

CO₂ Sensor DT040A

Carbon Dioxide Gas Sensor



The CO₂ sensor can be connected either to the Nova5000, MultiLogPRO or TriLink data loggers.

The CO₂ sensor measures carbon dioxide concentration (ppm) in gases, such as air. The CO₂ sensor is a new solid electrolyte sensor which offers high selectivity to CO₂, low dependency on humidity and compact size. A range of 350 to 5,000 ppm of carbon dioxide can be detected by CO₂ sensor, making it ideal for indoor air control applications.

The CO₂ sensor (DT-040A) is supplied with a 100 mL plastic sampling bottle and a rubber stopper (12244).

The CO₂ sensor is used for various experiments in Biology, Chemistry and Environmental Science.

Typical Experiments

- Increases in carbon dioxide levels from small animals and insects
- Changes in carbon dioxide concentration in a plant terrarium during photorespiration and photosynthesis cycles
- CO₂ levels during cellular respiration of peas and beans
- Changing carbon dioxide levels in a classroom
- The rate at which carbon dioxide is removed from an enclosed 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 or respiration of sugars

How it Works

The CO₂ sensitive element consists of a solid electrolyte formed between two electrodes, together with a printed heater (RuO₂) substrate. By monitoring the change in an electromotive force (EMF) generated between the two electrodes, it is possible to measure CO₂ gas concentration.

The top of the sensor cap contains adsorbent (zeolite) for the purpose of reducing the influence of interference gases.

The sensing element exhibits a linear relationship between the generated EMF and the logarithm CO₂ gas concentration. A built-in microprocessor and digital-to-analog converter produce an output voltage that is linearly proportional to the CO₂ gas concentration.



Sensor Specification

| | |
|--|---------------------------------------|
| Range: | 350 - 5000 ppm |
| Accuracy: | ±20 % at 1000 ppm |
| Resolution (12-bit): | 8 ppm at 350 ppm; 100 ppm at 5000 ppm |
| Recommended Sampling Rate: | 10 samples per second |
| Response Time: | 90 seconds (to 90% of final value) |
| Current Consumption: | Approx. 50 mA |
| Normal Operating Temperature Range: | -10 °C to 50 °C |
| Normal Operating Humidity Range: | 5% to 95% |
| Storage Temperature Range: | -20 °C to 60 °C |
| Storage Humidity Range: | 5% to 90% |

Technical Notes

- Since the CO₂ sensor consumes relatively high current, it is highly recommended to operate while the AC/DC adapter powers the data logger.
- MultiLogPRO data logger and Nova5000 can operate up to two CO₂ sensors simultaneously. The TriLink data logger can power only one sensor.

Equipment List

- CO₂ sensor and sampling bottle DT040A
- CO₂ sensor only DT040
- 100 mL Sampling Bottle 12244
with a rubber stopper

Calibration

The CO₂ sensor is shipped fully calibrated.

The CO₂ sensor performs a simple automatic calibration procedure every time you plug the sensor into the data logger.

To ensure successful calibration we recommend following the instructions below:

1. Place the sampling bottle together with your sensor outside your building for enough time to make sure that its contents are replaced with fresh air. The calibration is based on the fact that the outside air contains 400 ± 40 ppm of CO_2).
2. Insert the sensor into the gas sampling bottle containing fresh air. Do this by holding the rubber stopper of the sensor and not the bottle.
3. Connect the sensor to the data logger.

The calibration procedure starts automatically. The green LED blinks rapidly for the duration of the calibration process (approx. 120 seconds). When the blinking stops the sensor is calibrated and ready to use.

The graph below (Figure 1) was recorded during a calibration process.

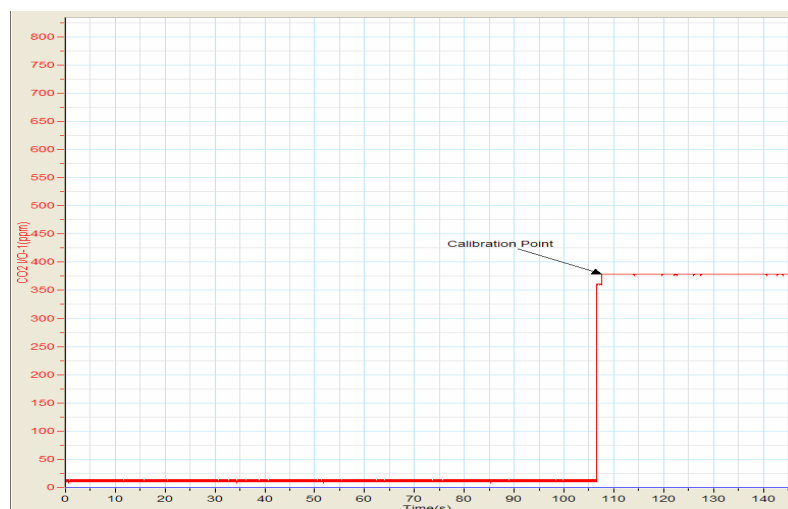



Figure 1: Monitoring the auto calibration procedure

Using the CO_2 Sensor with Fourier Data Loggers and MultiLab Software

1. Launch the MultiLab software (from either your PC or Nova5000).
2. Connect the CO_2 sensor to the data logger's first sensor input I/O-1.
3. The CO_2 sensor is automatically recognized by the MultiLab software.
4. Click **Setup** on the main toolbar and program the data logger's sample rate and number of samples. Click **Run** on the main toolbar to start the measurement.

Setting the Current Reading of the CO₂ Sensor Zero

1. Launch the MultiLab software (from either your PC or Nova5000).
2. Connect the CO₂ sensor to the data logger's first sensor input I/O-1.
3. The CO₂ sensor is automatically recognized by the MultiLab software.
4. Click **Setup** on the main toolbar.
5. Click **Properties**  next to the CO₂ sensor input.
6. Click the **Set Zero** tab.
7. Check the box near **Set the current reading to zero**.
8. Click **OK**.
9. Program the data logger's sample rate and number of samples. Click **Run** on the main toolbar to start the measurement.

An Example of using the CO₂ Sensor

Measurement of CO₂ Released during Respiration of Germinating Seeds

The germination process requires a large amount of energy supplied by cellular respiration. In this process storage materials decompose to CO₂ and oxygen is consumed.

In this experiment amounts of CO₂ released during respiration of swollen pea seeds is measured using a CO₂ sensor.

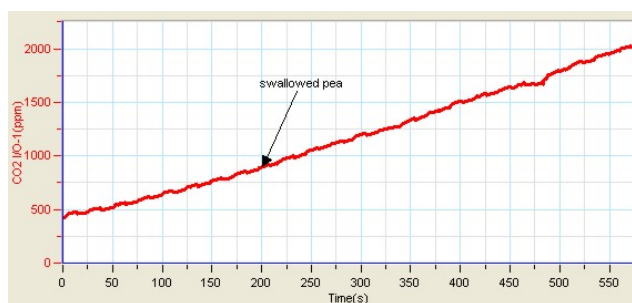


Figure 2: Measurement of CO₂ Released during Respiration of Germinating Seeds

Troubleshooting

If the CO₂ sensor isn't automatically recognized by the MultiLab software, please contact Fourier Systems technical support.



Technical Support

Please contact Fourier technical support as follows:

Web: http://www.fourier-sys.com/support_support.html

Email: support@fourier-sys.com

Consult the FAQs before contacting technical support:

http://www.fourier-sys.com/support_faq.html

Copyright and Warranty

All standard Fourier Systems sensors carry a one-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.