Thermocouple
(Order Code TCA-BTA)



The Thermocouple is a simple and rugged sensor designed to measure temperature in the range of –200°C to 1400°C. This sensor could be used for any of the following experiments:

- Study how the temperature inside a Bunsen burner flame varies with position.
- Compare the temperatures of different flames (candles *vs.* Bunsen burner).
- Check the calibration of ovens.
- Experimentally determine the melting point of copper, bismuth, or other solids.
- Measure the temperature of dry ice or liquid air.

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
- Thermocouple
- Type-K Thermocouple Wire

Compatible Software and Interfaces
See **www.vernier.com/manuals/tca-bta** for a list of interfaces and software compatible with the Thermocouple.

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® wireless technology, click your interface type and then select your device.
3. Prepare for data collection:
   - Vernier Graphical Analysis®: Launch the app, if necessary, and click Sensor Data Collection.
   - LabQuest® 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

Using the Product
Connect the sensor following the steps in the Quick Start section of this user manual.

The thermocouple wire is insulated by a high-temperature glass that has a lower maximum temperature (704°C, 1300°F) than the wire itself (1400°C, 2552°F). Therefore, in use, place only the tip of the wire in the heat source and keep the insulation out of direct contact with the heat source.

The default data-collection range for the Thermocouple is set to have the best accuracy between 0°C and 900°C. There are two other settings available for data collection if you would like increased accuracy at a lower temperature or a higher temperature.

- The low setting has the best accuracy for temperatures between –200°C and 0°C.
- The high setting has the best accuracy for temperatures between 900°C and 1400°C.

Videos
View videos related to this product at **www.vernier.com/tca-bta**

Calibration
You should not have to perform a new calibration when using the Thermocouple in the classroom. The sensor is custom calibrated before it is shipped.

Specifications

Typical accuracy	0°C to 900°C: ±2.2°C –200°C to 0°C: ±5°C 900°C to 1400°C: ±15°C
Power	11 mA @ 5 VDC
Typical Resolution	0.40°C

How the Sensor Works
Thermocouples make use of a property that occurs when two wires composed of dissimilar metals are joined at both ends. When one of the joined ends is heated, a continuous current is created and flows in a thermoelectric circuit. The small open-circuit voltage of this circuit (known as the Seebeck voltage) is a function of the junction temperature and the composition of the two metals. (The Vernier Thermocouple uses a type-K thermocouple wire.) By measuring the voltage, the temperature at the joined end can be calculated.

Measuring the Seebeck voltage requires connecting a voltmeter's leads to the thermocouple wires. This new junction creates an additional thermocouple. In order to compensate for this new thermocouple, we use a method called cold-junction compensation. This method requires knowing the temperature at the new junction. Traditionally, these junctions were held at 0°C in an ice bath. The Vernier Thermocouple performs a direct measurement of the temperature of the reference junction with an integrated-circuit amplifier.

Troubleshooting
For troubleshooting and FAQs, see **www.vernier.com/til/1440**

Repair Information
If you have watched the related product video(s), followed the troubleshooting steps, and are still having trouble with your Thermocouple, 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
Warranty information for this product can be found on the Support tab at **www.vernier.com/tca-bta**

General warranty information can be found at **www.vernier.com/warranty**

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