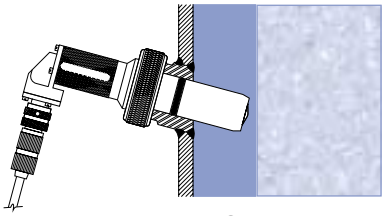
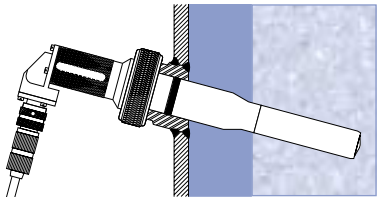
Precision Sensor News

An OxyProbe Success Story

When we first met John he had very little confidence in his dissolved oxygen measurements. He had been frustrated by problematic D.O. readings. Most times the displayed signal would mysteriously begin to drift shortly after the fermentation process had begun. Upon removing the sensor for examination after the run, he would find no obvious causes for the malfunction. We investigated the situation and found that the fermentation media was rather viscous and had a tendency to "coat" the inside wall of the 1000 gallon fermenter. The "coating" generally occured in the "laminar flow zone" of the fermenter. In this case the laminar flow zone extended out about 1-2 inches from the vessel wall. Our calculations concluded that the tip of the D.O. sensor was sitting right in the middle of this flow zone. We recommended that John try a D.O. sensor with an extended insertion length, a length that would allow the tip of the sensor to protrude into the "turbulent flow zone". As a result of this minor, but very important improvement, John's D.O. measurements stopped drifting and his confidence in the D.O. measurements is increasing with each batch. Subsequently, we conducted a hands-on training workshop for John and his group. We updated them on some of the techniques for troubleshooting, maintaining, servicing, and calibrating their sensors. John and his group are now getting reliable, reproducible data.

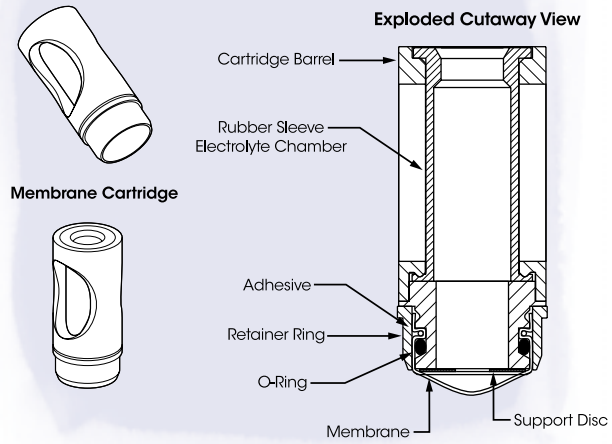


BEFORE



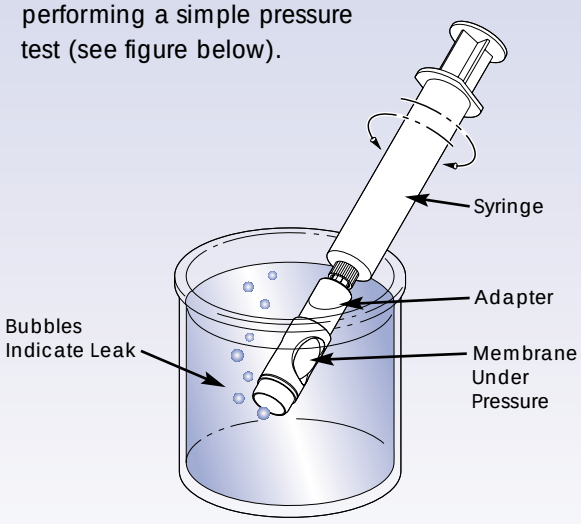
AFTER

25 mm Membrane Cartridge



D.O. Sensor Membrane Testing

Ensure the integrity and quality of your D.O. membrane by performing a simple pressure test (see figure below).

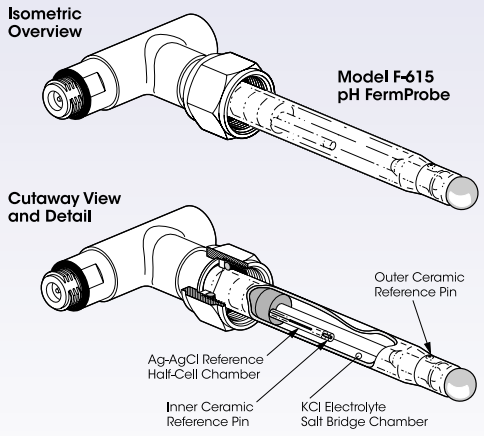


Call or fax us to request your free membrane test kit (P/N AM-9425).

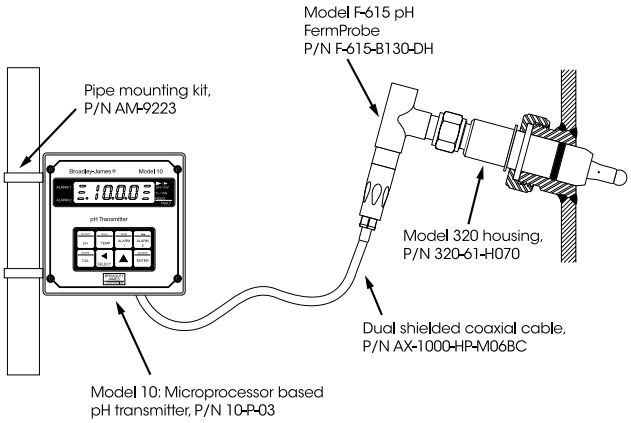
How does a double junction work?

All FermProbes have two built-in electrolyte chambers that act to protect and isolate the sensitive inner AgCl reference half-cell. This "double junction", dual chamber design effectively prevents common failure modes of pH electrodes in biopharmaceutical applications.

Only the inner, smaller chamber has Ag ions in the electrolyte. The larger chamber is free of Ag ions. This design prevents Ag ions from coming into contact with proteins in the sample media. Reactions between these proteins and the Ag ions will cause the formation of substances that will clog the outer ceramic reference pin junction.



pH Fermprobe and Model 10 pH analyzer are the perfect companions!



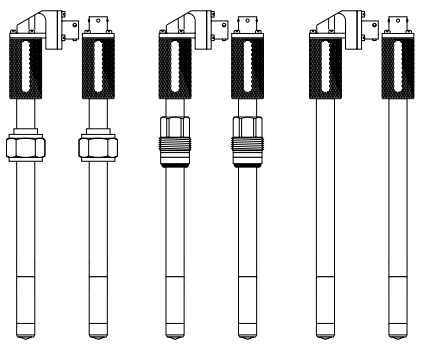
Every single FermProbe is put through our demanding QC procedure to ensure maximum reliability. Each FermProbe is exposed to 130° C steam for 1 hour. After the steam cycle each FermProbe is thermally shocked by quickly submersing in a cool liquid. They are each checked for their output in pH 7 and pH 4 buffers and for speed of response.

Following is some data comparing 3 FermProbe pH sensors to 3 "Brand X" pH sensors illustrating the effects of steam exposure over 4 cycles.

Stability/Drift Data in pH Units

cycle	FermProbe® A	FermProbe® B	FermProbe® C	Brand X A	Brand X B	Brand X C
0	—	—	—	—	—	—
1	.05	.03	.06	.04	.12	.06
2	.01	.01	.03	.03	.10	.04
3	.01	.01	.01	.01	.01	.01
4	.01	.01	.01	.04	.01	.03

The 12mm OxyProbes are available with or without our T-Pull connectors, and are available in 5 standard lengths.



TIP OF THE DAY

A properly functioning D.O. sensor should respond within 60 seconds to the 0% and/or 100% calibration conditions. A sluggish and/or low current output to 100% saturated condition may be the result of an obstruction or damage on the membrane surface.

pH Calibration

To achieve accurate pH measurements use reliable buffer solutions and sensors. For best results use fresh, NIST traceable buffers. Following is the recommended 2 point calibration procedure:

1. Rinse sensor off with D.I. water to remove any sources of contamination.
2. Insert the sensor and the temperature compensator in 7.00 buffer. Allow at least 30 seconds for the system to equilibrate, then adjust the meter's "zero" to read pH 7.00.
3. Repeat Step 1, and then insert the sensor and temperature compensator in 4.01 buffer. Again, allow 30 seconds for equilibration to occur. Adjust the meter's slope/span to read pH 4.01.
4. Repeat Steps 2 & 3 in order to maximize the accuracy of the meter's reading.

Dissolved Oxygen Sensor Calibration

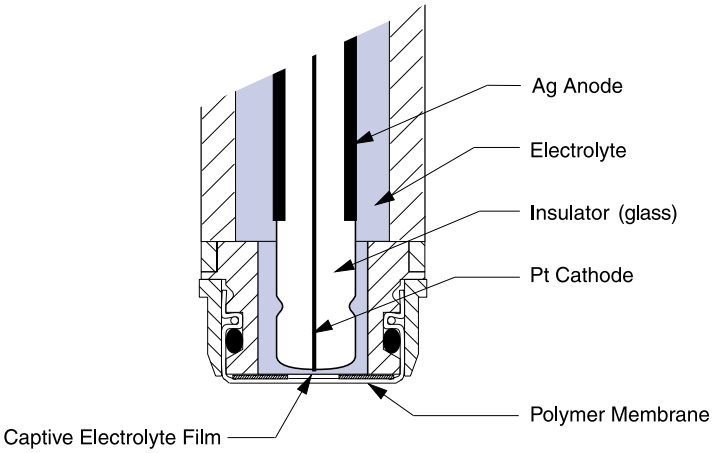
Following is the method for a proper 2 point calibration of a D.O. sensor. It's also a good time to check the sensor's performance during the calibration. The polarographic D.O. sensors produce a nano-amp signal proportional to the partial pressure of Oxygen. If your instrumentation has the ability to measure and display nano-amps, it can be useful diagnostic information. At 0% Oxygen there should be no current generated and at 100% saturation there should be between 40-90 nano-amps.

1. Ensure that the sensor has been properly polarized. (It typically takes about 4-6 hours for a sensor to completely polarize.)
2. Adjust the zero point of the sensor by inserting the sensor into a 0% Oxygen media (Nitrogen gas is recommended). Allow the sensor to equilibrate for a brief period of time and then set the instrument's zero point to reflect 0% Oxygen (if available, the displayed nano-amp output should be less than 1 nano-amp).
3. Place the sensor into a filtered air mix (20.9% Oxygen) and allow the sensor to equilibrate for a brief period of time. Adjust the instrument's full scale setting to reflect 100% saturation (if available, the displayed nano-amp output should read between 40-90 nano-amps).

Dissolved Oxygen Measurements

A basic explanation of the polarographic Dissolved Oxygen measurement.

Oxygen molecules diffuse through the gas permeable membrane. The Oxygen molecules are "reduced" at the cathode surface by a 675 mV polarization source. As a result, electrons are transferred and a proportional current is generated at the anode surface.



Clark D.O. Sensor

Dissolved Oxygen Measurement System