pH Electrode Troubleshooting Guide

Drifting/Erratic Readings

Contamination on sensing glass – Clean your electrodes regularly. Visit www.hannainst.com/cleaning for a selection of application-specific cleaning solutions.

Clogged junction – Depending on the sample clogging the electrode, use application specific cleaning solutions.
Visit hannainst.com/cleaning for a list of application specific cleaning solutions.

If the junction is constantly clogging due to measurement in semi solid or viscous samples, use a pH electrode that has an open junction design like the FC200. Visit hannainst.com/electrodes for a complete list of electrodes.

Low conductivity sample – Use an electrode that has a high junction flow rate or add high purity potassium chloride (KCl) to increase conductivity. The triple ceramic junction of the HI1053 allows for stable readings in low conductivity samples.

Electrode is not properly hydrated – Use HI70300L storage solution and soak for at least one hour.

Electrical noise interference –Noise from rectifiers, motors, pumps or ballasts can interfere with the high impedance measuring circuit. Direct measurement can be taken with an amplified electrode or electrodes with a matching pin, otherwise take a grab sample and measure away from the electronics. The Hanna H99XXX series of meters are application specific and have amplified electrodes built in.
Visit hannainst.com/amplified for a full selection.

Inaccurate Readings

Wiping a pH electrode with tissue– Wiping or rubbing an electrode can cause static electricity buildup, removal of the hydration layer on the electrode bulb, or scratching of the electrode surface. If removal of liquid from electrode bulb is required be sure to blot with lint-free paper towel (e.g. Kimwipes®).

Improper calibration – Make sure that pH electrode is rinsed with distilled water (DI) between calibration buffers to prevent cross-contamination, and the electrode is at thermal equilibrium with the buffer. Be sure to use fresh buffer for each calibration.

Hanna recommends using distilled water (DI) for rising electrodes; however, deionized , RO, pure, or demi water, all work.

(For meters that have mV setting) Check offset and slope of electrode. First put the meter in mV mode then place the electrode in pH 7.01 buffer, the mV should read ±30 mV; if outside of this range, try cleaning the electrode. Slope (difference in mV from pH 7.01 and pH 4.01) must be 150-186mV (85%-105%). If the slope is less than 85% or more than 105% then use fresh buffers, change fill solution (refillable electrodes only), and clean electrode. If the slope is not between 85% to 105%, replace electrode.

Buffers will change their value after they have been opened. pH 10.01 buffer is especially susceptible to contamination from atmospheric CO_2 diffusion. pH 10.01 buffer should be used within 1-2 weeks after opening the bottle. pH 4.01 and pH7.01 should be used within 4-8 weeks of opening.

Calibrating and measuring at different temperatures–Either use a meter that has automatic temperature compensation, or calibrate and measure at the same temperature. Note that the buffer pH at various temperatures will change. These differences are noted on buffer bottles.

Frozen pH Readings

Broken electrode – The pH meter will display the same value when placed in different buffers or samples. This indicates a crack or break in the sensing glass.

How to calculate offset and slope

(For meters that have mV setting) The procedure below is based on calibration buffers at 25°C. At this temperature the 100% theoretical slope is 59.16 mV/pH change from pH 7.01. Buffer values differ based on temperature, but temperature compensation corrects for these changes. To perform a slope check put the meter in mV mode.

Step 1 Measure mV of pH 7.01 buffer and record value
Step 2 Measure mV value of pH 4.01 buffer and record value
Step 3 Calculate the absolute mV difference (pH 4.01 value - pH 7.01 value)
Step 4 Calculate the slope (mV difference/3)/59.16) = Slope)

Examples

Electrode 1 pH 7.01 = -15 mV
pH 4.01 = +160 mV
Absolute mV difference is +160 mV - (-15 mV) = +175 mV
Slope = (175/3)/59.16 = 98%

Electrode 2 pH 7.01 = +15 mV
pH 4.01 = +160 mV
Absolute mV difference is +160 mV - (+15 mV) = +145 mV
Slope = (145/3)/59.16 = 82%

Conclusion: Electrode 1 is working properly while electrode 2 has an unacceptable slope. Change the fill solution, clean, condition, and calibrate the electrode, if this does not improve the slope, replace the electrode.

pH Electrodes Life Span (< 6 months)

Testing high temperature samples

Elevated temperatures reduce the life span of pH electrodes. At room temperature (25°C), a pH electrode will typically last 1 to 2 years. A general rule is that for every 25°C increase, the electrode life will decrease by ½.

Operating Temperature	Average Lifespan
25°C	1 to 2 years
50°C	6 to 12 months
75°C	3 to 6 months
100°C	<1 month

If measuring samples at temperatures greater than 50°C, use a pH electrode with high temperature (HT) glass such as the HI1043.

Storing a pH electrode in purified water – Purified water (DI) will cause an osmotic effect on the internal reference solution and will decrease electrode life. If using a refillable pH electrode, replace fill solution; if using a gel-filled electrode, the electrode will have to be replaced. When not in use, be sure to store electrodes in storage solution HI70300L is recommended.

Solutions with hydrofluoric acid will dissolve the glass. Use electrodes with HF resistant glass. The HI1143 will resist HF up to 2 g/L @ pH 2 at temperatures less than 60°C.

Hanna has put together this guide to serve as a quick reference tool. Always remember to consult the instruction manual or contact us directly for detailed instructions for your specific needs.

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Clean Regularly | **Calibrate** Often | **Condition** Always

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