

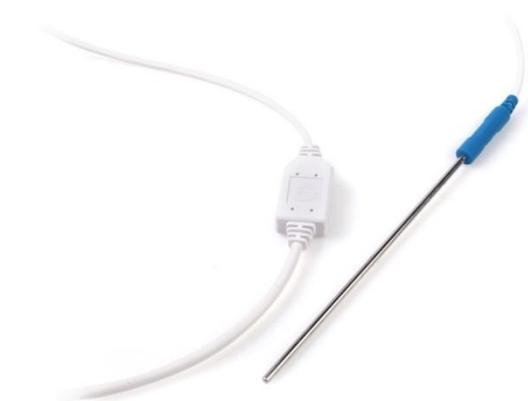


**einstein™**  
imagine • explore • learn

## Temperature Sensor

-40 °C to 140 °C

Product Number: ENTMP029



### Overview

Monitoring temperature change is a key part of many scientific experiments. Our Temperature sensor is made of stainless steel and covered with a protective material making it much more durable than the traditional glass thermometer.

Due to the sensor's wide range (-40 °C to 140 °C), it can be used for experiments in Chemistry, Physics, Biology, Earth Science and Environmental Science. It is mostly suitable for measuring the temperature of water and chemical solutions.

The Temperature sensor can be connected to all types of einstein™ data loggers.

## Typical experiments



### Chemistry

- Specific heat experiments
- Measuring freezing and boiling points
- Monitoring endothermic and exothermic reactions
- Investigating the Combined Gas Law

## How it works

The Temperature sensor contains a sensing element that puts out voltage proportional to the measured temperature. This output is between 0 to 3 V, the range accepted by the Analog-Digital converter, and the results are then displayed.

## Sensor specification

Range:	- 40 °C to 140 °C - 40 °F to 284 °F
Accuracy:	±2 % over entire range
Resolution (12-bit):	0.03 °C
Default Sample Rate:	10 samples per second
Response Time (for 90% change in reading):	20 seconds in liquid 40 to 60 seconds in air
Sensing Element:	Located inside the sensor's tip
Recommended Sensor Usage:	Use only in mild chemical solutions. Do not place the sensor's cable in liquid. Do not place the sensor in a flame or on a hot plate.

## Data logging and analysis

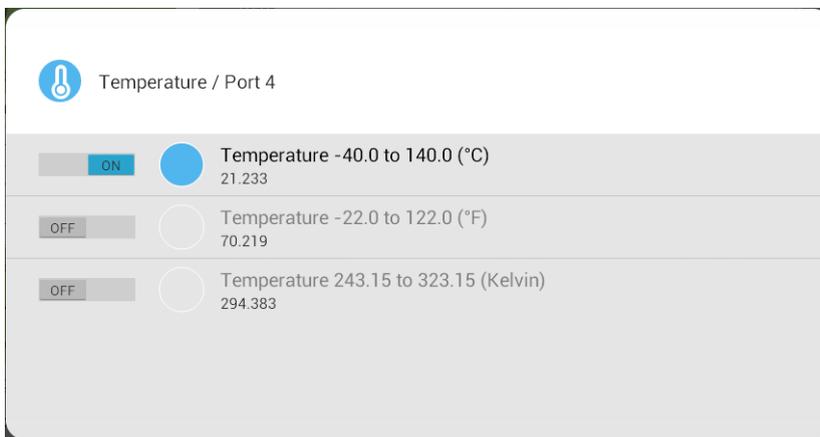
### MiLAB™

1. Take your einstein™ Tablet OR pair your einstein™LabMate with your Android or iOS tablet via Bluetooth
2. Insert the sensor cable into one of the sensor ports
3. Launch MiLAB

- MiLAB will automatically detect the sensor and show it in the Launcher View



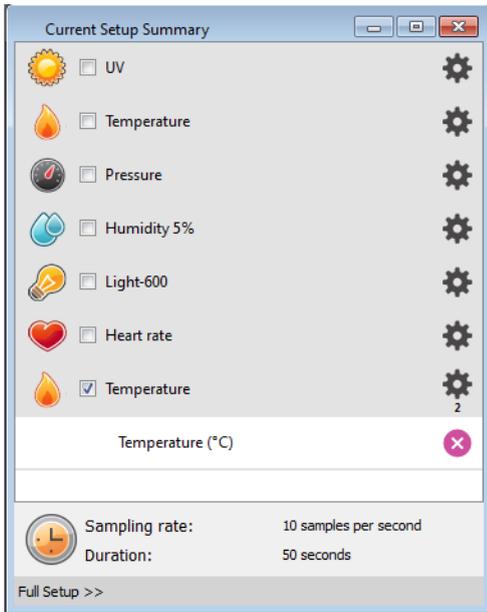
- Check the icon next to the sensor (✔) to enable it for logging
- Tap the Settings icon to select what unit(s) to measuring - Celsius, Fahrenheit and Kelvin



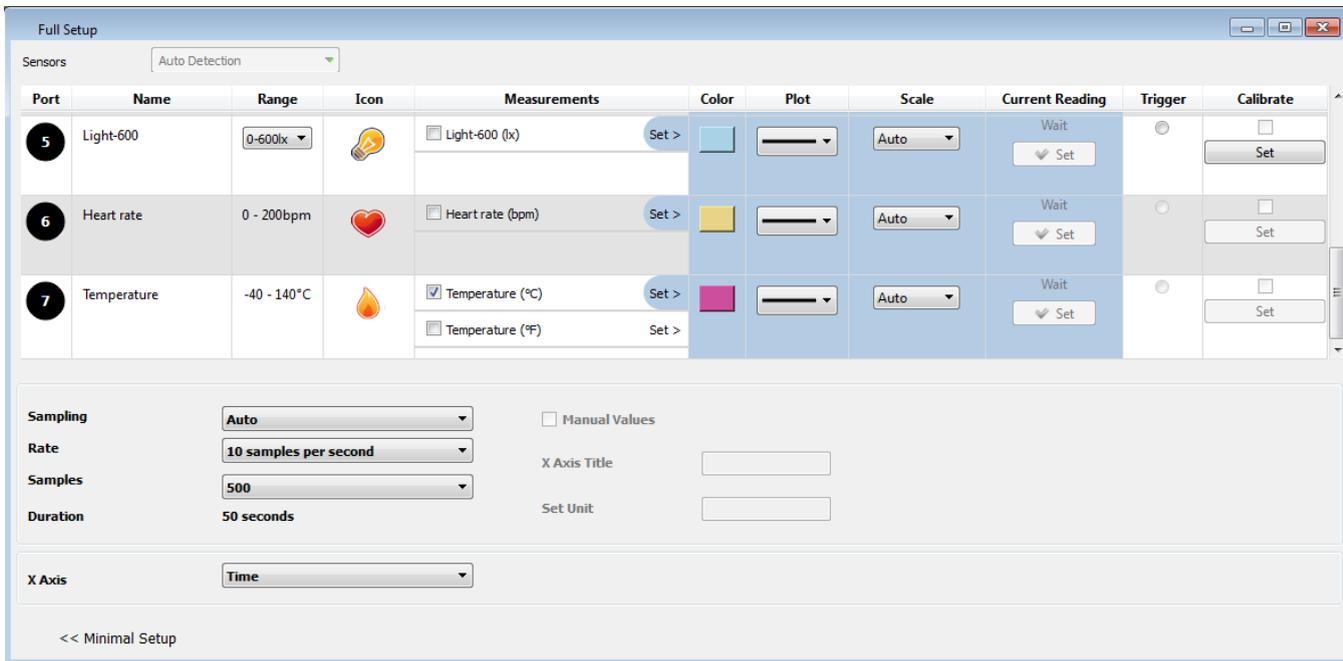
## MiLAB Desktop

- Pair your einstein™LabMate with your PC, MAC, or Linux machine via Bluetooth, or connect it via the USB cable (found in the einstein™LabMate box).
- Insert the sensor cable into one of the sensor ports
- Launch MiLAB

- MiLAB will automatically detect the sensor and show it in the Current Setup Summary window



- Click Full Setup, located at the bottom of the Current Setup Summary window to program the data logger's sample rate, number of samples, units of measurement, and other options



- Click the Run button (  ) on the main toolbar of the Launcher View to start logging

## Calibration

The Temperature sensor (-40 °C to 140 °C) requires no calibration.

## An Example of using the Temperature Sensor

### Measuring the Cooling Rate of a Glass of Hot Water

1. Insert the sensor into a glass of hot water
2. Go to Full Setup and define Sampling as 1 sample per second and the number of Samples as 2000 samples
3. Click the Run button (  ) on the main toolbar of the Launcher View to start logging
4. Figure 1 shows a sample graph from this experiment
5. You may repeat the experiment with different sizes and shapes of glasses and see the impact

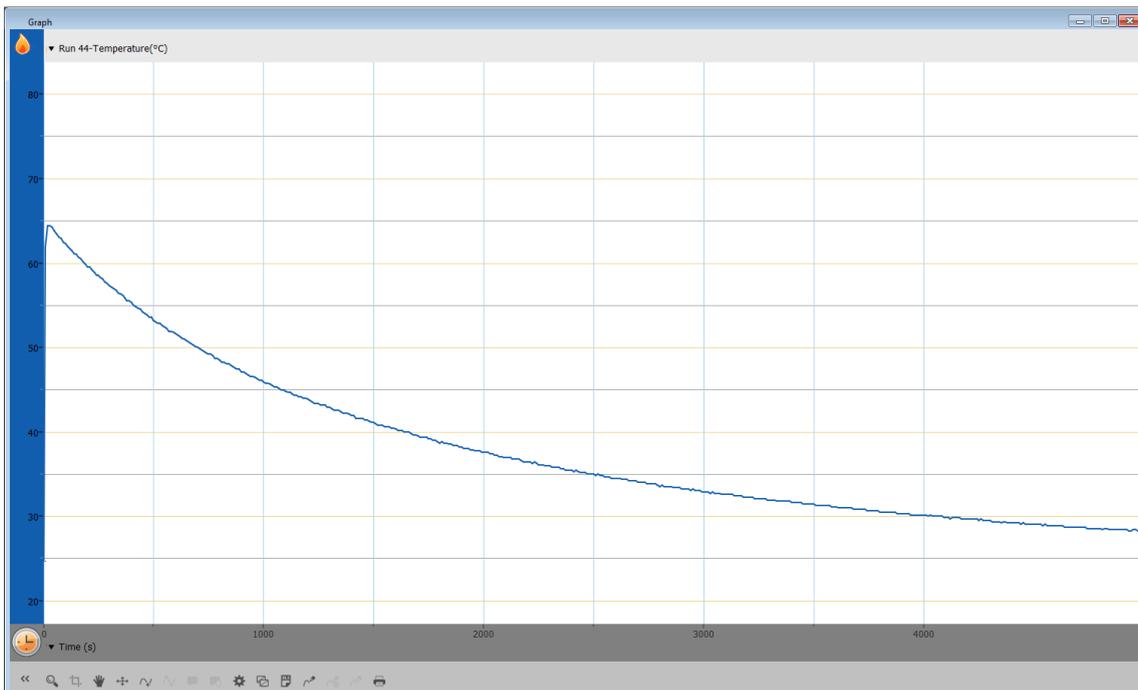


Figure 1: Sample graph of the above experiment

## Troubleshooting

If the Temperature Sensor isn't automatically recognized by MiLAB, please contact Fourier Education's technical support.

## Technical support

For technical support, you can contact the Fourier Education's technical support team at:

Web: [www.einsteinworld.com/support](http://www.einsteinworld.com/support)

Email: [support@fourieredu.com](mailto:support@fourieredu.com)

Phone (in the US): (877) 266-4066

## Copyright and Warranty

All standard Fourier Systems sensors carry a one (1) year warranty, which states that for a period of twelve months after the date of delivery to you, it will be substantially free from significant defects in materials and workmanship.

This warranty does not cover breakage of the product caused by misuse or abuse.

[www.einsteinworld.com](http://www.einsteinworld.com)

This warranty does not cover Fourier Systems consumables such as electrodes, batteries, EKG stickers, cuvettes and storage solutions or buffers.

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