

Wide-Range Temperature Probe

(Order Code NavWRT)

This rugged temperature probe features a wide temperature range, from -20 to 330°C . The high upper limit of the sensor allows for melting point determinations of most organic compounds. It uses RTD (Resistance Temperature Detection) technology to establish a $\pm 0.1^{\circ}\text{C}$ accuracy, as well as excellent stability and repeatability. Each unit is individually calibrated, and the calibration is stored on a smart chip in the sensor. **Note:** Do not completely submerge the sensor.

Important: When using this sensor, keep in mind that important electronic circuitry is built into the handle of the probe. For optimal accuracy of the RTD, keep the handle of the probe from warming above 40°C (104°F). If necessary, shield the handle from high-temperature sources using aluminum foil or other shielding material.

Collecting Data with the Wide-Range Temperature Probe

Here is the general procedure to follow when using the Wide-Range Temperature Probe:

1. Connect the Wide-Range Temperature Probe to the LabNavigator.
2. The software will identify the Wide-Range Temperature Probe and load a default data-collection setup. You are now ready to collect data.

Specifications

- Temperature range: -20 to 330°C (-4 to 626°F)
- Maximum temperature that the sensor can tolerate without damage: 380°C
- Resolution: 0.10°C
- Temperature detector used: Platinum RTD ($100\ \Omega$)
- Accuracy: $\pm 0.1^{\circ}\text{C}$ at 0°C
- Voltage Range: 0.2 – $4.8\ \text{V}$
- Response time (time for 90% change in reading):
 - 14.5 seconds (in water, still)
 - 8.0 seconds (in water, with stirring)
 - 420 seconds (in still air)
- Probe dimensions:
 - Probe length (handle plus body): $24.5\ \text{cm}$
 - Stainless steel body: length $17.0\ \text{cm}$, diameter $0.64\ \text{cm}$ ($6.4\ \text{mm}$)
 - Probe handle: length $6.8\ \text{cm}$, width $2.25\ \text{cm}$, thickness $1.3\ \text{cm}$

This sensor is equipped with circuitry that supports auto-ID.

How the Wide-Range Temperature Probe Works

The detector is an RTD (Resistance Temperature Detection) sensor whose output increases nonlinearly with increasing temperature. The best-fit approximation to this nonlinear characteristic is a quadratic equation:

$$T = K_0 + K_1 \cdot V + K_2 \cdot V^2$$

where T is temperature ($^{\circ}\text{C}$), $K_0 = \sim -33.8$, $K_1 = \sim 73.2$, and $K_2 = \sim 0.90$. During the Forston Labs custom calibration, these values are adjusted slightly, to achieve a $\pm 0.1^{\circ}\text{C}$ accuracy value. The data acquisition program converts V to $^{\circ}\text{C}$ (or other units, if you choose a different calibration).

Probe Chemical Tolerance

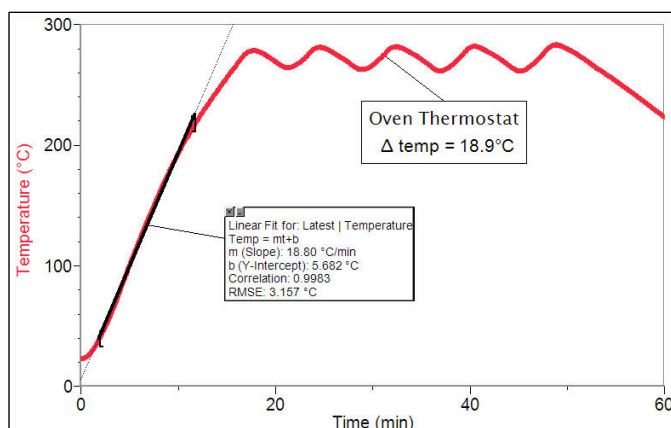
The stainless-steel probe body is constructed from grade 316 stainless steel.¹ This high-grade stainless steel provides a high level of corrosion resistance for use in the laboratory. Here are some general guidelines for usage:

1. The probe handle is constructed of molded plasticized Santoprene®. While this material is very chemical resistant, we recommend that you avoid submerging the probe beyond the stainless steel portion.
2. Always wash the probe thoroughly after use.
3. The probe can be left continuously in water at temperatures within the range of -20° to 330°C . Continuous usage in saltwater will cause only minor discoloration of the probe, with no negative effect on performance.
4. You can leave the probe continuously in most organic compounds, such as methanol, ethanol, 1-propanol, 2-propanol, 1-butanol, n-hexane, lauric acid, paradichlorobenzene, phenyl salicylate, and benzoic acid. The probe should not be left in n-pentane for more than 1 hour.
5. The probe can be left in strong basic solutions, such as NaOH, for up to 48 hours, with only minor discoloration. We do not recommend usage in basic solutions that are greater than 3 M in concentration.
6. The chart provides the maximum length of time we recommend for probe exposure to some common acids. Probes left in an acid longer than these times may bubble and/or discolor, but will still be functional. We do not recommend probes be left to soak in any acid longer than 48 hours.

Maximum acid exposure time	
1 M HCl	20 min
2 M HCl	10 min
3 M HCl	5 min
1 M H ₂ SO ₄	48 hours
2 M H ₂ SO ₄	20 min
3 M H ₂ SO ₄	10 min
1 M HNO ₃	48 hours
2 M HNO ₃	48 hours
3 M HNO ₃	48 hours
1 M CH ₃ COOH	48 hours
2 M CH ₃ COOH	48 hours
3 M CH ₃ COOH	48 hours
1 M H ₃ PO ₄	48 hours
2 M H ₃ PO ₄	48 hours
3 M H ₃ PO ₄	48 hours

Do I Need to Calibrate This Probe? No

The Wide-Range Temperature Probe will never need to be calibrated. Each probe is carefully calibrated before it ships, and this unique calibration is stored on a smart chip in the sensor. **Note:** There is no method to perform a calibration of this sensor in any of our software programs.



Temperature cycles of an oven using the Wide-Range Temperature Probe

¹ Grade 316 Wide-Range has a composition of 0.08% carbon, 2.0% manganese, 0.75% silicon, 0.04% phosphorus, 0.03% sulfur, 16–18% chromium, 10–14% nickel, 2–3% molybdenum, and 0.1% nitrogen.

Warranty

Forston Labs warrants this product to be free from defects in materials and workmanship for a period of one year from the date of shipment to the customer. This warranty does not cover damage to the product caused by abuse or improper use.



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