



Orion ORP Standard Offer Stable, Ready-to-Use Solution for Redox/ORP Calibration

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The Orion ORP standard is a vast improvement over other ORP standards on the market. For the user, it involves the same amount of preparation as an Orion pH buffer – just pour some out of the bottle into a beaker and calibrate! In addition to ease of use, this standard allows those measuring ORP to have a stable, reliable standard that they can easily use immediately each day to determine whether their samples or processes are changing or remaining constant. ORP is used as a quick measurement of the oxidation-reduction potential (E_H) of a solution. The oxidation-reduction is a measure of solution reactivity, which is a critical parameter in industries such as water/wastewater, pulp/paper, environmental, food, and those concerned with corrosion inhibition and disinfection.

The Orion ORP standard has been characterized with Orion electrodes at various temperatures to allow an automatic calibration for a direct reading (E_H) relative to the Normal or Standard Hydrogen Electrode (SHE) from any Orion Star™ series meter with pH measurement mode. The ORP standard can be used with any other electrodes and meters as a calibration standard using a mV offset or relative millivolts, when the fill solution molarity is known. The ease of use, the non-toxic composition, and other benefits of the ORP standard still make it the best ORP standard for any ORP measurement system.

Traditional ORP standards have several drawbacks. They are not calibration solutions back to the “gold standard” SHE, but are more for verification that the meter and electrode are functioning. Their greatest drawback is preparation and/or shelf life constraints, making ORP measurement more tedious than it needs to be. Specifically, the ZoBell’s solution is based on the ferrocyanide/ferricyanide redox couple. The cyanide complex solution itself is toxic and requires special handling disposal constraints. The Light’s solution is a ferrous/ferric redox couple solution. It offers stability for a few months but oxidizes and is acidic and dangerous to work with. Quinhydrone can be added to pH 4 and 7 buffers to verify a system at 2 different potentials. Quinhydrone is slow to dissolve and difficult to clean off the electrodes, stirring apparatus, and glassware. It is also a toxic compound. Although Quinhydrone solutions give two data points, they are only stable for a few hours and must be reprepared for each calibration. This is time consuming and creates an organic waste stream. Temperature effects are usually unknown as these prepared by the end users and change over time as well.

The benefits of the Orion ORP solution are:

- Ready-to-use - straight out of the bottle
- No mixing of reagents
- No organics or hazardous chemical exposure
- Very stable solution
- Convenient package sizes for lab and field
- No hazardous chemical disposal
- Reduced labor and glassware costs
- Ability to correlate to Normal or Standard Hydrogen Electrode (NHE or SHE)
- Known table for temperature correction of mV
- Orion Quality
- Great results in ASTM round-robin testing
- Included in ASTM Method D1498



The millivolt readings of the standard are dependent on the reference system (material and filling solution) of the ORP electrode and temperature of the solution. For Orion electrodes (Models 9678 and 9778) with the Orion 900011 fill solution, the standard will give a reading of 420 mV relative to the Normal or Standard Hydrogen electrode at 25 °C. The raw millivolts reading would be 220 mV at 25 °C. The Orion ORP Triode™ electrodes, Models 9179 and 9180, which offer the benefit of built-in temperature sensors, will give the same values. A table of values at different temperatures for the 900001 is also listed in the table below. This lower ionic strength filling solution is a beneficial alternative for some applications.

The values given in the mV vs. temperature tables are for Orion electrodes only. Use with other manufacturer's electrodes which may have different reference systems will give slightly different mV values. The mV value of the solution is stable and will not change over time so it is still an ideal standard for any ORP measurement system.

Any Orion Star meters with ORP mode offer the user simple automatic calibration to E_H with the push of the calibration button in the E_H mode using the Orion ORP electrodes.

Orion ORP Standard - Values for Orion Electrodes		Orion 9180 9678 9778	Orion 9179	Orion 9180 9678 9778
Orion Fill Solution Used		900011	Gel	900001*
Temp, C	Eh (mV)	E (mV)	E (mV)	E (mV)
0	438	218	222	176
5	435	218	223	176
10	431	219	223	175
15	428	219	224	175
20	424	219	224	174
25	420	220	224	173
30	415	220	224	172
35	411	220	224	171
40	406	220	224	170
45	401	220	224	169
50	396	220	224	167

* Using 900001 fill solution for dilute samples (total ionic strength < 0.2M).

For more detailed tables of Orion ORP Standard values at temperature, see Electrode Log #41 at www.thermo.com/water. Click the applications link and follow to ORP page. Electrode Log #41 also includes a table of Orion ORP Standard Values for Orion and other electrodes (by electrode reference and filling solution).