

Reference Electrode



KRE01

Ag/AgCl/Cl⁻ Reference Electrode

This is a silver/silver chloride reference electrode with dual compartments separating the reference electrolyte and bridge electrolyte. The electrode is supplied with

electrolyte filling, and electrolytes of desired concentrations can also be re-filled easily. The standard ground-joint 14/23 of the electrode, enables easy assembly with KLyte electrochemical cell-tops.

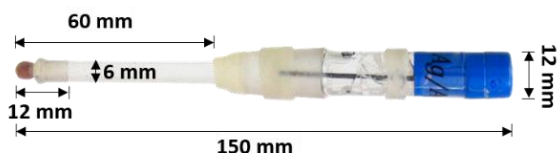
Technical Specification

Reference system	Ag/AgCl/Cl ⁻
Purpose	For aqueous medium
Chemical reaction	$\text{AgCl}_{(s)} + e^- \rightleftharpoons \text{Ag}_{(s)} + \text{Cl}^-$
E°	207mV vs. NHE (at 25°C)
Typical variance	±5mV
Bridge electrolyte	3M KCl solution
Reference electrolyte	3M KCl solution
Inner Diaphragm	Glass-frit (G4)
Outer Diaphragm	Silica-based porous frit
Electrode Plug-in-head	Compatible with KLyte banana connector cable (4mm)
Standard Ground-Joint sleeve	14/23
Temperature range (°C)	5-80 (Approx.)
Shaft material	Borosilicate glass
Shaft diameter (Top)*	12mm
Shaft diameter (Bottom)*	5mm
Length*	150mm
Immersion length*	>12mm; <60mm

*Please refer to the image of electrode dimension

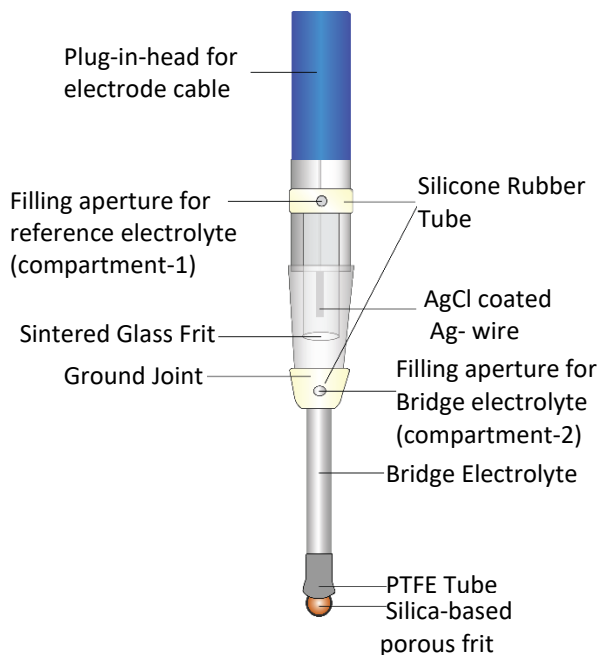
Note: This ecofriendly reference electrode is widely used as an alternative for the saturated calomel electrode (SCE). The later contains liquid mercury and its salts, which are known to be a health hazard and harmful to the environment.

Electrode dimensions



Maintenance and Handling

The reference electrodes are highly sophisticated, as well as delicate accessories. A small perturbation in an external parameter can change the performance of the electrode. Proper maintenance and careful handling ensure good reproducibility and longer life-time of the reference electrode.



Dual compartment reference electrode with Ag/AgCl/Cl⁻ reference system

➤ **Conditioning:** At first, the user needs to make sure to remove the silicone-rubber black cap at the end of the electrode tubing and rinse the electrode body with double-distilled water. The black cap should be removed as gently as possible so that the bottom frit does not come out and damage the electrode. The reference electrode then must be conditioned by dipping its bottom part in the KCl solution (same as the filling solution) for two days, at room temperature.

➤ **Storing the electrode:** The lower part of the electrode should always be immersed in the KCl solution (same as the filling solution) when not in use. Otherwise, the solution inside the pores will dry out causing, high resistance, an increase in noise, or even the potential out of control. It can be restored by refilling it with only deionized water and kept immersed in deionized water overnight. Afterwards, refilling it with KCl solution of the desired concentration and keeping it dipped in the KCl solution overnight.

➤ **Electrolyte filling procedure:** The reference electrodes are shipped pre-filled with 3M KCl solution. Both the compartments are refillable. For refilling, carefully remove the silicone rubber tube from the filling aperture by holding the glass tube in one hand and pushing the silicone rubber tube upwards/downwards with the other hand. It is recommended to use a syringe to refill both the compartment-1 and compartment-2. The solution level should be full, and there should not be any air-bubble trapped inside. The refilling solution should be inserted slowly to avoid generating much pressure. Pressure may cause the diaphragms (sintered glass frit and porous silica-based tip) to be popped out or

Note: Concentration other than 3M can also be refilled as per the requirement of the experiment. In that case, one should keep in mind that the value of the standard potential will vary depending on the concentration.

damaged.

➤ **Using in high-temperature measurement:** The operating temperature range of the KLyte Ag/AgCl, 3M KCl reference electrode is approximately 5°C to 80°C. It should be noted that the electrode potential is a temperature-dependent quantity. Hence, it is advisable to conduct high-temperature analysis by isolating the reference electrode with a salt-bridge and keeping the reference electrode at room temperature.

➤ **Precautions:** The reference electrode should be kept vertically in the storage vial and not exposed to the sunlight (e.g., don't keep it near window sill). UV-light decomposes AgCl to give metallic Ag and gives the electrode a black appearance. Fluorescent lights under laboratory conditions are safe.

The Ag/AgCl reference electrode cannot be used in NH₃ buffer as AgCl forms a soluble complex with NH₃.

The Ag/AgCl reference electrodes should not be exposed in certain chemicals that form a precipitate of some silver compounds. For example, it cannot be used in the basic medium. In the presence of [OH⁻] ions, it forms Ag₂O or AgOH and gives rise to a mixed Ag/AgCl/Ag₂O potential, which is pH-dependent. The Ag₂O also builds in the pores of the frit resulting in high impedance. The Ag/AgCl electrode cannot be used in sulfide containing electrolytes due to the formation of insoluble Silver sulfide.

The impedance of the reference electrode should be low (less than 10kΩ). The common cause for high impedance is the blockage of the junction frits. Adsorption of organic materials or precipitation of insoluble salts in the junction can both cause clogging and hence results in high impedance (more than 1MΩ). It is advisable to use salt-bridge to prevent the electrode frits from clogging.

Optional Parts:



KEC10A
Banana Cable Set



KEC10B
Banana Connector Pin

KA01 (Red), KA02 (Black)
Alligator Clip



Kanopy Techno Solutions

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Product Information Leaflet



Ag/AgCl/Cl⁻ Reference Electrode
Product ID: KRE01

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