

**VAN LONDON COMPANY
COMBINATION ORP ELECTRODE INSTRUCTION
MANUAL**

GENERAL INFORMATION

Van London combination electrodes offer the convenience of having the reference and measuring electrodes combined in a single housing. Basically, the design consists of an ORP indicating electrode coaxially joined to a silver/silver chloride reference electrode. A temperature sensor for ATC may or may not be built into the electrode. The ORP indicating electrode is located at the center of the probe. The reference electrode is located in the outer annular space of the probe. The outer annular space contains the silver/silver chloride reference element, electrolyte (4M KCl saturated with AgCl) and the reference junction. When immersed in a solution, the reference electrode makes contact with the sample through the junction, thus completing electrical contact between the reference electrode, sample, and ORP indicating electrode.

This combination ORP electrode comes in many styles and is designed for maximum reliability, accuracy, and ease of use. The outer body can be glass, epoxy, or other plastic materials. The plastic body electrode is available with a permanent non-removable bulb guard or a removable guard which is shipped attached to the cable. The reference half-cell can be refillable or permanently sealed at the factory and non-refillable. The refillable electrode will have one (for single junction) or two (for double junction) fill holes located underneath the cap at the top of the electrode. The electrode is shipped with a protective boot or soaker bottle filled with a membrane/junction wetting agent (1:1 pH4 buffer/KCl). Crystals which may form around the protective boot will in no way affect electrode performance.

Van London combination ORP electrodes are responsive over the full mV range from -2000 to +2000 mV. Glass body liquid-filled laboratory probes are available in standard and micro sizes, and are recommended for most routine applications. Polymer body liquid-filled laboratory probes are available in multiple sizes and are preferred for applications where breakage is a problem. Polymer body gel-filled industrial probes are recommended for those applications where there is a need for both low maintenance and breakage resistance.

SPECIFICATIONS

ORP Range: +2000 mV to -2000 mV
Slope (Span): 95 – 102% (between pH 7 & 4 at 25°C)
7 pH buffer with Quinhydrone crystals added: 86 mV +/- 20 mV
4 pH buffer with Quinhydrone crystals added: 264 mV +/- 20 mV

REQUIRED METERS & BUFFERS

Meter: This electrode will work with any ORP and/or mV meter commercially available. Consult the meter instruction manual for specific details on connecting/wiring the ORP electrode to the meter or operating the meter. Some electrodes may require adaptor cables or detachable lead cables for connection to the ORP and/or mV meter.

Buffers: For precise electrode checking, two buffers are required. pH 7.00 (at 25°C) buffer is normally recommended for initial checking, followed by pH 4.01 (at 25°C) to span(slope) the electrode. A pinch of Quinhydrone crystals should be added to both the pH 7 and pH 4 buffers. Sufficient crystals added will result in undissolved crystals suspended in solution. Note: quinhydrone buffers are not stable and should be discarded after completion of all electrode checks on a given day.

ELECTRODE PREPARATION

1. Remove the ORP bulb protector boot or soaker bottle covering the ORP element and rinse the element area with deionized water or tap water. Save the boot if the electrode will be stored.
2. Occasionally, some of the storage solution will creep out and appear as dry white crystal residue on the electrode. This will have no long-term effect on the electrode and the crystals can be rinsed off with deionized or tap water.
3. Reference electrodes that are refillable: For electrodes shipped with fill-hole plugs, remove the shipping tape covering the rubber fill-hole plug and withdraw the plug to expose the fill-hole. For electrodes shipped with a sleeve over the fill-hole(s), slide the rubber sleeve down and remove the shipping tape to expose the fill-hole. Fill the refillable electrodes with any fill solution(s) shipped with the electrode to a level just

below the fill-hole(s). The fill hole should be open whenever the electrode is in solution. Cover the fill hole when not in use.

4. Reference electrodes with sleeve junction: Remove parafilm from underneath sleeve and slide teflon or glass sleeve firmly into position on tip of electrode. Measurements should be made with only the lower part of sleeve immersed. For sleeve junction electrodes, when the liquid junction becomes clogged, the electrode may be flushed after loosening the sleeve. If the sleeve freezes in place, soak it in warm water to loosen it. After the sleeve is free, replenish the filling solution.
5. Attach the removable bulb guard, if provided, to the electrode by sliding guard over the end of the electrode.
6. Mount the electrode onto a suitable laboratory electrode holder or process installation and connect the electrode to the meter.
7. Prior to first usage, or after long-term storage, immerse the ORP element bulb in tap water for thirty minutes. This wets the reference junction for optimum performance. The electrode is now ready for use.
8. For refillable electrodes, the level of electrolyte in the outer chamber should be kept above the level of sample solution to prevent sample contamination through the reference junction into the outer chamber. The electrode need only be immersed far enough to cover both the ORP sensing element and reference junction to obtain accurate readings. The level of the electrolyte must always cover the inner reference element, otherwise electrical contact cannot be established. Add electrolyte as needed.
9. Unlike pH systems, ORP systems cannot be standardized against buffers. To improve the reliability of ORP measurement and control, test electrodes in standard potential solutions by the following sections. This electrode check will determine if your electrodes are correctly responding or need maintenance.

ELECTRODE WIRING (COMBO COAX)

Clear (BNC Pin) = ORP Signal

Black (BNC Shield) = Reference
White or Black, and Red = ATC
Green or Blue = Solution Ground

Color Code Variation – Direct replacement electrodes may differ from above color coding in order to match other manufacturer’s color schemes.

Wiring Tips – There are instances where a solution ground may be required for wiring but is not included with the electrode. In all cases, jumpering of the terminal marked “solution ground” with the terminal marked “reference” is all that is required. Consult the meter instruction manual for specific details on connecting/wiring the ORP electrode.

MEASURING HINTS

1. For refillable electrodes, the level of electrolyte in the outer chamber should be kept above the level of sample solution to prevent sample contamination through the reference junction into the outer chamber. The electrode need only be immersed far enough to cover both the ORP element and reference junction to obtain accurate readings. The level of the electrolyte must always cover the inner reference element, otherwise electrical contact cannot be established. Add electrolyte as needed.
2. If the electrode has not been hydrated (placed in solution for more than one hour, allow the electrode to soak in a buffer as needed prior to standardization or measurement.
3. Rinse the electrode with deionized or distilled water between samples.

CHECKING ELECTRODE& SAMPLE ORP MEASUREMENT

1. Place the electrode in fresh pH 7.00 buffer (Quinhydrone added) and stir. Read the mV value according to the meter instruction manual. The mV reading should be 66 mV to 106 mV.
2. Rinse the electrode in distilled water and place the electrode in fresh pH 4.01 buffer (Quinhydrone added). Stir and allow meter reading to stabilize for 30 seconds to one minute. Read the mV value. The mV reading should be 244 mV to 284 mV.

If the mV difference between the two solutions is less than 150 mV, or the buffer potentials do not fall in the acceptable mV range, clean the ORP electrode by one of the procedures outlined in the electrode cleaning section below.

3. Rinse the electrode with distilled water. Place in sample and stir. Allow meter reading to stabilize for 30 seconds to one minute. Record reading. For best accuracy, the temperature of the buffers and samples should be identical or at room temperature.

ELECTRODE STORAGE

For short terms, always keep the reference junction wet, preferably in a membrane/junction wetting agent (1:1 pH4 buffer/KCl). The protective boot/soaker bottle filled with wetting agent above will provide an ideal storage chamber for longer periods. **NOTE: Electrodes should not be stored for a period longer than 6 months for optimal performance. Electrode stock should be rotated accordingly.**

ELECTRODE CLEANING

Like pH electrodes, ORP sensors are subjected to coating and abrasion by the measured liquid, and in certain instances, are “poisoned” by chemicals which may be present if a system loses control. ORP Electrodes (which are mechanically intact with no broken parts) can often be restored to normal performance by one of the following procedures:

General Cleaning: Soak the electrode in 1:10 dilution of household laundry bleach in a 0.1-0.5% liquid detergent solution in hot water with vigorous stirring for 15 minutes. Place junction under warm, running tap water for 15 seconds. Drain/refill the reference chamber. Soak the electrode in storage solution for at least 10 minutes.

Salt Deposits: Dissolve the deposit by immersing the electrode in 0.1 M (1%) HCl for five minutes, followed by immersion in 0.1M (1%) NaOH for five minutes, and thorough rinsing with distilled water.

Oil/Grease Films: Wash electrode ORP element in a little detergent and water. Rinse electrode tip with distilled water. If the film is known to be soluble in a particular organic solvent, rub the ORP element gently with this solvent using a tissue or soft cloth. Acetone or isopropyl alcohol are often used to remove films.

Clogged Reference Junction: Heat a diluted KCl solution to 60-80°C. Place the reference portion of the ORP electrode into the heated KCl solution for approximately 10 minutes. Allow the electrode to cool while immersed in some unheated KCl solution.

Protein Deposits: Dissolve the deposit by immersing the electrode in a 1% pepsin solution with a background of 0.1M HCl for five minutes, followed by thorough rinsing with distilled water.

After any of these special cleaning procedures, remember to drain/refill the reference chamber, if refillable. Soak the electrode in wetting agent (storage solution) for at least 10 minutes. If these steps fail to restore normal electrode response, replace the electrode.

TROUBLESHOOTING HINTS

Symptom	Possible Causes	Next Step
Out of Range Reading	meter electrode electrode wired incorrectly	check meter with shorting plug check CALIBRATION check wiring connections
Noisy or Unstable Display	meter solution not grounded	check meter with shorting plug ground meter and electrode
Drift (reading slowly changing in one direction)	ORP element contaminated reference clogged	see CLEANING hints see CLEANING hints
Low Slope	buffers contaminated ORP element contaminated reference clogged electrode	use fresh buffers see CLEANING hints see CLEANING hints check CALIBRATION

WARRANTY

Van London Company ORP electrodes are warranted to be free from defects in material and workmanship for a period of 12 months from date of purchase. If a defect in material or workmanship occurs within the one year period, please contact Van London Company before returning items for any reason. When applying for authorization, please include data regarding the reason the items are being returned, the date of purchase and the invoice number.

To place an order or to contact customer service, call 1-800-522-7920.

To fax an order, use 832-456-6642.

To order online, visit www.vl-pc.com

For ORP technical support, call 1-832-456-6641 or email

tony@vanlondon.com.

We reserve the right to make changes, improvements, and modification to our ORP products.