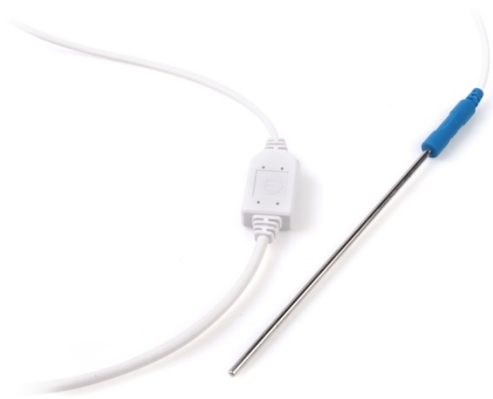einstein™
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Temperature Sensor
-40 °C to 140 °C

Product Number: ENTMP029

Overview

Monitoring temperature change is a key part of many scientific experiments. Our Temperature sensor is made of durable 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 the all einstein™ Tablets™, einstein™LabMate™, and einstein™LabMate+™.

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
4. MiLAB will automatically detect the sensor and show it in the Launcher View
5. Check the icon next to the sensor ( ) to enable it for logging

MultiLab4™

1. 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).
2. Insert the sensor cable into one of the sensor ports
3. Launch MultiLab4
4. MultiLab4 will automatically detect the sensor and show it in the Current Setup Summary window

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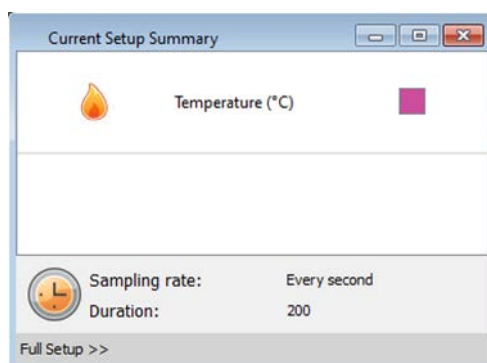
5. Click Full Setup, located at the bottom of the Current Setup Summary window to program the data logger's sample rate, number of samples, units of measurement, and other options
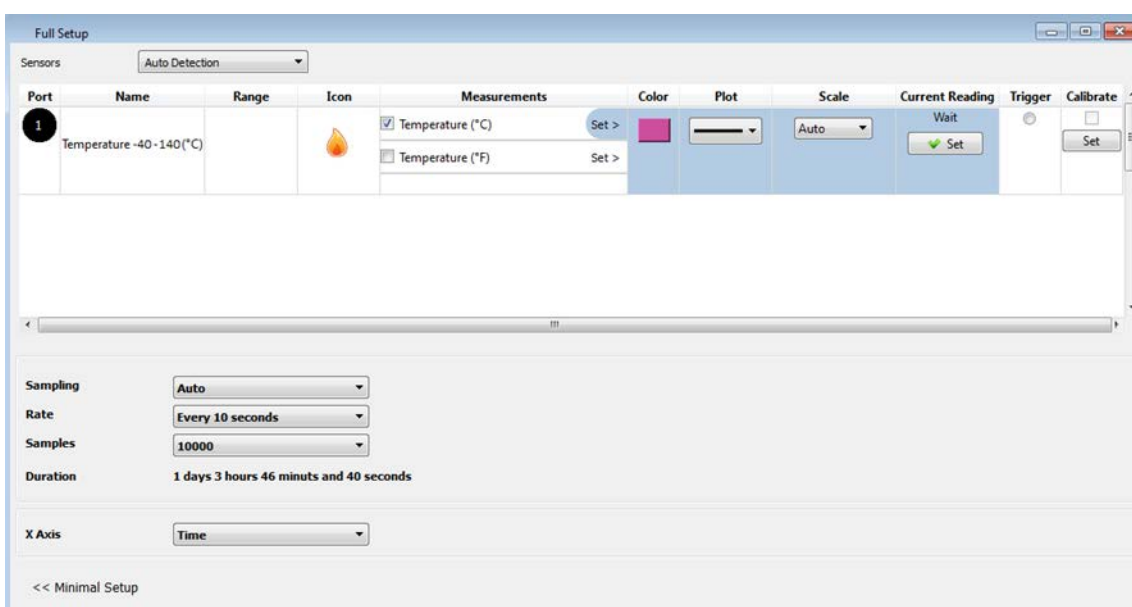
6. Click the Run button ( ) on the main toolbar of the Launcher View to start logging

Calibration

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

An Example of using the Temperature Sensor

Citric Acid and Baking Soda – An Endothermic Reaction

An endothermic reaction is a chemical process in which heat is absorbed. When we perform an endothermic reaction in a flask, heat from the environment flows to the flask until temperature balance is established. For example, the Temperature sensor can be used to measure the temperature drop when citric acid reacts with baking soda. Below is a graph typical of such a reaction:
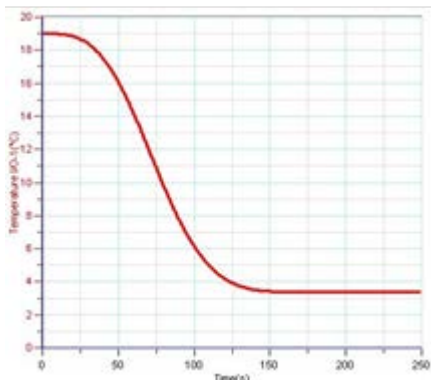
Figure 1: Graph of endothermic reaction

Troubleshooting

If the Temperature Sensor isn't automatically recognized by MultiLab4/ 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

Email: 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.

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