | Pt2000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | recommended: 0.1mA | maximum: 1mA |
|                                   | Pt5000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | recommended: 0.1mA | maximum: 1mA |
| 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.<br><b>Please also refer to the Installation Instructions B 90.6121.4 “Notes on the application of platinum-chip temperature sensors.”</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                    |              |
| 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 10N. 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 300mm 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             | >10MΩ 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<br>(v = 0.2m/sec)          | in air<br>(v = 2m/sec) | in water<br>(v = 0.4m/sec) |                  | in air<br>(v = 1m/sec) |                  |
|                |                                     |                        | t <sub>0.5</sub>           | t <sub>0.9</sub> | t <sub>0.5</sub>       | t <sub>0.9</sub> |
| 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                |



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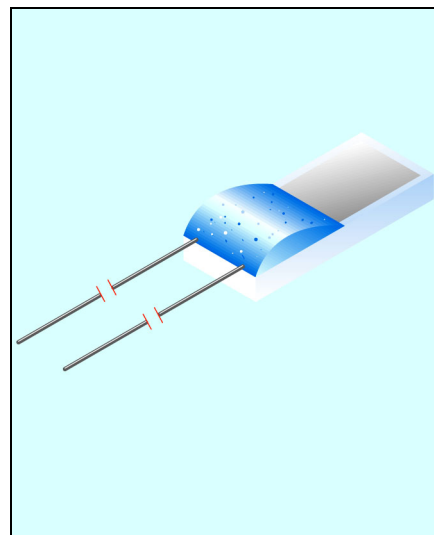
## Platinum-chip temperature sensors with connecting wires to EN 60 751

### Brief description

Platinum-chip temperature sensors are based on a temperature-dependent resistance whose development and permissible tolerance is 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, M version, provide the ultimate solution to most application tasks. The temperature sensors feature a particularly wide temperature range, extending from -70 to +550°C. A large selection of different versions is available ex-stock. Miniaturized versions can also be supplied, which considerably facilitate fabrication for locations where space is at a premium. Of particular advantage is the special covering layer procedure adopted for this version, allowing unprotected use under humid ambient conditions. Typical application examples can be found in HVAC engineering, and in industrial humidity measurement.

### PCA/M style



### Temperature sensors in blister belt packaging or packed in bags

| Temperature sensor |                   |     |     |     |      | Connecting wire |      |    |                         | Sales No. for tolerance class |                              |                              |
|--------------------|-------------------|-----|-----|-----|------|-----------------|------|----|-------------------------|-------------------------------|------------------------------|------------------------------|
| Type               | R <sub>0</sub> /Ω | W   | L   | H   | S    | Material        | D1   | L1 | R <sub>L</sub> in mΩ/mm | 1/3 DIN B                     | A                            | B                            |
| PCA 1.1505.1M      | 1x100             | 1.5 | 5   | 1.0 | 0.38 | Pt-Ni           | 0.20 | 10 | 2.8                     | 90/00409843T<br>90/00417179B  | 90/00409841T<br>90/00417177B | 90/00409840T<br>90/00417178B |
| PCA 1.1505.1M      | 1x100             | 1.5 | 5   | 1.0 | 0.38 | Pt-Ni           | 0.20 | 15 | 2.8                     | 90/00430392T<br>90/00430396B  | 90/00430393T<br>90/00430394B | 90/00430391T<br>90/00430395B |
| PCA 1.1505.5M      | 1x500             | 1.5 | 5   | 1.0 | 0.38 | Pt-Ni           | 0.20 | 10 | 2.8                     | 90/00409847T<br>90/00417185B  | 90/00409845T<br>90/00417183B | 90/00409844T<br>90/00417184B |
| PCA 1.1505.10M     | 1x1000            | 1.5 | 5   | 1.0 | 0.38 | Pt-Ni           | 0.20 | 10 | 2.8                     | 90/00409850T<br>90/00417182B  | 90/00409849T<br>90/00417180B | 90/00409848T<br>90/00417181B |
| PCA 1.1505.10M     | 1x1000            | 1.5 | 5   | 1.0 | 0.38 | Pt-Ni           | 0.20 | 15 | 2.8                     | on request<br>on request      | on request<br>on request     | 90/00425409T<br>on request   |
| PCA 1.2003.1M      | 1x100             | 2.0 | 2.5 | 1.3 | 0.64 | Pt-Ni           | 0.20 | 13 | 2.8                     | 90/00412342T<br>90/00415833B  | 90/00412341T<br>90/00415834B | 90/00412318T<br>90/00415832B |
| PCA 1.2005.1M      | 1x100             | 2.0 | 5   | 1.3 | 0.64 | Pt-Ni           | 0.20 | 10 | 2.8                     | 90/00387454T<br>90/00415836B  | 90/00387455T<br>90/00415837B | 90/00387456T<br>90/00415835B |
| PCA 1.2005.5M      | 1x500             | 2.0 | 5   | 1.3 | 0.64 | Pt-Ni           | 0.20 | 10 | 2.8                     | 90/00387453T<br>90/00415839B  | 90/00387449T<br>90/00415840B | 90/00387465T<br>90/00415838B |
| PCA 1.2005.10M     | 1x1000            | 2.0 | 10  | 1.3 | 0.64 | Pt-Ni           | 0.20 | 10 | 2.8                     | 90/00412308T<br>90/00415842B  | 90/00412311T<br>90/00415843B | 90/00412307T<br>90/00415841B |
| PCA 1.2010.1M      | 1x100             | 2.0 | 10  | 1.3 | 0.64 | Pt-Ni           | 0.20 | 10 | 2.8                     | 90/00412338T<br>90/00415845B  | 90/00412337T<br>90/00415846B | 90/00412339T<br>90/00415844B |
| PCA 1.2010.5M      | 1x500             | 2.0 | 10  | 1.3 | 0.64 | Pt-Ni           | 0.20 | 10 | 2.8                     | on request<br>on request      | on request<br>on request     | on request<br>on request     |
| PCA 1.2010.10M     | 1x1000            | 2.0 | 10  | 1.3 | 0.64 | Pt-Ni           | 0.20 | 10 | 2.8                     | 90/00387458T<br>90/00415848B  | 90/00387459T<br>90/00415849B | 90/00387460T<br>90/00415847B |

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

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

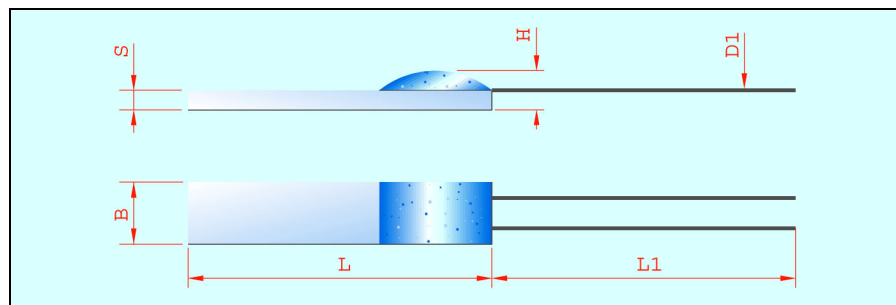
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## Dimensional drawing



## Technical data

|                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                     |               |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|---------------|
| <b>Standard</b>                          | EN 60 751                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                     |               |
| <b>Temperature coefficient</b>           | $\alpha = 3.850 \times 10^{-3} \text{ } ^\circ\text{C}^{-1}$ (between 0 and 100°C)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                     |               |
| <b>Temperature range</b>                 | -70 to +550°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                     |               |
| <b>Tolerance</b>                         | Temperature validity range Class 1/3 DIN B: -50 to +200°C<br>Temperature validity range Class A: -70 to +300°C<br>Temperature validity range Class B: -70 to +550°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                     |               |
| <b>Measuring current/maximum current</b> | Pt100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | recommended: 1.0 mA | maximum: 7 mA |
|                                          | Pt500                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | recommended: 0.7 mA | maximum: 3 mA |
|                                          | Pt1000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | recommended: 0.1 mA | maximum: 1 mA |
| <b>Operating conditions</b>              | This version of platinum-chip temperature sensors may not be used unprotected in corrosive atmospheres. They must also not be immersed directly in liquids. The user may have to carry out some checks before operation.<br><b>Please also refer to the Installation Instructions B 90.6121.4 "Notes on the application of platinum-chip temperature sensors."</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                     |               |
| <b>Connecting wires</b>                  | 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 that there may be restrictions on the application temperature. |                     |               |
| <b>Measurement point</b>                 | The nominal value specified refers to the standard connecting wire length L1. The measurement is acquired 2 mm 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                     |               |
| <b>Long-term stability</b>               | max. $R_0$ drift 0.05 %/year (see Data Sheet 90.6000 for definitions)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                     |               |
| <b>Low-temperature application</b>       | 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |               |
| <b>Insulation resistance</b>             | >10 MΩ at room temperature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                     |               |
| <b>Vibration strength</b>                | see EN 60 751, Section 4.4.2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                     |               |
| <b>Self-heating</b>                      | $\Delta t = I^2 \times R \times E$ (see Data Sheet 90.6000 for definitions)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |               |
| <b>Packaging</b>                         | Blister belt/bag                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                     |               |
| <b>Storage</b>                           | In the standard belt packaging, JUMO temperature sensors, PCA/M 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<br>(v = 0.2m/sec)          | in air<br>(v = 2m/sec) | in water<br>(v = 0.4 m/sec) |                  | in air<br>(v = 1 m/sec) |                  |
|                |                                     |                        | t <sub>0.5</sub>            | t <sub>0.9</sub> | t <sub>0.5</sub>        | t <sub>0.9</sub> |
| PCA 1.1505.1M  | 0.02                                | 0.2                    | 0.1                         | 0.3              | 3                       | 8                |
| PCA 1.1505.5M  | 0.02                                | 0.2                    | 0.1                         | 0.3              | 3                       | 8                |
| PCA 1.1505.10M | 0.02                                | 0.2                    | 0.1                         | 0.3              | 3                       | 8                |
| PCA 1.2003.1M  | 0.02                                | 0.2                    | 0.1                         | 0.3              | 3                       | 9                |
| PCA 1.2005.1M  | 0.02                                | 0.2                    | 0.1                         | 0.3              | 4                       | 16               |
| PCA 1.2005.5M  | 0.02                                | 0.2                    | 0.1                         | 0.3              | 4                       | 16               |
| PCA 1.2005.10M | 0.02                                | 0.2                    | 0.2                         | 0.3              | 4                       | 16               |
| PCA 1.2010.1M  | 0.02                                | 0.2                    | 0.3                         | 0.5              | 7                       | 22               |
| PCA 1.2010.5M  | 0.01                                | 0.2                    | 0.3                         | 0.5              | 7                       | 22               |
| PCA 1.2010.10M | 0.01                                | 0.2                    | 0.3                         | 0.5              | 7                       | 22               |

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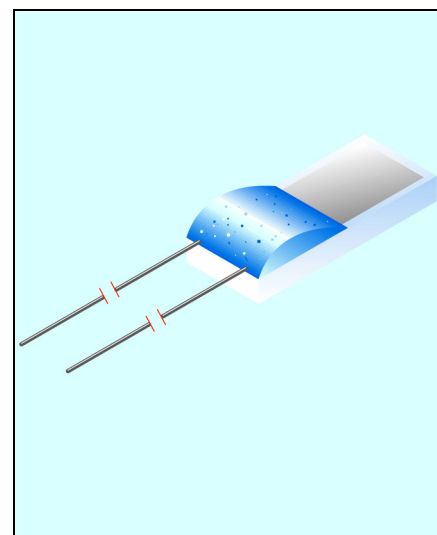
# Platinum-chip temperature sensors with connecting wires to EN 60 751

## Brief description

Platinum-chip temperature sensors are based on a temperature-dependent resistance whose development and permissible tolerance is 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, H version, are mainly used for applications at especially high or permanently elevated temperatures. They are particularly suitable for electrical connection through bonding or laser welding procedures, and through hard-soldered joints. The connecting wires are made from pure palladium. The application covers temperatures from -70 to +600°C.

## PCA/H style



## Temperature sensors in blister belt packaging or packed in bags

| Temperature sensor |              |     |    |     |      |
|--------------------|--------------|-----|----|-----|------|
| Type               | $R_0/\Omega$ | W   | L  | H   | S    |
| PCA 1.2010.1H      | 1x100        | 2.0 | 10 | 1.2 | 0.64 |
| PCA 1.2010.5H      | 1x500        | 2.0 | 10 | 1.2 | 0.64 |
| PCA 1.2010.10H     | 1x1000       | 2.0 | 10 | 1.2 | 0.64 |

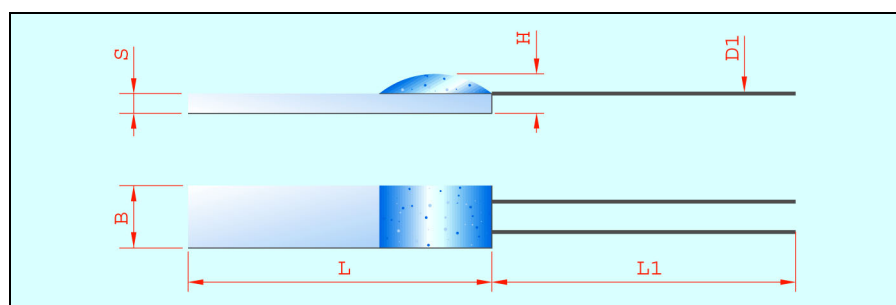
| Connecting wire |      |    |                         |
|-----------------|------|----|-------------------------|
| Material        | D1   | L1 | $R_L$ in m $\Omega$ /mm |
| Pd              | 0.25 | 10 | 2.3                     |
| Pd              | 0.25 | 10 | 2.3                     |
| Pd              | 0.25 | 10 | 2.3                     |

| Sales No. for tolerance class |              |              |
|-------------------------------|--------------|--------------|
| 1/3 DIN B                     | A            | B            |
| 90/00343070T                  | 90/00343069T | 90/00053198T |
| 90/00415851B                  | 90/00415852B | 90/00415850B |
| on request                    | on request   | on request   |
| on request                    | on request   | on request   |
| 90/00343065T                  | 90/00343064T | 90/00044796T |
| 90/00415855B                  | 90/00415856B | 90/00415854B |

Dim. tolerances:  $\Delta B = \pm 0.2$  /  $\Delta L = \pm 0.5$  /  $\Delta H = \pm 0.2$  /  $\Delta S = \pm 0.1$  /  $\Delta D1 = \pm 0.01$  /  $\Delta L1 = \pm 0.5$   
Dimensions in mm.

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

## Dimensional drawing



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## Technical data

|                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Standard</b>                          | EN 60 751                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Temperature coefficient</b>           | $\alpha = 3.850 \times 10^{-3} \text{ }^{\circ}\text{C}^{-1}$ (between 0 and 100 °C)                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Temperature range</b>                 | -70 to +600 °C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Tolerance</b>                         | Temperature validity range Class 1/3 DIN B: -50 to +200 °C<br>Temperature validity range Class A: -70 to +300 °C<br>Temperature validity range Class B: -70 to +600 °C                                                                                                                                                                                                                                                                                                                                                        |
| <b>Measuring current/maximum current</b> | Pt100 recommended: 1.0mA maximum: 7mA<br>Pt1000 recommended: 0.1mA maximum: 1mA                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Operating conditions</b>              | 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.<br><b>Please also refer to the Installation Instructions B 90.6121.4 "Notes on the application of platinum-chip temperature sensors."</b>                                                                                                                                                |
| <b>Connecting wires</b>                  | These temperature sensors feature connecting wires made from pure palladium. The connecting wires are suitable for bonding or laser welding procedures 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 6N. Any unnecessary bending of the connecting wires must be avoided as this may result in material fatigue and a wire break. |
| <b>Measurement point</b>                 | The nominal value specified refers to the standard connecting wire length L1. The measurement is acquired 2 mm 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.                                                                                                                                                                                                                                                          |
| <b>Long-term stability</b>               | max. $R_0$ drift 0.05 %/year (see Data Sheet 90.6000 for definitions)                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Low-temperature application</b>       | 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.                                                                                                                                                                                                                                                                                                                 |
| <b>Insulation resistance</b>             | >10 MΩ at room temperature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Vibration strength</b>                | see EN 60 751, Section 4.4.2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Self-heating</b>                      | $\Delta t = I^2 \times R \times E$ (see Data Sheet 90.6000 for definitions)                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Packaging</b>                         | Blister belt/bag                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Storage</b>                           | In the standard belt packaging, JUMO temperature sensors, PCA/H 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.                                                                                                                                                                                                                                                                      |

## Self-heating coefficients and response times

| Type           | Self-heating coefficient E in °C/mW |                        | Response times in seconds  |                  |                        |                  |
|----------------|-------------------------------------|------------------------|----------------------------|------------------|------------------------|------------------|
|                | in water<br>(v = 0.2m/sec)          | in air<br>(v = 2m/sec) | in water<br>(v = 0.4m/sec) |                  | in air<br>(v = 1m/sec) |                  |
|                |                                     |                        | t <sub>0.5</sub>           | t <sub>0.9</sub> | t <sub>0.5</sub>       | t <sub>0.9</sub> |
| PCA 1.2010.1H  | 0.02                                | 0.2                    | 0.3                        | 0.5              | 7                      | 22               |
| PCA 1.2010.5H  | 0.02                                | 0.2                    | 0.3                        | 0.5              | 7                      | 22               |
| PCA 1.2010.10H | 0.01                                | 0.2                    | 0.3                        | 0.5              | 7                      | 22               |