

On the Care and Feeding of pH Probes...



A sample of standard pH probes and calibration solutions..

pH probes...

Are probably the most common process sensor used in industry today..., with the possible exception of the temperature probe.

There are many varieties of pH probes. Some are designed for quick response such as in a lab environment, others for slower response but long term use. Some are meant for measuring pH in very small samples, and are usually very fragile. Others are used for very rugged applications such as in waste water treatment plants. This article will address some of the basic do's and don'ts, and will introduce several types commonly used in agricultural, aquacultural and industrial processes, among others.

Care and feeding of pH probes..

There are a few basic rules for using and storing pH probes. Follow them, and the probes will last a long time.

- Never touch the delicate glass tip of the probe. It will break!
- Never let the probe dry out. Store it in a buffer solution of pH 7.0, or pH 4.0
- Never store a pH probe in distilled or deionized water
- Always rinse the probe before storing it.
- When taking a fresh probe out of storage, shake the probe down, as you would do with a thermometer, to clear any air bubbles that might be present at the junctions.

As you can see from the above rules, most of the problems with pH probes come from not following proper procedures for handling and storage. Here's some additional hints: If you intend to use the probe in a solution of pH 7 or greater, store the probe in a buffer solution of pH 7. If you intend to use it in a solution below pH7, store the probe in a buffer solution of pH 4.

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If the probe has been stored for some time at pH 4, and you need to use it in a solution of pH 8 or above, you will probably find that the probe doesn't respond too well, or has a severe drift problem. You might get better results sooner if you briefly place the probe in a bleach solution with a pH of 10 or higher. Leave it in the solution for about 15 minutes. This will "shock" the probe and clean the probe tip.

The same problem can occur if you've stored the probe in a solution of pH 7, and need to use it in a solution of pH 4 or below. In this case, clean the tip by immersing it in a pH 1 buffer solution (0.1 M HCl) for 10 to 15 minutes.

Should the glass membrane dry out, you can usually restore it by placing the tip in a fresh buffer solution of pH 4 or pH 7, and let it soak for at least an hour. If the tip has dried for more than several days, it may have caused permanent damage, and the probe may need to be replaced.

If the probe still has an excessive drifting problem, or very slow response, soak the tip in a warm (about 120 Deg F.) buffer solution of pH 4 for an hour. Rinse the tip well with deionized or distilled water before using it. If the problem persists, place the probe in a pH 1 buffer solution (0.1M HCl) for at least an hour, rinse well with distilled water, then place the tip in a pH 4 solution and re-check.

If the probe fails to respond:

If the readings are noisy and fluctuating, it may be due to a clogged or dirty junction. Clean the tip in the pH 1 buffer (0.1M HCl) solution for 1 hour, then rinse in distilled water. Refer to the maintenance tips above.

The probe may have developed an air bubble at the reference junction. Shake the probe to clear the bubble. Refer to the maintenance tips above.

In some rare cases, the probe may have exhausted the reference solution of the internal reference junction. If this is the case, either re-fill the junction solution, or, in the case of a gel solution, replace the probe.

The probe tip may also be cracked or leaking. If either is the case, replace the probe.

On using a pH probe:

Single junction pH probes are less costly than double junction types. Single junction probes tend to suffer from drift and offset problems caused by chemical poisoning of the probe.

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A solution to this is to use the much more stable double junction probe. This probe type simply provides a second chemical barrier between the reference electrode and the process fluid. This is done to help slow down the effects of electrode poisoning. Our experience has shown that the double junction probes also have a higher tolerance to electrical interference and electrochemical “stripping” of the reference cell over prolonged, continuous use periods.

Another big problem with pH measurements, in general, is the potential difference that can exist between the solution the probe is immersed in and the electronics of the measuring system. Usually, this results from a difference in ground reference between the two systems, which can be caused by electrical noise induced by a motor controller, faulty wiring, or other noise source. In these cases, it's imperative that the measuring instrument or amplifier have an electrically isolated input.

Electrical potentials between the probe and the measuring instrument also cause electrochemical “stripping”, or depletion of the reference junction solution in the probe, causing premature failure. By using an electrically isolated amplifier (usually an optically isolated amplifier), probe life can often exceed several years, even in continuous use, 24/7 process control applications.



Long term storage:

Over a period of time, some of the storage solution will leak out of the protective enclosure. Here's an example:

Note the formation of crystals around the container seal.

This is not a problem, except when the solution totally evaporates in the container.

Replenish the solution if necessary.