Agilent P3212 pH Combined Electrode
pH 电极

Operating Guide
用户手册

Agilent Technologies

Overview

The P3212 pH Combined Electrode can measure the pH in aqueous solutions. It is used with a 3200P Meter or similar meter.

WARNING **Use this electrode according to the operating manual to avoid personal injury.**

WARNING **The electrode solution can cause chemical burns or illness if it is taken orally or contacted by human skin. Use protective clothing or gloves to avoid contact. In case of contact, rinse contacted area with tap water or deionized water thoroughly.**

CAUTION The electrode measuring tip is glass. Handle with care to avoid damage to the instrument.

Specifications

Table 1 P3212 pH Combined Electrode specifications

Specification	Value
pH range	0 to 14
Zero potential pH	7.00 ± 0.5
Temperature range	0 to 60 °C
Electrode impedance	<300 MΩ
Reference type	Ag/AgCl
Body material	PC (polycarbonate)
Liquid junction material	Porous polymer
Reference filling solution	3 mol/L KCl containing AgCl
Electrode diameter	12 mm
Electrode length	120 mm
Cable interface	BNC
Cable length	1000 mm

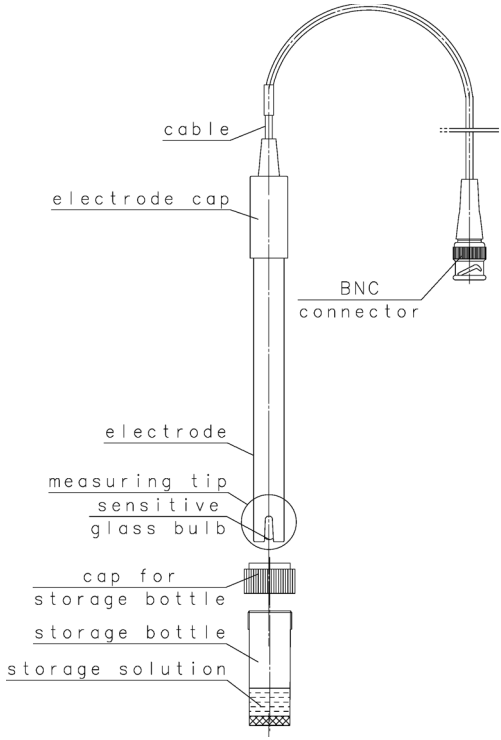

Figure 1 P3212 pH Combined Electrode assembly

Operation

Preparing the electrode

1. Remove the electrode storage bottle and the storage bottle cap from the electrode. Store the bottle upright for future use.
2. Rinse the measuring tip with distilled or deionized water. Hold the measuring tip downwards and shake the electrode gently to dry.
3. Unplug the filling hole.

Measurement

1. Connect the electrode to the meter. Enter the temperature of calibration solution according to the meter operating manual.
2. Soak the measuring tip in calibration solutions in sequence. Calibrate the electrode according to the meter operating manual.
3. Soak the measuring tip in sample solution. When the reading becomes stable, read the value from the meter.

Operating hints

- The main material the of measuring tip is polycarbonate. Ensure that the sample solution will not damage the measuring tip before measurement.
- Maintain the calibration solution and sample solution at a uniform flow rate, or the accuracy of measurement may be impacted.
- The reference filling solution contains silver ions. Do not use to measure sample solutions that contain protein. The silver ion will precipitate near the liquid junction and damage the electrode.
- Do not soak the electrode in sample solution for an extended period of time. Rinse the electrode carefully after use.
- The pH value of a solution is affected by its temperature.
- White powder or crystals that collect on the electrode during measurement or transportation do not affect the performance of the electrode. Rinse the residue with tap or deionized water.
- For acidic sample solutions, use pH 4.00 and pH 7.00 standards for calibration. For alkaline sample solutions, use pH 7.00 and pH 10.01 standards.
- Do not apply force onto the electrode cap, cable, or cable interface.
- Keep the cable interface dry.

Maintenance

Cleaning of inorganics

Soak the measuring tip in 0.1 mol/L HCl or EDTA solution for 15 minutes.

Cleaning of organics

Soak the measuring tip in absolute ethyl alcohol or other organic solvent that can dissolve organics for 15 minutes.

Cleaning of grease

Soak the measuring tip in warm, weakly alkaline detergent for 15 minutes.

Cleaning of protein precipitation

Soak the measuring tip in 0.1 mol/L HCl solution that contains 1% pepsin for 15 minutes.

Regeneration of the glass sensitive membrane

WARNING **HF is lethal. Refer to the HF material safety data sheet before use.**

1. Soak the sensitive membrane in 4% HF solution for 3 to 5 seconds.
2. Rinse in 0.1 mol/L HCl for 10 seconds.
3. Rinse with distilled or deionized water.
4. After one or more cleaning procedures, thoroughly rinse the electrode with distilled or deionized water. Soak the measuring tip in reference filling solution for 2 hours.

Troubleshooting

Meters

Refer to the meter operating manual. Check all related parts, such as the electrode, calibration solution, and samples.

Electrode

1. Connect the electrode to the meter with mV displayed.
2. Soak the measuring tip in pH 4.00 calibration solution. Record the mV when the reading becomes stable.
3. Soak the measuring tip in pH 10.01 calibration solution. Record the mV when the reading becomes stable.
4. The difference between these two mV readings should be in the range of 326 to 366 mV. If not, clean the electrode, then repeat the measurements.
5. Hold the electrode with the measuring tip downwards and swing it several times.
6. Check the accuracy of the electrode by repeating steps 2 and 3 using any two other calibration solutions. Compare the measurements against the expected mV responses.

Calibration Solution

- Use the correct calibration solution.
- The distilled water or DI water used to prepare calibration solution should meet with corresponding requirements.
- The calibration solution should not be contaminated, degraded, or expired.

Sample

The electrode is only suitable for measuring the pH value of a conventional solution. When measuring the pH value of a solution with low conductivity, high viscosity, or nonaqueous reagents, the response time of electrode may be prolonged or the measurement accuracy may be affected.

For any other problems during electrode use, contact your Agilent Technologies customer service representative.

Storage

1. Rinse the measuring tip.
2. Install the storage bottle cap, and the storage bottle onto the electrode body.
3. Screw the storage bottle cap onto the storage bottle until finger tight.
4. Place the electrode in the storage box and store at ambient temperature.

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概述

实验室常规 pH 值测量用不可充式 pH 复合电极，与 3200P 仪器或类似仪器配套使用。

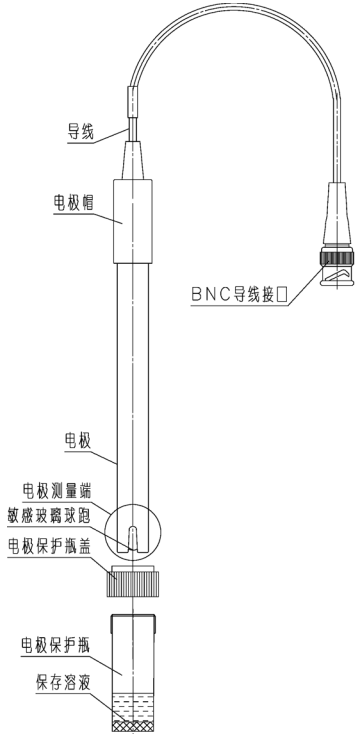
安全提示

1. 按使用说明使用电极。
2. 电极附带的填充液不宜口服或接触人体敏感器官，如意外接触，应立即用自来水或去离子水清洗
3. 在储运或使用过程中，电极上可能有少量白色粉末或晶体附着，这是由部分渗出的参比填充液或保存溶液失去水分引起，可用自来水或去离子水冲洗去除，不影响电极的性能。

技术参数

测量范围	0–14 pH
零电位	7.0±0.5 pH
适用温度范围	0–60 ˚C
电极内阻	< 300 MΩ
参比系统	Ag/AgCl
外壳材质	PC （聚碳酸酯）
液接界材料	高分子
导线接口	BNC
电极直径	12 mm
电极长度	120 mm
导线长度	1000 mm

电极插图



使用步骤

1 电极准备

   a 旋开电极保护瓶盖，依次取下电极保护瓶、电极保护瓶盖，将电极保护瓶开口向上水平放置待用。

   b 用蒸馏水或去离子水冲洗电极测量端，将电极测量端向下，空甩电极数次。

   c 开启加液塞。

2 电极测量

   a 将电极与仪器连接，按仪器说明输入校正溶液的温度值。

   b 将电极测量端依次浸没于校正溶液中，按照仪器说明校正电极。

   c 校正完毕，将电极测量端浸于被测溶液中，待仪器读数稳定后，读取读数。

   d 测量完毕，冲洗电极测量端，依次将电极保护瓶盖、电极保护瓶安装在电极外壳上，并旋紧电极保护瓶盖。

储存方法

电极放回电极包装盒内，室温干燥保存。

注意事项

1 电极测量端的主要材料为 PC （聚碳酸酯），测量前应确认被测溶液不会对电极测量端造成损伤。

2 保持校正溶液和被测溶液的流速一致，否则会引起测量误差。

3 因电极参比填充液内含银离子，因此电极不适合经常测量含蛋白质的溶液，否则银离子会逐渐沉淀于液接界附近，造成电极损坏。

4 请勿将电极长时间浸泡于被测溶液内，电极使用完毕，请及时对电极进行清洗。

5 溶液的 pH 值受温度影响。例如，被测溶液的温度为 10 ℃，此时仪器显示的 pH 值是该溶液 10 ℃时的 pH 值。如需得到 25 ℃下的样品 pH 值，则需把样品温度

升至 25 ℃后进行测量，仪器的温度补偿功能不能将溶液 10 ℃时测量的 pH 值转换为 25 ℃时的 pH 值。

6 校正电极时，若被测溶液的 pH 值为酸性，建议使用 pH 4.00 和 pH 7.00 校正溶液；若被测溶液的 pH 值为碱性，建议使用 pH 7.00 和 pH 10.01 校正溶液。

7 电极帽、导线以及导线接口部分应避免受力，以免损坏。

8 导线接口必须保持干燥。

电极维护

电极清洗和修复

1 无机物清洗：
将电极测量端浸于 0.1 mol/L HCl 或 EDTA 溶液中 15 min。

2 有机物清洗：
将电极测量端浸于无水乙醇 （或能够溶解该有机物的溶剂）中 15 min。

3 油脂类清洗：
将电极测量端浸于温热的弱碱性洗涤剂中 15min。

4 蛋白质沉淀的清洗：
将电极测量端浸于含 1% 胃蛋白酶的 0.1mol/L 盐酸溶液中 15 min。

5 玻璃敏感膜修复 （注意：HF 是有毒物质，使用前阅读该物质使用说明）：
将电极测量端浸于 4 % HF 溶液中 3–5 s，然后用 0.1 mol/L HCl 漂洗数次，用蒸馏水或去离子水清洗。

电极清洗完毕，应将电极测量端浸没于参比填充液内 2h。

疑难解答

电极使用中发现异常情况，请按下列步骤查找原因

仪器

参看仪器说明书的相关部分

查看仪器、电极、校正溶液、样品等相关部分之间的衔接。

电极

1 确认电极性能良好

   a 将电极与仪器连接，仪器显示模式为 mV 读数。

   b 将电极测量端依次浸于 pH 4.00 和 pH 10.01 校正溶液中，待仪器读数稳定后分别记录 mV 值。

   c 两次记录的 mV 值绝对值之和应符合 （326–370） mV，则电极性能良好，否则需要维护电极。

2 检查电极测量准确度

   a 使用任意两种校正溶液对电极进行校正。

   b 使用电极测量其他校正溶液的 pH 值，将测量值与被测校正溶液的理论值进行比对，查看电极测量准确度是否满足用户需求。

校正溶液

1 校正溶液来源有效。

2 配制校正溶液用的蒸馏水或去离子水应符合要求。

3 校正溶液应在有效期内，不污染或变质。

样品

电极仅适合测量常规溶液的 pH 值，在测量低电导率溶液、粘度较大或非水试剂等非常规溶液的 pH 值时，电极的响应时间会延长或测量结果会受影响。

如在电极使用过程中有其他疑问，请联系售后服务部门。

如需购买，请与安捷伦经销商联系或者登陆安捷伦官方网站。

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