pH Getting Started

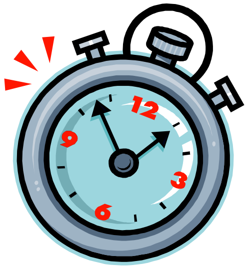
Recommendations for simple start-up:

- Place the sensor in 7.0 pH Buffer solution
- Wait 10 minutes for temperature to equilibrate and cal temp
  - Using 4 and 7 pH buffers cal meter
    - Use fresh off-the-shelf buffer
- Triple rinse and place in process
- Allow minimum time to equilibrate
- Repeat Buffer calibration in 24 hours.
- Determine appropriate cleaning and calibrating schedule for your application. Try weekly and based upon observed results increase or decrease frequency for desired results.

Potential Measuring Problems

To Troubleshoot a problem:

- Use buffers to gauge
  - response time
  - accuracy
  - stability



- Use logs to record maintenance intervals and events
- Check critical connections, seal areas, sensor surfaces
- Clean sensor and calibrate; if the sensor cannot be calibrated, it is probably time to replace it

pH Troubleshooting

Measuring Offset:

- Thoroughly decontaminate electrode with clean water
- Clean electrode tip in beaker of 5% HCl solution, < 30 seconds
- Thoroughly rinse off HCl residue with clean water
- Place electrode in beaker of fresh 7.0 pH Buffer solution
- Using electrode gently stir buffer for about 10 seconds.
- Wait for mV on controller to stabilize (should only need a few seconds)
- mV value on controller display should be 0 mV, +/- 50 mV
- Make note of mV value and retain for determining Span.

Example: mV value measured in 7.0 pH Buffer = - 10 mV

Caution: Always wear appropriate safety gear and exercise proper safety practices when working with or near liquids & chemicals

pH Troubleshooting / Maintenance

Measuring Span:

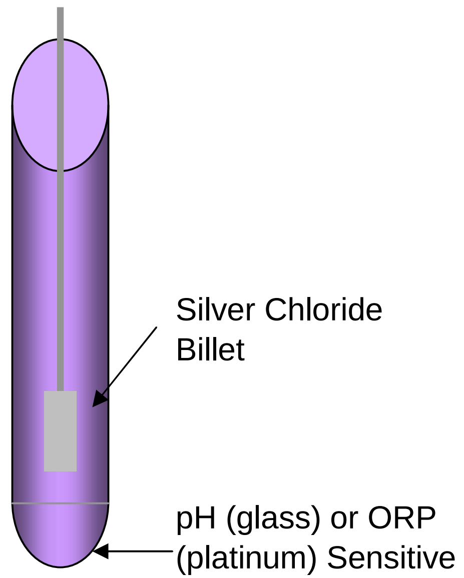
- Remove electrode from 7.0 pH Buffer solution
- Thoroughly rinse electrode with clean water
- Place electrode in beaker of fresh 4.0 pH Buffer solution
- Using electrode gently stir buffer for about 10 seconds.
- Wait for mV on controller to stabilize (should only need a few seconds)
- mV value on controller display should be +177 mV away from the value measured in 7.0 pH Buffer, +/- 50 mV.

Example: Offset value was -10 mV, therefore Span value should be +167 mV, +/- 50 mV (+117 to +217 mV)

Caution: Always wear appropriate safety gear and exercise proper safety practices when working with or near liquids & chemicals

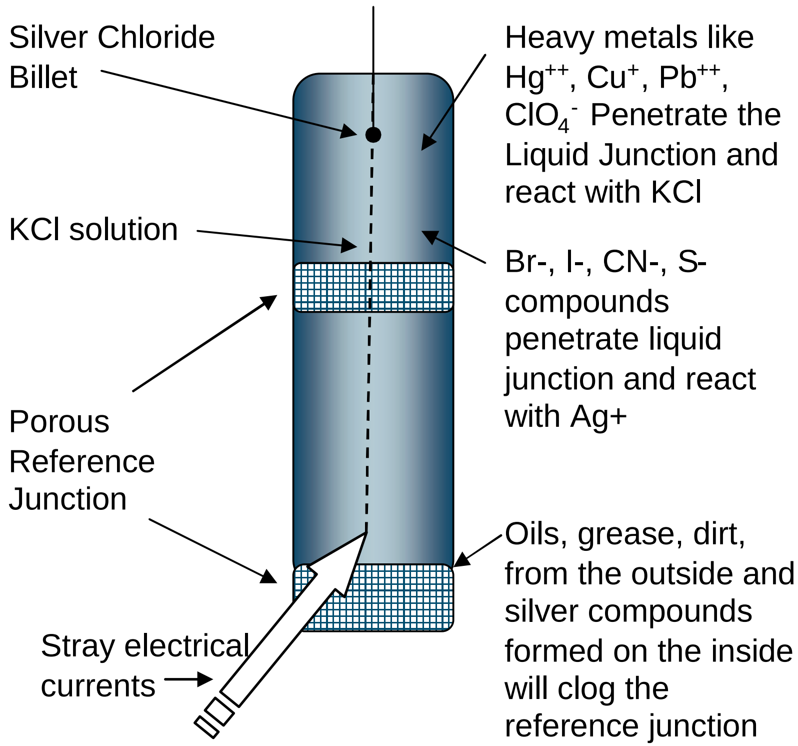
Potential Measuring Problems

What can Affect a pH Measuring or Reference Electrode Output?



pH Measuring Electrode: Internal solution and silver chloride (AgCl) wire is protected from outside elements.

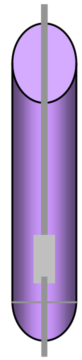
Extreme pH or temperature values, harsh chemicals, and hairline cracks will affect the reading



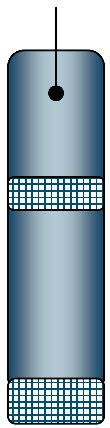
Reference Electrode: There are many elements that can affect the reference electrode.

Potential Measuring Problems

- **pH Measurement Electrode**
  - Process coating
  - Mechanical failure
  - Chemical attack



- **pH Reference Electrode**
  - Poisoning
  - Junction Blockage
  - Depletion
  - Ground Loops



+GF+

pH / ORP Troubleshooting

Occurrence:	**Effect:**
• Natural aging	mV slowly drift more positive
• Clogged Reference	Slow response in same direction
• Coated pH Glass Tip	Erratic drifting multiple direction
• Damaged pH Glass	Short Span
• Sodium Ion Error	Reads low above 12.5 pH
• Attacked Reference	Large Offset (prematurely)
• Depleted Reference	Large Offset (over time)
• Cracked Glass	mV value always around +55, or 0mV
• Shorted Wiring	mV value always around 0 mV
• Moisture intrusion	Very wrong mV values, erratic, stuck
• Glass pH Etched	>2% HF, or >12.5 pH

Note: Offset problems are typically associated with Reference half
Span problems are typically associated with Measurement half

pH Things To Watch For

- **Dry Glass / Junction** (keep submerged in liquid)
- **Clogging of reference** (avoid build-up of solids, oils/grease, salts, etc)
- **Coating of Glass** (avoid build-up of oils/grease, solids, salts, etc)
- **Etching of Glass** (avoid >2% hydrofluoric, caustics above 12.5 pH, etc)
- **Stray electrical currents** (plating baths, poor grounding)
- **Chemical attack of Reference Fill** (minimize exposure to mercury, copper, lead, perchlorate, etc)
- **Chemical attack of Reference Element** (minimize exposure to bromine, ammonia, iodine, sulphur, cyanide, etc)
- **Moisture intrusion at back of pre-amp** (properly seal seal chemistry, condensate)
- **Moisture intrusion between electrode & pre-amp** (select proper "O"-Ring and lubricant to properly seal out chemistry)
- **Cracked Glass** (mount in an easily accessible area for maintenance, away from mixer blades, do not drop)

pH Things To Watch For - continued

- **Controlling pH** (should only be performed in tank or recirculation loop)
- **Retention time** (in flow through tank, size the tank to allow at least 10 minutes for every 3 pH units of neutralization)
- **Improve pH adjustment** (use proportionally controlled metering pumps, and provide proper mixing)
- **Elevated Temperature** (increases ionic activity, decreasing electrode life)
- **Temperature fluctuations** (cause pumping of fill solution, decreasing electrode life)
- **Low conductivity solutions** (deplete electrode fill solution, decreasing electrode life)
- **Mounting angles** (use plunger type electrodes for mounting greater than 70° from vertical, or less than 30° from horizontal)

pH Electrode Cleaning

Cleaning techniques vary depending on the type of coating:

- Soft coatings can be removed by directed spray of an applicable detergent or solvent onto the junction and glass surface.
- Hard coatings can be chemically removed. Use the least harsh chemical which will remove the contaminant within two (2) minutes without attacking the materials of construction.

  Example: calcium carbonate may be removed with a 5% HCL (muriatic acid) solution.
- Oily or organic coatings can be removed with detergents or an appropriate solvent that does not attack the materials of construction such soap, or isopropyl alcohol, gently scrub junction with soft tooth brush (avoid glass area), and follow up with brief soaking(<5 min) in 0.25-0.50 Molar NaOH (sodium hydroxide).
- Remember cleaning is for the glass surface, junction surface and pores.

After Cleaning:

- Sensor may not initially behave properly; temporary offset due to the cleaning
- Soak sensor in pH 4 buffer for a few hours to regenerate

Caution: Always wear appropriate safety gear and exercise proper safety practices when working with or near liquids & chemicals

pH Storage Recommendations

- When long-term storing of boxed sensors, lay the sensor flat to maximize hydration of the reference surface. Keep the reference surface wet at all times. Store sensors at a stable room temperature.

- Remove storage boot that sensor is shipped in; keep boot and re-boot with pH 4 buffer to keep sensors wetted during storage and transportation.

- If the sensor dehydrates: Clean sensor, and soak the sensor tip in pH 4 buffer for 24 to 48 hours, then visually inspect the electrode for surface cracks, swelling, or discoloration. Severely dehydrated electrodes cannot be restored to reliable operation.

- Never expose electrode to temperatures below 0° C or allow it to dehydrate. These conditions may damage the electrode.

pH Electrode Date Codes

Signet Tech-Tips

Tech-Tip Index

Tech-Tip Reference #: TT_pH_ORP_electrode_date_codes **Date Posted:** 5/1/2006

Date Codes for pH Electrodes

George Fischer Signet general purpose pH and ORP sensors are marked with a birth date code that is located near the amplifier connection of the sensors body. This manufacturing date code is important for two reasons:

1. Distributor that stocks pH and ORP sensors should use this code to rotate stock to ensure older sensors are sold first.
2. Validate warranty claims. Please view our warranty statement at: http://www.gfsignet.com/warranty.htm

Date Codes for Signet Electrodes

1st Digit = Month	2nd Digit = Year
N = January	6 = 2001
M = February	7 = 2002
L = March	8 = 2003
K = April	9 = 2004
J = May	0 = 2005
H = June	1 = 2006
G = July	2 = 2007
F = August	3 = 2008
E = September	4 = 2009
D = October	5 = 2010
C = November	6 = 2011
B = December	7 = 2012