einstein™
imagine • explore • learn
Apr 2024

Humidity + Temperature 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 measures a wide range of temperatures (-40 °C to 125 °C) while the Humidity sensor measures relative humidity from 0-100 %. Two additional parameters can be measured using these sensors: Heat Index & Dew Point. Together these sensors are ideal for experiments in Biology, Earth Science and Environmental Science. The Temperature and Humidity sensor can be connected to all types of einstein™ data loggers.

Typical experiments

Biology

- Regulation of Human Body Temperature
- Measuring Abiotic Conditions in a Habitat
- 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.

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

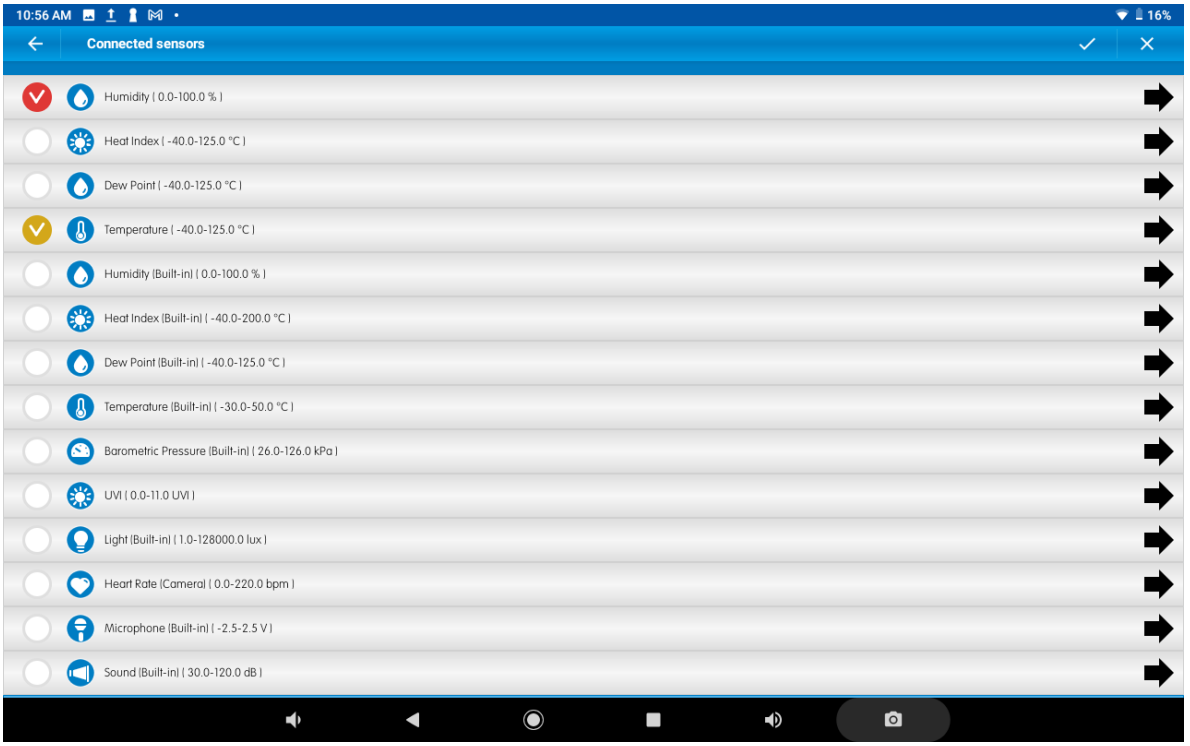
Range (Temperature):	-40 to 125 °C
Range (Humidity):	0 to 100 %
Accuracy (Humidity):	±2 % (in a range of 0 to 80 % Relative Humidity)
Accuracy (Temperature):	0.03 °C (in a range of -10 to 85°C)
Resolution (12-bit) (Temperature):	0.04 °C
Resolution (12-bit) (Humidity):	0.025 % Relative Humidity

Note: Sensor cables sold separately

Data logging and analysis

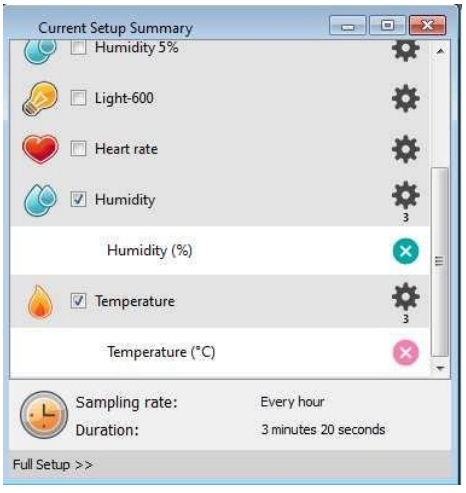
MiLABEx™

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. Tap on Sensors and check the icon next to the sensors to enable it for logging

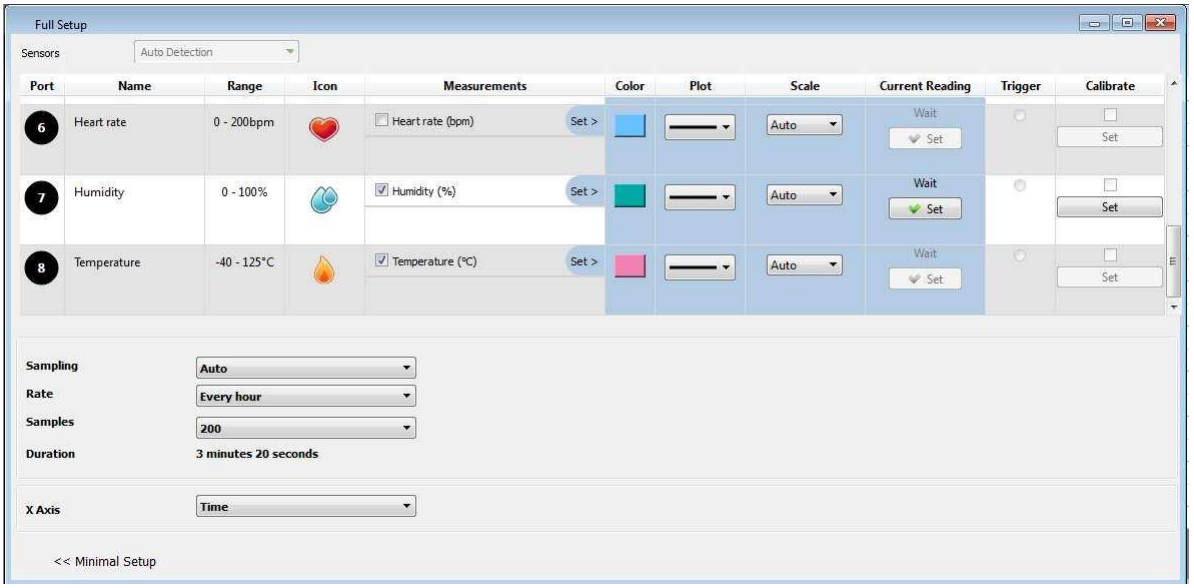


MiLABEx™ Desktop

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 click on LAB – Start an Experiment
4. MiLABEx 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

1. einstein™ enabled device
2. Temperature and Humidity sensor
3. Plastic bag

Equipment Setup

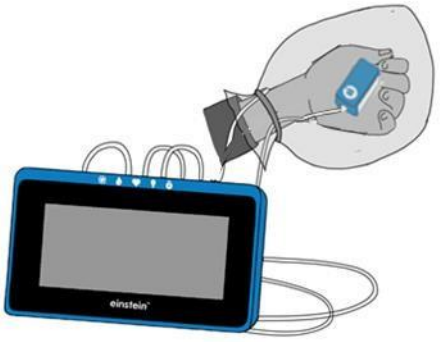
1. Launch MiLABEx.

2. Connect the Temperature and Humidity Sensor to a sensor port
3. Make sure that only the Temperature and Humidity sensor 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



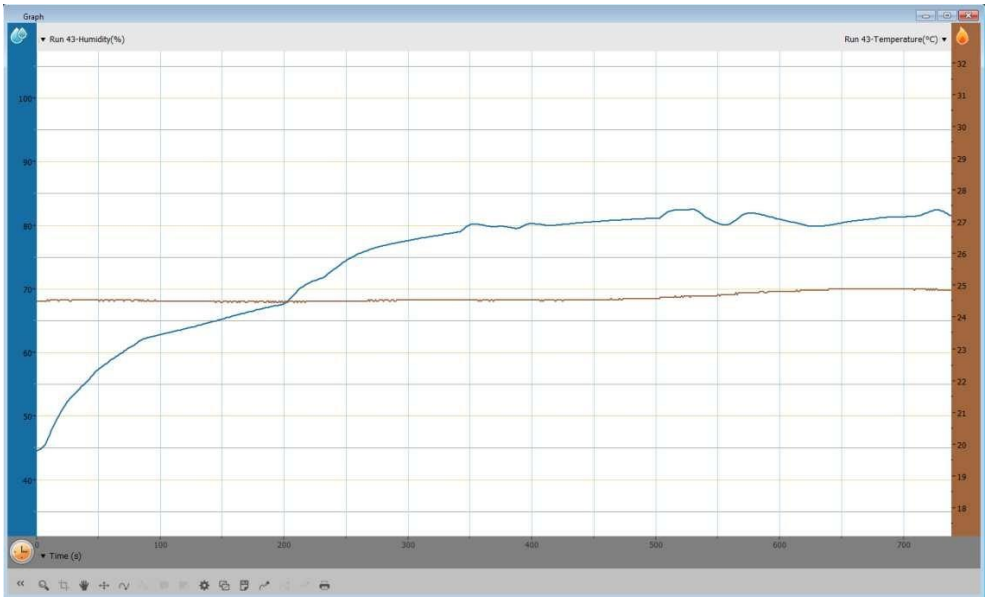
Procedure

Select **Run** to begin recording data.

Cover your hand with a plastic bag; the Temperature and Humidity sensor should be in the plastic bag.

Tie the bag covering your hand, to prevent airflow into and out of the bag.

Follow changes in humidity and temperature inside the bag, for about 10 minutes.



Data Analysis

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 MiLABEx, 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.