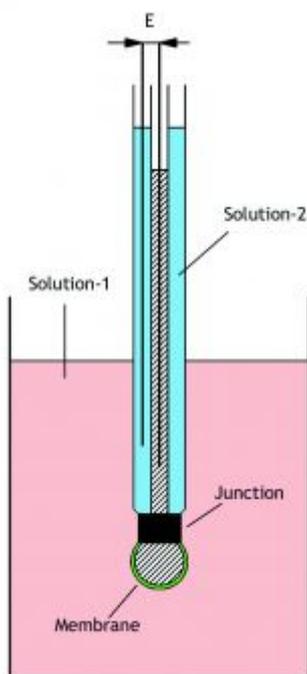


pH Electrode construction

Combination Electrode



A combination electrode is an indicating and a reference electrode combined into a single body that is easy to use and popular because of its compactness. A minimum amount of sample is required due to the close proximity of the pH responsive membrane and the liquid junction.

Solution-1: sample to be measured

Solution-2 : known buffer solution (7 pH)

Reference-1: silver wire in a salt-bridge (KCl)

Reference-2: silver wire in a salt-bridge (KCl)

Junction Types

Glass combination electrodes mostly feature an anti-fouling annular ceramic junction. The annular junction is formulated with a special ceramic which encircles the glass bulb. Numerous pores in the ceramic provide lower resistance and more stable pH readings. The epoxy body combination electrodes come standard with a specially formulated porous ceramic plug junction.

Sleeve junctions provide the highest flow rate for difficult samples.

A **double junction** reference is constructed with an Ag/AgCl inner chamber and a chemically compatible reference solution in the outer chamber. It is recommended for samples containing organic compounds, proteins, heavy metals, and other compounds that interact with silver, such as bromides, iodides, cyanides, and sulphides.

Membrane Types

- General and low temperature glass is especially suited for low temperature, non aqueous solutions and pH measurements under 12 pH.
- Universal glass is best suited for most pH measurements where minimal or no Na^+ is present. It is a low-resistant glass with a very fast and stable response and is designed for pH ranges of 0 to 13 and temperatures of 0° to 135°C.

- High pH, low sodium ion error glass is especially formulated for continuous, long-term use at high temperatures, particularly in strong alkaline solutions above pH 11. It experiences negligible Na^+ ion error above 13 pH. The impedance of the glass is much higher than other glasses, and a slower response will be experienced at room temperatures and below. Response time will increase as the temperature is elevated.

Internal Reference Types

Calomel reference electrodes ($\text{Hg}/\text{Hg}_2\text{Cl}_2$) can give very accurate potentials. Both its reproducibility and potential stability are superior to those of the Ag/AgCl electrode, although only at a constant and relatively low temperature. Calomel is subject to a constant and relatively low temperature fluctuation with a temperature limitation of 80°C .

Silver/silver chloride reference (Ag/AgCl) electrodes are largely hysteresis-free and can be used at higher temperatures with lower temperature coefficients. Ag/AgCl is the best general purpose reference with a wide temperature range (-5° to 110°C).

Reference Construction

Refillable Reference Cell: selected for high accuracy, stability, and longer electrode life. Refillable types sacrifice convenience and ease of maintenance.

Sealed Reference Cell: sealed gel-filled reference electrodes are designed for convenience where minimal maintenance is required. Slightly lower accuracy and shorter life must be taken in account.

Electrode Construction

Glass Body Electrodes: ideally suited for most routine pH measurements for accuracy, high temperature, and ease of cleaning.

Epoxy Body Electrodes: a good choice for applications where rough handling and breakage are a major problem.

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