

# Wide-Range Temperature Probe

(Order Code WRT-BTA)



This rugged temperature probe features a wide temperature range, from  $-20$  to  $330^{\circ}\text{C}$ . 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  $\pm 0.5^{\circ}\text{C}$  accuracy, as well as excellent stability and repeatability. Each unit is individually calibrated, and the calibration is stored on the sensor. It is designed to be used as you would use a thermometer for experiments in organic and inorganic chemistry, physics, biology, Earth science, and environmental science.

**Note:** Vernier products are designed for educational use. Our products are not designed nor are they recommended for any industrial, medical, or commercial process such as life support, patient diagnosis, control of a manufacturing process, or industrial testing of any kind.

## What's Included

- Wide-Range Temperature Probe

## Compatible Software and Interfaces

See [www.vernier.com/manuals/wrt-bta](http://www.vernier.com/manuals/wrt-bta) for a list of interfaces and software compatible with the Wide-Range Temperature Probe.

## Getting Started

1. Connect the sensor to the interface (LabQuest Mini, LabQuest 2, etc.).
2. Start the appropriate data-collection software (Logger *Pro*, Logger Lite, LabQuest App) if not already running, and choose New from File menu.

The software will identify the sensor and load a default data-collection setup. You are now ready to continue your experiment.

If you are collecting data using a Chromebook™, mobile device such as iPad® or Android™ tablet, or a Vernier wireless sensor or interface, please see the following link for up-to-date connection information:

[www.vernier.com/start/wrt-bta](http://www.vernier.com/start/wrt-bta)

## Using the Product

Connect the sensor following the steps in the Getting Started section of this user manual.

**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  $40^{\circ}\text{C}$  ( $104^{\circ}\text{F}$ ). If necessary, shield the handle from high-temperature sources using aluminum foil or other shielding material.

## Videos

View videos related to this product at [www.vernier.com/wrt-bta](http://www.vernier.com/wrt-bta)

## Calibration

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 the sensor. **Note:** There is no method to perform a calibration of this sensor in most of our software programs; however, there is no need to do so. Logger *Pro* does allow for an approximate calibration, but the results would likely be less accurate than the custom factory calibration.

## Specifications

Temperature range	$-20$ to $330^{\circ}\text{C}$
Maximum temperature that the sensor can tolerate without damage	$380^{\circ}\text{C}$
12-bit resolution	$0.12^{\circ}\text{C}$
Temperature sensing element	Platinum RTD ( $100\ \Omega$ )
Accuracy	$\pm 0.5^{\circ}\text{C}$ or better
Response time from $25$ to $100^{\circ}\text{C}$ in water	30 seconds
Probe dimensions	Probe length (handle plus body): 24.5 cm Stainless steel body: length 17 cm, diameter 6.4 mm Probe handle: length 6.8 cm, width 2.25 cm, thickness 1.3 cm

## Care and Maintenance

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

- 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.
- Always wash the probe thoroughly after use.
- The probe can be left continuously in water at temperatures within the range of  $-20^{\circ}\text{C}$  to  $330^{\circ}\text{C}$ . Continuous usage in saltwater will cause only minor discoloration of the probe, with no negative effect on performance.
- 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 one hour.

- 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.
- 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 <sub>2</sub> SO <sub>4</sub>	48 hours
2 M H <sub>2</sub> SO <sub>4</sub>	20 min
3 M H <sub>2</sub> SO <sub>4</sub>	10 min

### How the Sensor Works

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

$$T = K_0 + K_1 * V + K_2 * V^2$$

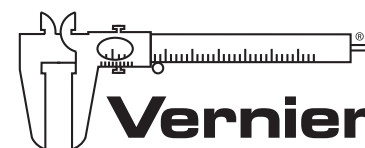
where  $T$  is temperature (°C),  $K_0 = \sim -33.8$ ,  $K_1 = \sim 73.2$ , and  $K_2 = \sim 0.90$ . During the Vernier custom calibration, these values are adjusted slightly to achieve a  $\pm 0.3^\circ\text{C}$  accuracy value at  $100^\circ\text{C}$ . The data acquisition programs convert  $V$  to temperature in units of °C (default), K, or °F.

### Repair Information

If you have watched the related product video(s), followed the troubleshooting steps, and are still having trouble with your Wide-Range Temperature Probe, contact Vernier Technical Support at support@vernier.com or call 888-837-6437. Support specialists will work with you to determine if the unit needs to be sent in for repair. At that time, a Return Merchandise Authorization (RMA) number will be issued and instructions will be communicated on how to return the unit for repair.

### Warranty

Vernier warrants this product to be free from defects in materials and workmanship for a period of five years from the date of shipment to the customer. This warranty does not cover damage to the product caused by abuse or improper use. This warranty covers educational institutions only.



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