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INSTRUCTIONS FOR GLASS STERILIZABLE OXYGEN PROBE

NON TEMPERATURE COMPENSATED D.O.

MEASUREMENT WITHOUT TEMPERATURE COMPENSATION

This electrode is not temperature compensated. Calibration must be done at the fermentation temperature. Electrode measurements without temperature compensation must have a 27K resistor bridged across the NTC terminals. Cable #9001092 has a 27K resistor bridged across the temperature compensator leads.

CALIBRATION

Calibration must be made at the temperature of fermentation. The O_2 measuring system should be calibrated prior to every measurement. If work is performed under sterile conditions, the system must be calibrated when fitted after sterilization but prior to inoculation. If the electrode is employed to monitor a fermentation process that extends over several days (or weeks) with no possibility of changing it, both the electrical zero point of the amplifier and the electrode zero point should be calibrated before insertion. The electrode should be fitted into the fermentor only if the deviation of the electrode zero point from the zero point of the amplifier is smaller than the desired measuring accuracy.

ZERO POINT OF AMPLIFIER

The electrical zero point of the amplifier must be set.

ZERO POINT OF THE ELECTRODE

The zero current of the O_2 electrode (electrode current at 0mm Hg O_2) is usually negligibly small and almost identical with the amplifier zero point. Nonetheless, the electrode zero point should be periodically checked as some electrode faults result in an excessive zero current. Moreover, checking the zero point is necessary before the measurement of low oxygen concentration.

Zero point calibration may be effected in both pure nitrogen and in water saturated with nitrogen. A further alternative is the use of a freshly prepared 2% bisulfite solution.

The saturation of water with nitrogen takes several minutes. Calibration with pure nitrogen gas is faster and more reliable. The zero point can be read after about 5 minutes. For zero current correction on the instrument refer to the instructions on the amplifier.

out put voltage with ambient air is 40 mV

ELECTRODE SLOPE

Zero point adjustment must precede slope calibration. In contradiction to zero point calibration, the aqueous phase is preferred for slope adjustment. The following problems arise in calibration done in air.

1. Membrane permeably slightly differs in air and in water.
2. Relative air humidity rarely 100%.
3. Temperature badly defined.

For calibration in a fermentor, slope calibration may be performed only after sterilization as the latter may alter the electrode slope. This alteration is comparatively large.

After cooling, the fermentor is aserated. As soon as the reading is stable, the desired value is set with the "Balance" potentiometer. Depending on the calibration method the oxygen partial pressure is selected in mm Hg or the calculated oxygen concentration in mg O_2/1. In order to insure the maximum possible measuring accuracy the calibration value is set to at least 70% of the maximum scale reading.

Calibration is usually effected at oxygen saturation since it is the simplest. In calibrating the reading is adjusted to 100% saturation. As it is dependent on pressure, the 100% adjustment should be effected under operating pressure.

Specifications Polarographic Electrode (Clark type)

Electrode shaft	Glass
Membrane	Teflon
Cathode	Platinum, diameter 0.25mm
Anode	Ag/AgCl
Electrolyte	Chloride Solution
Response time	45 to 60 seconds 98%
Stability drift	In water under constant pressure at constant temperature and amounts less than 2% per week
Flow dependence	Reading in stirred and unstirred solutions differ by approximately 5%
Polarization time	Some hours
Output current	Ambient air about 0.1 uA non-temperature compensated.

MEMBRANE MOUNTING

1. Cut a 3/4" length of silicone rubber tubing and place it in a container of methyl chloroform solvent. The solvent will cause the tubing to swell and soften. Allow the tubing to soak for at least 2 minutes.

2. Slit the silicone rubber tubing on the probe and carefully remove it and the membrane from the probe. Caution: Do not attempt to slide the silicone tubing off the probe end. Always slit it for removal.

3. Apply a thin bead of silicone RTV around the outside of the probe body about 1/8" from the tip.

4. Remove a membrane and carefully lay it across the tip of the probe, stretch it slightly and hold its end against the side of the probe with the thumb and forefinger. (See Figure 1)

5. Remove the silicone rubber tubing from the solvent and carefully slide it over the membrane onto the probe.

6. Inspect the membrane. It should be taut and should not be wrinkled where it covers the cathode.

7. Allow the solvent to evaporate from the silicone tubing, then inspect the membrane again. Trim off the excess from behind the silicone tubing.

8. With a hypodermic syringe and needle, fill the probe completely through the fill tube at the rear.

9. After filling the probe, tap the side near the tip to eliminate any air bubbles which may be trapped in this area.

Figure 1
Membrane
Mounting
Procedure