

**CS510 OXYGUARD DISSOLVED OXYGEN PROBE
INSTRUCTION MANUAL**

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CS510 OxyGuard Dissolved Oxygen Probe

An accurate and reliable sensor is a critical element in any measurement system. The OxyGuard Stationary Probe meets these criteria for the measurement of dissolved oxygen.

1. General Information

The OxyGuard Stationary Probe is a galvanic probe which produces a millivolt signal proportional to the amount of oxygen present in the measured medium. Oxygen diffuses through the membrane onto the cathode, reacts chemically, and combines with the anode. An electrical current is produced by this chemical reaction which is converted from microamps to millivolts by an in-line resistor. An in-line thermistor also conditions the signal providing automatic temperature compensation. With these features, the probe produces a millivolt output proportional to the oxygen present in the medium in which it is placed. The probe consists of two parts, an upper part with cathode, anode and cable, and a lower part comprising a screw on membrane cap with fitted membrane. The cap is filled with electrolyte and simply screwed onto the top component.

The probe is self polarizing and requires no external power source. There are only two wires to connect. Cable length is rarely a limiting factor and generally there is no need for shielded wire.

Because the probe's output is linear, it is possible to connect it directly to a data acquisition system capable of handling the small millivolt signal.

The probe's robust construction and simple design make maintenance and servicing it straightforward. There is no need to send the probe back to the factory for servicing. It utilizes a strong, easy-to-clean and easy-to-change membrane in a screw-on membrane cap. Regular servicing is not required. When necessary probe can be fully overhauled in five minutes.

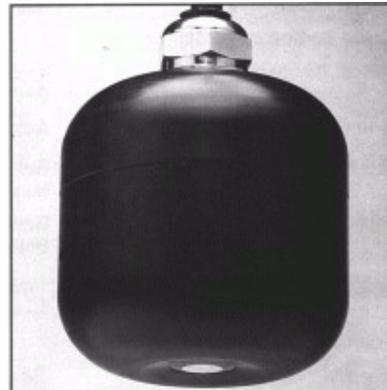


FIGURE 1-1. CS510-L

2. Specifications

Principle of Measurement: Membrane covered polarographic oxygen probe—
self polarizing galvanic cell

Output Signal: 5 mV per mg/l, 2 mV per %/vol nominal

Accuracy: Better than +/- 2 % of reading +/- 1 digit when calibration
temperature equals measuring temperature +/- 5 C

Repeatability: Better than +/- 0.2 mg/l; Better than +/- 0.5 %/vol when
barometric pressure unchanged

Output Impedance: 1 kOhm nominal

Response Time:

mg/l: 60 s for 90 % of 100 % step change at constant temperature

%vol: 10 s for 90 % of 100 % step change at constant temperature

Materials of Construction:

Probe body: POM (polyoxymethylene)

O-rings: Viton

Membrane: 0.05 mm (2 mil) Teflon

Dimensions and Weight:

58 mm diameter by 59 mm high (2-1/4 inch diameter by 2-1/4 inch high)

350 g (3/4 lb) including standard 3 m (10 ft) cable length

Cable: 2-conductor, 0.75 square mm (16 gauge), standard length 3 m (10 ft);
other lengths available upon request

Operating Conditions: Temperature: 0 to 50 C (32 to 122 F)

Pressure: Maximum 10 atmospheres (147 psig)

Minimum Submersion Depth: 60 mm (2 1/2 in)

Minimum Water Flow: 2.5 cm/s (1 in/sec) across membrane

Calibration: In air or in air saturated water. Use of EasyCal calibrator optional.

Temperature Compensation: Automatic from 4 - 40 C (40 - 104 F)

Probe Options:

	Type I	Type II
Range of dissolved oxygen	0-50 mg/l, 0-500 % Sat	0-15 mg/l, 0-150 % Sat
Gaseous oxygen	0-100 %/vol	0-35 %/vol
Electrode materials	Ag cathode/Zn anode	Ag cathode/Pb anode
Probe electrolyte	NaCl	Na ₂ CO ₃

3. Service Kit

- Spare membrane cap with fitted membrane.
- 50 ml electrolyte.
- Spare anode and O-ring.

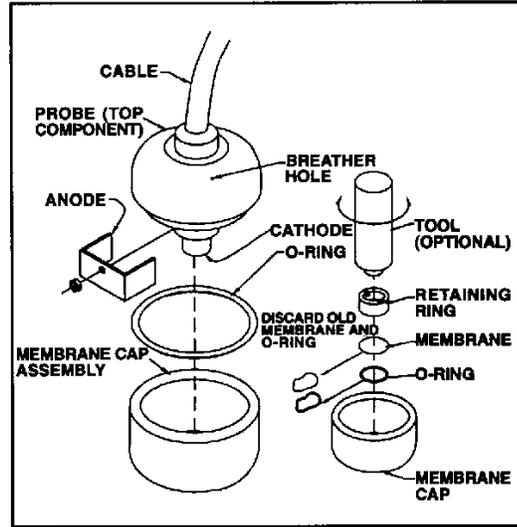


FIGURE 3-1. Exploded View of CS510-L

4. Optional Probe Accessories

- Agitator for stagnant conditions.
- Probe Mounting assembly for waste water installations.
- Flow-through and by-pass fittings.
- EasyCal calibrator for fast and accurate calibration.

5. Optional Agitator

The PT4 Agitator is a reliable and robust agitator for use in conjunction with probes subjected to bio-fouling in ponds and stagnant water conditions.

O₂ probes require a minimum water velocity across their membranes to function properly. Therefore, to measure DO in stagnant water conditions, it is necessary to move the water past the membrane to get accurate and reliable DO measurements. In many instances the water also has a high bio-loading and the probes become fouled resulting in inaccurate DO measurements.

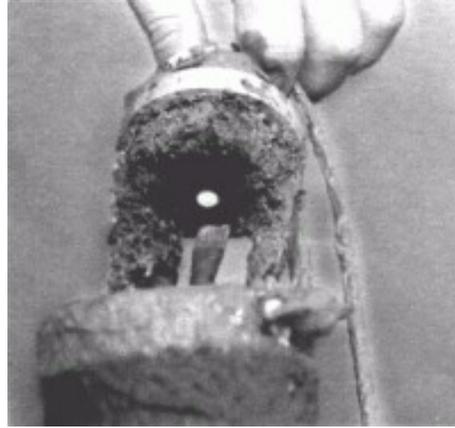


FIGURE 5-1. Preventing Bio-fouling of the CS510-L

The PT4 Agitator overcomes these problems. The device is designed so that a soft bristle brush sweeps across the probe membrane or sensor tip. This sweeping action of the brush provides the required water velocity as well as prevents the membrane from becoming bio-fouled.

The optimum sweeping frequency depends upon the design of probe and type of membrane used and water conditions. An ON-time of 0.25 seconds and OFF-time of 5 seconds is suitable in most circumstances.

Agitator's overall size: 7-1/8" x 3-1/4" diameter, 1-1/4 lb. (180mm x 83mm, 0.6 kg)

Supplied with 10 ft. (3 meters) cable.

Power required: 10.5 to 18 VDC at the agitator, 1.1 amps. Maximum ON-time is 3 seconds.

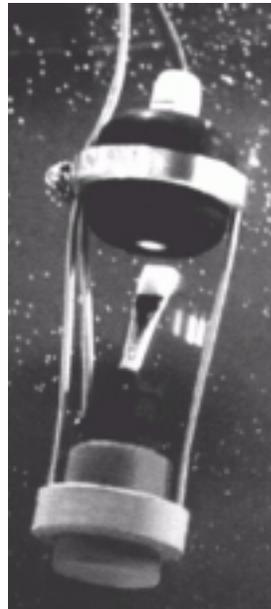


FIGURE 5-2. CS510-L with PT4 Agitator

Optional Repeat Cycle Timer for Agitators: Reciprocating action may be controlled by the optional solid state Repeat Cycle Timer. It sends 12 VDC pulses to the agitator coil. The ON-time is 0.25 sec. The OFF-time is adjustable from 3 to 12 sec.; requires supply voltage 10 to 17 VDC; housed in watertight cylinder 6.6" x 2" diameter (170 mm X 50 mm).

6. Application Information

NOTE

Short Cut users: This application note was written primarily for those whose needs are not met by Short Cut. Your procedure is much simpler: just add the OxyGuard probe (it's in the water quality sensor group), save your program, and follow the wiring shown in Step 4 of Short Cut.

7. Wiring

The OxyGuard probe uses one differential channel. Differential wiring is better at rejecting electrical noise and ground loop error.

Red ----- 1H
 Blue----- 1L

8. Programming

Instruction 2, differential millivolt measurement is required for the OxyGuard probe. The example measurement instructions that follow do not store data to final storage. Additional instructions (Typically P92, P77 and output processing instructions such as P70) are required to store data permanently.

*1 Table 1			
01:	15	Sec. Execution Interval	
01: Volt (Diff) (P2)			
01:	1	Rep	
02:	24	250 mV	
03:	1	Diff Chan	
04:	1	Loc: [DO]	
05:	1	Mult.	*See calibration*
06:	0	Offset	

9. Calibration

The multiplier is used to calibrate the OxyGuard probe. To calculate the multiplier:

- 1) Program the CR10(X) using a multiplier of one.
- 2) Place the OxyGuard probe in the air, shaded from the sun. Wait for readings to stabilize. This may take 15 minutes or more.

- 3) Determine the air temperature and barometric pressure.
- 4) Using a calibration chart such as that provided in the probe's manual, determine the oxygen concentration of the air.
- 5) Use the following equation to calculate the multiplier:

$$M = P/R$$

M = Multiplier
 P = Concentration in PPM of the air (from the calibration chart)
 R = The signal output of the OxyGuard probe when using a multiplier of one
- 6) Change the multiplier in the CR10 program from one to the calculated number.

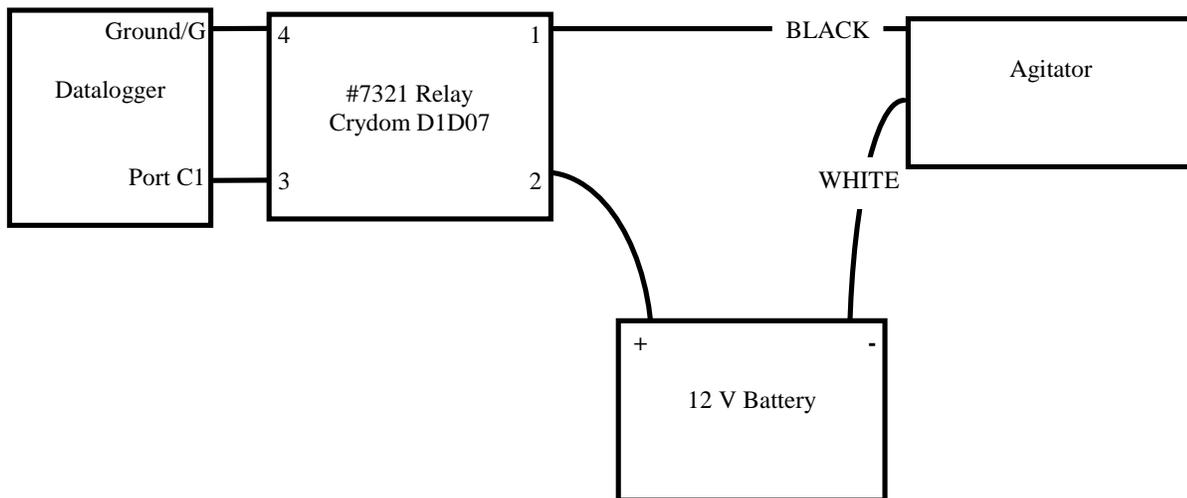
10. Maintenance

The OxyGuard probe needs little maintenance. Regular cleaning of the membrane is all that is required. The membrane is very durable and can be cleaned with a cloth or soft paper. Do not scratch it clean with your fingernail. Please see the OxyGuard manual for complete maintenance procedures.

11. Agitator Control

In low flow conditions (less than about 2 cm/sec), it may be necessary to add an agitator to the OxyGuard probe. The distributor for OxyGuard in North America sells a self-timed agitator which can be purchased through Campbell Scientific. The self-timed agitator requires no datalogger programming. However, some users choose to use a solid state relay and have the datalogger agitate the water on the probe face either periodically throughout the day or just before measurement. Agitating just before the measurement saves on power and causes less wear and tear on the agitator and probe membrane.

The wiring for the agitator as controlled by this example program would be as follows:



The following instructions in program table 2 would trigger the agitator as discussed in the agitator manual:

*Table 2 Program		
02:	2.0	Execution Interval (seconds)
1: Do (P86)		
1:	41	Set Port 1 High ; Use port number as wired
2: Excitation with Delay (P22)		
1:	1	Ex Channel
2:	0	Delay W/Ex (units = 0.01 sec)
3:	25	Delay After Ex (units = 0.01 sec)
4:	0	mV Excitation
3: Do (P86)		
1:	51	Set Port 1 Low

The above example is not as power efficient as possible, and would require AC power. If it is necessary to operate an agitator without AC power available, write the program so that the agitator is only operated for a short period of time just before the measurement is to be taken.

