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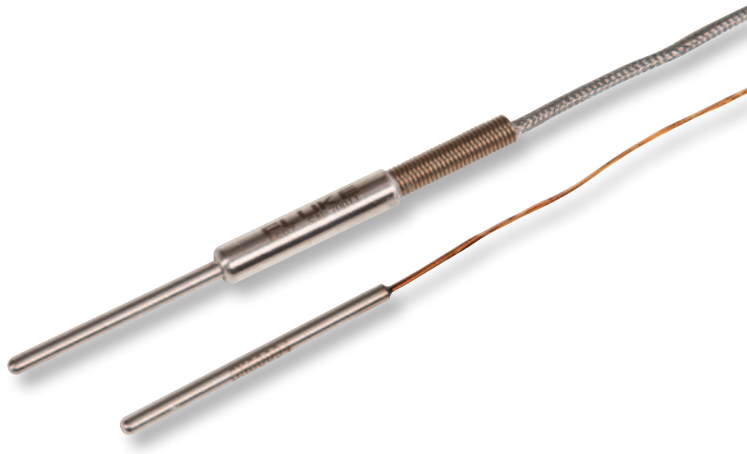
Calibration

# 5606 and 5607 Full Immersion PRTs

## for laboratory freezers, autoclaves, and furnaces

## Technical Data

- 5606: -200 °C to 160 °C
- 5607: 0 °C to 450 °C
- Calibration accuracy of ± 0.05 °C
- Transition junction and lead wires can withstand full PRT temperature range
- Unique probe seal of 5606 prevents ingress of moisture
- Calibration not included; NVLAP-accredited calibration optional



The 5606 and 5607 Full Immersion PRTs are designed to perform in extreme environments where both the transition junction and the lead wires are required to withstand temperatures covering the entire operating range of the probe. ("Immersion" in this case simply means exposure to temperatures other than ambient and does not necessarily refer to the medium to which the PRT and its components are subjected.)

Applications where "full immersion" of probe, transition junction, and lead wire is required can include calibration or validation of sensors used in laboratory or bio freezers, walk-in refrigerators, autoclaves, ovens, stability test chambers, furnaces or incubators. Other applications might include IQ/OQ/PQ qualification procedures, temperature mapping, or data logging in temperature controlled spaces or environmental chambers.

The 5606 is just two inches (50 mm) in length with a sheath diameter of 1/8 inch (3.1 mm). Since it can be fully immersed over its entire temperature range, you don't have to worry about calculating minimum immersion depth—immerse the entire probe, transition junction, and lead wires, in either non-corrosive liquids or dry mediums ranging from –200 °C to 160 °C. The 100 Ω precision sensing element (alpha = 0.00385) is specially constructed to prevent the ingress of moisture while achieving calibration accuracies as good as ± 0.05 °C. You get both accuracy and flexibility built into a small, durable package.

The lead wires of the 5606 are made of single-conductor enameled copper wire which prevents moisture from wicking to the sensing element as it would if a more common, stranded lead wire were used. The diameter of the lead wire is no greater than 0.2 mm, making it easy to run lead wires through a freezer door to your readout or transmitter with effectively zero energy loss. The 5606 has been proven in common heat transfer fluids such as silicone oil, mineral oil, ethanol, and even liquid nitrogen with no degradation of the transition junction seal or lead wire insulation.

Are you performing calibrations or verifying the accuracy of sensors used in ovens or furnaces? The 5607 has been designed specifically for your application. Intended to be used in dry mediums only, the 5607 can be fully immersed over a temperature range of 0 °C to 450 °C. There isn't another PRT on the market that can be fully immersed over this range and remain as stable and accurate (± 0.055 °C). The lead wire of the 5607 is shielded with braided stainless steel and connected to the transition junction with a strain relief spring.

If you need longer lead wire than the standard length, call one of our Application Specialists today for a free quote. They can also help you determine which readout and probe termination are best suited for your application or help you select the right calibration for your probe.

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## Specifications

| Specifications | 5606 | 5607 |
|---|---|---|
| Temperature range | –200 °C to 160 °C | 0 °C to 450 °C |
| Nominal resistance at 0.01 °C | 100 Ω ± 0.1 Ω | |
| Temperature coefficient | 0.00385 Ω/Ω/°C | |
| Accuracy[1] | ± 0.04 °C at 0.01 °C<br>± 0.06 °C at 160 °C | ± 0.04 °C at 0.01 °C<br>± 0.07 °C at 450 °C |
| Short-term repeatability[2] | ± 0.03 °C at 0.01 °C<br>± 0.04 °C at 160 °C | ± 0.020 °C at 0.01 °C<br>± 0.035 °C at 450 °C |
| Drift[3] | ± 0.03 °C at 0.01 °C<br>± 0.04 °C at 160 °C | ± 0.02 °C at 0.01 °C<br>± 0.04 °C at 450 °C |
| Hysteresis | ± 0.015 °C | |
| Sheath length | 50 mm ± 5 mm<br>(2 in ± 0.2 in) | 40 mm ± 5 mm<br>(1.6 in ± 0.2 in) |
| Sheath diameter | 3.1 mm ± 0.1 mm (1/8 in ± 0.004 in) | |
| Sheath material | 316 SST | Inconel® 600 |
| Transition junction temperature range[4] | –200 °C to 160 °C | 0 °C to 450 °C |
| Transition junction dimensions | No transition | 35 mm x 7 mm<br>(1.4 in x 0.3 in) |
| Sensor length | 30 mm ± 3mm (1.2 in ±0.1 in) | |
| Sensor location | 3 mm ± 1 mm from tip (1.2 in ± 0.04 in) | |
| Minimum insulation resistance | 20 MΩ at 23 °C | 100 MΩ at 23 °C |
| Minimum immersion length | Full immersion | Full immersion |
| Maximum immersion depth in liquid medium | Full immersion | Use SST or glass tube to protect transition junction |
| Maximum immersion depth in dry medium | Full immersion | Full immersion |
| Response time[5] | 12 seconds typical | 9 seconds typical |
| Self heating (in 0 °C bath) | ± 0.003 °C | |
| Lead-wire cable type | Enameled copper wire | SST over-braid |
| Lead-wire length | 2.4 meters (8 ft) | |
| Lead-wire temperature range | 160 °C | 450 °C |
| Calibration | Calibration not included. NVLAP accredited calibration available. See ordering information. | |

[1] Includes calibration and 100 hr drift (k = 2).
[2] Three thermal cycles from min to max temp, includes hysteresis, 95 % confidence (k = 2).
[3] After 100 hours at max temp, 95 % confidence (k = 2).
[4] Temperatures outside this range will cause irreparable damage.
[5] Per ASTM E 644.

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## Calibration uncertainty

| | 5606 | |
|---|---|---|
| **Temperature** | **1924 Calibration Uncertainty†** | **Tolerance w/out Calibration‡** |
| -197 °C | 0.03 °C | 0.4 °C |
| -38 °C | 0.03 °C | 0.2 °C |
| 0 °C | 0.03 °C | 0.1 °C |
| 100 °C | 0.045 °C | 0.3 °C |
| 157 °C | 0.05 °C | 0.4 °C |

| | 5607 | |
|---|---|---|
| **Temperature** | **1924 Calibration Uncertainty†** | **Tolerance w/out Calibration‡** |
| 0 °C | 0.03 °C | 0.1 °C |
| 157 °C | 0.05 °C | 0.2 °C |
| 232 °C | 0.05 °C | 0.3 °C |
| 450 °C | 0.055 °C | 0.5 °C |

† Lab code 200348-0
‡ Each PRT includes a certificate with a measured R0 value.

An uncalibrated 5606 or 5607 meets ASTM E 1137 Grade A Classification of Tolerances. Use the coefficients below to achieve the tolerances listed in the "No Calibration" column or calculate the Grade A tolerance using the following formula: Grade A = ± [0.13 + 0.0017|t|]°C where: |t| = value of temperature (°C) without regard to sign. See ASTM E 1137.

R0: Enter the R0 value provided
A: $3.9083 \times 10^{-3}$
B: $-5.775 \times 10^{-7}$
C: $-4.183 \times 10^{-4}$

## Ordering information

**5606-50-X†** Probe, Immersion PRT, 50 mm, –200 to 160 °C

**5607-75-X†** Probe, Hi-Temp Immersion PRT, 75mm, 0 to 450 °C

**1924-4-10** PRT Calibration, –200 to 157 °C, NVLAP-accredited‡

**1924-5-10** PRT Calibration, -40 to 157 °C, NVLAP-accredited‡

**1924-P** PRT Calibration, 0 to 450 °C, NVLAP-accredited‡

**1930-4-10** System Calibration by Comparison, -200 to 157 °C, NVLAP-accredited‡

**1930-5-10** System Calibration by Comparison, -40 to 157 °C, NVLAP-accredited‡

**1930-P** System Calibration by Comparison, 0 to 450 °C, NVLAP-accredited‡

**2603** Small Probe Carrying Case

† X = termination. Specify "A" (INFO-CON for 914X), "B" (bare wire), "D" (5-pin DIN for Tweener Thermometers), "G" (gold pins), "I" (INFO-CON for 1521 or 1522), "J" (banana plugs), "L" (mini spade lugs), "M" (mini banana plugs), "P" (INFO-CON for 1523 or 1524), or "S" (spade lugs).

‡ Lab code 200348-0

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