TC-08

Temperature Logger

User's Guide

Contents

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1 Welcome

Thank you for buying a TC-08 from Pico Technology!

The TC-08 is a temperature and voltage data logger designed to support multiple thermocouples. With PicoLog 6 software, the unit can be used with any laptop or PC running Windows, macOS or Linux.

The TC-08 provides cold junction compensation for thermocouples and the software supports up to 20 TC-08 devices.

To measure voltage, you can plug the optional TC-08 single-channel terminal board (PP624) into one channel on the data logger. It has a set of screw terminals, allowing you to connect sensors with voltage or current outputs to the data logger without any need for soldering.

For an explanation of how to use the software please refer to the A to Z of Data acquisition and logging. For detailed technical information, please refer to the *TC-08 Data Sheet* and the *TC-08 Single-Channel Terminal Board User's Guide*.

Software Development Kit
You can download a free Software Development Kit (SDK) from www.picotech.com/downloads. This enables you to write your own applications to control the TC-08. Refer to the *TC-08 Programmer's Guide* for further information.

⚠ **CAUTION**

For safety information, please read the *Quick Start Guide* supplied with the data logger. For the most recent version of the *Quick Start Guide*, please download it from our website here.

2   General information

2.1   Conformance

The TC-08 temperature and voltage data logger complies with CE marking regulations and FCC Part 15 Subpart B.

For more information, please refer to your product's EU Declaration of Conformity, available for download from TC-08 manuals.

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Viruses. This software was continuously monitored for viruses during production. However, the user is responsible for virus checking the software once it is installed.

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Upgrades. We provide upgrades, free of charge, from www.picotech.com. We reserve the right to charge for updates or replacements sent out on physical media.

2.3   Trademarks

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Pico Technology **warrants** upon delivery, and for a period of 5 years unless otherwise stated from the date of delivery, that the goods will be free from defects in material and workmanship.

Pico Technology shall not be liable for a breach of the warranty if the defect has been caused by fair wear and tear, willful damage, negligence, abnormal working conditions or failure to follow Pico Technology's spoken or written advice on the storage, installation, commissioning, use or maintenance of the Goods or (if no advice has been given) good trade practice; or if the Customer alters or repairs such goods without the written consent of Pico Technology.

2.5 Minimum system requirements

To ensure that your TC-08 data logger operates correctly, you must have a computer with at least the minimum system requirements as shown in the following table. The performance of the data logger will be better with a more powerful PC, and will benefit from a multi-core processor.

|	Specification
Operating system	Windows 7, Windows 8, Windows 10. 32-bit and 64-bit versions. Software is also available for Linux (64-bit) and macOS operating systems.
Processor	
Memory	As required by the operating system.
Free disk space	
Ports	USB 3.0 or USB 2.0 port(s)

2.6 Long term support

Software upgrades and beta versions are available to download from our website. You can also call or email our technical specialists for support, or visit our support forum. All of these services are available free of charge for the lifetime of the product.

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3 Getting started

3.1 Usage

Note: Do not expose the TC-08 to a direct heat source (e.g. sunlight) as heating/cooling of the device may cause inaccurate readings.
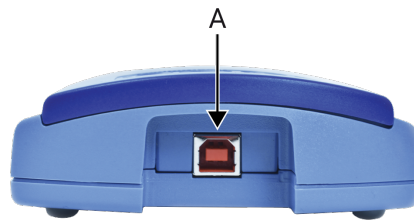
## 3.2 Connecting the TC-08
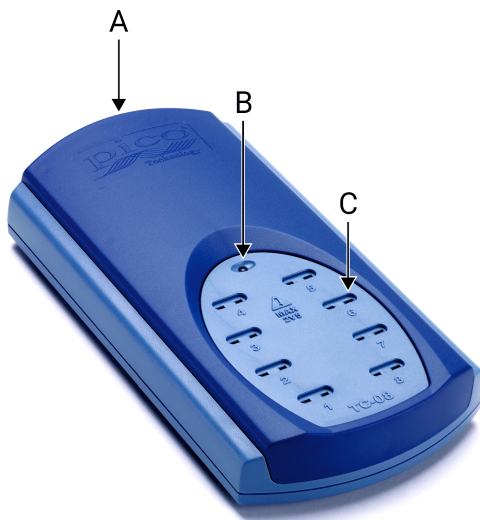
A. USB socket

B. Status LED

C. Miniature thermocouple sockets (**1** to **8**)

Install the PicoLog software before connecting a TC-08 for the first time.

To begin using the TC-08, connect it to the USB port on your computer using the cable provided. Next, connect a thermocouple to one of the miniature sockets and start the PicoLog software. On your screen you will see an image of the TC-08 in the **Devices** tab:
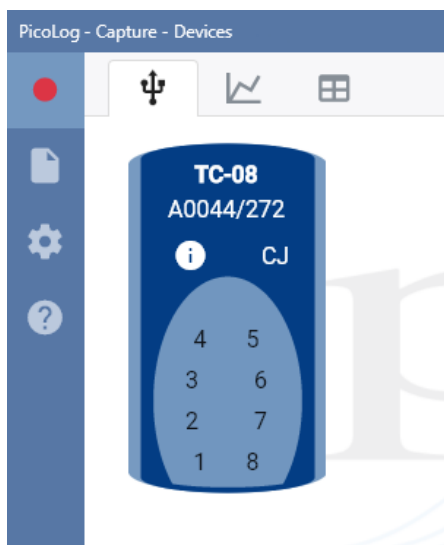
1. Select the channel corresponding to the location you chose for the thermocouple. The channel setup dialog will then display, allowing you to configure the channel. You can type in a channel **Label** and choose a channel **Color**, **Sample interval** and **Input type** (thermocouple type). You also have an advanced option to set **Custom scaling:**
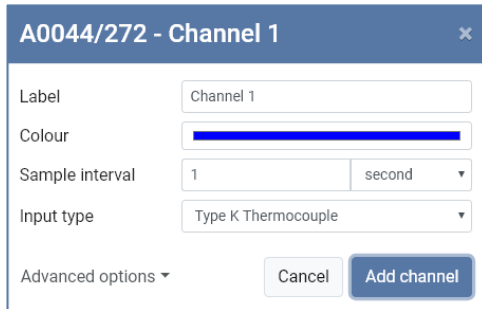

2. Click **Add channel**. The selected channel (in this case, channel **1**) on the TC-08 will be highlighted in a color corresponding to the plot line **Color** chosen when the channel was set up. The **Maths channel** configurator will appear in the **Devices** tab as a small calculator. The thermocouple channel will be displayed in the **Channels & Axes** column on the right of the screen and also the **Start recording**, **Pause**, **Delete**, **Save** and **Export** buttons will be available:
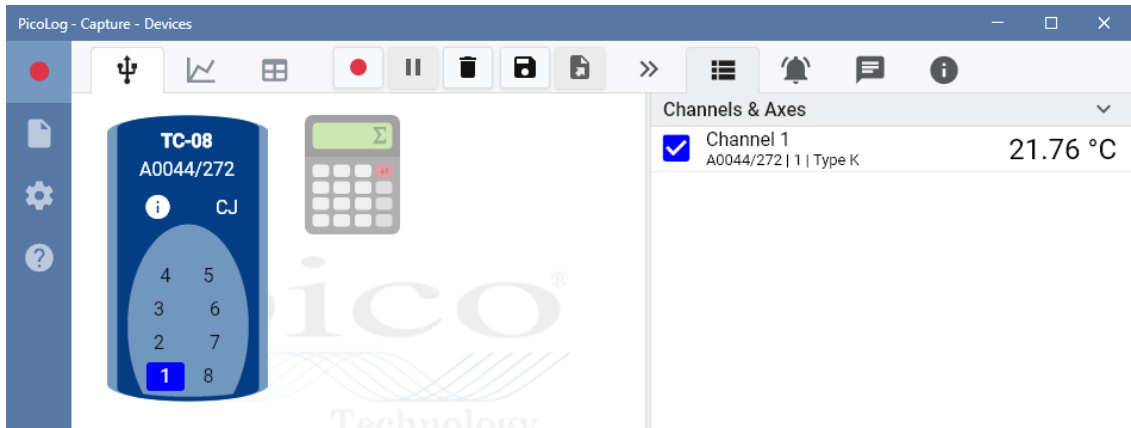
Note: To make the configuration of multiple channels easier you can hold Ctrl (Windows and Linux) or cmd (macOS) and click on the channels to be configured. Then release Ctrl (or cmd) and click one of the channels, or press enter, to display the channel setup dialog box.

3. Click the red **Start recording** button and choose a **Capture** setting of either **Unlimited** or **Fixed length**. Don't forget to ensure there is sufficient PC storage capacity. Then click **Start capture:**
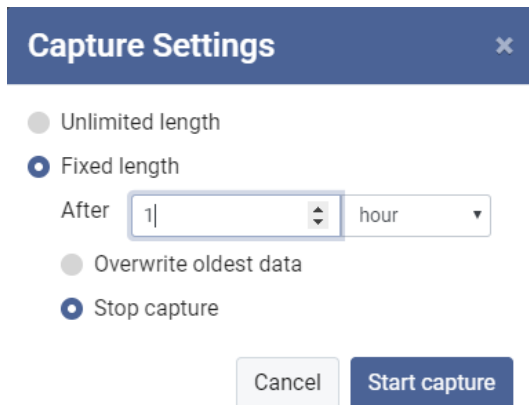
> **TIP: Status LED**
> - When PicoLog has established a connection to the device, the LED will be green.
> - When PicoLog is capturing readings, the LED will change to alternating red and green.

3.3   Single channel terminal board (PP624)

The [PP624 Single-Channel Terminal Board](#) is an accessory for the TC-08 data logger. The screw terminals allow wires to be attached to the data logger without soldering and enable the TC-08 to measure voltages in the ranges ±5 V, ±500 mV and ±50 mV, or 4–20 mA current loop.
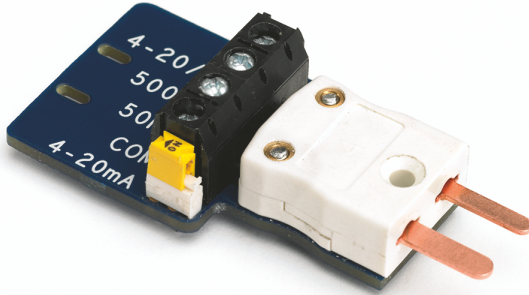
4   Background information

4.1   How a thermocouple works

In 1821 the German physicist Thomas Seebeck discovered that if two dissimilar conductors were joined at each end, into a loop, and the two ends were maintained at different temperatures, a magnetic field was generated. This was due to a thermoelectric current and became known as the Seebeck effect.

A thermocouple is a temperature sensor consisting of two wires of dissimilar metals which are joined at one end called the measuring junction. When this junction is heated or cooled, a temperature gradient generates a thermoelectric voltage along the wires.

To determine the actual temperature at the measuring junction, the instrument measures its internal temperature at a reference junction (Tref) and the thermoelectric voltage generated in the thermocouple wires is also measured. This data is then referenced to Seebeck coefficient tables for the particular thermocouple in use.
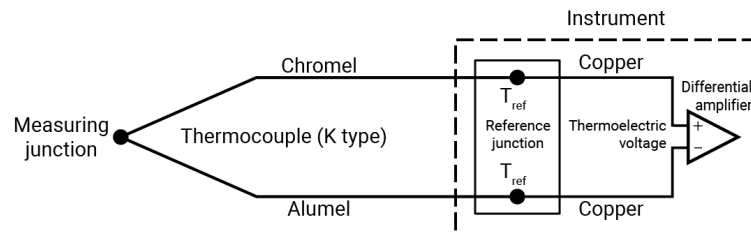
Note: More information on choosing and using thermocouples can be found on our Thermocouple selection and use page. You can also read more about thermocouple tolerances here.

5   Glossary

Cold junction compensation (CJC). A method of compensating for ambient temperature variations in thermocouple circuits.

Thermocouple. A device consisting of two dissimilar metals joined together. The thermoelectric voltage developed between the two junctions is proportional to the temperature difference between the junctions.

Type B thermocouple. Type B thermocouples are made from platinum and rhodium and are suitable for high temperature measurements of up to 1820 °C. Unusually, due to the shape of their temperature / voltage curve, type B thermocouples give the same output at 0 °C as at 42 °C.

Type E thermocouple. Type E thermocouples are made from chromel and constantan. They have a high output (68 µV/°C), making them well suited to low-temperature (cryogenic) use. They are non-magnetic.

Type J thermocouple. Type J thermocouples are made from iron and constantan. They measure temperatures in the range -210 to +1200 °C. The main application is with old equipment that can not accept the more modern thermocouple. J types should not be used above 760 °C, as an abrupt magnetic transformation will cause permanent decalibration.

Type K thermocouple. Type K thermocouples are low-cost, general-purpose thermocouples, made from chromel and alumel, operating in the -270 °C to +1370 °C temperature range. Sensitivity is approx 41 µV/°C.

Type N thermocouple. Type N thermocouples are made from nicrosil and nisil. The high stability and resistance to high-temperature oxidation of these thermocouples make them suitable for measuring high temperatures. They are less expensive than platinum types B,R, and S and were designed to be an improved type K.

Type R thermocouple. Type R thermocouples are made from platinum and rhodium, and are suitable for high-temperature measurements of up to 1760 °C. Low sensitivity (10 µV/°C) and high cost make them unsuitable for general purpose use.

Type S thermocouple. Type S thermocouples are made from platinum and rhodium, and are suitable for high-temperature measurements of up to 1760 °C. Low sensitivity (10 µV/°C) and high cost make these thermocouples unsuitable for general purpose use. Due to their high stability, type S thermocouples are used as the standard of calibration for the melting point of gold.

Type T thermocouple. Type T thermocouples are made from copper and constantan, are highly accurate, and operate in the −270 °C to +400 °C temperature range.

USB. Universal Serial Bus. This is a standard port that enables you to connect external devices to PCs. A full-speed USB 2.0 port operates at up to 480 megabits per second. The TC-08 is also compatible with any USB port from USB 1.1 upwards.

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