

# Go Direct<sup>®</sup> Thermocouple (Order Code GDX-TC)



Go Direct Thermocouple is a simple and rugged sensor designed to measure temperature in the range of  $-200^{\circ}\text{C}$  to  $1400^{\circ}\text{C}$ . 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

- Go Direct Thermocouple Amplifier
- Type-K Thermocouple Wire
- Micro USB Cable

## Compatible Software and Interfaces

See [www.vernier.com/manuals/gdx-tc](http://www.vernier.com/manuals/gdx-tc) for a list of software compatible with Go Direct Thermocouple.

## Getting Started

Please see the following link for platform-specific connection information:

[www.vernier.com/start/gdx-tc](http://www.vernier.com/start/gdx-tc)

### Bluetooth Connection

1. Ensure the thermocouple wire is securely connected to the thermocouple amplifier box with the + and – symbols aligned.
2. Install Graphical Analysis 4 on your computer, Chromebook™, or mobile device. If using LabQuest, make sure LabQuest App is up to date. See [www.vernier.com/ga4](http://www.vernier.com/ga4) for Graphical Analysis 4 availability or [www.vernier.com/downloads](http://www.vernier.com/downloads) to

### USB Connection

1. Ensure the thermocouple wire is securely connected to the thermocouple amplifier box with the + and – symbols aligned.
2. If using a computer or Chromebook, install Graphical Analysis 4. If using LabQuest, make sure LabQuest App is up to date. See [www.vernier.com/ga4](http://www.vernier.com/ga4) for Graphical Analysis 4 availability or [www.vernier.com/downloads](http://www.vernier.com/downloads) to

3. Charge your sensor for at least 2 hours before first use.
4. Turn on your sensor by pressing the power button once. The LED will blink red.
5. Launch Graphical Analysis 4 or turn on LabQuest.
6. If using Graphical Analysis 4, click or tap Sensor Data Collection. If using LabQuest, choose Wireless Device Setup > Go Direct from the Sensors menu.
7. Select your Go Direct sensor from the list of Discovered Wireless Devices. Your sensor's ID is located near the barcode on the sensor. The LED will blink green when it is successfully connected.
8. Click or tap Done. You are now ready to collect data.
9. This is a multi-channel sensor. To change the channel selections, see [www.vernier.com/start/gdx-tc](http://www.vernier.com/start/gdx-tc)

**Note:** This sensor does not work with the original LabQuest. It works with LabQuest 2 or LabQuest 3.

## Charging the Sensor

Connect Go Direct Thermocouple to the included Micro USB Cable and any USB device for two hours.

You can also charge up to eight Go Direct Thermocouples using our Go Direct Charge Station, sold separately (order code: GDX-CRG). An LED on each Go Direct Thermocouple indicates charging status.

Charging	Orange LED next to battery icon is solid while sensor is charging.
Fully charged	Green LED next to battery icon solid when sensor is fully charged.

## Powering the Sensor

Turning on the sensor	Press button once. Red LED indicator flashes when unit is on.
Putting the sensor in sleep mode	Press and hold button for more than three seconds to put into sleep mode. Red LED indicator stops flashing when sleeping.

## Connecting the Sensor

See the following link for up-to-date connection information:

[www.vernier.com/start/gdx-tc](http://www.vernier.com/start/gdx-tc)

### Connecting via Bluetooth Wireless Technology

Ready to connect	Red LED flashes when sensor is powered and ready to connect.
Connected	Green LED flashes when sensor is connected via Bluetooth wireless technology.

### Connecting via USB

Connected via USB, data collection software is not running	Red LED flashes when sensor is powered and ready to connect.
Connected via USB, data collection software is running	Green LED is solid when connected to the software via USB.

## Identifying the Sensor

Use the Identify feature to flash the LED on the sensor that is connected via Bluetooth wireless technology. In Graphical Analysis 4, Identify is accessed from Sensor Information. In LabQuest App, Identify is accessed by tapping the sensor meter, then tapping Go Direct.

## Using the Product

Connect the sensor following the steps in the Getting Started 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.

### Channels

Go Direct Thermocouple has three sensor channels:

- K-type (default)
- J-type
- T-type

**Note:** The K-type channel is the default channel for this sensor. All channels are mutually exclusive. In order to collect data from the other temperature channels, you must also attach the applicable corresponding thermocouple wire to the amplifier box.

## Calibrating the Sensor

You should not have to perform a new calibration when using Go Direct Thermocouple in the classroom. The sensor is custom calibrated before it is shipped. If you wish to calibrate the sensor, you can conduct a one-point calibration in the software. This calibration will be stored automatically to the sensor.

## Specifications

Temperature range	-200°C to 1400°C
Typical accuracy	±2.2°C or 0.75% of reading, whichever is greater
Compatible thermocouple wires	K-type, J-type, and T-type
Wireless Specification	Bluetooth 4.2
Battery	300 mA Li-Poly

## Care and Maintenance

### Battery Information

Go Direct Thermocouple contains a small lithium-ion battery. The system is designed to consume very little power and not put heavy demands on the battery. Although the battery is warranted for one year, the expected battery life should be several years. Replacement batteries are available from Vernier (order code: GDX-BAT-300).

### Storage and Maintenance

To store Go Direct Thermocouple for extended periods of time, put the device in sleep mode by holding the button down for at least three seconds. The red LED will stop flashing to show that the unit is in sleep mode. Over several months, the battery will discharge but will not be damaged. After such storage, charge the device for a few hours, and the unit will be ready for use.

Exposing the amplifier box to temperatures below -15°C or over 45°C will damage it. Additionally, temperatures over 35°C (95°F) will reduce the battery's lifespan. If possible, store the device in an area that is not exposed to temperature extremes.

### Water Resistance

**Important:** Go Direct Thermocouple is neither waterproof, nor is it water resistant and should never be immersed in water.

If any liquid gets into the device, immediately power the unit down (press and hold the power button for more than three seconds). Disconnect the sensor and charging cable, and remove the battery. Allow the device to dry thoroughly before attempting to use the device again. Do not attempt to dry using an external heat source.

**Note:** Damage due to liquids is not covered under warranty.

## 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. (Go Direct Thermocouple uses a K-type thermocouple wire with chromel and alumel.) 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. Go Direct Thermocouple performs a direct measurement of the temperature of the reference junction with an integrated-circuit amplifier.

## Troubleshooting

The thermocouple wire is installed properly and ready to use if the LED next to the check symbol turns green. If it turns red, your connection is not secure or your wire may be damaged.

For troubleshooting and FAQs, see [www.vernier.com/til/7738](http://www.vernier.com/til/7738)

## Repair Information

If you have followed the troubleshooting steps and are still having trouble with your Go Direct Thermocouple, 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.

## Accessories/Replacements

Item	Order Code
Micro USB Cable	CB-USB-MICRO
Type-K Thermocouple Wire	KWIRE-TCA
Go Direct 300 mAh Replacement Battery	GDX-BAT-300

## Warranty

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

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

## Disposal

When disposing of this electronic product, do not treat it as household waste. Its disposal is subject to regulations that vary by country and region. This item should be given to an applicable collection point for the recycling of electrical and electronic equipment. By ensuring that this product is disposed of correctly, you help prevent potential negative consequences on human health or on the environment. The recycling of materials will help to conserve natural resources. For more detailed information about recycling this product, contact your local city office or your disposal service.

Battery recycling information is available at [www.call2recycle.org](http://www.call2recycle.org)

Do not puncture or expose the battery to excessive heat or flame.



The symbol, shown here, indicates that this product must not be disposed of in a standard waste container.

## Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

### FCC Caution

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference and
- (2) this device must accept any interference received, including interference that may cause undesired operation

### RF Exposure Warning

The equipment complies with RF exposure limits set forth for an uncontrolled environment. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

## IC Statement

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

- (1) this device may not cause interference, and
- (2) this device must accept any interference, including interference that may cause undesired operation of the device.

**Industry Canada - Class B** This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus as set out in the interference-causing equipment standard entitled "Digital Apparatus," ICES-003 of Industry Canada. Operation is subject to the following two conditions: (1) this device may not cause interference, and

- (2) this device must accept any interference, including interference that may cause undesired operation of the device.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that permitted for successful communication.

**RF exposure warning:** The equipment complies with RF exposure limits set forth for an uncontrolled environment. The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

(1) l'appareil ne doit pas produire de brouillage, et

(2) l'appareil doit accepter toute interférence radioélectrique, même si cela résulte à un brouillage susceptible d'en compromettre le fonctionnement.

Cet appareil numérique respecte les limites de bruits radioélectriques applicables aux appareils numériques de Classe B prescrites dans la norme sur le matériel interférant-brouilleur: "Appareils Numériques," NMB-003 édictée par Industrie Canada. L'utilisation est soumise aux deux conditions suivantes:

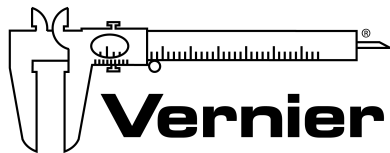
(1) cet appareil ne peut causer d'interférences, et

(2) cet appareil doit accepter toutes interférences, y comprises celles susceptibles de provoquer un dysfonctionnement du dispositif.

Afin de réduire les interférences radio potentielles pour les autres utilisateurs, le type d'antenne et son gain doivent être choisis de telle façon que l'équivalent de puissance isotrope émise (e.i.r.p) n'est pas plus grand que celui permis pour une communication établie.

**Avertissement d'exposition RF:** L'équipement est conforme aux limites d'exposition aux RF établies pour un environnement non supervisé. L'antenne (s) utilisée pour ce transmetteur ne doit pas être jumelée ou fonctionner en conjonction avec toute autre antenne ou transmetteur.

**Note:** This product is a sensitive measurement device. For best results, use the cables that were provided. Keep the device away from electromagnetic noise sources, such as microwaves, monitors, electric motors, and appliances.



Vernier Software & Technology  
13979 SW Millikan Way • Beaverton, OR 97005-2886  
Toll Free (888) 837-6437 • (503) 277-2299 • Fax (503) 277-2440  
info@vernier.com • www.vernier.com

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