

## Features

- Conforms to DIN EN 60751
- Wide operating temperature range:  
-200°C to +600°C (Au-coated Nickel wire and Class F 0.3, Ag-Wire versions are limited to +300°C)
- Standard nominal resistances values:  
R0: 100Ω and 1000Ω (others available upon request)
- Standardized Tolerance Classes:  
Class F 0.1 (T = AA), F 0.15 (A), F 0.3 (B) and F 0.6 (C) accuracy with defined tolerance temperature ranges
- Excellent long-term stability
- Fast response time due to low thermal mass
- Variety of outline dimensions available to fit a wide range of space requirements
- Global interchangeability

## Applications

- Temperature feedback control
- White goods
- Industrial applications
- Automotive
- Medical
- Sensing element for plug-in probes

## PTF -FAMILY

### Platinum Thinfil (PTF) Temperature Elements (PT-RTD's)

#### Product Description

The PTF family combines a group of resistance temperature detectors (RTD) using a Platinum resistor element utilizing the latest in thin film technology. It consists of a structured platinum film on a ceramic substrate, passivated by a glass coating. The connection wires are protected with glass on the welding area.

The characteristic curve of this Platinum RTD complies with DIN EN 60751. The usage of Platinum as the resistive material provides excellent long-term stability.

Due to small size and low mass, this RTD has a fast response time and low time constant; therefore, it is an optimal solution for fast and precise feedback control systems.

- Platinum Temperature Sensor (Pt-RTD)
- Conformal to DIN EN 60751
- Global interchangeability
- Wide operating temperature range
- Fast response time
- Other Geometries, Nominal Resistance values and specific Characteristics (TCR) on request
- Unprotected use of the elements in dry and clean environment only
- Resistance drift typically <0.03% after 1000h at 300°C
- Tests according to AEC-Q200 passed

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# PTF TEMPERATURE ELEMENTS (PT-RTD'S)

Datasheet

## Sensor properties

\* Operating temperature range is, -200°C to +600°C for elements with Au-coated Ni wire. Max temperature for elements with Ag wire is 300°C. Accuracy is not guaranteed if the sensor is exposed to temperatures outside the specified tolerance temperature range.

\*\* The response times given are for comparison of several element geometries, will change on the later assemblies.

\*\*\* The limitations of measuring current values for narrower tolerance classes is made due to the self-heating effects affecting accuracy.

| Parameter                                                              | Symbol             | Condition                                                                                                                                                     | Min                                                | Typ                                                      | Max                                                                                              | Unit   |
|------------------------------------------------------------------------|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|----------------------------------------------------------|--------------------------------------------------------------------------------------------------|--------|
| Nominal Resistance at 0 °C                                             | R <sub>0</sub>     | Class B (F0.3) Pt100<br>Class A (F0.15) Pt100<br>Class AA or T (F0.1) Pt100<br>Class B (F0.3) Pt1000<br>Class A (F0.15) Pt1000<br>Class AA or T (F0.1) Pt1000 | 99.88<br>99.94<br>99.96<br>998.8<br>999.4<br>999.6 | 100.00<br>100.00<br>100.00<br>1000.0<br>1000.0<br>1000.0 | 100.12<br>100.06<br>100.04<br>1001.2<br>1001.6<br>1001.4                                         | Ω      |
| Tolerance at 25°C                                                      |                    | Room temperature calibration                                                                                                                                  | -0.43                                              | 0                                                        | 0.43                                                                                             | °C     |
| Temperature Coefficient of Resistance                                  | TCR                | 0 °C, 100 °C                                                                                                                                                  |                                                    | 3850                                                     |                                                                                                  | ppm/°C |
| Tolerance Temperature Range<br>(*see remarks above)                    |                    | Class C (F 0.6)<br>Class B (F 0.3)<br>Class A (F 0.15)<br>Class AA or T (F 0.1)<br>Class B/Cryo (F 0.3)                                                       | -50<br>-50<br>-30<br>-30<br>-200                   |                                                          | 600(Ag-wire 300)<br>600(Ag-wire 300)<br>300<br>200<br>200                                        | °C     |
| Self-Heating Coefficient in Air<br>Flow: 1 m/s                         |                    | PTFC outline<br>PTFD outline<br>PTFF outline<br>PTFM outline                                                                                                  |                                                    | 0.5<br>0.33<br>0.5<br>0.5                                |                                                                                                  | °C/mW  |
| Response Time Water<br>Flow: 0.4 m/s<br>(**see remarks above)          | τ <sub>W,0.9</sub> | PTFC outline<br>PTFD outline<br>PTFF outline<br>PTFM outline                                                                                                  |                                                    | 0.2<br>0.35<br>0.2<br>0.2                                |                                                                                                  | s      |
| Response Time Air<br>Flow: 1 m/s<br>(**see remarks above)              | τ <sub>A,0.9</sub> | PTFC outline<br>PTFD outline<br>PTFF outline<br>PTFM outline                                                                                                  |                                                    | 10<br>17<br>10<br>10                                     |                                                                                                  | s      |
| Measuring Current<br>R <sub>0</sub> : 100 Ω<br>(***see remarks above)  |                    | PTFC outline (Class C/B/A/T)<br>PTFD outline (Class C/B/A/T)<br>PTFF outline (Class C/B/A/T)<br>PTFM outline (Class C/B/A/T)                                  |                                                    |                                                          | 1.4 / 1.4 / 1.0 / 0.8<br>1.7 / 1.7 / 1.2 / 1.0<br>1.4 / 1.4 / 1.0 / 0.8<br>1.4 / 1.4 / 1.0 / 0.8 | mA     |
| Measuring Current<br>R <sub>0</sub> : 1000 Ω<br>(***see remarks above) |                    | PTFC outline (Class C/B/A/T)<br>PTFD outline (Class C/B/A/T)<br>PTFF outline (Class C/B/A/T)<br>PTFM outline (Class C/B/A/T)                                  |                                                    |                                                          | 0.4 / 0.4 / 0.3 / 0.2<br>0.5 / 0.5 / 0.3 / 0.3<br>0.4 / 0.4 / 0.3 / 0.2<br>0.4 / 0.4 / 0.3 / 0.2 | mA     |

## Calculation Formulas

The temperature dependencies of resistance of this Pt-RTD's are defined in DIN EN 60751 as:

For T ≥ 0 °C:

$$R_{(T)} = R_{(0)} \cdot (1 + a \cdot T + b \cdot T^2)$$

For T < 0 °C:

$$R_{(T)} = R_{(0)} \cdot [1 + a \cdot T + b \cdot T^2 + c \cdot (T - 100^\circ\text{C}) \cdot T^3]$$

Coefficients:

$$a = 3.9083\text{E-}03 \quad b = -5.775\text{E-}07 \quad c = -4.183\text{E-}12$$

Tolerances:

|                       |                           |                  |
|-----------------------|---------------------------|------------------|
| Class F 0.1 (T = AA): | ± (0.10+0.0017* T/°C ) °C | (-30...+200 °C)  |
| Class F 0.15 (A)      | ± (0.15+0.002* T/°C ) °C  | (-30...+300 °C)  |
| Class F 0.3 (B):      | ± (0.30+0.005* T/°C ) °C  | (-50...+600 °C)  |
| Class F 0.6 (C):      | ± (0.60+0.06* T/°C ) °C   | (-50...+600 °C)  |
| Class F 0.3 B (Cryo)  | ± (0.30+0.005* T/°C ) °C  | (-200...+200 °C) |

Typical Performance Curves

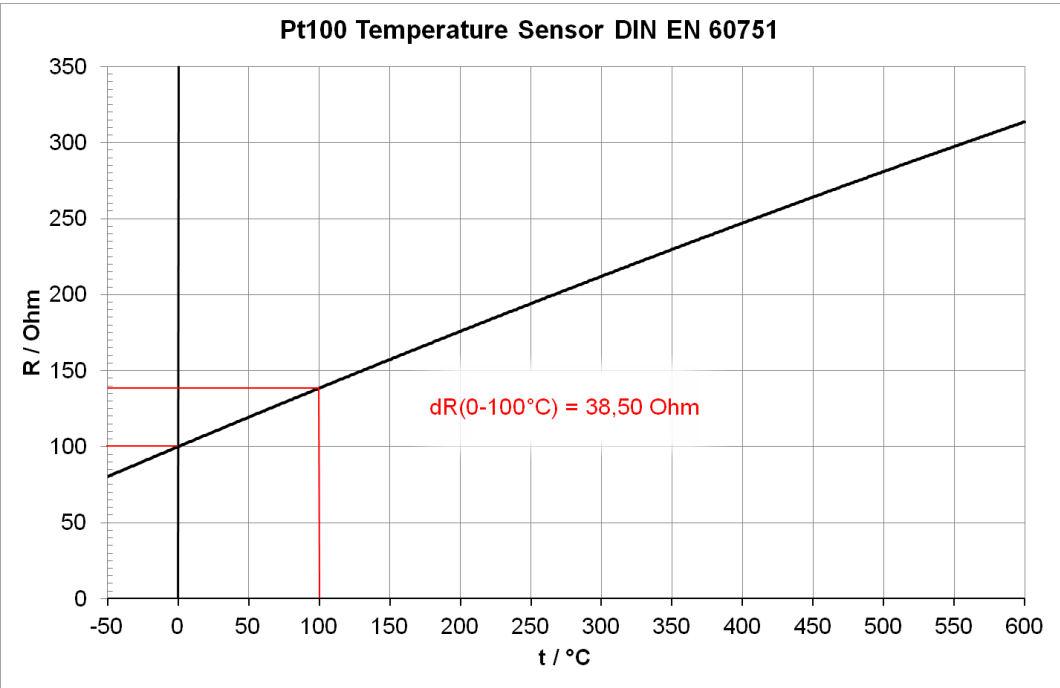


Figure 1: Resistance characteristics  
(For Pt1000 use for Resistance Values Scale a Nominal Resistance Factor 10)

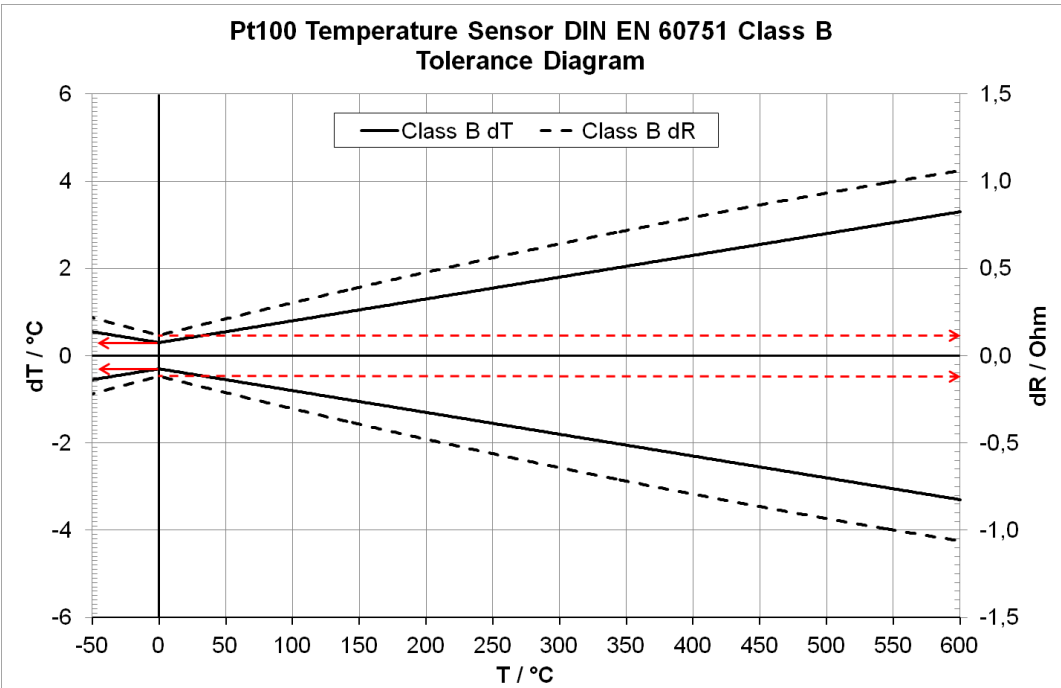


Figure 2: Tolerance chart  
(For Pt1000 use for Resistance Values Scale a Nominal Resistance Factor 10,  
Temperature Tolerance scale is equal to Pt100)

## PTF TEMPERATURE ELEMENTS (PT-RTD'S)

Datasheet

### Dimensional Drawing - PTFC Outline

Wire diameter depends on wire material, drawings are for Au-coated Ni-wire ( $\varnothing$  Ag-wire is 0.3mm)

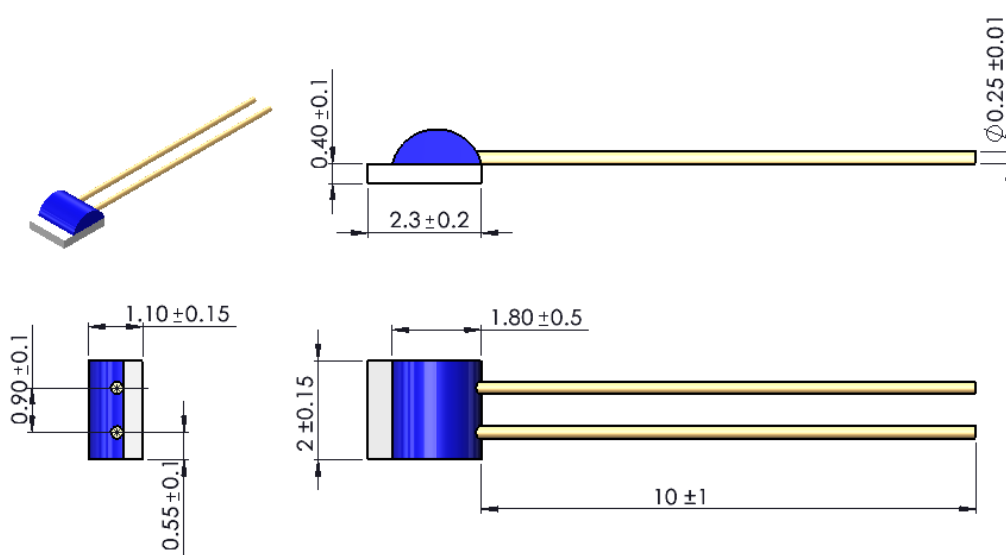


Figure 3: PTFC outline dimensions (mm)

### Dimensional Drawing - PTFD Outline

Wire diameter depends on wire material, drawings are for Au-coated Ni-wire ( $\varnothing$  Ag-wire is 0.3mm)

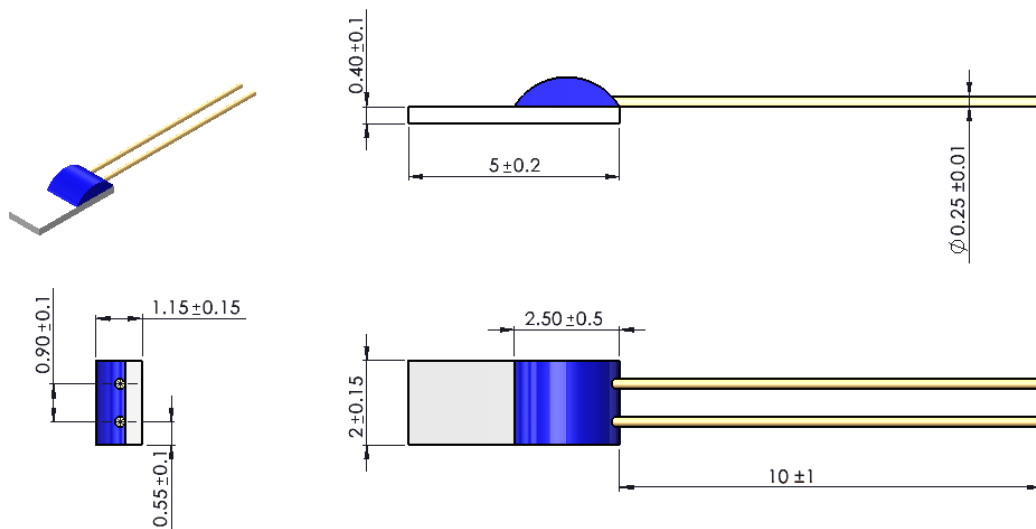


Figure 4: PTFD outline dimensions (mm)

PTF TEMPERATURE ELEMENTS (PT-RTD'S)

Datasheet

Mechanical Dimensions PTFF Outline

Wire diameter depends on wire material, drawings are for Au-coated Ni-wire (Ø Ag-wire is 0.3mm)

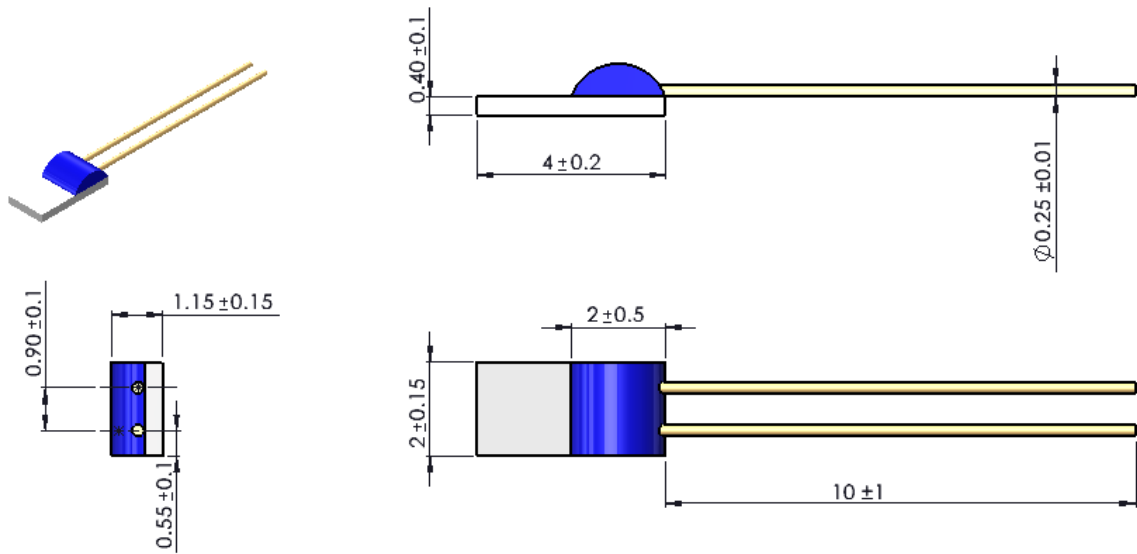


Figure 5: PTFF outline dimensions (mm)

Dimensional Drawing - PTFM Outline

Wire diameter depends on wire material, drawings are for Au-coated Ni-wire (Ø Ag-wire is 0.25mm)

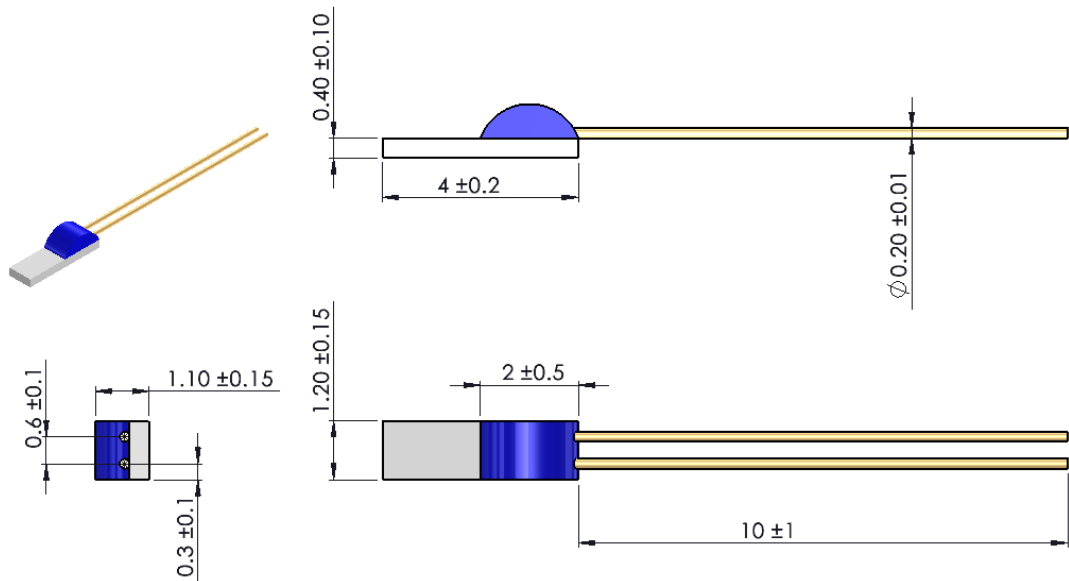


Figure 6: PTFM outline dimensions (mm)

## PTF TEMPERATURE ELEMENTS (PT-RTD'S)

Datasheet

### Type Configuration Matrix

| Sensor family | Type | Outline Dimensions | Nominal Resistance |               | Tolerance Class<br>DIN EN 60751 |   |   |   | Connection Wire |            |
|---------------|------|--------------------|--------------------|---------------|---------------------------------|---|---|---|-----------------|------------|
|               |      |                    | 100 $\Omega$       | 1000 $\Omega$ |                                 |   |   |   | Ag wire         | Ni/Au wire |
| PTF           | C    | 2.0 x 2.3          | 101                | 102           | T                               | A | B | C | 1A0             | 1G0        |
| PTF           | D    | 2.0 x 5.0          | 101                | 102           | T                               | A | B | C | 1A0             | 1G0        |
| PTF           | F    | 2.0 x 4.0          | 101                | 102           | T                               | A | B | C | 1A0             | 1G0        |
| PTF           | M    | 1.2 x 4.0          | 101                | 102           | T                               | A | B | C | 1A0             | 1G0        |

### Packing and Minimum Order Quantity

| Packing                                             | PCS per Packing unit | MOQ          |
|-----------------------------------------------------|----------------------|--------------|
| Transparent Blister Box 80(120)mm x 50(60)mm x 20mm | 500 (bulk)           | 500 per Type |

### Ordering Information PTFC Outline (2.0 mm x 2.3mm)

| Part Number | Type         | Description                                                                 |
|-------------|--------------|-----------------------------------------------------------------------------|
| NB-PTCO-005 | PTFC101C1G0  | 100 Ohms, 2.0 mm x 2.3 mm, F 0.6 (C), Au-coated Ni-wire                     |
| NB-PTCO-002 | PTFC101B1G0  | 100 Ohms, 2.0 mm x 2.3 mm, F 0.3 (B), Au-coated Ni-wire                     |
| NB-PTCO-011 | PTFC101A1G0  | 100 Ohms, 2.0 mm x 2.3 mm, F 0.15 (A), Au-coated Ni-wire                    |
| NB-PTCO-058 | PTFC101T1G0  | 100 Ohms, 2.0 mm x 2.3 mm, F 0.1 (T = AA), Au-coated Ni-wire                |
| NB-PTCO-159 | PTFC101C1A0  | 100 Ohms, 2.0 mm x 2.3 mm, F 0.6 (C), Ag-wire                               |
| NB-PTCO-160 | PTFC101B1A0  | 100 Ohms, 2.0 mm x 2.3 mm, F 0.3 (B), Ag-wire                               |
| NB-PTCO-161 | PTFC101A1A0  | 100 Ohms, 2.0 mm x 2.3 mm, F 0.15 (A), Ag-wire                              |
| NB-PTCO-162 | PTFC101T1A0  | 100 Ohms, 2.0 mm x 2.3 mm, F 0.1 (T = AA), Ag-wire                          |
| NB-PTCO-046 | PTFC102C1G0  | 1000 Ohms, 2.0 mm x 2.3 mm, F 0.6 (C), Au-coated Ni-wire                    |
| NB-PTCO-006 | PTFC102B1G0  | 1000 Ohms, 2.0 mm x 2.3 mm, F 0.3 (B), Au-coated Ni-wire                    |
| NB-PTCO-029 | PTFC102A1G0  | 1000 Ohms, 2.0 mm x 2.3 mm, F 0.15 (A), Au-coated Ni-wire                   |
| NB-PTCO-154 | PTFC102T1G0  | 1000 Ohms, 2.0 mm x 2.3 mm, F 0.1 (T = AA), Au-coated Ni-wire               |
| NB-PTCO-163 | PTFC102C1A0  | 1000 Ohms, 2.0 mm x 2.3 mm, F 0.6 (C), Ag-wire                              |
| NB-PTCO-157 | PTFC102B1A0  | 1000 Ohms, 2.0 mm x 2.3 mm, F 0.3 (B), Ag-wire                              |
| NB-PTCO-164 | PTFC102A1A0  | 1000 Ohms, 2.0 mm x 2.3 mm, F 0.15 (A), Ag-wire                             |
| NB-PTCO-165 | PTFC102T1A0  | 1000 Ohms, 2.0 mm x 2.3 mm, F 0.1 (T = AA), Ag-wire                         |
|             |              |                                                                             |
| NB-PTCO-295 | PTFC101BC1G0 | 1000 Ohms, 2.0 mm x 2.3 mm x 1.1 mm, F 0.3 (B) cryo, 10mm Au-coated Ni-wire |
| 10213359-00 | PTFC101BC1G0 | 100 Ohms, 2.0 mm x 2.3 mm x 1.1 mm, F 0.3 (B) cryo, 10mm Au-coated Ni-wire  |

## PTF TEMPERATURE ELEMENTS (PT-RTD'S)

Datasheet

### Ordering Information PTFD Outline (2.0 mm x 5.0mm)

| Part Number | Type        | Description                                                   |
|-------------|-------------|---------------------------------------------------------------|
| NB-PTCO-013 | PTFD101C1G0 | 100 Ohms, 2.0 mm x 5.0 mm, F 0.6 (C), Au-coated Ni-wire       |
| NB-PTCO-024 | PTFD101B1G0 | 100 Ohms, 2.0 mm x 5.0 mm, F 0.3 (B), Au-coated Ni-wire       |
| NB-PTCO-037 | PTFD101A1G0 | 100 Ohms, 2.0 mm x 5.0 mm, F 0.15 (A), Au-coated Ni-wire      |
| NB-PTCO-155 | PTFD101T1G0 | 100 Ohms, 2.0 mm x 5.0 mm, F 0.1 (T = AA), Au-coated Ni-wire  |
| NB-PTCO-166 | PTFD101C1A0 | 100 Ohms, 2.0 mm x 5.0 mm, F 0.6 (C), Ag-wire                 |
| NB-PTCO-053 | PTFD101B1A0 | 100 Ohms, 2.0 mm x 5.0 mm, F 0.3 (B), Ag-wire                 |
| NB-PTCO-158 | PTFD101A1A0 | 100 Ohms, 2.0 mm x 5.0 mm, F 0.15 (A), Ag-wire                |
| NB-PTCO-152 | PTFD101T1A0 | 100 Ohms, 2.0 mm x 5.0 mm, F 0.1 (T = AA), Ag-wire            |
| NB-PTCO-167 | PTFD102C1G0 | 1000 Ohms, 2.0 mm x 5.0 mm, F 0.6 (C), Au-coated Ni-wire      |
| NB-PTCO-126 | PTFD102B1G0 | 1000 Ohms, 2.0 mm x 5.0 mm, F 0.3 (B), Au-coated Ni-wire      |
| NB-PTCO-168 | PTFD102A1G0 | 1000 Ohms, 2.0 mm x 5.0 mm, F 0.15 (A), Au-coated Ni-wire     |
| NB-PTCO-150 | PTFD102T1G0 | 1000 Ohms, 2.0 mm x 5.0 mm, F 0.1 (T = AA), Au-coated Ni-wire |
| NB-PTCO-169 | PTFD102C1A0 | 1000 Ohms, 2.0 mm x 5.0 mm, F 0.6 (C), Ag-wire                |
| NB-PTCO-035 | PTFD102B1A0 | 1000 Ohms, 2.0 mm x 5.0 mm, F 0.3 (B), Ag-wire                |
| NB-PTCO-170 | PTFD102A1A0 | 1000 Ohms, 2.0 mm x 5.0 mm, F 0.15 (A), Ag-wire               |
| NB-PTCO-151 | PTFD102T1A0 | 1000 Ohms, 2.0 mm x 5.0 mm, F 0.1 (T = AA), Ag-wire           |

### Ordering Information PTFF Outline (2.0 mm x 4.0mm)

| Part Number | Type        | Description                                                   |
|-------------|-------------|---------------------------------------------------------------|
| NB-PTCO-171 | PTFF101C1G0 | 100 Ohms, 2.0 mm x 4.0 mm, F 0.6 (C), Au-coated Ni-wire       |
| NB-PTCO-172 | PTFF101B1G0 | 100 Ohms, 2.0 mm x 4.0 mm, F 0.3 (B), Au-coated Ni-wire       |
| NB-PTCO-173 | PTFF101A1G0 | 100 Ohms, 2.0 mm x 4.0 mm, F 0.15 (A), Au-coated Ni-wire      |
| NB-PTCO-174 | PTFF101T1G0 | 100 Ohms, 2.0 mm x 4.0 mm, F 0.1 (T = AA), Au-coated Ni-wire  |
| NB-PTCO-175 | PTFF101C1A0 | 100 Ohms, 2.0 mm x 4.0 mm, F 0.6 (C), Ag-wire                 |
| NB-PTCO-176 | PTFF101B1A0 | 100 Ohms, 2.0 mm x 4.0 mm, F 0.3 (B), Ag-wire                 |
| NB-PTCO-177 | PTFF101A1A0 | 100 Ohms, 2.0 mm x 4.0 mm, F 0.15 (A), Ag-wire                |
| NB-PTCO-178 | PTFF101T1A0 | 100 Ohms, 2.0 mm x 4.0 mm, F 0.1 (T = AA), Ag-wire            |
| NB-PTCO-149 | PTFF102C1G0 | 1000 Ohms, 2.0 mm x 4.0 mm, F 0.6 (C), Au-coated Ni-wire      |
| NB-PTCO-101 | PTFF102B1G0 | 1000 Ohms, 2.0 mm x 4.0 mm, F 0.3 (B), Au-coated Ni-wire      |
| NB-PTCO-179 | PTFF102A1G0 | 1000 Ohms, 2.0 mm x 4.0 mm, F 0.15 (A), Au-coated Ni-wire     |
| NB-PTCO-180 | PTFF102T1G0 | 1000 Ohms, 2.0 mm x 4.0 mm, F 0.1 (T = AA), Au-coated Ni-wire |
| NB-PTCO-181 | PTFF102C1A0 | 1000 Ohms, 2.0 mm x 4.0 mm, F 0.6 (C), Ag-wire                |
| NB-PTCO-182 | PTFF102B1A0 | 1000 Ohms, 2.0 mm x 4.0 mm, F 0.3 (B), Ag-wire                |
| NB-PTCO-183 | PTFF102A1A0 | 1000 Ohms, 2.0 mm x 4.0 mm, F 0.15 (A), Ag-wire               |
| NB-PTCO-184 | PTFF102T1A0 | 1000 Ohms, 2.0 mm x 4.0 mm, F 0.1 (T = AA), Ag-wire           |

## PTF TEMPERATURE ELEMENTS (PT-RTD'S)

Datasheet

### Ordering Information PTFM Outline (1.2 mm x 4.0mm)

| Part Number | Type        | Description                                                   |
|-------------|-------------|---------------------------------------------------------------|
| NB-PTCO-148 | PTFM101C1G0 | 100 Ohms, 1.2 mm x 4.0 mm, F 0.6 (C), Au-coated Ni-wire       |
| NB-PTCO-032 | PTFM101B1G0 | 100 Ohms, 1.2 mm x 4.0 mm, F 0.3 (B), Au-coated Ni-wire       |
| NB-PTCO-142 | PTFM101A1G0 | 100 Ohms, 1.2 mm x 4.0 mm, F 0.15 (A), Au-coated Ni-wire      |
| NB-PTCO-156 | PTFM101T1G0 | 100 Ohms, 1.2 mm x 4.0 mm, F 0.1 (T = AA), Au-coated Ni-wire  |
| NB-PTCO-185 | PTFM101C1A0 | 100 Ohms, 1.2 mm x 4.0 mm, F 0.6 (C), Ag-wire                 |
| NB-PTCO-186 | PTFM101B1A0 | 100 Ohms, 1.2 mm x 4.0 mm, F 0.3 (B), Ag-wire                 |
| NB-PTCO-187 | PTFM101A1A0 | 100 Ohms, 1.2 mm x 4.0 mm, F 0.15 (A), Ag-wire                |
| NB-PTCO-188 | PTFM101T1A0 | 100 Ohms, 1.2 mm x 4.0 mm, F 0.1 (T = AA), Ag-wire            |
| NB-PTCO-189 | PTFM102C1G0 | 1000 Ohms, 1.2 mm x 4.0 mm, F 0.6 (C), Au-coated Ni-wire      |
| NB-PTCO-012 | PTFM102B1G0 | 1000 Ohms, 1.2 mm x 4.0 mm, F 0.3 (B), Au-coated Ni-wire      |
| NB-PTCO-050 | PTFM102A1G0 | 1000 Ohms, 1.2 mm x 4.0 mm, F 0.15 (A), Au-coated Ni-wire     |
| NB-PTCO-153 | PTFM102T1G0 | 1000 Ohms, 1.2 mm x 4.0 mm, F 0.1 (T = AA), Au-coated Ni-wire |
| NB-PTCO-190 | PTFM102C1A0 | 1000 Ohms, 1.2 mm x 4.0 mm, F 0.6 (C), Ag-wire                |
| NB-PTCO-191 | PTFM102B1A0 | 1000 Ohms, 1.2 mm x 4.0 mm, F 0.3 (B), Ag-wire                |
| NB-PTCO-192 | PTFM102A1A0 | 1000 Ohms, 1.2 mm x 4.0 mm, F 0.15 (A), Ag-wire               |
| NB-PTCO-193 | PTFM102T1A0 | 1000 Ohms, 1.2 mm x 4.0 mm, F 0.1 (T = AA), Ag-wire           |

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