

# 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.

## 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.

## Quick Start

1. Plug the sensor into the interface (LabQuest 3, LabQuest Mini, etc.).
2. Connect the interface to your device.
  - If using USB, connect to the USB port on your computer.
  - If using Bluetooth<sup>®</sup> wireless technology, click your interface type and then select your device.
3. Prepare for data collection:
  - Vernier Graphical Analysis<sup>®</sup>: Launch the app, if necessary, and click Sensor Data Collection.
  - LabQuest<sup>®</sup> App: Choose New from the File menu.

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

## Need Additional Information?

Visit the following link:

[www.vernier.com/start-lq-sensor](http://www.vernier.com/start-lq-sensor)

## Using the Product

Connect the sensor following the steps in the Quick Start 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.

## Specifications

Temperature range	$-20$ to $330^{\circ}\text{C}$
Maximum temperature that the sensor can tolerate without damage	$380^{\circ}\text{C}$
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<sup>®</sup>. 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.
- Do not wrap the cable tightly around the sensor for storage. Repeatedly doing so can irreparably damage the wires and is not covered under warranty.
- The chart below 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 ( $^{\circ}\text{C}$ ),  $K_0 = \sim -33.8$ ,  $K_1 = \sim 73.2$ , 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  $^{\circ}\text{C}$  (default), K, or  $^{\circ}\text{F}$ .

### Troubleshooting

For troubleshooting and FAQs, see [www.vernier.com/til/1987](http://www.vernier.com/til/1987)

### 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](mailto: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

Warranty information for this product can be found on the Support tab at [www.vernier.com/wrt-bta](http://www.vernier.com/wrt-bta)

General warranty information can be found at [www.vernier.com/warranty](http://www.vernier.com/warranty)



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