ADINSTRUMENTS

MLT1115 Galvanic Oxygen Electrode

Transducer Series

Description

The MLT1115 Galvanic Oxygen Electrode is designed for measuring the concentration of oxygen in aqueous solution.

Operation

Connect the electrode to the input connector of any PowerLab (or other recording device having an input impedance of at least 1 MΩ). The unit may be connected directly into a BNC input or alternately to a Pod Port via the supplied MLAC22 BNC to DIN Smart Adaptor. The output in air-saturated deionized water should be 20 – 35 mV at 25 °C. The output will be larger at higher temperatures or in water saturated with pure oxygen or Carbogen (5% CO_2, 95% O_2).

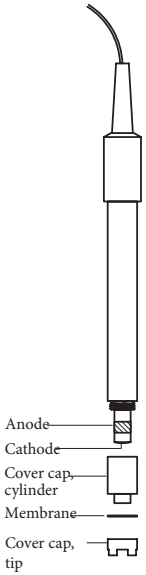
Note: Constant temperature must be maintained to obtain a meaningful signal.

Principle of Operation

The electrode comprizes a platinum cathode and a lead anode connected via an internal 7.5 kΩ resistor. As oxygen diffuses across the membrane and into the electrolyte solution inside the electrode, the following reactions occur:

$O_2 + 2H_2O + 4e^-$	→	$4OH^-$	at cathode
$2Pb + 4OH^-$	→	$2Pb(OH)_2 + 4e^-$	at anode
$O_2 + 2H_2O + 2Pb$	→	$2Pb(OH)_2$	overall

For every molecule of oxygen consumed at the cathode, four electrons are transferred from the anode. The potential across the internal 7.5 kΩ resistor is proportional to this current flow therefore, to oxygen concentration.



The rate of oxygen consumption by the electrode is given by the formula:

$$d[O_2]/dt = E/(4000RF)$$

where:

$d[O_2]/dt$ is the rate of oxygen consumption in mol/s

E is the output signal (potential) in mV

R is the value of the internal resistor, 7.5 kΩ

F is the Faraday constant, 96486.7 A·s/mol

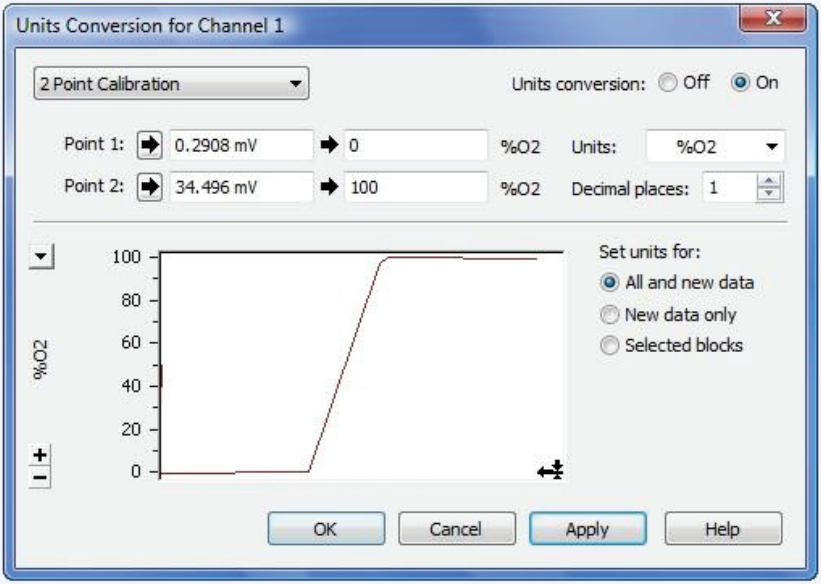
Operating Instructions

Use the LabChart software to set your PowerLab input channel to a gain range of 50 mV. (If you are using another recording device adjust its input sensitivity to an appropriate range). A recording speed of 4 samples per second is more than sufficient and provides a good graphical display as the signal moves across the computer monitor. A low pass filter setting of 1 Hz (available on most PowerLab models) can be used to get a noise-free signal.

To calibrate the electrode using a PowerLab, start the LabChart recording while the electrode is immersed in stirred deoxygenated water (a steady level must be obtained for a couple of minutes). Transfer the electrode to a stirred, air-saturated, solution while continuing to record the signal until a steady level is obtained in LabChart. Stop recording. Use the Units Conversion feature of the LabChart software (see the LabChart User's Guide) to assign values of zero and 100% O_2 saturation to the appropriate regions of the signal. Other units, such as "µmol/L", "mmHg", or "ppm", can also be used.

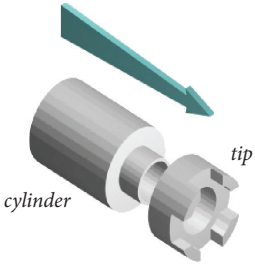
Storage

To store the electrode for short periods of time (overnight or for a few days), place a few drops of water in the vinyl cap used to cover the electrode tip. For long term storage (weeks or more) the electrode should be drained of filling solution and stored dry. Refer to the refilling instructions on the next page.

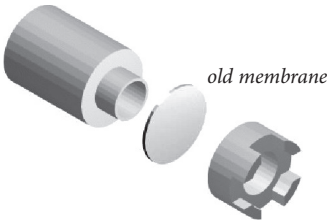


Calibration of the electrode using Units Conversion.

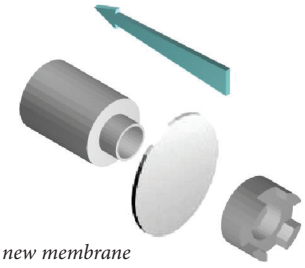
Replacement of membrane tip and refilling of the electrode.



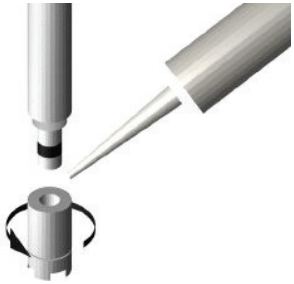
1. Unscrew the lower part of the electrode then pull to remove tip from cylinder.



2. Remove old membrane and clean cylinder and tip.



3.Place new membrane over top of tip and press onto cover cylinder. Trim excess membrane.



4. Use syringe (supplied with electrode) to place a small amount of R001069 Electrolyte filling solution into the lower part of the electrode then screw back onto the main body. Excess filling solution will be extruded.

Wear rubber gloves and eye protection to avoid contact with the electrolyte filling solution. The filling solution should be replaced periodically.

Troubleshooting

Q. The probe, when in air-saturated water, displays a zero signal ?
A. Check that all cable connections are correct. Check that the probe is filled with electrolyte (filling solution).

Q. The maximum signal, in air saturated water, is less than 20 mV ?
A. The output signal will be smaller at temperatures less than 25 °C. If the membrane is dirty install a new membrane. Replace the electrolyte filling solution. If the electrode is old it may need replacement.

Q. The output signal is unstable and shows random drift ?
A. Check that the sample is being maintained at a constant temperature. Check that the stirring rate is constant. Check the grounding (if any) of the sample vessel, PowerLab and any other instrumentation connected to the sample (temperature probes, pH meters etc).

Caution

Read “Statement of Intended Use” on our website or in “Getting Started with PowerLab” before use. The electrode filling solution is caustic and contains sodium hydroxide. Wear rubber gloves and eye protection when refilling the electrode. If skin or eye contact occurs, wash the affected area immediately with running water.

Specifications

Probe type:	Galvanic
Cathode:	Platinum
Anode:	Lead
Membrane:	PTFE (Teflon®)
Output:	20 – 30 mV @ 25 °C in air-saturated deionized water
	< 1 mV in deoxygenated water
Response time:	< 30 s to 90% of final value
DC drift:	< 2% per week at constant pressure and temperature
Oxygen consumption:	3.45×10^{-13} mol O_2/s per mV of signal
	1.10×10^{-11} g O_2/s per mV of signal
Filling solution:	2% NaOH, 65% ethylene glycol, 33% water
Electrode body:	Plastic (Delrin)
Connector:	BNC
Dimensions:	12 mm OD x 137 mm (0.47" OD x 5.4")
Cable length:	3 m (9.8')

All specifications were tested at the time of printing and are subject to change.

Ordering Information:

MLT1115 Galvanic Oxygen Electrode

Supplied with:
MLAC22 BNC to DIN Smart Adaptor

For use with:
Any PowerLab