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# Surface Temperature Sensor -40°C to 140°

Product Number: ENTMP060

## Overview

This high accuracy Surface Temperature Sensor measures the temperature of a wider variety of surfaces, including metals, wood, glass and even human skin. It is used in situations where low thermal mass or flexibility is required. With its wide range and ease of use it is ideal for experiments in human physiology, chemistry and physics, especially for kids in elementary school (but nor only).

The Surface Temperature sensor can be connected to all types of einstein™ data loggers. It can be used for various experiments in Types of Experiments.

## Typical experiments

**Chemistry**

- Measure of specific Heat
- Measure of heat Transfer between bodies

**Physics**

- Friction and energy conversion studies
- Properties of solids

**Biology and environmental sciences**

- Skin temperature measurements in different conditions
- Ground temperature.
- Plants adaptations

## How it works

The Surface Temperature sensor contains a sensing element that changes its electrical resistance in proportion to the surface temperature. A conditioning circuit translates this change into 0-3V, the range accepted by the Analog-Digital converter. The Analog-Digital converter translates the voltage and sends this data to the software where the information is displayed and recorded.

## Sensor specification

| | |
|---|---|
| Range: | - 40 °C to 140 °C |
| - 40 °F to 284 °F | |
| Accuracy: | ±2 % over entire range |
| Resolution (12-bit): | 0.03°C |
| Recommended Sampling Rate: | 10 samples per second Maximum temperature that the sensor |
| can tolerate without damage: | 140°C |

## Calibration

The Surface Temperature sensor requires no calibration

## Data logging and analysis

### Android

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 MiLABEx And tap on LAB start an Experiment
4. MiLABEX will automatically detect the sensor
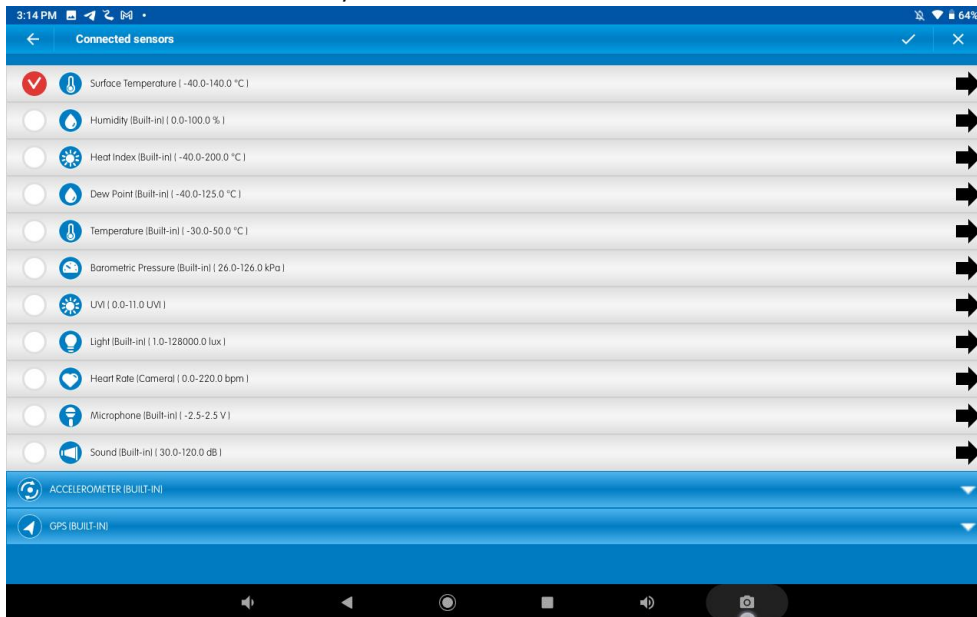


5. Make sure the icon next to the sensor is to enable it for logging

## Desktop

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 MiLABEx and then tap LAB start an Experiment

4. MiLABEx will automatically detect the sensor and show it in the Current Setup Summary window

5.
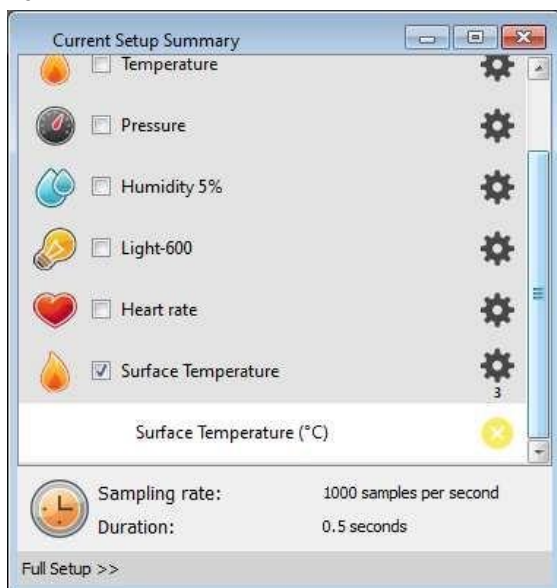


6. Click Full Setup, located at the bottom of the Current Setup Summary window to program the data logger's sample rate, number of samples, units of measurement, and other options
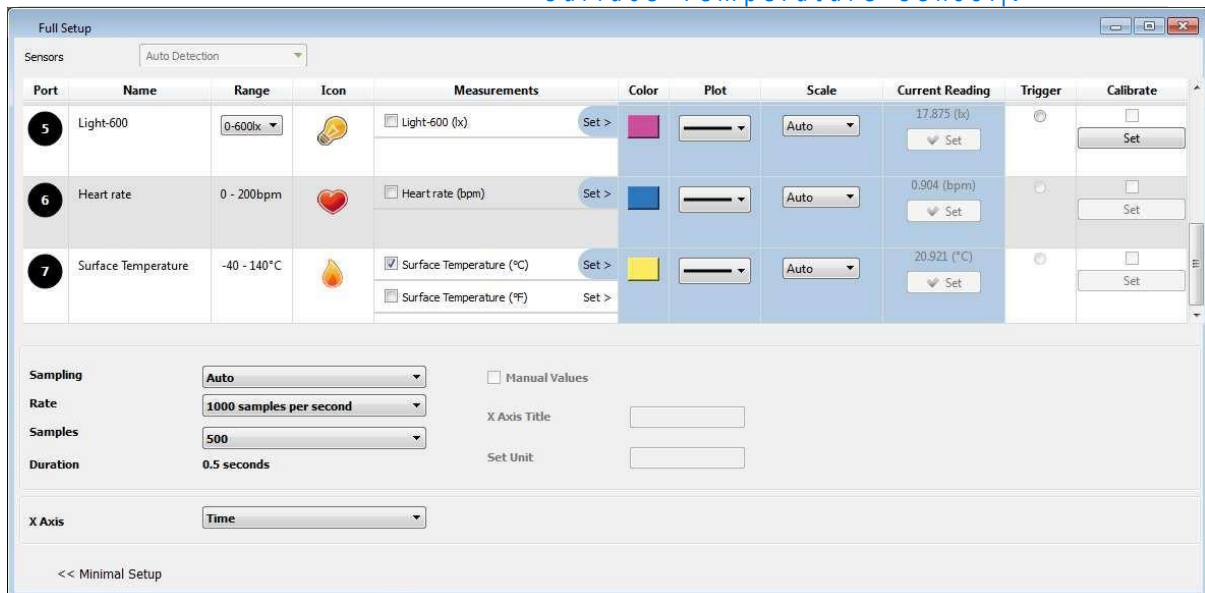
# An example of using the Sensor

## The Effect of Exertion on Body Temperature

1. As we do physical exercise our muscles burn organic compounds (e.g. sugars and fats) for energy. These are exothermic reactions, where heat is released. This heat causes our body temperature to rise. However, our body has physiological mechanisms to maintain a constant body temperature. One of the ways to eliminate the generated heat is to drive more blood towards the skin. This blood carries heat to skin, and to the sweat secreted from gland cells in the skin. The evaporation of the sweat from the skin causes the heat to leave the body. Measuring the changes before, during and after physical activity allows us to follow these effects and ask questions like What is the effect of the duration of physical activity on the amount of heat emitted from the body through the skin?

2. Place the Surface Temperature Sensor on the back of your hand and hold it there (without pressing)

3. Select Run to begin recording data.

4. Follow changes in temperature until it stabilizes (at about two minutes).

5. Jog in place for 2 minutes

6. Follow changes in temperature for an additional one to two minutes after completing the exercise.

7. Save your data
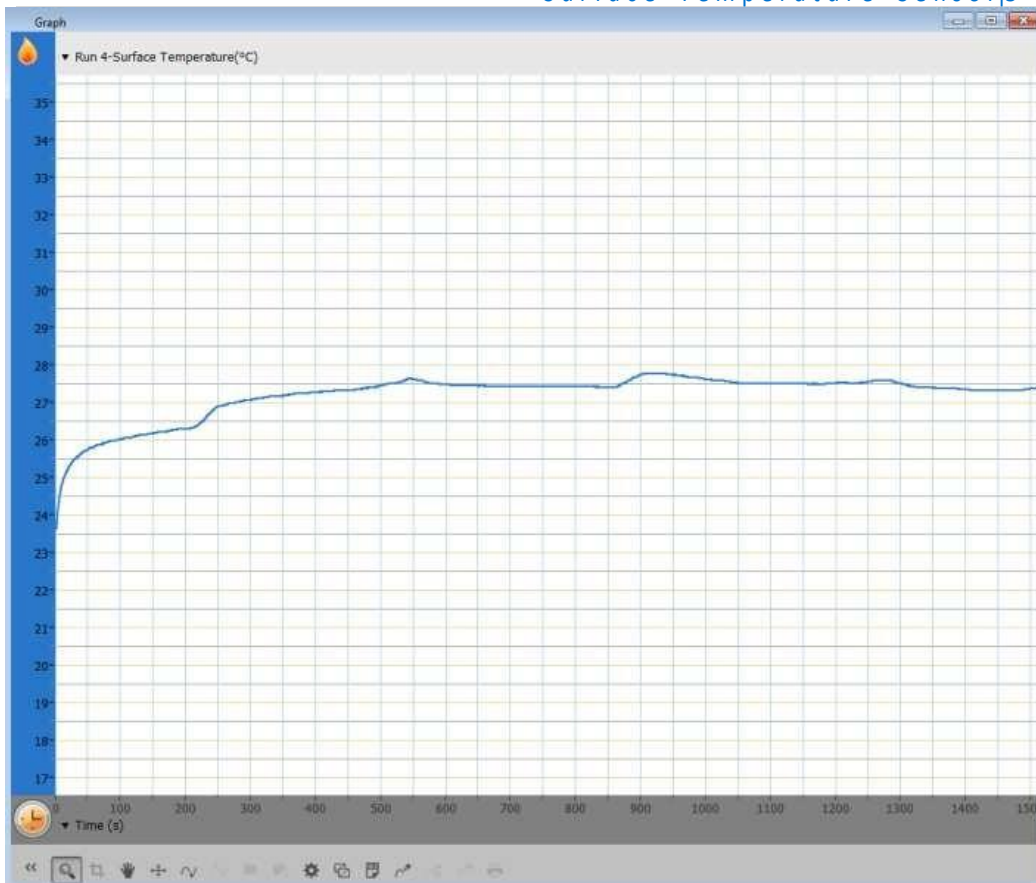
## Troubleshooting

If the Surface 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
Email: support@fourieredu.com

## 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.