

# pH measurement is easy, until you automate it...

Ever noticed pH in the water reservoir is different from the same water in a cup?

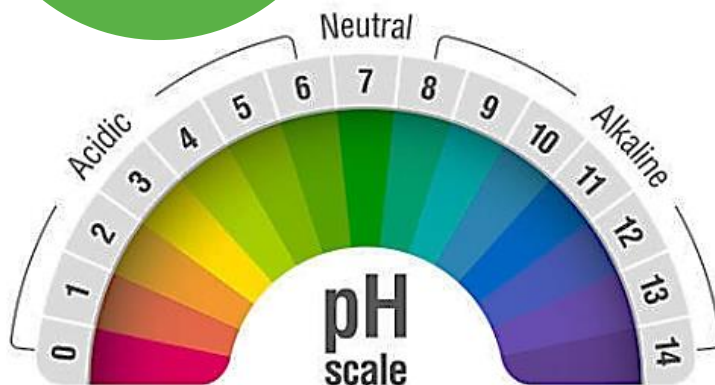
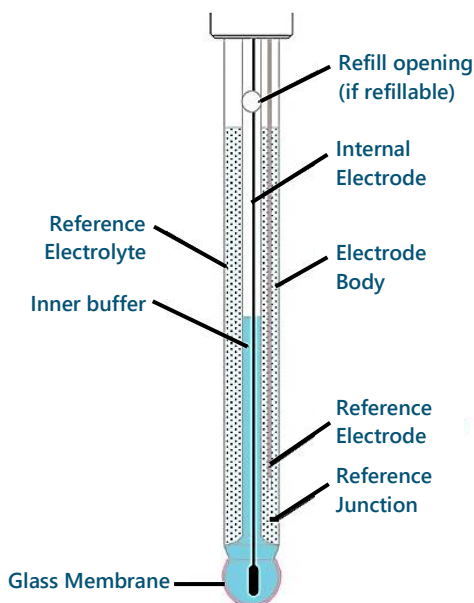


## What is pH?

pH is simply the measurement of H<sup>+</sup> ions and OH<sup>-</sup> ions.

- Neutral pH is 7 (H<sup>+</sup> equals OH<sup>-</sup>)
- pH 0 to 7 is acidic (more H<sup>+</sup> ions)
- pH 7 to 14 is alkaline (more OH<sup>-</sup> ions)

## What is in a pH probe?



## How it works

During pH measurement, there is an ion exchange phenomenon which creates a small voltage (or electrical potential) across the 'glass membrane' surface that is picked up.

As a result, the voltage generated by the solution is equivalent to the pH meter value.

↓ Voltage = less H<sup>+</sup> / more OH<sup>-</sup> = ↓ acidity = ↑ pH

↑ Voltage = more H<sup>+</sup> / less OH<sup>-</sup> = ↑ acidity = ↓ pH

## Electrolyte Solution Types

Gel & Electrode Filling Solutions (Electrolyte) are all 3M Potassium Chloride (KCl).

3M KCl solution is made by dissolving 22.37 grams of potassium chloride into 100 mL of deionised (DI) or distilled water.

pH storage solution is also recommended to be a 3M KCl solution.

## Bad pH readings are caused by grounding loops!

Grounding loops (stray electrical current) from equipment like pumps will cause problems for a passive instrument measuring an electrical potential across a 'glass membrane'.

The presence of ground loops is not merely something that distorts the readings but rather something that also polarizes and damages the sensor.

## Grounding Loop (stray electrical current)



### Small Electrical Potential Grounding

±0.030V greatly impacts pH

0.000V to 0.059V

Changes the pH by 1 whole unit

Grounding loops sources can include

Pump 12V / Stirrer 24V / Aerator 240V

## LazyGrow has an isolate pH system

This keeps the reference wire safe from grounding loops and stray electrical current.

And stabilises pH readings.

## pH Storage

Do NOT store the electrode in deionized water.

Use 3M KCl electrode solution for pH storage.

	Refillable	Replaceable
Lifespan	3 to 5 years average	6mth to 5 years
Applications	Best for pH extremes Variable applications	General use
Cost	Initially more expensive But more cost effective over time	Cheaper initially But <b>more replacements</b>
Accuracy	Equal	Equal
Maintenance	Requires refilling as the electrolyte flows fast than gel electrolyte A faster flowing electrolyte reduces the pH probe 'glass membrane' fouling	No refills and gel electrolyte lasts longer
What kills a pH probe?	<ul style="list-style-type: none"> <li>• Breaking glass membrane bulb. The smallest crack in the 'glass membrane' will cause the probe readings to become unstable.</li> <li>• The reference wire is oxidised over time and eventually dies. Ground loops (stray electrical current) will oxidise the wire very fast. LazyGrow isolated pH system protects the probe.</li> </ul>	

