# 钾离子电极操作指南

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钾离子电极可简便快速地测量水溶液中的钾离子浓度，同时也适用于食品、土壤、饮料、农用肥料以及血液、尿液、汗液等生物液体中钾含量的测定。

## 电极性能

- 离子选择膜：PVC 膜
  测量范围：$10^{-6}$~1mol/l $K^+$
  温度范围：0 ~ 50°C
- pH 范围：2 ~ 12
- 电极内阻：< 10MΩ
- 响应时间：由低浓度到高浓度检测时，响应时间约几十秒。
- 干扰离子：不能有阳离子表面清洁剂存在，以下几种离子的浓度与$K^+$离子浓度的摩尔比必须符合：
  $Rb^+/K^+<5\times10^{-3}$，$Cs^+<0.02$，$NH_4^+<1$，$Ba^{2+}$，$Sr^{2+}<20$，$Ca^{2+}<500$，$H^+<1000$，$Na^+$，$Mg^{2+}<2000$。

## 准备

**a. 添加内充溶液**

使用前，先倒置电极并旋下电极头，分别在电极体和电极头内加入内充溶液，并确保没有气泡产生。再缓慢拧上电极头，将电极浸泡在0.01mol/L $K^+$离子溶液中1小时，再用去离子水反复清洗至空白电位稳定。

**b. 制备标准溶液**

取分析纯的固体氯化钾在120° C烘2小时，称重7.456g KCl (或1.907g) 并溶解在1000ml去离子水中制得0.1mol/l $K^+$ (或1 g/l $K^+$) 离子标准储备液。用去离子水逐级稀释标准储备液来配制不同浓度的标准钾离子溶液。

**c. 参比电极**

取下加液口的保护帽，轻轻旋开磨砂口接界隔膜，待外参比电解液全部流出后再旋紧接界隔膜 (注意不能太紧)。从外参比电解质加液口充入0.9mol/l $Al_2(SO_4)_3$溶液，重新盖上保护帽。并用手指捏紧电极，上下震动，去除液络部的气泡。

## 标定及测量

—如果您使用**离子计**，可按下列步骤测定：

**a. 两点标定**

选择两个包括试样预期浓度范围且彼此浓度差十倍的标准溶液。标准溶液可采用任何浓度位来制备。

根据离子计使用说明书将离子计设置在标定方式，设置浓度较小的标准溶液为第一个校正点，浓度较大的标准溶液为第二个校正点。

将100ml浓度较小的标准溶液与2ml ISA溶液混合搅拌，然后将钾电极和参比电极一起插入溶液中，进行第一点校正。

将100ml浓度较大的标准溶液与2ml ISA溶液混合搅拌，将两支电极插入溶液中，进行第二点校正。

离子计将自动显示电极斜率。

**b. 试样测量**

用去离子水冲洗电极。

取100ml试样与2ml ISA 溶液混合搅拌，然后将两支电极插入溶液中，测量试样浓度。

—如果您使用 **pH/mV 计**，可按下列步骤测定：

**a. 绘制工作曲线**

选择两个或两个以上，能包括试样预期浓度范围的标准溶液。标准溶液可采用任何浓度单位来制备。根据 pH/mV 计使用说明书将 pH/mV 计设置在 mV 方式。

分别在各100ml 标准溶液中加入 2ml ISA 溶液，然后将两支电极插入溶液中。由稀到浓测定溶液的 mV 值。

用上述测定的一系列mV值为y轴，以相应的标准溶液钾离子浓度为x轴，在半对数图纸上作图，即为工作曲线。

**b. 试样测量**

每次测量后用去离子水冲洗电极。

将100ml 试样与 2ml ISA 溶液混合，按照上述方法测定试样的mV值，然后在工作曲线上读出mV值对应的钾离子浓度值。

在测定低浓度的钾离子时，也可以采用标准加入法。

## 维护

敏感膜上若存在沉积物，可将钾电极浸泡在去离子水或浓度小于0.01mol/l的稀酸或稀碱溶液中清洗几分钟，然后再将钾电极在 0.01mol/l $K^+$ 溶液浸泡几小时恢复。

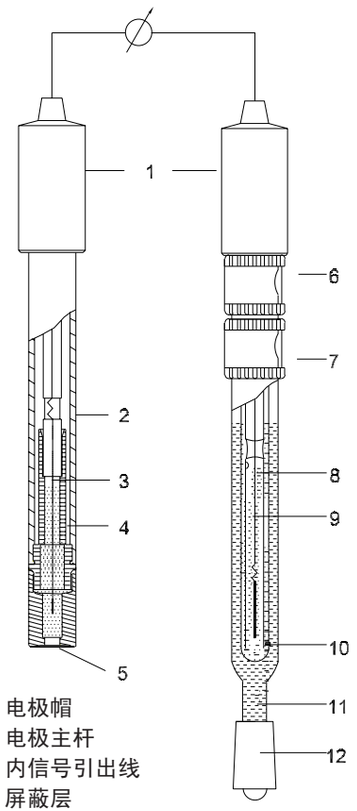
## 储藏

测量结束后，必须清洗电极，再用保护盖将探测表面盖好并存放于干燥处。

## 附件

LE302 参比电极
（订货号：12107202或12107204）
外盐桥电解质：0.9mol/l $Al_2(SO_4)_3$
离子强度调节剂 (ISA): 0.9mol/l $Al_2(SO_4)_3$

**产品订货号：12107130或12107100**




1 电极帽
2 电极主杆
3 内信号引出线
4 屏蔽层
5 离子敏感膜
6 内参比电解液充液口
7 外参比电解液充液口
8 内参比电解液
9 Ag/AgCl参比电极
10 多孔陶瓷隔膜
11 外参比电解液
12 磨砂口接界隔膜

## General information

Potassium electrode is intended for measuring the potassium content of aqueous system. Its preferred applications are to be found in the fields of food-products, soil, fertilizer, beverage and biological fluid (blood, urine, perspiration, etc.) analysis.

## Specifications

- Type of ion selective membrane:
  PVC polymer-matrix
- Membrane impedance:< 10MΩ
- Measurement range:
  $10^{-6}$mol/l up to 1mol/l $K^+$
- Operating temperature range: 0~50° C
- Optimum pH range: 2 to 12
- Response time:
  when passing from lower to higher concentrations, a few seconds.
- Interfering ion:
  cationic surface-tension agents (detergents) must be absent; the molar proportions of the following ions to he potassium ion must lie below the following levels (ratios): $Rb^+/K^+<5\times10^{-3}$, $Cs^+<0.02$, $NH_4^+<1$, $Ba^{2+}$, $Sr^{2+}<20$, $Ca^{2+}<500$, $H^+<1000$, $Na^+$, $Mg^{2+}<2000$。

## Preparatory operations

**a. Filling internal solution**

Before the potassium electrode was used, place electrode with the head downwards and unscrew module from the electrode body. Fill electrode body and membrane module completely with internal filling solution ensuring that there are no air bubbles. Screw slowly the membrane module right home and then immerse it in 0.01 mol/l potassium solution for an hour and rinsed repeatedly with deionized water till blank potential is steady.

**b. Perparation of standard solution**

Dry AR grade potassium chloride at 120° C for 2 hours. Weight out 7.456g KCl (for a 0.1 mol/l $K^+$ solution ), or 1.907g KCl (for a 1.0 g/l $K^+$ solution ), dissolve in deionized water in a 1000ml calibrated flask and make up to the mark. Prepare solutions with different potassium concentrations by diluting the standard stock solution with deionized water as appropriate.

**c. Reference electrode**

Remove cap from electrolyte filling port.Slightly loosen the ground-joint diaphragm (by careful turning) so that out reference electrolyte flows out. Tighten up ground joint again (but not too tight). Top up with 0.9 mol/l $Al_2(SO_4)_3$ electrolyte to filling port for outmediate electrolyte and recover the cap. Clutch the eletrode and shake up and down in order to reduce air bubbles.

## Calibration and measurement

If you are using **ionic meter**, proceed as follows to measure potassium ion concentration:

**a. 2 point calibration**

Prepare two standards; one standard has 10 times difference in concentration from another one. The standard solutions can be prepared with any concentration unit.

According to the menu setting process of your ionic meter, set the lower concentration standard as the first calibration point, and the higher one as the second calibration point.

To 100ml the lower concentration standard add 2ml ISA solution, and stir. Place the potassium electrode and reference electrode together in the mixed solution,start the first point calibration.

To 100ml the higher concentration standard add 2ml ISA solution, and stir. Place two electrodes in the mixed solution, start the second point calibration.

After 2 points calibration, the meter automatically determines the calibration slope.

**b. Measurement Sample**

Rinse two electrodes with deionized water.

To 100ml sample solution add 2ml ISA solution and stir. Place two electrodes in the mixed solution and start measurement.

If you are using **pH/mV meter**, proceed as follows to measure potassium ion concentration:

**a. Plotting calibration diagram**

Select two or more standard solutions including the sample's potassium concentration. The standard solutions can be prepared with any concentration unit.

According to pH/mV meter instruction manual, select mV mode.

To 100ml standard solutions add 2ml ISA solution and stir, respectively. Place the potassium electrode and reference electrode in the mixed solution and measure the mV of the mixed solution from lower to higher concentrations.

Plot measured mV values on a calibration diagram against the logarithm of the potassium concentration of the corresponding solution (use loggraph paper).

**b. Measurement Sample**

Rinse two electrodes with deionized water after each measurement.

To 100ml sample solutions add 2ml ISA solution and stir. According to above method measure the mV of sample solution. Use the calibration diagram to read off the potassium concentration of the sample solutions from the measured mV values.

It is advisable when carrying out lower potassium determination to apply a standard addition method.

## Maintenance

Deposits on the active surface of the membrane module may be removed by immersing the potassium electrode in deionized water or in a diluted solution of an acid or a base (<0.01 mol/l) for a few minutes. After rinsing, recondition the electrode by immersion for a few hours in 0.01 mol/l standard $K^+$ solution.

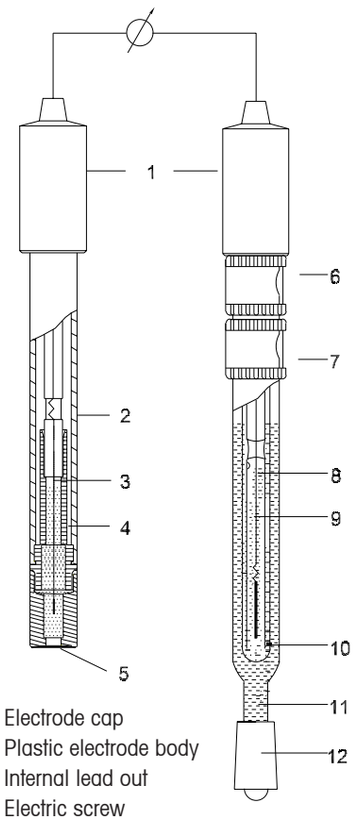
## Storage

After measurement, potassium electrode must be rinsed. The potassium electrod should be stored dry in the air, preferably in the protective tube supplied with the electrode.

## Accessories

LE302 Ref. electrode
(Order No.12107202 or 12107204)
Bridge electrolyte: 0.9mol/l $Al_2(SO_4)_3$
Ionic Strength Adjuster (ISA): 0.9mol/l $Al_2(SO_4)_3$

**Order NO: 12107130 or 12107100**




1 Electrode cap
2 Plastic electrode body
3 Internal lead out
4 Electric screw
5 Ion-selective membrane
6 Filling port for inner electrolyte
7 Filling port for outer electrolyte
8 Internal reference electrolyte
9 Ag/AgCl reference element
10 Porous ceramic diaphragm
11 Outer reference electrolyte
12 Ground-joint diaphragm