



ALTERNATE ORP CALIBRATION PROCEDURE:

Calibration outside the range of the commercially available ~ +230 & ~ +470 mV ORP Buffers

Introduction:

Unlike pH sensors, the measurement half-cell of the ORP (Redox) sensors undergo no zero-point or slope changes. Nevertheless, incorrect Redox potentials may be occasionally measured and the cause of these errors is usually a contaminated Pt surface. In such cases, the sensor may be regenerated by cleaning as described in the next section.

To test the Redox (ORP) sensor's accuracy proceed with the following Quinhydrone tests. The oxidation-reduction potential of a Quinhydrone solution is pH dependent. By saturating pH buffers with Quinhydrone (CAS # 106-34-3, ACS Reagent Grade) you can make stable mV standard solutions to use in testing your ORP sensor. Ideal values for some common buffers (saturated with Quinhydrone) are listed below:

7.00 pH +90 mV	$\Delta = 2.99 \text{ pH } \Delta = 177 \text{ mV (SPAN)}$	READINGS in pH 7 BUFFER/QUINHYDRONE MIXTURE			
4.01 pH +267 mV		Temperature:	20C(68F)	25C (77F)	30C(86F)
<i>Note that mV potential of this system is highly pH dependent!</i>		Reading:	+96mV	+90mv	+83mV

Sensor construction and prior usage will make the actual magnitude of the first two test readings vary. The actual readings in the buffers could vary by as much as ± 30 mV. However, a clean ORP sensor will give reproducible Δ values of $\Delta 173 \pm 5$ mV. This Δ value provides an indication of the functional performance of the sensor rather than the absolute mV values.

Testing & Calibration Procedure:

1. Place 50 -100 ml of pH 7.00 and 4.01 buffers in suitably sized beakers, stir about 0.2g/100ml of Quinhydrone into each buffer. Not all of the Quinhydrone will dissolve. The intention here is to prepare a saturated solution. There should be a little excess quinhydrone powder undissolved in each buffer solution.
2. Prepare the ORP sensor for testing by cleaning the platinum surface with Micro-90 surfactant (<http://www.ipcol.com/>) and soft toothbrush or Q-Tip. Do not scar or scratch the platinum. Consult factory prior to using solvents or other cleaning agents. Rinse thoroughly with deionized water.
3. Connect the ORP sensor to a suitable pH or ORP meter, set to the millivolt scale.
4. Immerse the sensor in the pH 7.00 Quinhydrone mixture. The meter should read between +60 and +120 millivolts. Allow the reading to stabilize 30 to 60 seconds typically, and note the reading.
5. Rinse the sensor thoroughly with deionized water, and immerse it in the pH 4.01 Quinhydrone mixture. The meter should now read between +230 and +290 millivolts. Allow the reading to stabilize 30 to 60 seconds typically, and note the reading.
6. With time and/or use, the absolute mV value in the 7 & 4 buffer saturated with Quinhydrone may change. However, the +168 to +178mV span between readings in 7 and 4 buffers should remain nearly the same.

Cleaning and Maintenance:

If short span is found (less than a +168mV change between the 7 and 4 buffers saturated with Quinhydrone) the platinum measuring surface may be coated. Remove the coating by one the following means:

1. Wipe the surface clean with a soft cloth or tissue.
2. Soak the electrode in a chemical known to dissolve the suspected coating material.
3. As a last resort, very gently polish the surface with 600 grade wet or dry silicone carbide paper.
4. After cleaning the electrode, soak in one of the calibrating solutions for about five minutes before re-calibrating.

NOTES:

- This test verifies the function of the platinum combination Redox (ORP) sensor by actual measurement of a known oxidation-reduction potential change. If a sensor responds adequately in this test (e.g. $\Delta 168$ to $\Delta 178$ mV between the 7 and 4 buffer saturated with Quinhydrone mixtures) but the values fall outside of these ranges, it indicates a fouled reference junction or unclean platinum sensing electrode.
- The buffer/Quinhydrone mixtures will maintain ideal values for about two hours since the Quinhydrone decomposes slowly in contact with air. Dispose of this solution per local wastewater regulations.

CAUTION: Quinhydrone is very toxic and should be handled by qualified technicians only. Handle with care and avoid ingesting. Avoid contact with bare skin. Dispose of the Quinhydrone solutions per your local wastewater regulations.