Dissolved Oxygen Probe

(Order Code DO-BTA)

The Dissolved Oxygen Probe can be used to measure the concentration of dissolved oxygen in water samples tested in the field or in the laboratory. You can use this sensor to perform a wide variety of tests or experiments to determine changes in dissolved oxygen levels, one of the primary indicators of the quality of an aquatic environment.

- Monitor dissolved oxygen in an aquarium containing different combinations of plant and animal species.
- Measure changes in dissolved oxygen concentration resulting from photosynthesis and respiration in aquatic plants.
- Use this sensor for an accurate on-site test of dissolved oxygen concentration in a stream or lake survey, in order to evaluate the capability of the water to support different types of plant and animal life.
- Measure Biological Oxygen Demand (B.O.D.) in water samples containing organic matter that consumes oxygen as it decays.
- Determine the relationship between dissolved oxygen concentration and temperature of a water sample.

Inventory of Items Included with the Dissolved Oxygen Probe

Check to be sure that each of these items is included in your Dissolved Oxygen Probe box.

- Dissolved Oxygen Probe (dissolved oxygen electrode with membrane cap)
- Replacement membrane cap
- Sodium Sulfite Calibration Standard (2.0 M Na_2SO_3) and MSDS sheet
- D.O. Electrode Filling Solution, MSDS sheet, and filling pipet
- Calibration bottle (empty, lid with hole)
- D.O. Polishing Strips (1 pkg)

Collecting Data with the Dissolved Oxygen Probe

This sensor can be used with the following interfaces to collect data.

- Vernier LabQuest® 2 or original LabQuest® as a standalone device or with a computer
- Vernier LabQuest® Mini with a computer
- Vernier LabPro® with a computer or TI graphing calculator
- Vernier Go!®Link
- Vernier EasyLink®
- Vernier SensorDAQ®
- CBL 2™
- TI-Nspire™ Lab Cradle

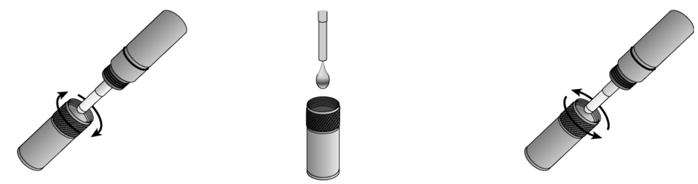
Optional Calibration Procedure

It is not always necessary to perform a new calibration when using the Dissolved Oxygen Probe in the classroom. If your experiment or application is looking only at a change in dissolved oxygen, then the software's stored calibration is all you need. If you are making discrete measurements, such as taking readings in a stream or lake, and you want to improve the accuracy of your measurements, then it is best to perform a new calibration.

Preparing the Dissolved Oxygen Probe for Use

Part A Probe preparation

1. Prepare the Dissolved Oxygen Probe for use.
   a. Remove the blue protective cap from the tip of the probe. This protective cap can be discarded once the probe is unpacked.
   b. Unscrew the membrane cap from the tip of the probe.



Remove membrane cap — Add electrode filling solution — Replace membrane cap

   c. Use a pipet to fill the membrane cap with 1 mL of DO Electrode Filling Solution.
   d. Carefully thread the membrane cap back onto the electrode.
   e. Place the probe into a beaker filled with about 100 mL of distilled water.

Part B Probe warm-up

2. Connect the Dissolved Oxygen Probe to the interface.[1]
3. It is necessary to warm up the Dissolved Oxygen Probe for 10 minutes before taking readings. To warm up the probe, leave it in the water and connected to the interface with the data collection program running for 10 minutes. The probe must stay connected at all times to keep it warmed up. If disconnected for a few minutes, it will be necessary to warm up the probe again.[2]

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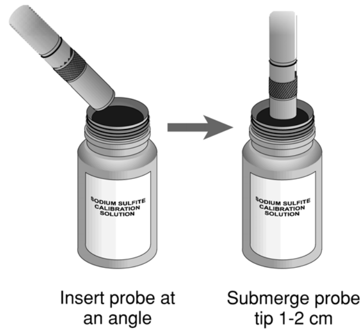
[1] If your system does not support auto-ID, open an experiment file in Logger *Pro* or set up the sensor manually.

[2] The polarization process is slightly different for EasyLink because the Dissolved Oxygen Probe receives power only when the calculator is on and EasyData is running. If the calculator goes to sleep, the Dissolved Oxygen Probe does not receive power. To work around this, navigate to the Live Calibration screen, where the sensor will receive constant power, and leave it there for the duration of the warm-up period.

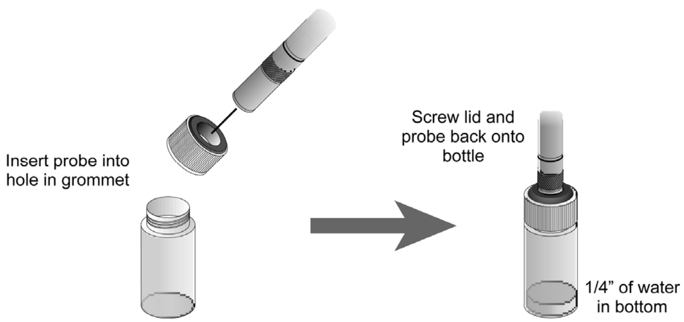
Part C Probe calibration

4. You are now ready to choose the calibration method.
   - If you wish to use the stored calibration, proceed to Part D.
   - If you wish to perform a new calibration for the Dissolved Oxygen Probe, follow the procedure below.

   a. Enter the calibration routine for your data-collection program.[3]
   b. **First Calibration Point** Remove the probe from the water and place the tip of the probe into the Sodium Sulfite Calibration Solution.
   c. When the displayed voltage reading stabilizes, enter 0 (the known dissolved oxygen value in mg/L).
   d. **Second Calibration Point** Rinse the probe with distilled water and gently blot dry.
   e. Unscrew the lid of the calibration bottle provided with the probe. Slide the lid and the grommet about ½ inch onto the probe body.



   f. Add water to the bottle to a depth of about ¼ inch and screw the bottle into the cap, as shown. **Important**: Do not touch the membrane or get it wet during this step. Keep the probe in this position for about a minute.
   g. When the displayed voltage reading stabilizes, enter the correct saturated dissolved oxygen value (in mg/L) from Table 1 using the current barometric pressure and air temperature values. If you do not have the current air pressure, use Table 2 to estimate the air pressure at your altitude.



Part D Collecting data

5. You are now ready to collect data.
   a. Place the tip of the probe into the water being tested (submerge 4–6 cm). Do not completely submerge. The handle is not waterproof.
   b. Gently stir the probe in the water sample. Monitor the dissolved oxygen concentration in the live readouts. Note: It is important to keep stirring the probe in the water sample. There must always be water flowing past the probe tip when you are taking measurements. As the probe measures the concentration of dissolved oxygen, it removes oxygen from the water at the junction of the probe membrane. If the probe is left still in calm water, reported DO readings will appear to be dropping.

[3] If using an EasyLink and EasyData, you will need to press a button on the calculator every few minutes in order to keep the calculator and EasyData active and providing power to the sensor.

Specifications

Range		0 to 15 mg/L (or ppm)
Accuracy		±0.2 mg/L
Resolution		
13-bit (SensorDAQ)		0.007 mg/L
12-bit (LabPro, LabQuest, LabQuest 2, TI-Nspire Lab Cradle, LabQuest Mini, Go!Link, SBI, ULI II)		0.014 mg/L
10-bit (CBL 2)		0.056 mg/L
Response time		95% of final reading in 30 seconds, 98% in 45 seconds
Temperature compensation		automatic from 5–35°C
Pressure compensation		manual, accounted for during calibration
Salinity compensation		manual, accounted for during calibration
Minimum sample flow		20 cm/second
Stored calibration values		
	slope	3.27
	intercept	–0.327

This sensor is equipped with circuitry that supports auto-ID. When used with LabQuest 2, LabQuest, LabQuest Mini, LabPro, Go! Link, SensorDAQ, TI-Nspire™ Lab Cradle, EasyLink, or CBL 2™, the data-collection software identifies the sensor and uses pre-defined parameters to configure an experiment appropriate to the recognized sensor.

Table 1 Dissolved oxygen (mg/L) in air-saturated distilled water (at various temperature and pressure values)

	770 mm	760 mm	750 mm	740 mm	730 mm	720 mm	710 mm	700 mm
0°C	14.76	14.57	14.38	14.19	13.99	13.80	13.61	13.42
1°C	14.38	14.19	14.00	13.82	13.63	13.44	13.26	13.07
2°C	14.01	13.82	13.64	13.46	13.28	13.10	12.92	12.73
3°C	13.65	13.47	13.29	13.12	12.94	12.76	12.59	12.41
4°C	13.31	13.13	12.96	12.79	12.61	12.44	12.27	12.10
5°C	12.97	12.81	12.64	12.47	12.30	12.13	11.96	11.80
6°C	12.66	12.49	12.33	12.16	12.00	11.83	11.67	11.51
7°C	12.35	12.19	12.03	11.87	11.71	11.55	11.39	11.23
8°C	12.05	11.90	11.74	11.58	11.43	11.27	11.11	10.96
9°C	11.77	11.62	11.46	11.31	11.16	11.01	10.85	10.70
10°C	11.50	11.35	11.20	11.05	10.90	10.75	10.60	10.45
11°C	11.24	11.09	10.94	10.80	10.65	10.51	10.36	10.21
12°C	10.98	10.84	10.70	10.56	10.41	10.27	10.13	9.99
13°C	10.74	10.60	10.46	10.32	10.18	10.04	9.90	9.77
14°C	10.51	10.37	10.24	10.10	9.96	9.83	9.69	9.55
15°C	10.29	10.15	10.02	9.88	9.75	9.62	9.48	9.35
16°C	10.07	9.94	9.81	9.68	9.55	9.42	9.29	9.15
17°C	9.86	9.74	9.61	9.48	9.35	9.22	9.10	8.97
18°C	9.67	9.54	9.41	9.29	9.16	9.04	8.91	8.79
19°C	9.47	9.35	9.23	9.11	8.98	8.86	8.74	8.61
20°C	9.29	9.17	9.05	8.93	8.81	8.69	8.57	8.45
21°C	9.11	9.00	8.88	8.76	8.64	8.52	8.40	8.28
22°C	8.94	8.83	8.71	8.59	8.48	8.36	8.25	8.13
23°C	8.78	8.66	8.55	8.44	8.32	8.21	8.09	7.98
24°C	8.62	8.51	8.40	8.28	8.17	8.06	7.95	7.84
25°C	8.47	8.36	8.25	8.14	8.03	7.92	7.81	7.70
26°C	8.32	8.21	8.10	7.99	7.89	7.78	7.67	7.56
27°C	8.17	8.07	7.96	7.86	7.75	7.64	7.54	7.43
28°C	8.04	7.93	7.83	7.72	7.62	7.51	7.41	7.30
29°C	7.90	7.80	7.69	7.59	7.49	7.39	7.28	7.18
30°C	7.77	7.67	7.57	7.47	7.36	7.26	7.16	7.06
31°C	7.64	7.54	7.44	7.34	7.24	7.14	7.04	6.94
32°C	7.51	7.42	7.32	7.22	7.12	7.03	6.93	6.83
33°C	7.39	7.29	7.20	7.10	7.01	6.91	6.81	6.72
34°C	7.27	7.17	7.08	6.98	6.89	6.80	6.70	6.61
35°C	7.15	7.05	6.96	6.87	6.78	6.68	6.59	6.50

Table 1, cont. Dissolved oxygen (mg/L) in air-saturated distilled water (at various temperature and pressure values)

	690 mm	680 mm	670 mm	660 mm	650 mm
0°C	13.23	13.04	12.84	12.65	12.46
1°C	12.88	12.70	12.51	12.32	12.14
2°C	12.55	12.37	12.19	12.01	11.82
3°C	12.23	12.05	11.88	11.70	11.52
4°C	11.92	11.75	11.58	11.40	11.23
5°C	11.63	11.46	11.29	11.12	10.95
6°C	11.34	11.18	11.01	10.85	10.68
7°C	11.07	10.91	10.75	10.59	10.42
8°C	10.80	10.65	10.49	10.33	10.18
9°C	10.55	10.39	10.24	10.09	9.94
10°C	10.30	10.15	10.00	9.86	9.71
11°C	10.07	9.92	9.78	9.63	9.48
12°C	9.84	9.70	9.56	9.41	9.27
13°C	9.63	9.49	9.35	9.21	9.07
14°C	9.42	9.28	9.14	9.01	8.87
15°C	9.22	9.08	8.95	8.82	8.68
16°C	9.02	8.89	8.76	8.63	8.50
17°C	8.84	8.71	8.58	8.45	8.33
18°C	8.66	8.54	8.41	8.28	8.16
19°C	8.49	8.37	8.24	8.12	8.00
20°C	8.33	8.20	8.08	7.96	7.84
21°C	8.17	8.05	7.93	7.81	7.69
22°C	8.01	7.90	7.78	7.67	7.55
23°C	7.87	7.75	7.64	7.52	7.41
24°C	7.72	7.61	7.50	7.39	7.28
25°C	7.59	7.48	7.37	7.26	7.15
26°C	7.45	7.35	7.24	7.13	7.02
27°C	7.33	7.22	7.11	7.01	6.90
28°C	7.20	7.10	6.99	6.89	6.78
29°C	7.08	6.98	6.87	6.77	6.67
30°C	6.96	6.86	6.76	6.66	6.56
31°C	6.85	6.75	6.65	6.55	6.45
32°C	6.73	6.63	6.54	6.44	6.34
33°C	6.62	6.53	6.43	6.33	6.24
34°C	6.51	6.42	6.32	6.23	6.13
35°C	6.40	6.31	6.22	6.13	6.03

Elevation Barometric Pressure Table

If you do not have a barometer available to read barometric pressure, you can estimate the barometric pressure reading at your elevation (in feet) from Table 2. The values are calculated based on a barometric air pressure reading of 760 mm Hg at sea level.

Table 2 Approximate barometric pressure at different elevations

Elevation (feet)	Pressure (mm Hg)	Elevation (feet)	Pressure (mm Hg)	Elevation (feet)	Pressure (mm Hg)
0	760	2000	708	4000	659
250	753	2250	702	4250	653
500	746	2500	695	4500	647
750	739	2750	689	4750	641
1000	733	3000	683	5000	635
1250	727	3250	677	5250	629
1500	720	3500	671	5500	624
1750	714	3750	665	5750	618

How the Dissolved Oxygen Probe Works

The Vernier Dissolved Oxygen Probe is a Clark-type polarographic electrode that senses the oxygen concentration in water and aqueous solutions. A platinum cathode and a silver/silver chloride reference anode in KCl electrolyte are separated from the sample by a gas-permeable plastic membrane.

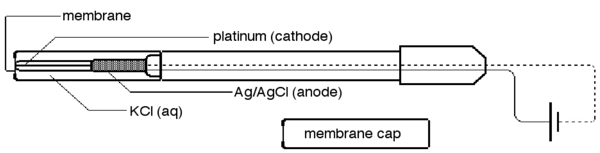


Figure 1

A fixed voltage is applied to the platinum electrode. As oxygen diffuses through the membrane to the cathode, it is reduced

$$1/2\ O_2 + H_2O + 2e^- \longrightarrow 2\ OH^-$$

The oxidation taking place at the reference electrode (anode) is

$$Ag + Cl^- \longrightarrow AgCl + e^-$$

Accordingly, a current will flow that is proportional to the rate of diffusion of oxygen, and in turn to the concentration of dissolved oxygen in the sample. This current is converted to a proportional voltage, which is amplified and read by any of the data-collection interfaces.

Storage and Maintenance of the Dissolved Oxygen Probe

Following the procedure outlined in this section will enhance the lifetime of your Dissolved Oxygen Probe and its membrane cap. Follow these steps when storing the electrode.

- **Long-term storage (more than 24 hours)** Remove the membrane cap and rinse the inside and outside of the cap with distilled water. Shake the membrane cap dry. Also rinse and dry the exposed anode and cathode inner elements (blot dry with a lab wipe). Reinstall the membrane cap loosely onto the electrode body for storage. Do not screw it on tightly.
- **Short-term storage (less than 24 hours)** Store the Dissolved Oxygen Probe with the membrane end submerged in about 1 inch of distilled water.
- **Polishing the metal electrodes** If the cathode (the small, shiny, metal contact in the center of the glass stem shown in Figure 1) and anode (the silver, metal foil surrounding the lower portion of the inner body) become discolored or appear corroded, polish them with the polishing strip that is provided with the probe. Perform this operation only as needed to restore electrode performance—it should be necessary only once every year or so. Remove the membrane cap from your Vernier Dissolved Oxygen Probe. Thoroughly rinse the inner elements of the probe with distilled water to remove all filling solution. Cut a one-inch piece from the D.O. Electrode Polishing Strip provided. Wet the dull (abrasive) side of the polishing strip with distilled water. Using a circular motion, polish the center glass element of the cathode (on the very end of the electrode). Use gentle finger pressure during this polishing operation. Polish only enough to restore a bright, clean surface to the center element. Next, polish the silver anode located around the base of the electrode inner element. Polish only enough to restore a silver appearance. **Note**: Aggressive polishing will damage the probe inner elements. *Be sure* to use only gentle pressure when performing the polishing of the anode and cathode. When you have completed the polishing, rinse the cathode and anode elements thoroughly and dry with a lab wipe.

With normal use, the Vernier Dissolved Oxygen Probe will last for years. The membrane cap will, however, require replacement after about 6 months of continuous use. Replacement of the membrane is recommended when your Dissolved Oxygen Probe will no longer respond rapidly during calibration or when taking D.O. readings. Use of your Dissolved Oxygen Probe in samples that are non-aqueous or in those that contain oil, grease, or other coating agents will result in shortened membrane life. Replacement membranes can be obtained from Vernier (order code MEM).

Automatic Temperature Compensation

Your Vernier Dissolved Oxygen Probe is automatically temperature compensated, using a thermistor built into the probe. The temperature output of this probe is used to automatically compensate for changes in permeability of the membrane with changing temperature. If the probe was not temperature compensated, you would notice a change in the dissolved oxygen reading as temperature changed, even if the actual concentration of dissolved oxygen in the solution did not change. Here are two examples of how automatic temperature compensation works.

- If you calibrate the Dissolved Oxygen Probe in the lab at 25°C and 760 mm Hg barometric pressure (assume salinity is negligible), the value you enter for the saturated oxygen calibration point would be 8.36 mg/L (see Table 1). If you were to take a reading in distilled water that is saturated with oxygen by rapid stirring, you would get a reading of 8.36 mg/L. If the water sample were then cooled to 10°C with no additional stirring, the water would no longer be saturated (cold water can hold more dissolved oxygen than warm water). So, the reading of the temperature-compensated Dissolved Oxygen Probe would still be 8.36 mg/L.
- If, however, the solution was cooled to 10°C and continually stirred so it remained saturated by dissolving additional oxygen, the temperature-compensated probe would give a reading of 11.35 mg/L—the value shown in Figure 2. **Note**: Temperature compensation does not mean that the reading for a saturated solution will be the same at two different temperatures—the two solutions have different concentrations of dissolved oxygen, and the probe reading should reflect this difference.

NOTE: Vernier products are designed for educational use. Our products are not designed nor recommended for any industrial, medical, or commercial process such as life support, patient diagnosis, control of a manufacturing process, or industrial testing of any kind.

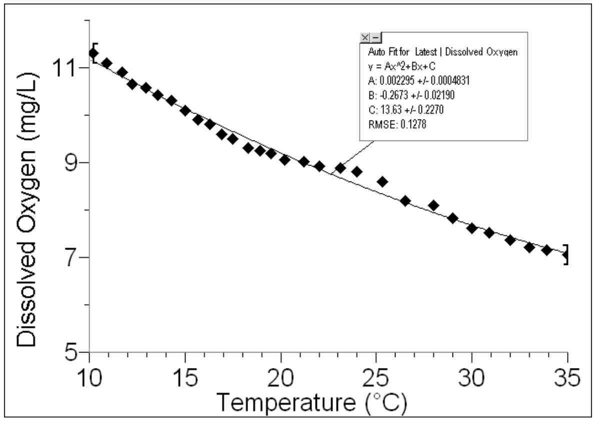


Figure 2 Saturated dissolved oxygen vs. *temperature data*

Sampling in Ocean Salt Water or Tidal Estuaries

(at salinity levels greater than 1000 mg/L)

Dissolved Oxygen concentration for air saturated water at various salinity values, $DO_{(salt)}$, can be calculated using the formula.

$$DO_{(salt)} = DO - (k \cdot S)$$

- $DO_{(salt)}$ is the concentration of dissolved oxygen (in mg/L) in salt-water solutions.
- *DO* is the dissolved oxygen concentration for air-saturated distilled water as determined from Table 1.
- *S* is the salinity value (in ppt). Salinity values can be determined using the Vernier Chloride Ion-Selective Electrode or Conductivity Probe as described in the *Water Quality with Vernier* lab manual.
- *k* is a constant. The value of *k* varies according to the sample temperature, and can be determined from Table 3.

Table 3 Salinity correction constant values

Temp (°C)	Constant, *k*	Temp (°C)	Constant, *k*	Temp (°C)	Constant, *k*	Temp (°C)	Constant, *k*
1	0.08796	8	0.06916	15	0.05602	22	0.04754
2	0.08485	9	0.06697	16	0.05456	23	0.04662
3	0.08184	10	0.06478	17	0.05328	24	0.04580
4	0.07911	11	0.06286	18	0.05201	25	0.04498
5	0.07646	12	0.06104	19	0.05073	26	0.04425
6	0.07391	13	0.05931	20	0.04964	27	0.04361
7	0.07135	14	0.05757	21	0.04854	28	0.04296

Example

Determine the saturated DO calibration value at a temperature of 23°C and a pressure of 750 mm Hg, when the Dissolved Oxygen Probe is used in seawater with a salinity value of 35.0 ppt.

First, find the dissolved oxygen value in Table 1 (DO = 8.55 mg/L). Then find *k* in Table 3 at 23°C (k = 0.04662). Substitute these values, as well as the salinity value, into the previous equation.

$$DO_{(salt)} = DO - (k \cdot S) = 8.55 - (0.04662 \times 35.0) = 8.55 - 1.63 = 6.92 \text{ mg/L}$$

Use the value 6.92 mg/L when performing the saturated DO calibration point (water-saturated air). The Dissolved Oxygen Probe will now be calibrated to give correct DO readings in salt-water samples with a salinity of 35.0 ppt.

Important: For most dissolved oxygen testing, it is not necessary to compensate for salinity; for example, if the salinity value is 0.5 ppt, using 25°C and 760 mm Hg, the calculation for *DO*(s) would be

$$DO_{(salt)} = DO - (k \cdot S) = 8.36 - (0.04498 \times 0.5) = 8.36 - 0.023 = 8.34 \text{ mg/L}$$

At salinity levels less than 1.0 ppt, neglecting this correction results in an error of less than 0.2%.

Maintaining and Replenishing the Sodium Sulfite Calibration Solution

Having an oxygen-free solution to perform a zero-oxygen calibration point is essential for accurate readings with your Dissolved Oxygen Probe. The Sodium Sulfite Calibration Solution that was included with your probe will last a long time, but not indefinitely. Here are some suggestions for maintaining and replacing this solution:

- After your first use of the solution for calibration, the solution will no longer be brim full (some overflow results when the probe is inserted into the solution). If you cap the solution with an air space above the probe, oxygen gas in the space will dissolve in the sodium sulfite solution—as a result, the solution may not be oxygen free. To prevent this from occurring, before putting on the lid, gently squeeze the bottle so the level of the solution is at the very top of the bottle neck; with the solution at this level, screw on the lid. The bottle will remain in this "collapsed" position. Using this procedure, the 2.0 M Na_2SO_3 should remain oxygen free for a long period of time. If the calibration voltage reading displayed during the first calibration point is higher than in previous calibrations, it may be time to replace the solution, as described below.
- The 2.0 M sodium sulfite (Na_2SO_3) solution can be prepared from solid sodium sulfite crystals: Add 25.0 g of solid anhydrous sodium sulfite crystals (Na_2SO_3) to enough distilled water to yield a final volume of 100 mL of solution. The sodium sulfite crystals do not need to be reagent grade; laboratory grade will work fine. Many high school chemistry teachers will have this compound in stock. Prepare the solution 24 hours in advance of doing the calibration to ensure that all oxygen has been depleted. If solid sodium sulfite is not available, you may substitute either 2.0 M sodium hydrogen sulfite solution, (sodium bisulfite, 20.8 g of $NaHSO_3$ per 100 mL of solution) or 2.0 M potassium nitrite (17.0 g of KNO_2 per 100 mL of solution).

Using the Dissolved Oxygen Probe with Other Vernier Sensors

Some combinations of sensors interfere with each other when placed in the same solution. The degree of interference depends on many factors, including which combination of sensors is being used, which interface is being used, and others. For more information, see www.vernier.com/til/638/

Replacement Parts

Vernier Software & Technology

Part	Order Code
Replacement Membrane Caps	MEM
Polishing Strips (pkg of 2)	PS
D.O. Probe Filling Solution	FS
D.O. Probe Calibration Solution	DO-CAL

Flinn Scientific (www.flinnsci.com, (800) 452-1261)

Part	Order Code
sodium sulfite, anhydrous solid, 500 g bottle	SO111

Background Information about Dissolved Oxygen

Dissolved oxygen is a vital substance in a healthy body of water. Various aquatic organisms require different levels of dissolved oxygen to survive. Whereas trout require higher levels of dissolved oxygen, fish species like carp and catfish survive in streams with low oxygen concentrations. Water with a high level of dissolved oxygen is generally considered to be a healthy environment that can support many different types of aquatic life.

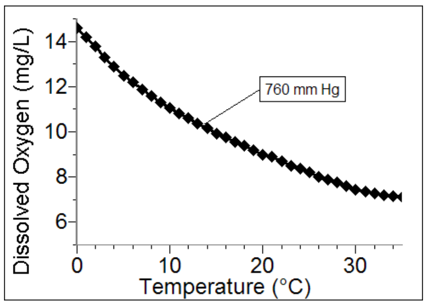


Figure 3 Saturated dissolved oxygen vs. temperature at 760 mm Hg

There are many factors that can affect the level of dissolved oxygen in a body of water. Turbulence from waves on a lake or from a fast-moving stream can greatly increase the amount of water exposed to the atmosphere, resulting in higher levels of dissolved oxygen. Water temperature is another factor that can affect dissolved-oxygen levels; like other gases, the saturated level of dissolved oxygen is less in warm water than in cold water, shown in Figure 3.

Photosynthesis cycles also have a large effect on dissolved oxygen levels of an aquatic environment. Aquatic plants and photosynthetic microorganisms will cause oxygen gas to be produced during daylight hours from photosynthesis:

$$CO_2 + H_2O \longrightarrow C_xH_yO_z + O_2$$

As the afternoon progresses, dissolved-oxygen levels increase as photosynthesis occurs. After sundown, photosynthesis decreases—however, plant and animal organisms continue to respire. Throughout the night and early morning, respiration results in a decrease in dissolved-oxygen levels:

$$C_xH_yO_z + O_2 \longrightarrow CO_2 + H_2O$$

The amount and variety of plant and animal life in a stream affects the degree to which the photosynthesis-respiration cycle occurs.

Levels of organic wastes from manmade sources such as pulp mills, food-processing plants, and wastewater treatment plants can also result in lower levels of dissolved oxygen in streams and lakes. Oxidation of these wastes depletes the oxygen, sometimes at a faster rate than turbulence or photosynthesis can replace it. Thus, use of a Dissolved Oxygen Probe to determine dissolved oxygen concentration and biological oxygen demand of a stream can be important tests in determining the health and stability of an aquatic ecosystem.

Calibrating and Monitoring Using Units of Percent Saturation

Instead of calibrating using units of mg/L (equal to parts per million or ppm), you may also choose to calibrate dissolved oxygen using units of % saturation. When doing a calibration for units of % saturation, the calibration point done in the sodium sulfite solution (zero oxygen) is assigned a value of 0%, and that for water-saturated air (or air-saturated water) is given a value of 100%. It must be noted, however, that 100% represents an oxygen-saturated solution only at that particular temperature, pressure, and salinity level. If you intend to compare your measured dissolved oxygen values with data collected under a different set of conditions, a preferable method would be to use units of mg/L (described earlier in this booklet).

If you have calibrated your Dissolved Oxygen Probe in units of mg/L, you can easily calculate percent saturation using the formula:

$$\%\ \text{saturation} = (\text{actual DO reading} / \text{Saturated DO reading from Table 1}) \times 100$$

For example, if your Dissolved Oxygen Probe gives a D.O. reading of 6.1 mg/L at a temperature of 20°C and a pressure of 740 mm Hg, look up the saturated dissolved oxygen reading in Table 1 (8.93 mg/L). The value for % saturation is:

$$\%\ \text{saturation} = (6.1 / 8.93) \times 100 = 68\%$$

Warranty

Vernier warrants this product to be free from defects in materials and workmanship for a period of five years from the date of shipment to the customer. This warranty does not cover damage to the product caused by abuse or improper use. The membrane cap is covered by a one-year warranty.

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Rev. 12/4/2013