

# 4x Thermocouple Phidget

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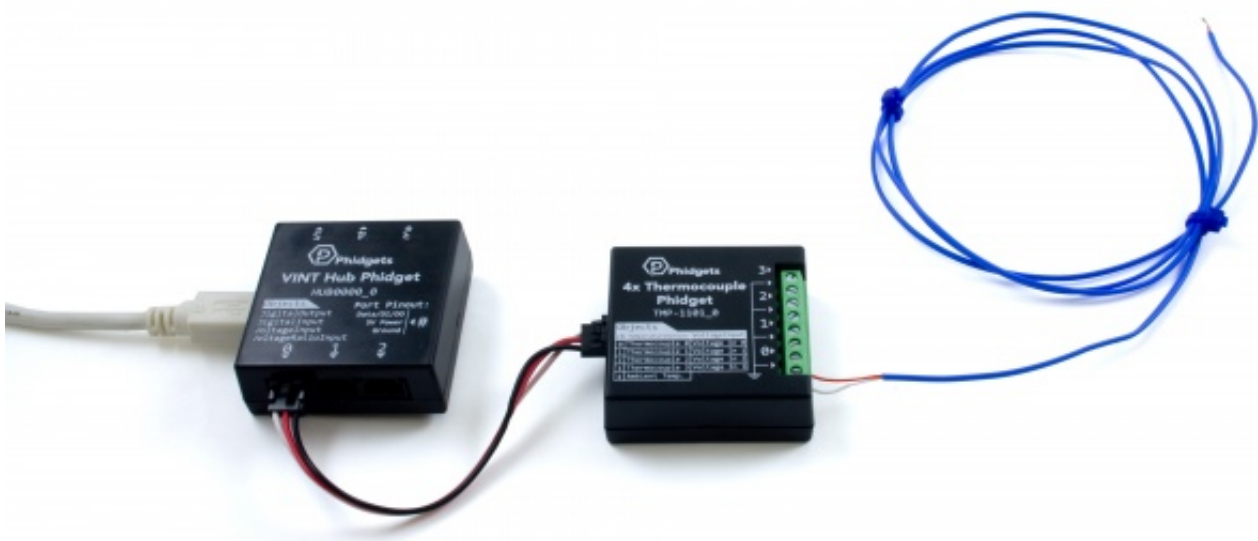
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## Getting Started

Welcome to the TMP1101 user guide! In order to get started, make sure you have the following hardware on hand:

- TMP1101 - 4x Thermocouple Phidget
- VINT Hub
- Phidget cable
- USB cable and computer
- Thermocouple

Next, you will need to connect the pieces:



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1. Connect the thermocouple to one of the inputs on the TMP1101. The datasheet or product page for the thermocouple should tell you which wire is positive and which is negative.
2. Connect the TMP1101 to the VINT Hub using the Phidget cable.
3. Connect the VINT Hub to your computer with a USB cable.

Now that you have everything together, let's start using the TMP1101!

## Using the TMP1101

### Phidget Control Panel

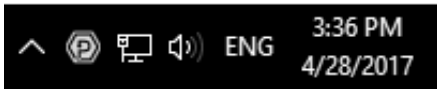
In order to demonstrate the functionality of the TMP1101, the Phidget Control Panel running on a Windows machine will be used.

The Phidget Control Panel is available for use on both macOS and Windows machines.


### Windows

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To open the Phidget Control Panel on Windows, find the  icon in the taskbar. If it is not there, open up the start menu and search for Phidget Control Panel



## macOS

To open the Phidget Control Panel on macOS, open Finder and navigate to the Phidget Control Panel in the Applications list. Double click on the  icon to bring up the Phidget Control Panel.

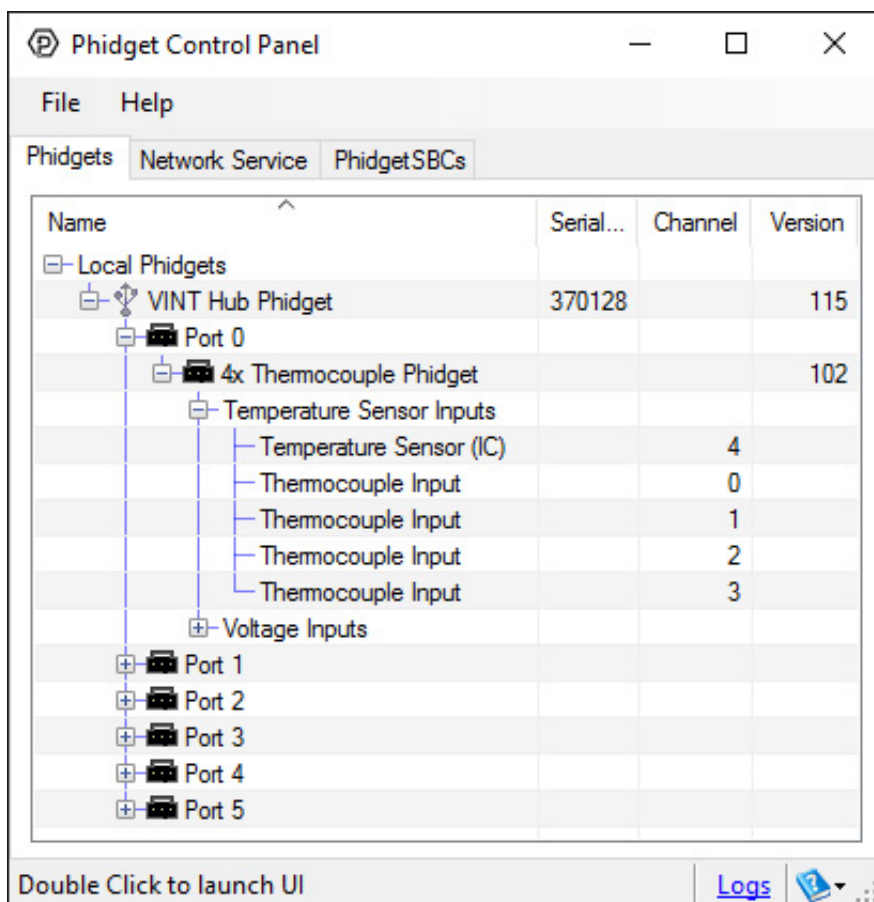
For more information, take a look at the getting started guide for your operating system:

- Getting started with Windows
- Getting started with macOS

Linux users can follow the getting started with Linux guide and continue reading here for more information about the TMP1101.

## First Look

After plugging the TMP1101 into your computer and opening the Phidget Control Panel, you will see something like this:



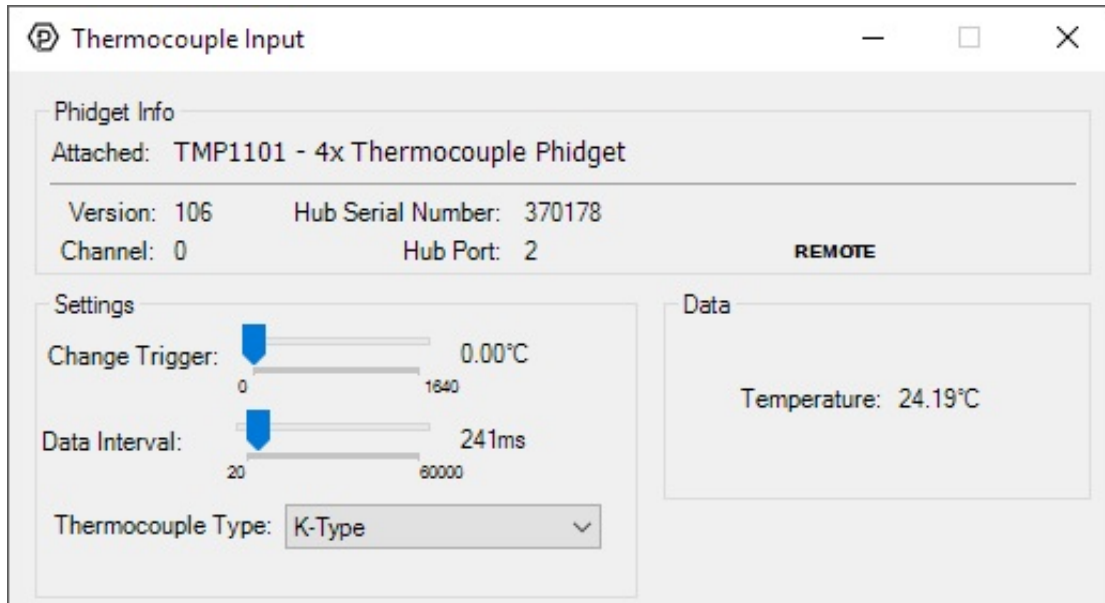
The Phidget Control Panel will list all connected Phidgets and associated objects, as well as the following information:

- **Serial number:** allows you to differentiate between similar Phidgets.
- **Channel:** allows you to differentiate between similar objects on a Phidget.
- **Version number:** corresponds to the firmware version your Phidget is running. If your Phidget is listed in red, your firmware is out of date. Update the firmware by double-clicking the entry.

The Phidget Control Panel can also be used to test your device. Double-clicking on an object will open an example.

## Temperature Sensor (Thermocouple)

Double-click on the Temperature Sensor object, labelled Thermocouple Input, in order to run the example:

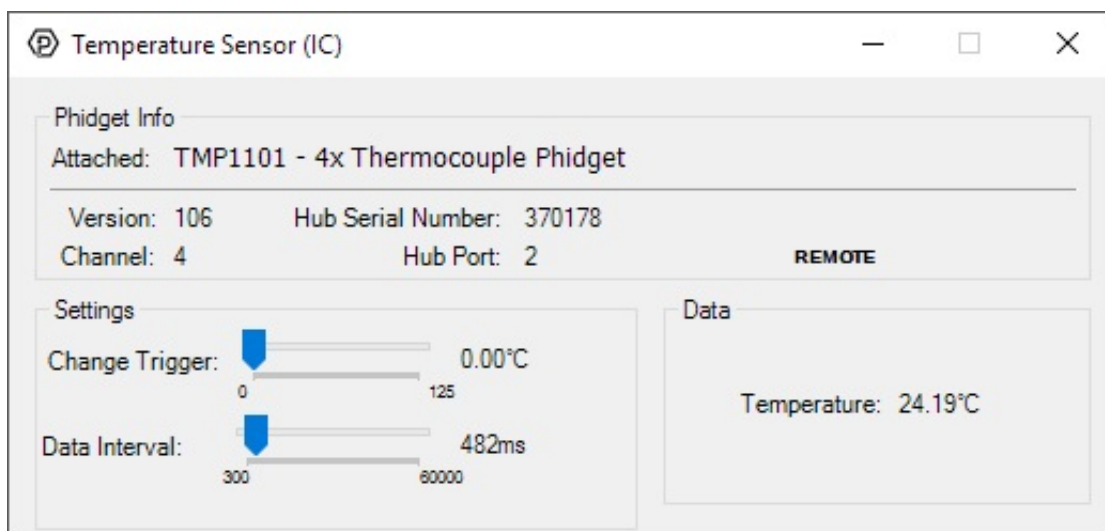


General information about the selected object will be displayed at the top of the window. You can also experiment with the following functionality:

- Modify the change trigger and/or data interval value by dragging the sliders. For more information on these settings, see the data interval/change trigger page.
- Select your thermocouple type from the Thermocouple Type drop-down menu.
- The measured temperature will be updated next to the Temperature label. Touch the thermocouple wire with your hands to see the temperature increase. If the temperature decreases when it should be increasing, you may have the wires plugged in incorrectly.

## Temperature Sensor (IC)

Double-click on the Temperature Sensor object , labelled Temperature Sensor (IC), in order to run the example:

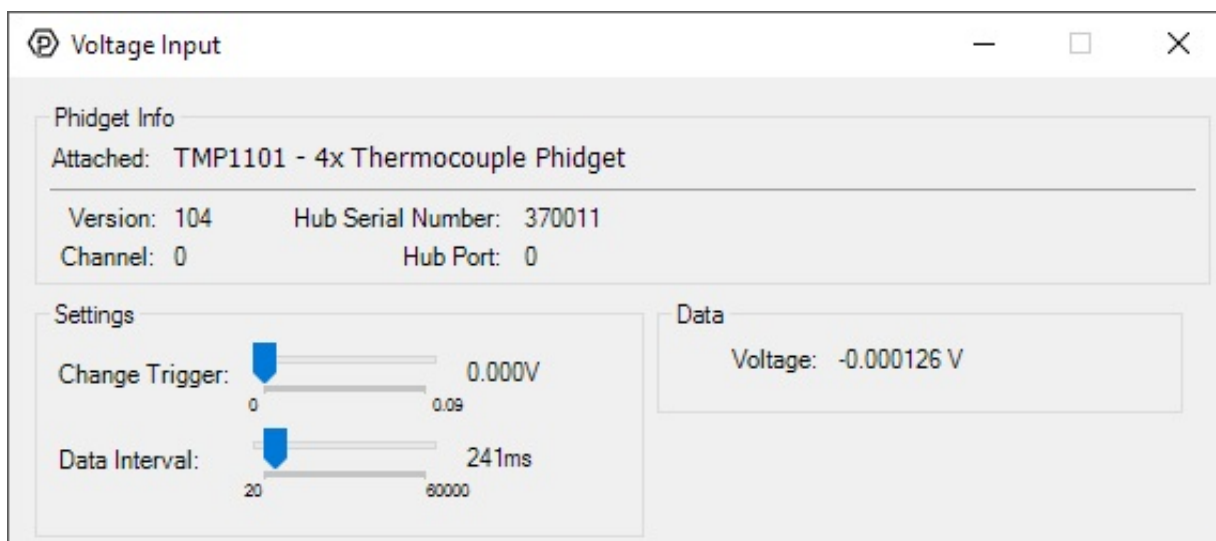


General information about the selected object will be displayed at the top of the window. You can also experiment with the following functionality:

- Modify the change trigger and/or data interval value by dragging the sliders. For more information on these settings, see the data interval/change trigger page.
- The measured temperature can be seen next to the Temperature label. Cover the board with your hands to see the temperature quickly rise.

## Voltage Input

Double-click on the Voltage Input object in order to run the example:



General information about the selected object will be displayed at the top of the window. You can also experiment with the following functionality:

- Modify the change trigger and/or data interval value by dragging the sliders. For more information on these settings, see the data interval/change trigger page.

## Technical Details

### Cold Junction Compensation and Self-heating

Thermocouples consist of two junctions, one where the thermocouple meets the Phidget and one where the two wires are welded together at the sensing end of the device. In simplified terms, a thermocouple works by detecting the temperature difference between these two junctions. As such, in order to measure the temperature at the sensing end we need to know the temperature where the thermocouple connects to the Phidget. To do so, there is an ambient temperature sensor on the board.

An important thing to note is that the ambient temperature sensor measures the temperature of the board and the air around it, though not specifically at the junction. Generally you can assume they are nearly the same temperature, however as the electronics heat up by being powered on there can be some small error introduced. This is exacerbated by having the board in an enclosed space where normal airflow is restricted thereby increasing the effect of self-heating. As a result we recommend that the board be left in as open and well ventilated/cooled a place as possible to minimize this error source.

For more information on thermocouples, check out the Thermocouple Primer.

### What to do Next

- Software Overview - Find your preferred programming language here to learn how to write your own code with Phidgets!
- General Phidget Programming - Read this general guide to the various aspects of programming with Phidgets. Learn how to log data into a spreadsheet, use Phidgets over the network, and much more.
- Phidget22 API - The API is a universal library of all functions and definitions for programming with Phidgets. Just select your language and device and it'll give you a complete list of all properties, methods, events, and enumerations that are at your disposal.