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Apr 2024

CO₂ Sensor

Product Number: ENCO2B040A



Overview

Carbon Dioxide (CO₂) is one of the most important gases on earth. It is critical for photosynthesis in plants. It also plays an important part in the greenhouse effect, trapping heat inside the atmosphere.

The CO₂ sensor has a broad dynamic range of 0-10k ppm. Plus, it's easy to use – the sensor automatically calibrates itself before every experiment.

The CO₂ sensor can be connected to all einstein™ data loggers.

It can be used for various experiments in Biology, Chemistry and Environmental Science.

Typical experiments



Environmental Science

- Changes in carbon dioxide concentration inside a plant terrarium during photorespiration and photosynthesis cycles



Biology

- Carbon dioxide levels during cellular respiration of seeds
- Changing carbon dioxide levels in a classroom
- CO₂ concentration in solution during respiration



Chemistry

- The rate at which carbon dioxide is removed from a closed atmosphere using sodium hydroxide or potassium hydroxide
- The rate of production of carbon dioxide in a chemical reaction between hydrochloric acid and sodium bicarbonate
- The rate at which carbon dioxide gas diffuses through a gas diffusion tube
- The production of carbon dioxide during fermentation of sugars

How does it work?

The CO₂ sensor uses non-dispersive infrared (NDIR) principle to detect the existence of CO₂ in the air.

An infrared (IR) lamp directs waves of light through a tube filled with air towards an IR light detector, which measures the amount of IR light that hits it. As the light passes through the tube, any gas molecules that are the same size as the wavelength of the IR absorb the IR light only, while letting other wavelength of light pass through.

Next, the remaining light hits an optical filter that absorbs every wavelength of light except the exact wavelength absorbed by CO₂.

Finally, an IR detector reads the amount of light that was not absorbed by the CO₂ molecules or optical filter.

The difference between the amount of light radiated by the IR lamp and the amount of IR light received by the detector is measured. The difference is proportional to the concentration of CO₂ molecules in the air inside the tube.

You can also compliment the sensor with a unique sleeve that enables using the sensor and detect CO₂ solution. Ask us for more information.

Sensor specification

Range	0 to 10,000 ppm
Accuracy	±50 ppm, ±5% full scale
Resolution(12-bit):	8 ppm at 350 ppm; 100ppm at 5,000 ppm Recommended Sampling
Response Time	90 seconds (to 90% of full value)
Rate:	10 samples per second
Current Consumption	Approx. <85 mA Normal Operating Temp. Range: -10 °C to 50 °C

Note: Sensor cables sold separately

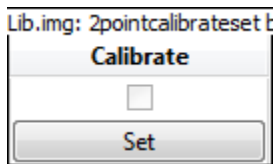
Calibration

The CO₂ Sensor is shipped fully calibrated and performs a simple, automatic, calibration procedure every time you plug the sensor into an einstein™ device.

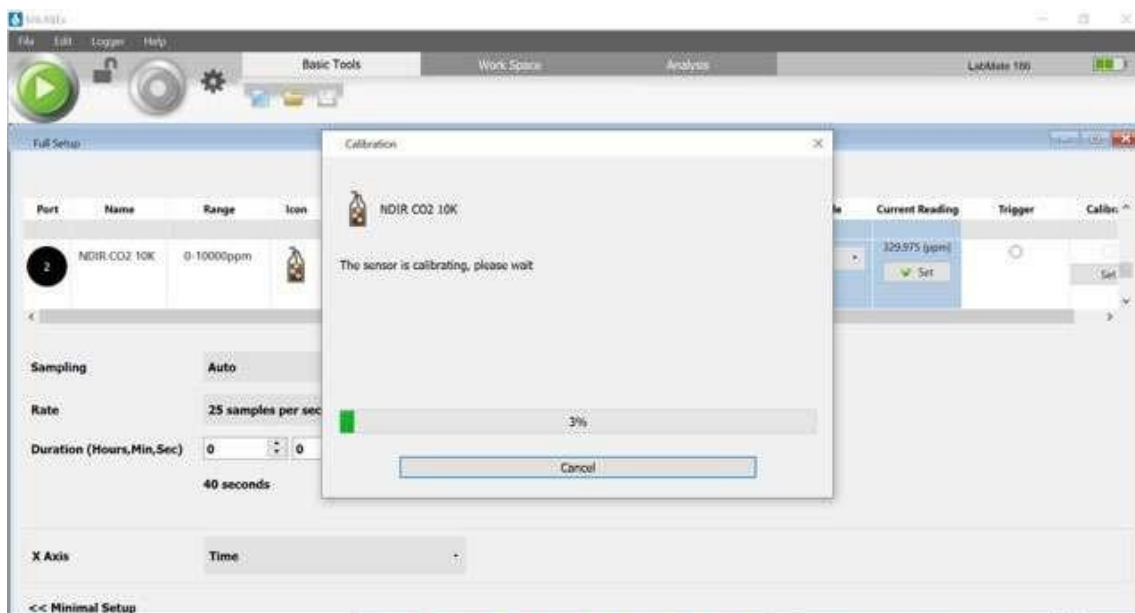
For greater accuracy the sensor can be manually calibrated.

MiLABEx Desktop

1. Go to the Full Setup window and in the Calibrate column click Set



2. The Calibration window will appear



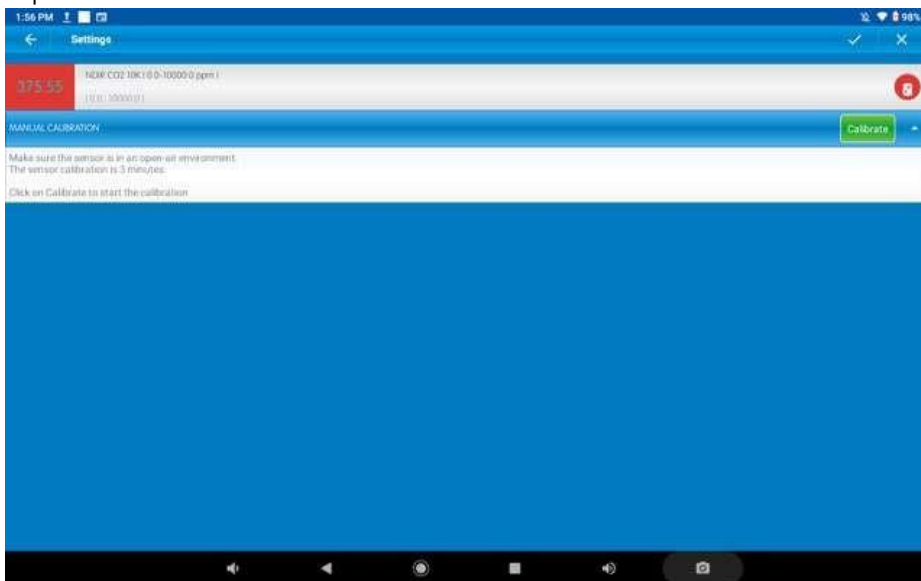
3. Click Calibrate
4. Wait until the calibration process will stop (around 3 min)

MiLABEx Android

1. Tap the Settings button next to the sensor's name



2. Tap Manual Calibration

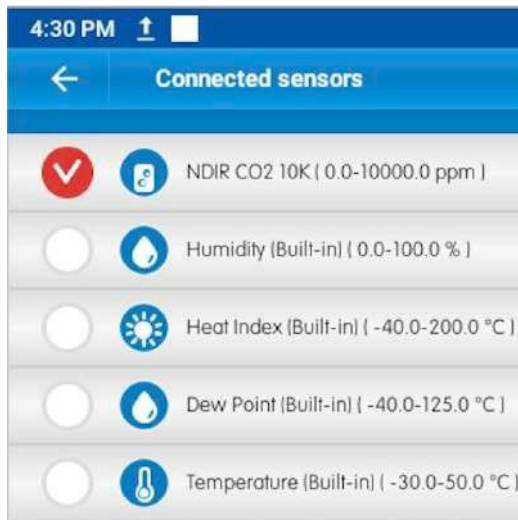


3. Measure the air in a well-ventilated room and wait for the readings to stabilize
4. Tap Calibrate
5. The calibration process will take around 3 minutes

Data Logging and Analysis

MiLABEx Android

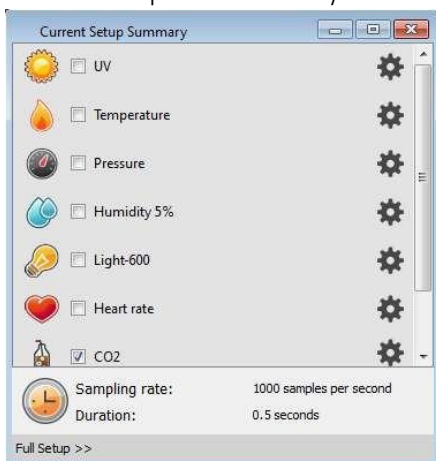
1. Take your einstein™ Tablet or pair your einstein™ LabMate with your Android or iOS tablet via Bluetooth
2. Insert the sensor cable into one of the sensor ports
3. Launch MiLABEx
4. MiLABEx will automatically detect the sensor and selects it. You can find the sensors list in Sensors



5. Make sure the icon next to the sensor is checked to enable it for logging
6. You are ready to experiment!

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 Desktop
4. MiLABEx Desktop 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

Experimental Setup

The CO₂ sensor comes with:

- One CO₂ sensor
- One Flask
- One Rubber Stopper

An example of using the CO₂ Sensor

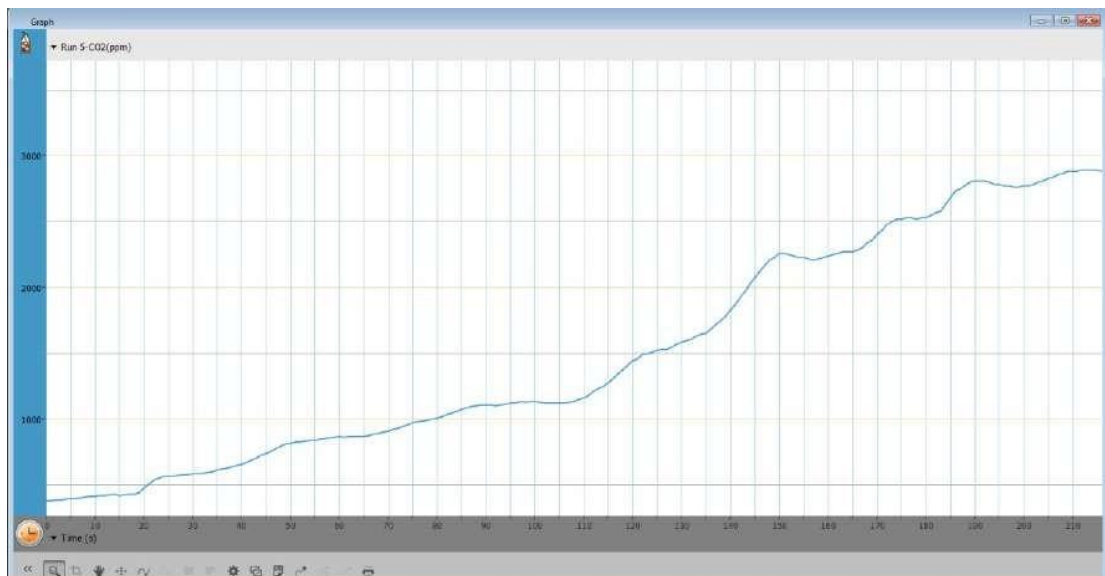
Measuring the CO₂ produced by a burning candle

For this experiment you will need:

- An einstein™ device
- A CO₂ sensor (with stopper)
- A container
- A cover for the container

The experiment:

1. Cut a hole in the cover to hold the rubber stopper
2. Put the CO₂ sensor in the stopper
3. Tap Run to start the experiment with the calibrated sensor
4. Put the cover the container and follow the changes in CO₂ levels



Troubleshooting

If the CO₂ sensor isn't automatically recognized by MiLABEx, please contact Fourier Education's technical support.

Technical support

Please contact the Fourier technical support team as follows: Web: <http://fourieredu.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 the 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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