Frequently Asked Questions

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What is the output from a pH electrode?

Most pH electrodes use a specially formulated glass bulb to sense the acidity of a solution. These electrodes create a millivolt potential of 59.16 mV per pH unit at 25°C with the zero potential set at pH 7. The polarity of the signal is positive on the acid side and negative on the alkaline side. The electrical resistance of the glass is very high, 100 - 1000 meg-ohms, so high input impedance millivolt meters must be used for measurement.

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What should I store the electrode in when it is not in use?

Most electrodes used today are combination electrodes, that is they have a glass pH electrode and a reference electrode in one body. Glass electrodes perform best when stored in slightly acidic solutions, pH 4 buffer is a good choice. Reference electrodes perform best when stored in the same electrolyte that is immediately inside the reference junction, typically saturated KCl. An optimal storage solution for combination electrodes is pH 4 buffer (clear not pink) with 225 grams of KCl per liter. Table salt, NaCl, can be used if KCl is not readily available. Distilled or deionized water should never be used as a storage solution unless you like buying new pH electrodes.

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Should my lab electrode be a sealed or refillable electrode?

When properly used neither design is inherently more accurate than the other. Sealed electrodes are convenient and suitable for most applications. Refillable electrodes allow the user to fill the reference cell with the solution of their choice, possibly improving the performance compared to a standard KCl electrolyte. The reference electrolyte in the refillable design can be recharged when it becomes depleted extending the electrodes life. It is a question of convenience vs versatility.

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Why should I use a Double Junction reference electrode?

A double junction reference has two chambers, the standard KCl-AgCl reference cell and a cell at the front of the electrode containing a screening electrolyte, typically KNO3. Many applications contain materials that will react with the silver or chloride in the primary reference cell either fouling the reference junction or poisoning the silver wire. The nitrate (KNO3)cell provides extra life by screening the poisoning ions and minimizing precipitation reactions that could clog the reference junction. If your application contains metals, cyanides or sulfides a double junction is needed, if you are unsure, use a double junction reference cell.

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How does temperature effect a pH electrode?

The theoretical output of a pH electrode at 25°C is 59.16 mV/pH unit. The output varies directly as a ratio of the temperatures in °K, if the temperature increases the output increases. This is the parameter that automatic temperature compensation in a pH meter compensates for the electrical resistance of the pH glass varies inversely with temperature, as the temperature decreases the resistance increases, roughly doubling every 7°C. Cold measurements increase the resistance of the electrode causing slower, noisier response. High temperatures accelerate the degradation of the electrode, an electrode designed for 1 years life at 25°C may only live a few weeks in an alkaline solution at 90°C.

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How long of a cable can I use on an electrode?

The high resistance and low current signal of a pH electrode is extremely susceptible to electrical interference. Inductive and triboelectric noise are the two main types of interference. Inductive noise is generated by moving electrical fields near the cable, an electric motor varying in speed or a person walking by wearing clothing with a high static charge can influence the electrode reading. Triboelectric noise is a static discharge in the cable caused by moving the cable. If the cable is shielded from inductive noise and fixed so it doesn't move then cable lengths up to 10 meters can be used. In noisy environments or where cable movement is inevitable the cable should be less than 10 ft. If a longer cable is needed or the environment is noisy, use the battery powered preamp or a built in unity gain amplifier.

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What effect does flow have on a pH reading?

Flow has little to no effect on the pH reading but can have a major effect on the electrodes overall performance. Particulate matter tends to settle out and bacteria tend to grow on the electrode in non-flowing applications, slowing the response. Flows of 0.5 ft./sec. are usually adequate to keep the surface clean. Abrasive material in the application can abraid the electrode if the flow is a few ft./sec, the Model 12 pH sensor is a good choice for these applications. In the absence of particulate matter, flows of 10ft./sec. do not pose a problem except if the stream is high purity water where static charges can be created.

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What is the highest temperature solution in which pH sensors can measure?

If the temperature is above 100°C then the pressure must be above the critical point of water for that temperature or the electrolyte will boil away. If this condition is met, measurements can be made up to 130°C. The life expectancy of an electrode at 130°C is a few weeks at best.

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What is the lowest temperature solution in which pH sensors can measure?

The internal electrolytes are formulated to resist freezing to temperatures of -40°C, which is coincidentally -40°F. The problem with measurements at cold temperatures is the dramatic increase in the resistance of the pH glass. Depending on the input impedance of your pH meter the lowest measurement temperature will be between -20°C and -30°C.

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When do I need an automatic temperature compensation (ATC)?

Most pH meters include a circuit for automatic temperature compensation. This circuit uses the signal from a temperature sensor to compensate for the change in the Nernst factor due to the electrodes temperature. The Nernst factor varies from 54 mV/pH at 0°C to 74 mV/pH at 100°C. If the temperature of the sample remains constant, the meter can be set manually. If the sample temperature varies then an ATC is convenient.

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Are pH electrodes fully submersible?

The electrode cable and epoxy seals are water resistant and will survive months of submersion service, however this is not a recommended method of installation. Supporting an electrode from its cable can lead to a separation of the seal between the cable and the epoxy, shorting out the electrode. The sensor should be coupled to an extension pipe using a waterproof sealant. This assembly can then be submersed in the sample and firmly mounted to the tank structure.

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