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Dissolved Oxygen Sensor with Temperature Compensation

Product Number: ENOXT422

Overview

The Oxygen sensor is a maintenance- free galvanic oxygen electrode capable of measuring Oxygen in solutions. With built-in temperature compensation, this sensor provides an easy way for students to receive accurate results without having to preform complicated compensation calculations.

The Oxygen sensor can be used to perform a wide variety of experiments taking place in a number of different environments such as measuring the amount of oxygen in an aquarium or understanding the effects of germination on oxygen levels.

The Oxygen Sensor can be connected to all types of einstein™ Tablets, einstein™LabMate™, and einstein™LabMate™+.

Typical experiments

Biology

- Monitoring changes in oxygen levels during photosynthesis and respiration of plants
- Consumption of oxygen by yeast during the respiration of sugars
- Fermentation of yogurt

Water Quality

- Monitoring dissolved oxygen concentrations resulting from photosynthesis and respiration in an aquarium containing plants and/or fish.
- Monitoring the pattern between light and dissolved oxygen levels, in an aquarium with pondweed
- On-site testing in streams and ponds to evaluate the water's capability to support plant and animal life

Chemistry

- Oxidation of metals

Sensor specification

Range:	0 to 14 mg/L DO
Accuracy:	± 2% over entire range (After calibration)
Temperature Compensation:	Yes
Temperature Compensation range:	0 to 40 °C
Response Time for 95% of Reading:	Up to 2 minutes

Note: sensor cables sold separately

Technical Notes

- Before use, let the sensor adjust to the surrounding temp for several minutes.
- Before use, remove the protective cap and use the dropper to fill it with Galvanic O_2 Fill solution. Make sure it contains no air bubbles. This procedure is necessary only if you have had to replace the electrode membrane or the Galvanic O_2 fill solution.
- It is important to stir the solution during measurement as oxygen consumption by the probe can momentarily reduce the oxygen concentration at the probe surface.
- Do not allow any air bubbles to be trapped on the membrane surface, as it will read an air bubble as an oxygen–saturated sample.
- The DO electrode membrane is very sturdy, relative to other electrodes. Its function is more of a physical barrier (permeable to O_2) rather than a chemical reaction type membrane. In pond water, its useful life is determined by how well it is cared for e.g. avoiding stretching, scratching, and fouling the membrane.
- The membrane's only problem areas are:
    - Scratches or tears - Scratches could change the accuracy of the probe, tears will cause immediate failure
    - Fouling of the membrane impacts measurement only if it impedes the membranes permeability to DO. This is unlikely in pond water whereas in wastewater this may be a common problem.
    - Fouling of the Galvanic O_2 Fill solution impacts measurement. If needed, replace the solution or the solution together with the membrane.
    - Stretching of the membrane impacts measurement as the thickness of the membrane and position of the membrane on the cathode are critical parameters of the measurement.

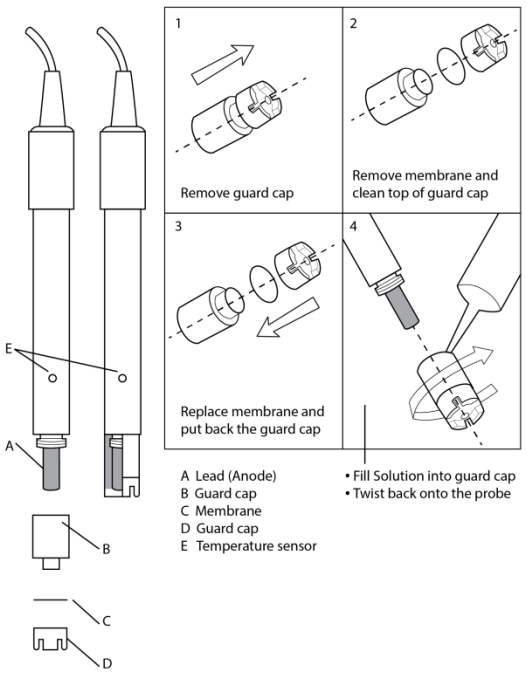
Maintenance and Storage

After the electrode has been used for a period of time the following cleaning method is recommended:

1. Carefully unscrew the cap from the body.
2. Rinse the inside of the membrane cartridge with DI water.
3. Soak the lead anode in 0.1N HCL (8.3 mL concentrated HCl in 1000 mL DI water) for 15 to 20 minutes. Rinse the lead anode with DI water, blot dry with tissue paper. Screw the lead anode back onto the body.
4. Rinse the soaked portions thoroughly with DI water. Blot dry with tissue paper.
5. Fill the cap with electrolyte to a level just above the membrane cartridge using the dropper provided with the sensor. Hold the electrode in an upright position and gently screw the cap back onto the body.
6. Inspect the membrane for tears or leakage. The membrane should be uniformly stretched across the inner body. Replace the membrane if any damage has occurred.

Membrane Replacement

1. The membrane should be examined routinely after each fermentation cycle and replaced if any deterioration is evident. See the illustration below.
2. Carefully unscrew the cap from the body.
3. Using the membrane tool provided, pop the membrane cartridge from the cap.
4. Inspect the platinum cathode. Gently wipe it with tissue paper and see if there are any cracks or damage.
5. Take a new membrane out of the plastic package and insert into the cap. Push it down inside until firmly seated inside the outer cap using the membrane tool provided.
6. Fill the cap with electrolyte to a level just above the membrane cartridge, using the dropper provided with the sensor.
7. Do not allow any air bubbles to be trapped on the membrane surface, as it will read an air bubble as an oxygen–saturated sample
8. Hold the electrode in an upright position and gently screw the cap back onto the body. Inspect the membrane for tears or leakage. The membrane should be uniformly stretched across the inner body.



Calibration

MiLAB™Desktop Set Zero Calibration

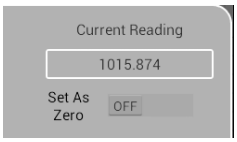
In the Current Reading column, click Set 

to set the current value as the zero or base value. Reset 

cancels this action

MiLAB™ Set Zero Calibration

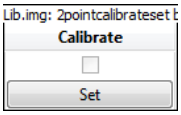
Under Current Reading column flip the Set As Zero switch to set the current value as the zero or base value.



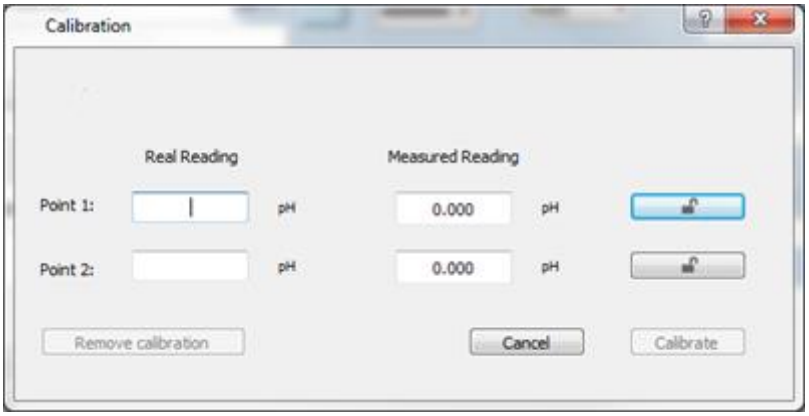
Calibrating in MiLAB™Desktop

Two Point Calibration

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



2. The Calibration window will appear



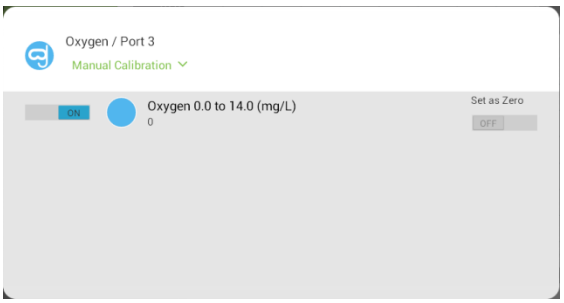
3. Saturate water with Oxygen by vigorously stirring the water. Enter the known value for saturated water according to your location in the Point 1, Real Reading field (go to http://water.usgs.gov/software/DOTABLES/ for help in determining saturation levels for your location)
4. Measure the solution and, wait for the readings to stabilize. Enter the measurement as the Point 1 Measured Reading field and click the lock button 
5. Prepare a second solution with a known value (we recommend using sodium sulfite or Na_2SO_3 for zero solution in order to reduce the DO of water to zero). Enter this known value in the Point 2, Real Reading field
6. Measure the solution and, wait for the readings to stabilize. Enter the measured value as the Real Reading on the first line and click the lock button 
7. Click Calibrate

Calibrating in MiLAB

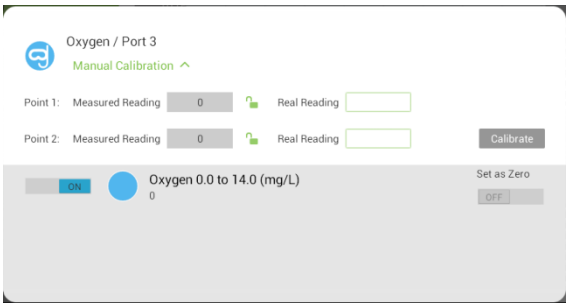
Note: Graphics in your version of MiLAB may differ

Two Point Calibration

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



2. Tap Manual Calibration



3. Saturate water with Oxygen by vigorously stirring the water. Enter the known value for saturated water according to your location in the Point 1, Real Reading field (go to http://water.usgs.gov/software/DOTABLES/ for help in determining saturation levels for your location)
4. Measure the substance and, wait for the readings to stabilize. Enter the value as the Point 1 Measured Reading field and click the lock button
5. Prepare a second solution with a known value (we recommend using sodium sulfite or Na_2SO_3 for zero solution in order to reduce the DO of water to zero). Enter this known value in the Point 2, Real Reading field
6. Measure the solution and, wait for the readings to stabilize. Enter the known value as the Real Reading on the first line and click the lock button
7. Click Calibrate

Data logging and analysis

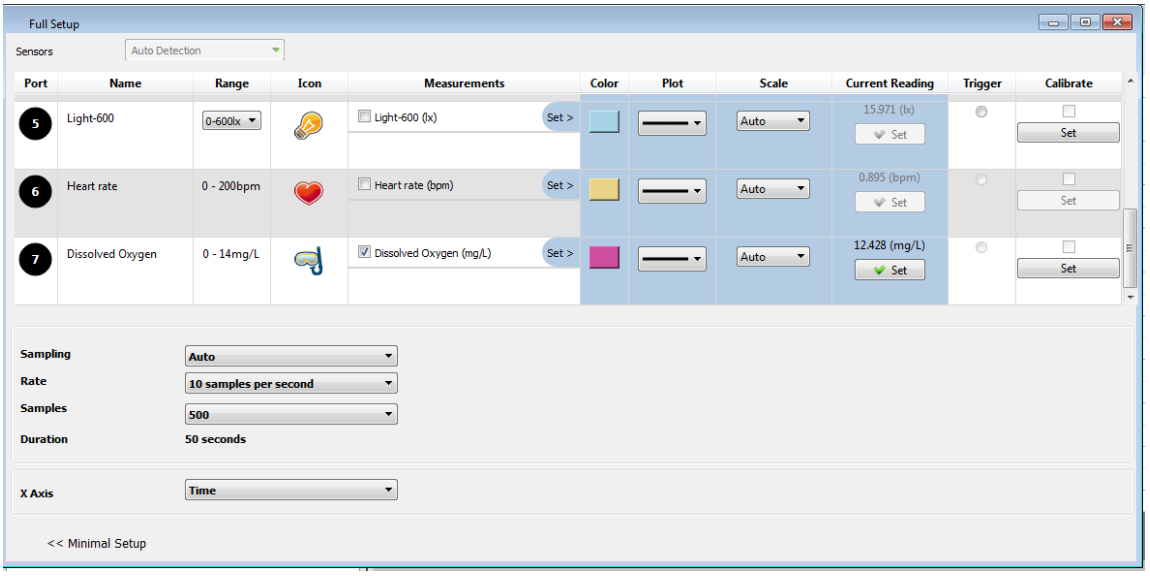
MiLAB™

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 sensor ( ) 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

Experiment set up

The Oxygen Sensor comes with:

- One Oxygen sensor
- One electrode
- One bottle Galvanic O_2 Fill Solution
- One bottle Salt for zero solution
- One plastic dropper
- Extra membranes

An example of using the Dissolved Oxygen Sensor

1. Fill a beaker with water.
2. Insert the electrode into the water and calibrate.
3. Click the Run button ( ) to start logging.
4. Use a stirrer or a simple spoon to increase the oxygen concentration.
5. See expected results on figure-1.

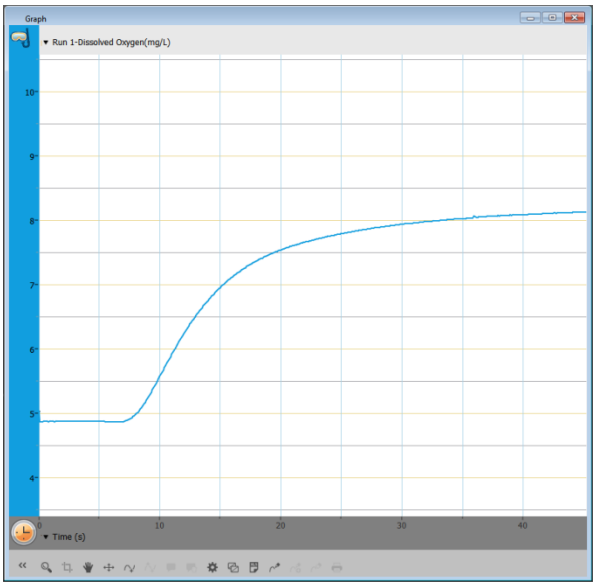


figure-1

Troubleshooting

If the Oxygen 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

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.