

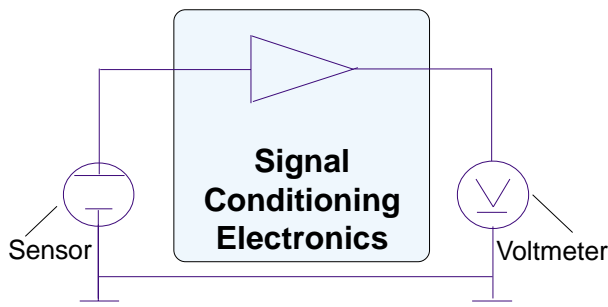
## Aquarius Technical Bulletin - No. 21

# Isolation for pH & ORP controllers.

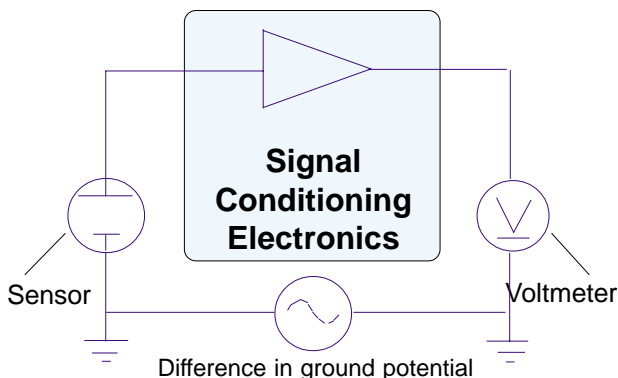
The use of pH and ORP control is becoming increasingly important in Water Treatment control. However, the accurate measurement of these parameters outside of laboratory conditions, can be greatly affected by many factors including other measurement processes being carried out concurrently and indeed can in turn create problems to these otherwise unassociated measurements.

This paper deals with the reasons for this unwanted interference and addresses how these problems can be overcome. This discussion uses pH measurement as the example, but can be equally applied to ORP or Redox measurement.

Figure 1 below, shows a simplified schematic depicting the basic method of measuring pH. Note that the pH sensor is essentially a battery outputting a minute voltage directly related to the pH value, and that we have an appropriately scaled voltmeter to read the pH value. Note that this simplified schematic assumes that the return of the voltmeter is at the same potential as the reference electrode of the pH sensor.



However, what happens if these two points are not at the same potential as shown in figure 2. below.



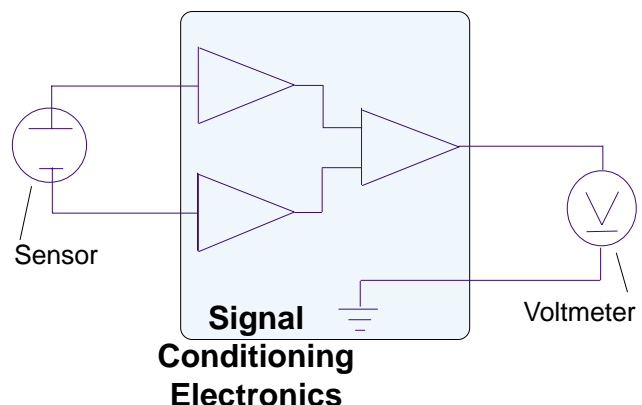
Unfortunately, this problem occurs frequently in plants requiring pH and/or ORP control, especially in both air conditioning plant rooms and in industrial applications. As an example, a welding machine may induce several volts on the water used for cooling, or cooling system circulating pumps may introduce stray currents, as do dissimilar metals in the system.

When we consider that 100 mV. approximates to 2.00 pH units, this has a dramatic effect upon the accuracy of measurement. Another cause of this inequality of potential between input and output occurs where electronic corrosion monitoring is being performed. In this case, voltages are deliberately applied to one of the electrodes at different points in the measurement cycle.

Thus, any form of accurate and reliable pH or ORP measurement has to be able to handle these unwanted voltage potentials. **Isolation of these induced voltages from the sensor measurement signal is essential** and can be achieved in two ways.

Physical isolation may in some cases negate the effect; for example, locating the pH or ORP probe many, many metres away from the corrosion measurement sensor, but this is usually unpractical due to space restrictions within the plant room.

The second and preferred way is to utilise differential inputs for the sensor whereby any voltage induction is felt by both electrodes of the pH or ORP sensor and thereby negating the effect. Figure 3 below shows the simplified schematic utilising differential inputs for the pH or ORP sensor.

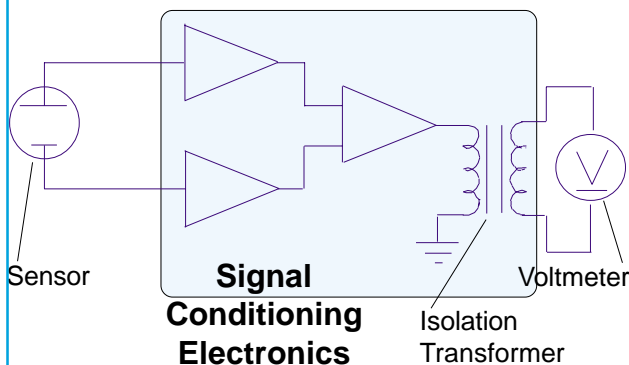


If unwanted potentials cause problems between the sensor and input electronic measuring circuitry, ***then similar problems occur if the end user of the pH measurement information creates similar problems.***

This is particularly applicable to data acquisition systems e.g. BMS or DDC systems which use the same ground signal as the pH measurement electronics to reference the pH voltage.

Again, there are two solutions. Firstly, differential inputs could be used to measure the signal and ground reference, or preferably the output signal from the pH or ORP measurement circuitry can be electrically isolated from the remainder of the electronics. Figure 4 below depicts this preferred method.

Importantly, note this method of isolation creates no problems to the pH or ORP measurement circuitry regardless of how or what the data acquisition system may be doing or measuring.



Aquarius Technologies Pty Ltd has been manufacturing pH and ORP controllers for some time which utilise all of these isolation techniques to ensure instrumentation with the highest order of accuracy and reliability.

***The end result is a series of controllers which can be used in virtually any environment regardless of outside influences and which along with other innovative techniques, such as microprocessor circuitry which allows for P.I.D. control of dosage, and produces exceptional results for accuracy, reliability and stability.***

***In other words greatly improved control of tight water treatment chemical levels, and dramatically improved plant performance without any dramas!!***

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The author is Wayne Rann - Technical Manger of Aquarius Technologies Pty Ltd, a Quality Assured manufacturer of dosage and control equipment for the Water Treatment Industry.