

Reporting Redox (ORP Reporting)

Redox reactions are the transport of electrons from one element to another. Oxidation is the loss of electrons. Reduction is the enrichment of electrons. Redox is the abbreviation of reduction and oxidation. In United States literature, Redox is referred to as ORP and stands for Oxidation Reduction Potential. Redox and ORP are identical measurements. Redox is measured in mV. The normal reference electrode against which all redox measurements are made is a hydrogen electrode (Standard Hydrogen Electrode or SHE). Using SHE electrodes in the field is impractical so normally more field-suitable reference electrodes are used. Nonetheless ALL measurements are required to be translated AS IF they were taken with a SHE electrode (BS ISO 11271). The difference is in the region of 200 mV but this is temperature dependent. For your convenience here is a conversion table for SOME of the most common reference electrodes. BUT always check to make sure you know what electrode you are using.

Temp. °C	Mercury/calomel/KCl	KCl 1m/l	KCl 3m/l	KCl 3.5 m/l
40	234.3	227.3	196.1	193.3
35	237.7	230.4	199.8	197.1
30	241.1	233.4	203.4	200.9
25	244.4	236.3	207.0	204.6
20	247.7	239.1	210.5	208.2
15	250.9	241.8	214	211.7
10	254.1	244.4	217.4	215.2
5	257.2	246.9	220.9	218.7

The conversion is done according to this formula: $E_h = E_m + E_{ref}$. Where:

E_h = the Redox value according to a SHE reference electrode

E_m = the Redox value measured by your instrument

E_{ref} = the correction factor from the above table.

Example:

$E_m = 225$ mV at 15° C with a KCl 3.5 m/l reference electrode. $E_{ref} = 211.7$ mV

Then according to the formula $E_h = E_m + E_{ref}$: $E_h = 436.7$ mV

A CAUTION about calibration of water quality meters

Most water quality meters DO NOT automatically compensate for temperature during the calibration sequence. You MUST do this MANUALLY. Check on the calibration standard bottle or literature and this should contain values of the standard AT THE TEMPERATURE OF YOUR SAMPLE.

Example:

The Van Walt Redox Standard calibration fluid is product RS250. This will read 250 mV at 25° C with a 3.0M reference electrode.

Other temperature calibration values are:

- 10° C = 273.6 mV
- 15° C = 265.8 mV
- 20° C = 258.1 mV
- 25° C = 250.0 mV
- 30° C = 242.7 mV