Atlas Scientific™
Environmental Robotics

V 1.4
Revised 2/12/19

Mini
pH Probe

Silver / silver chloride

Reads	**pH**
Range	**0 – 14**
Accuracy	**+/– 0.002**
Connector	**SMA**
Resolution	**+/- 0.0001**
Response time	**95% in 1s**
Max pressure	**100 PSI**
Max depth	**60m (197 ft)**
Temperature range °C	**1 – 99 °C**
Cable length	**89mm (3.5”)**
Internal temperature sensor	**No**
Time before recalibration	**~3 Months**
Life expectancy	**~1.5 Years**
Maintenance	**N/A**

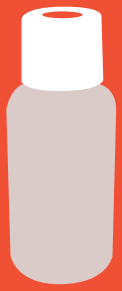
Specifications

Max depth	**60m (197 ft)**
Cable length	**89mm (3.5")**
Weight	**29 grams**
Speed of response	**95% in 1 second**
Isopotential point	**pH 7.00 (0 mV)**
Dimensions	**9.5mm x 65mm (0.4" x 2.5")**
SMA connector	**Yes**
Sterilization	**Chemical only**
Food safe	**Yes**

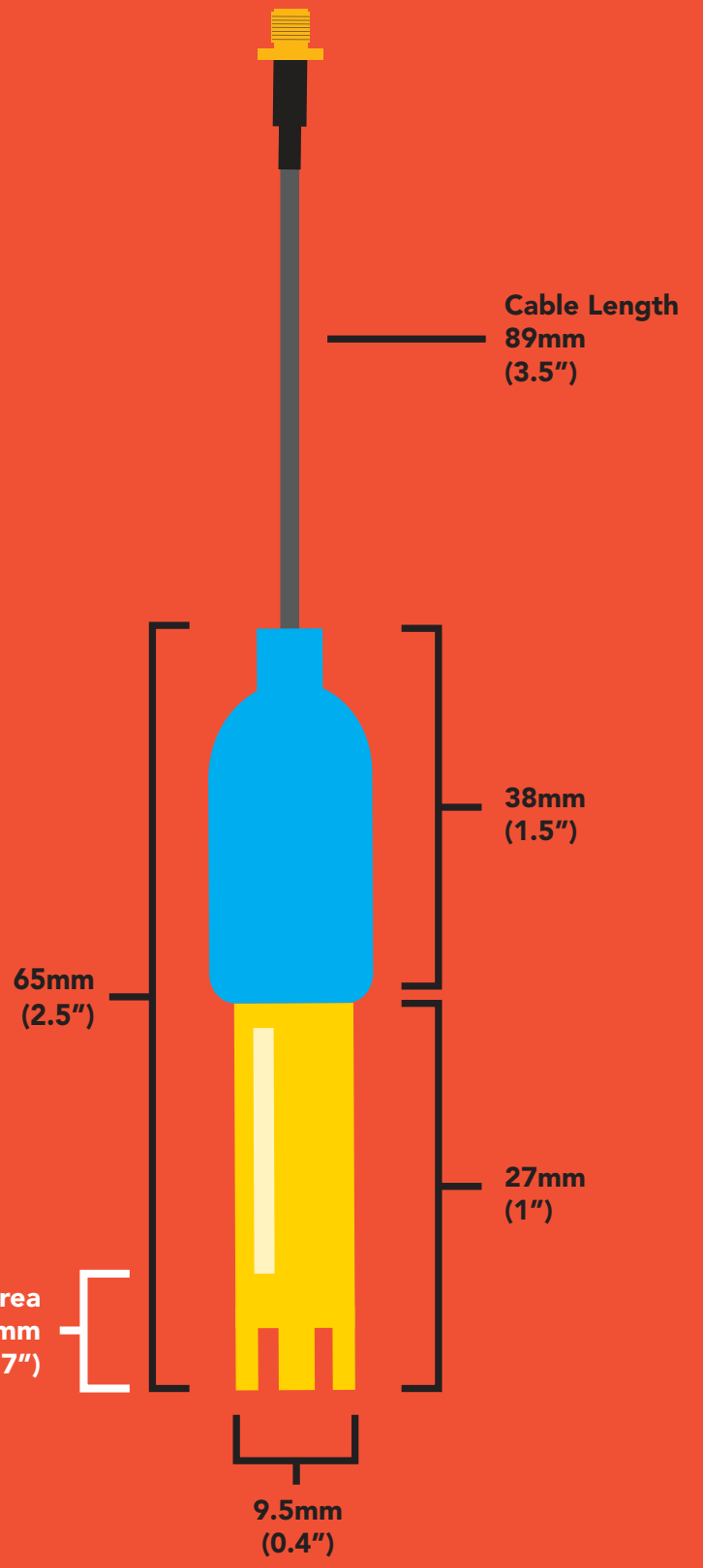
Typical Applications

- Standard lab use
- Field use
- Soil
- Low ionic and ultra-pure water
- High pH solutions (up to 14 pH)
- Samples containing heavy metals
- Hydroponics / aquaponics
- Beer, wine and other liquor

This Mini pH Probe can be *fully submerged* in fresh or salt water, up to the SMA connector *indefinitely*.



Soaker bottle
~3.8 pH



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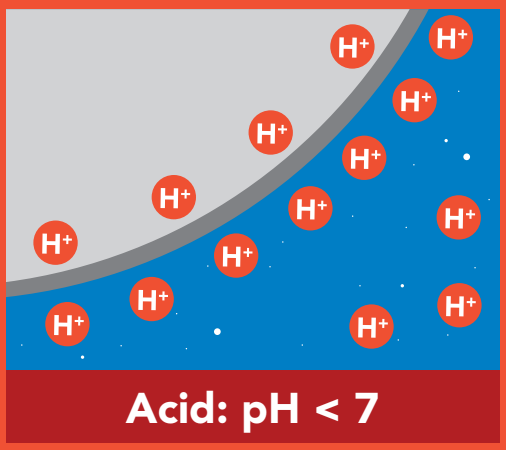
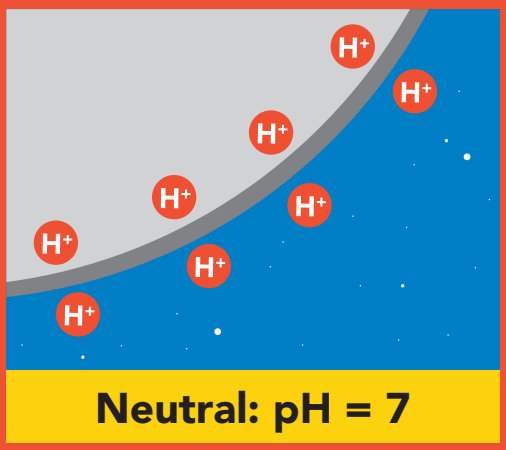
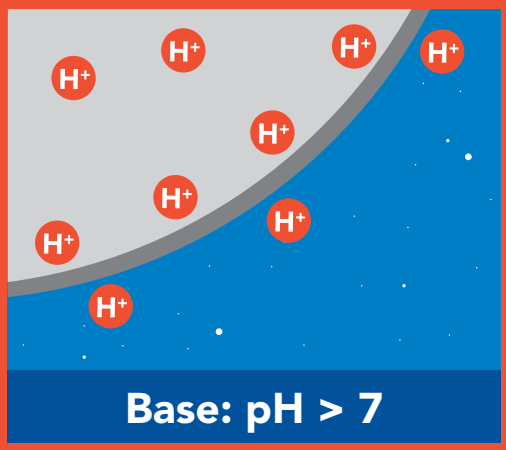
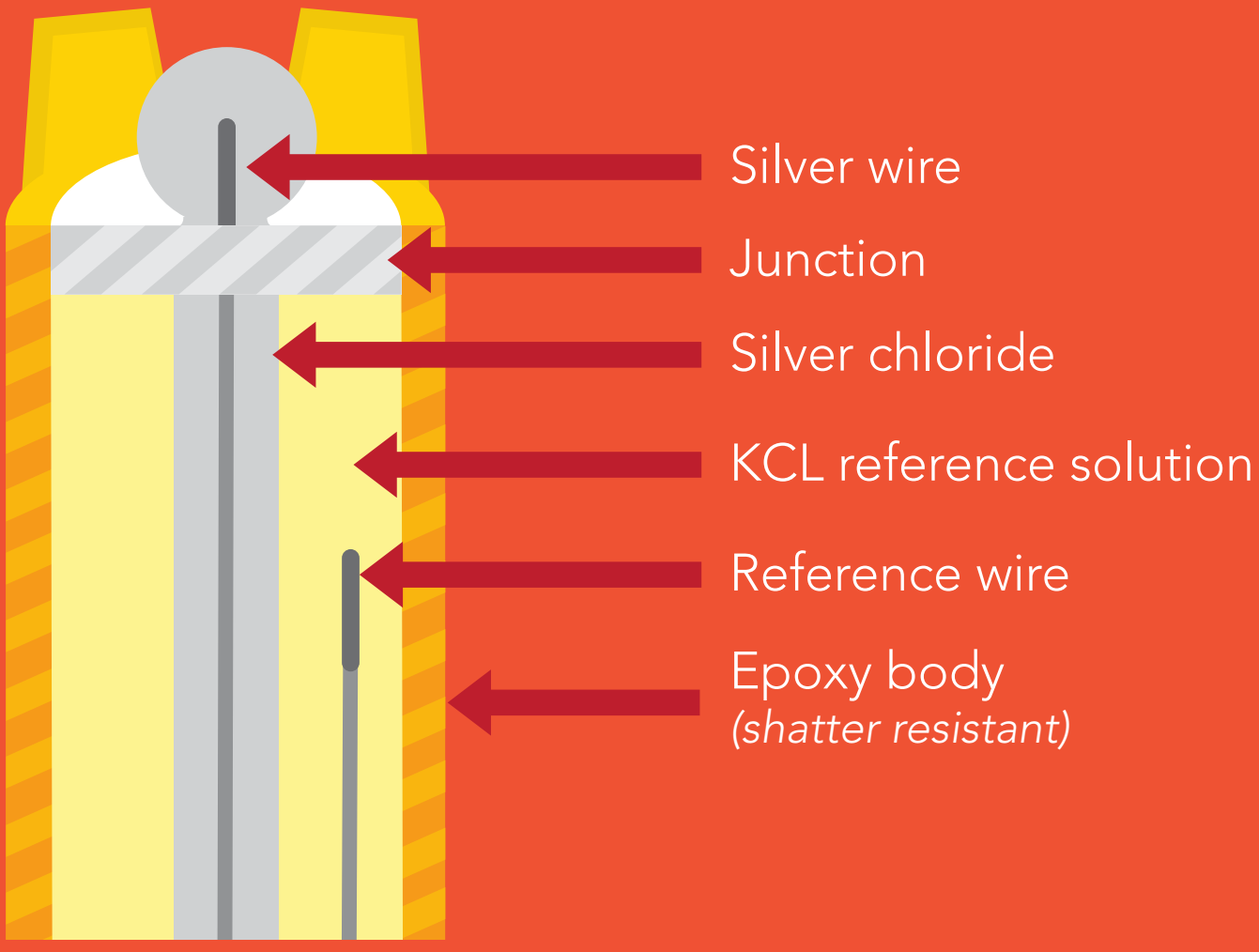
Operating principle

A pH ***(potential of Hydrogen)*** probe measures the hydrogen ion activity in a liquid. At the tip of a pH probe is a glass membrane. This glass membrane permits hydrogen ions from the liquid being measured to defuse into the outer layer of the glass, while larger ions remain in the solution. The difference in the concentration of hydrogen ions (outside the probe vs. inside the probe) creates a VERY small current. This current is proportional to the concentration of hydrogen ions in the liquid being measured.



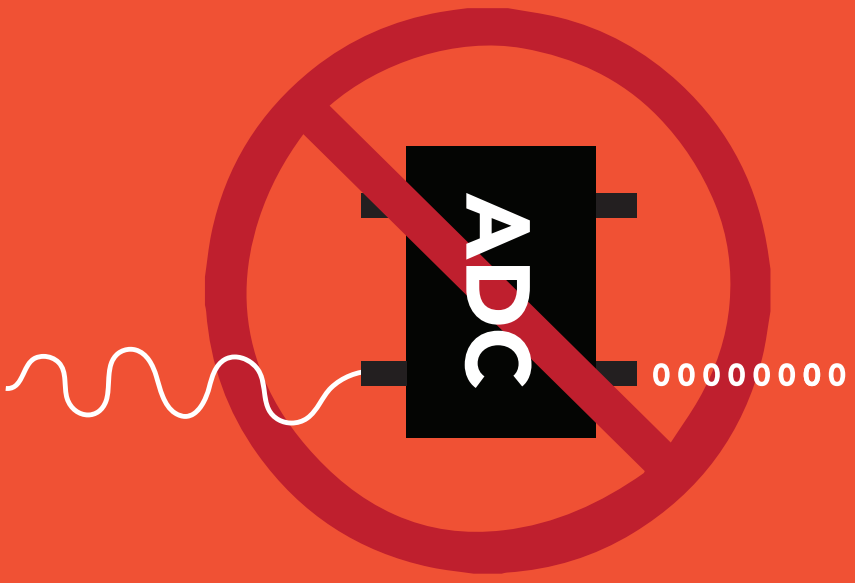






A pH electrode is a passive device that detects a current generated from hydrogen ion activity. This current *(which can be positive or negative)* is *very weak and cannot be detected with a multimeter, or an analog to digital converter.* This weak electrical signal can easily be disrupted and care should be taken to only use proper connectors and cables.

Result will ***always*** read zero.



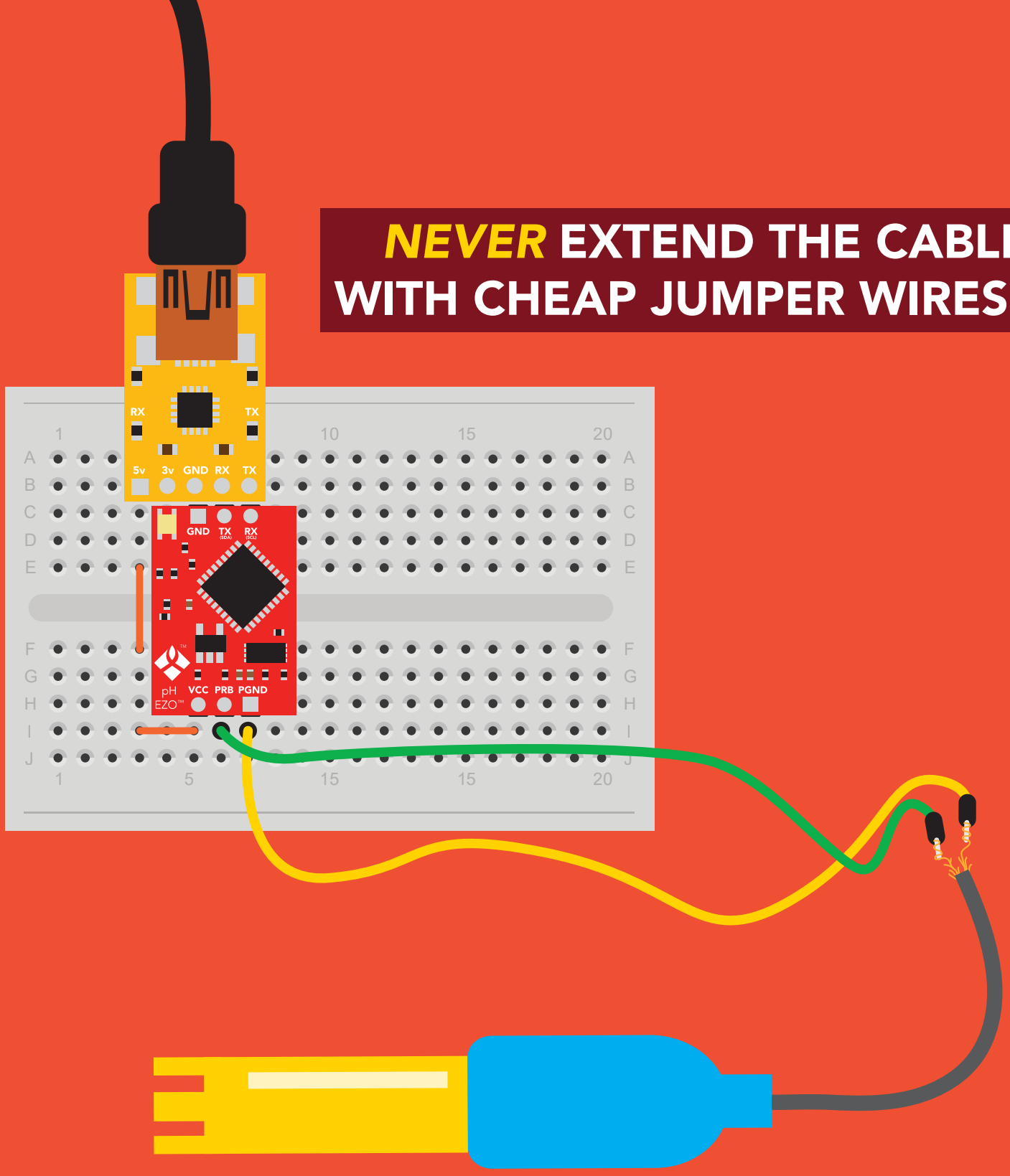
Result will ***always*** read zero.

The current that is generated from the hydrogen ion activity is the reciprocal of that activity and can be predicted using this equation:

$$E = E^0 + \frac{RT}{F}\ln(\alpha_{H+}) = E^0 - \frac{2.303RT}{F}pH$$

Where **R** is the ideal gas constant.
T is the temperature in Kelvin.
F is the Faraday constant.

Because a pH probe is a passive device it can pick up voltages that are transmitted through the solution being measured. This will result in incorrect readings and will slowly damage the pH probe over time. In this instance, proper isolation is required.



NEVER EXTEND THE CABLE WITH CHEAP JUMPER WIRES!

DO NOT CUT THE PROBE CABLE WITHOUT REFERING TO *THIS DOCUMENT!*

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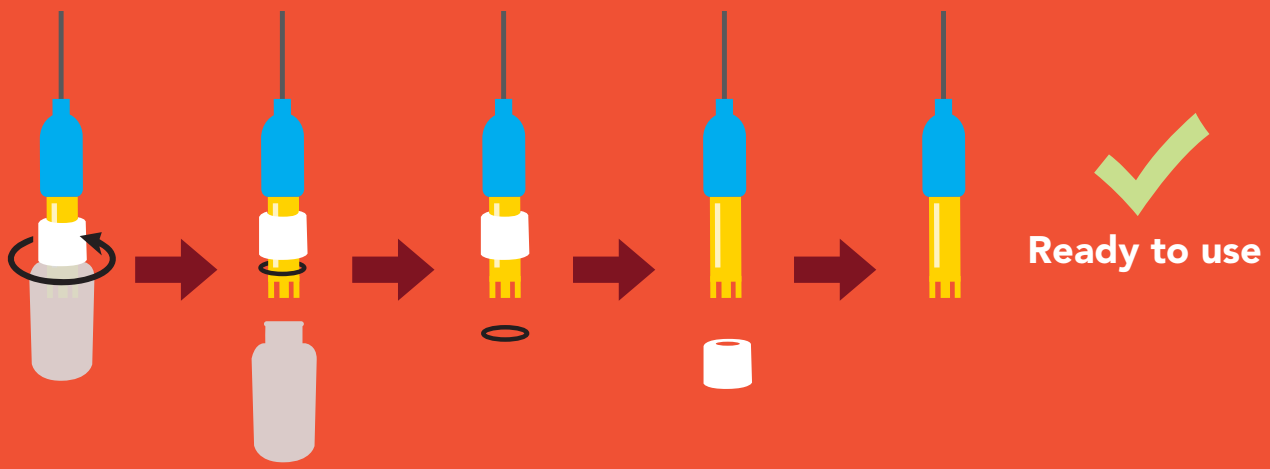
Helpful operating tips

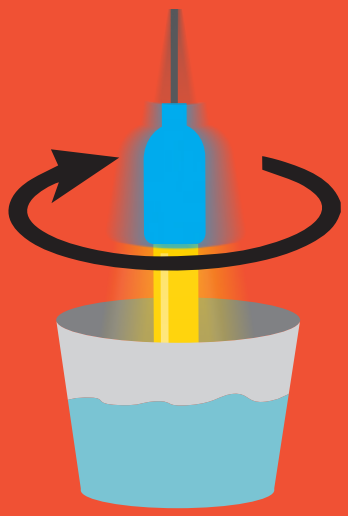
pH probes must stay wet and cannot be allowed to dry out, this is why every pH probe is shipped in a plastic soaker bottle containing pH probe storage solution. The probe should remain in the bottle until it is used. If the probe is used infrequently, the bottle and its solution should be saved and the probe stored inside.

1 Remove the probe by loosening the cap of the soaker bottle, turning it counter clockwise and pulling the probe up and out. Then, slide the O-ring and the cap off the probe.



2 During shipment the air bubble in the probes stem may move into the bulb area. If bubbles are seen in the bulb area, hold the probe by its top cap and shake downward as done with a clinical thermometer.

3 Vigorously stir the probe in the sample, calibration solution, or rinse solution. This action will bring solution to the probes surface quicker and improve the speed of response.



Response time

Probe cleaning

Coating of the pH bulb can lead to erroneous readings including shortened span (slope). The type of coating will determine the cleaning technique. Soft coatings can be removed by vigorous stirring or by the use of a squirt bottle. Organic chemical, or hard coatings, should be chemically removed. A light bleach solution or even a 5 – 10% hydrochloric acid (HCl) soak for a few minutes, often removes many coatings. If cleaning does not restore performance, reconditioning may be tried. ***Do not use a brush or abrasive materials on the pH probe.***

How often do you need to recalibrate a pH probe?

Because every use case is different, there is no set schedule for recalibration.

If you are using your probe in a fish tank, a hydroponic system or any environment that has generally weak levels of acids and bases you will only need to recalibrate your probe once per year for the first two years. After that every ~three months.

If you are using the pH probe in batch chemical manufacturing, industrial process, or in a solution that is known to have strong acids and bases, then calibration should be done monthly or in extreme cases after each batch.

Probe reconditioning

When reconditioning your pH probe is required due to aging, we recommend you use the **Atlas Scientific pH probe reconditioning kit**.