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Temperature and Humidity Sensor

Product Number: ENHMT041

Overview

Humidity and Temperature are not only a key part of many scientific experiments, they are quite commonly measured together. With the new einstein™ Temperature and Humidity sensor these experiments are now easier than ever. The Temperature sensor has a wide range (-40 °C to 125 °C) while the Humidity sensor measures relative humidity from 0-100 %. Together these sensors are ideal for experiments in Biology, Earth Science and Environmental Science.

The Temperature and Humidity sensor can be connected to the all einstein™ Tablets™, einstein™LabMate™, and einstein™LabMate+™.

Typical experiments

Subject

- Regulation of Human Body Temperature

- Measuring Abiotic Conditions in a Habitat Beneath a Rock
- Measuring Heat Index and Dew point
- Calculating Thermal comfort

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.

The Humidity sensor contains a variable capacitor that changes its capacity according to the humidity in the environment. The sensor is part of an electronic oscillator that changes frequency with changing humidity. The oscillator frequency is converted to voltage. This voltage is then adjusted and the proper result is then recorded and stored in the data logger's memory.

Sensor specification

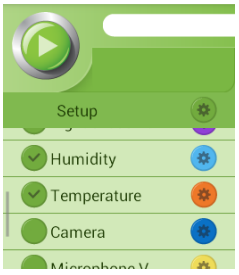
Range (Temperature):	-40 to 125 ºC
Range (Humidity):	0 to 100 %
Accuracy (Humidity):	±2 % (in a range of 0 to 80 % Relative Humidity)
Accuracy (Temperature):	0.03 °C (in a range of -10 to 85°C)
Resolution (12-bit) (Temperature):	0.04 °C
Resolution (12-bit) (Humidity):	0.025 % Relative Humidity

Note: Sensor cables sold separately

Data logging and analysis

MiLAB™

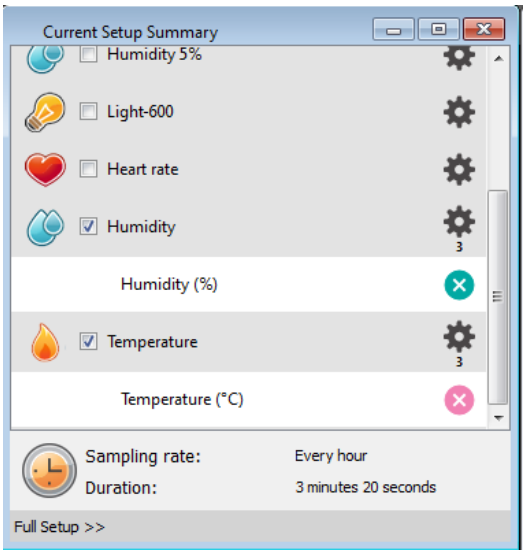
1. Take your einstein™ Tablet OR pair your einstein™LabMate with your Android or iOS tablet via Bluetooth
2. Insert the sensor cable into one of the sensor ports
3. Launch MiLAB
4. MiLAB will automatically detect the sensor and show it in the Launcher View



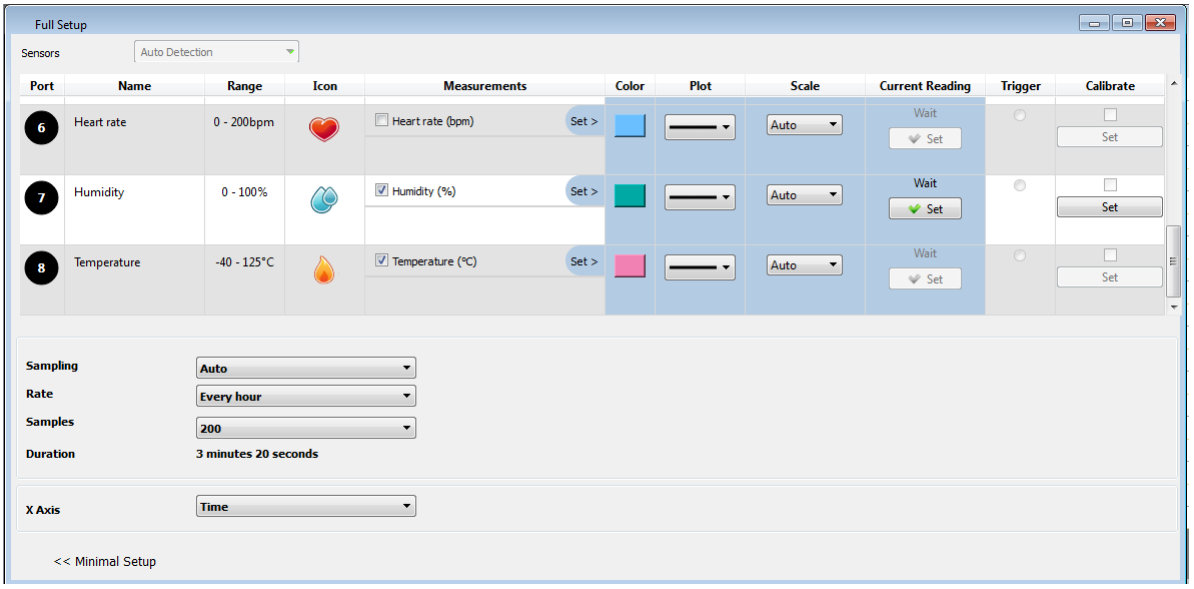
5. Check the icon next to the sensors ( ) to enable it for logging

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



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

An example of using the Temperature and Humidity Sensor

Heat Loss Measured at the Fingertips with Humidity and Temperature Sensors

Exposure of our bodies to high temperatures or physical exertion can lead to an increase in body temperature. Blood vessels near the skin's surface dissipate heat well. Therefore, blood flow in the skin rises when body temperature increases. To help dissipate heat, sweat production increases significantly. This is done by over three million sweat glands spread throughout the skin. Sweat production and evaporation is essential to maintaining body temperature but it can lead to dehydration if water loss is not replaced through drinking.

In this experiment we measure the effect of an increase in hand temperature on heat dissipation through sweat evaporation.

Equipment

einstein™ enabled device
Temperature and Humidity sensor
Temperature Sensor (-40°C to 140°C)
Plastic bag

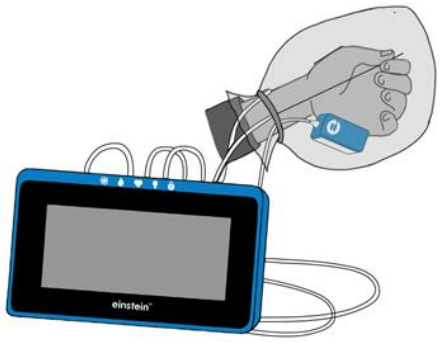
Equipment Setup

1. Launch MiLAB.
2. Connect the Temperature and Humidity Sensor to a sensor port
3. Connect the Temperature sensor to a sensor port
4. Make sure that only the Temperature and Humidity sensor and the Temperature sensor are selected

Current Setup Summary

Program the sensors to log data according to the following setup:

Measurements:	Humidity (%)
Measurements:	Temperature (°C)
Rate:	Every second
Samples	2000
Duration:	33 minutes 20 seconds



Procedure

1. Attach the Temperature Sensor to the fingers of your right arm. Make sure you are touching the tip of the Temperature Sensor.
2. Select **Run** ( ) to begin recording data.
3. Follow temperature changes in your fingertips until it stabilizes (at about 2-3 minutes).
4. Cover the hand with a plastic bag; the Temperature and Humidity sensor should be in the plastic bag.
5. Tie the bag covering your hand, to prevent airflow into and out of the bag.
6. Follow changes in humidity and temperature inside the bag, for about 10 minutes.

7. Remove the plastic bag from your hand, leaving the Temperature and Humidity sensor inside the bag. Follow changes in the humidity and temperature inside the plastic bag as well as the temperature of your fingertips, for an additional 10 minutes.
8. Save your data by selecting **Save** from the Basic Tools window on the upper menu bar.

Data Analysis

For more information on working with graphs see: Working with Graphs in MultiLab4

1. Use the cursors to mark the changes in humidity and temperature while the hand is covered by the plastic bag. What was the initial value of each parameter, the final value, and the difference between the two values?
2. Mark the course of changes in humidity and temperature after the removal of the plastic bag. Examine your hand immediately after removal of the plastic bag. Is it moist or dry?

Troubleshooting

If the 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
Phone (in the US): (877) 266-4066
Phone (International): +972-3-901-4849 ext. 232

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.

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