Use and Care of a pH Meter

A MoreManual!™

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Congratulations!

Your new *MoreWine!* pH meter is a great addition to your home winery. Knowledge of the pH of your wine can give you insight into the correct sulifite levels for your wine, the wine's suitability for Malolactic Fermentation and how well your wine will age in the bottle. You can also use the pH meter to help more accurately determine the endpoint of a Total Acidity test in red wines where it can be hard to determine by color change. Please take a few minutes to thoroughly review the following information paper, it has been written to help you get the longest life and best performance out of your meter.

Parts of a pH Meter:

Your pH meter consists of two or three basic parts, depending on the model you have purchased. All meters will have a main body component, which houses the microchip used to process the measurements made by the meter and the meter's display. All meters also have a probe (also commonly called an electrode) which is the part where the measurement actually takes place. The probe is the consumable, sensitive, and most expensive part of the meter; and should be handled with care. Some pH meters are equipped with the ability to measure the temperature of the solution being measured and account for it in the reading that the meter displays. This feature is called ATC, for "Automatic Temperature Compensation." Since pH is directly influenced by the temperature of the solution, this is a great feature! Some ATC pH meters have the temperature sensor built into the electrode, and some have an independent thermometer probe which plugs into its own port on the back of the body of the meter.

How a pH Meter Works:

A pH meter works by measuring the change in electronic voltage potential when it is immersed in the solution being tested. The pH unit is a measure of the acidity of a solution, taken by measuring the concentration of free, positively charged Hydrogen ions in the solution. For winemakers, this is different from expressing the acidity of the wine in terms of the physical number of grams of solid acids there are present in the wine - which is done through the TA test.

The meter's electrode is filled with an electrolyte solution that responds to the presence of positively charged Hydrogen ions. The elecrolyte does this by accepting or releasing electrons in an effort to keep the environment charge-neutral, with no more positively charged particles than negatively charged ones. As this happens, the amount of electrons available to flow between the solutions - the voltage potential - of the solution changes. This change is what the meter is measuring and then extrapolating into the number that you see on the display of the meter. This is important to understand because it shows how the electrode is the most important part of the meter - and because it is pretty neat!

The electrode has a membrane on the outside of the glass tip which regulates the flow of the Hydrogen ions in to the electrode and the electrolyte solution out of it. As the meter is used this membrane slowly degrades for a variety of reasons. This degradation is a large part of why an electrode wears out and needs to be replaced - if the membrane can't regulate the flow of the solutions back and forth, then the meter can't accurately determine the change in voltage. The other reason that a probe wears out is that the general net flow of solutions is in the direction of the electrolyte solution flowing into the test sample, so eventually you'll run out of it even if you maintain the probe's membrane impeccably - unless you're working with a high-end pH meter which features a refillable electrode.

Now let's get you using your meter!

Conditioning Your Probe:

The first thing that you'll need to do with a new pH meter is to condition the probe. Your meter should have come with a layer of white crystals all over it, resembling sea salt - this is perfectly normal and is actually done on purpose by the manufacturer in an effort to protect the probe while it sits on the shelf at our or another distributor's facility. So you need to get these crystals off the probe and, more importantly, out of the pores of the membrane on the electrode. Failure to do this will result in trouble calibrating the meter and taking readings, and is the primary cause of out-of-the-box problems that we troubleshoot for customers. Here's what you want to do:

- Rinse the majority of the crystals off of the electrode under the running tap.
- Now soak the electrode in distilled water if possible, or tap water if not, for 1-2 hours.

This process will absorb the last, invisible, layer of crystals out of your probe's membrane and yield a meter that is prepared to be used.

Calibrating Your Meter:

Before the pH meter can give you accurate readings, it needs to index itself against at least one solution of a known pH. Most pH meters are set up to perform 2-point calibrations using a pair of the three built-in calibration points - usually pH 4.00, 7.01 and 10.01 - depending on what you'll be measuring. As brewers and winemakers, we deal with acidic solutions rather than basic ones, so it is appropriate to calibrate your meter using the 7.01 and 4.00 points. Some meters have an expanded range of calibration points that the user can set, and can be capable of using three or more calibration points for added precision. Your meter should have been supplied with a set of small packets, called sachets, of solutions which have the same pH as the calibration points programmed into the meter. You can use these to get going, but you'll want to purchase a set of calibration standards ***(MT610)****, which are also called "buffers" for their ability to resist changes in pH if some acid or base is added to them.

> ****Note:** If you are using the MT616 Hanna Pro Series meter your calibration points are 7.01 and 3.00, and you'll need to purchase a different buffer for your low-point calibration. The part number for this is MT611.*

Every pH meter has a slightly different method of initiating the calibration procedure and accepting each calibration point. Please refer to your meter's included instructions for this procedure. The following is a general outline of how the calibration should be performed.

- To calibrate the meter, you'll need to have 3 small glass jars or beakers - or two jars and a wash bottle (*MT644*).
- Fill two of the jars with enough of each calibrating solution to submerge the electrode in. If you aren't using a wash bottle, then fill the third jar about halfway with distilled water for rinsing.
- Enter your meter's calibration mode. The meter should ask for the 7.01 buffer first. Submerge the probe in the buffer while gently swirling the glass to ensure there is a constant supply of fresh buffer solution in contact with the probe.
- When the meter accepts the first reading, confirm it to the meter as per its own instructions. Then rinse the meter in your jar or with the wash bottle, shake off the excess water. The meter will now be asking for the second buffer, likely the pH 4.00 solution.
- Place the meter in the second buffer, swirling it, and wait for the meter to accept this reading. Confirm the reading to the meter, and you're set to start making pH measurements

  > ****Note:** If you're calibrating the meter for the first time, right out of the conditioning water, you'll want to shake as much of the water off of the electrode as possible before immersing it in the buffer, as though you were shaking down an old mercury thermometer. If the meter has been stored, discard the old storage solution and rinse the probe in your jar or with the wash bottle. Shake any excess water off the probe before putting it in the buffer. **DO NOT** attempt to dry off the probe with a cloth or paper towel, you risk damaging the probe's membrane.*

Taking a Reading:

Taking a pH reading of a sample solution is a pretty straightforward thing to do. There are only two key things to keep in mind. First, the sample must completely cover the probe to ensure an accurate reading. Secondly, you always want to rinse the probe with distilled water between different samples and between your calibration buffers and your samples. So to take a reading, do as follows:

- Turn on and calibrate your pH meter.
- After rinsing the second calibration buffer off of the probe, submerge it in your sample to be tested.
- Swirl the container in which you've got your sample gently to ensure a constant supply of fresh sample be in contact with the probe.
- Allow enough time for your meter's reading to stabilize. The amount of time this takes will depend on the model of pH meter you have and the condition of the probe. As time goes by you'll get to have a pretty good idea of how long your meter takes to stabilize a reading. If your reading won't stabilize, please see the troubleshooting section below.
- When you're finished, give the probe one final rinse, and return the cap to it with fresh storage solution.

Other Tips:

- Your pH electrode should be stored in a solution that is designed to maintain the integrity of the electrode and prevent the electrolyte solution from leaching out. We sell an electrode storage solution under part number *MT618*.
- As we've said, the probe is the consumable and most expensive part of the meter. As an owner, there are two things that you can do to help ensure the longest life out of the probe that comes with your meter. The first is to be on top of keeping your electrode in fresh storage solution. If you don't use your meter for an extended period of time, be sure to change the storage solution about every 6 weeks. Never store your electrode in water or in pH 7.01 buffer solution, as this will leach the electrolyte solution out of the meter and shorten its service life. Secondly, be careful with your probe. Take care not to allow it to physically bang into the wall or rim of your testing vials, as this could damage the membrane.
- All told, with proper care, most pH electrodes will last 12-18 months before they require replacement.

Troubleshooting:

**All Troubleshooting entries are in the "problem" = "· solution" format.*

> ****Note:** Problems with a meter's ciruitry are rare and usually exhibit a number of unusual symptoms if the meter will turn on at all. We always approach this as the last possible thing that could be going wrong.*

1) My meter won't turn on =

   Likely a result of depleted batteries. Otherwise there is an issue with your circuit board.

2) My meter won't calibrate =

   Ensure that your calibrating buffers are fresh.

   If the meter is brand new then it most likely needs to continue to soak in water to finish conditioning; otherwise there is a defect in the electrode or the circuitry.

   If the meter worked in the past and will no longer calibrate, either the electrode has worn out or you have developed a problem in the circuitry of the meter.

3) My meter's reading drifts =

   The electrode is damaged or worn out.

4) My meter takes too long to stabilize =

   If you've used the meter heavily during the crush season as a winemaker, then this can be caused by a clogging of the membrane by some of the wine particles. You can try cleaning the electrode with some Cleaning Solution for Wine Deposits (*MT619*). Soak the probe in this solution for 30-60 minutes then re-condition in water and re-calibrate the meter.

   Be sure to swirl your container to keep fresh sample in contact with the electrode.