

# **User Manual**

EZ-101

Perma-Check

pH Meter

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# Contents

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1 Introduction .....	- 1 -
1.1 Introduction.....	- 1 -
1.2 Technical Specification .....	- 2 -
1.3 Function Introduction.....	- 3 -
2 Safety Notices.....	- 4 -
3 Terms Explanation .....	- 5 -
4 Overview and Installation .....	- 6 -
4.1 Overview .....	- 6 -
4.2 Instrument installation.....	- 7 -
4.2.1 Multifunctional electrode holder mounting.....	- 7 -
4.2.2 Electrode installation .....	- 8 -
5 Instrument Operation.....	- 9 -
5.1 Screen Icons.....	- 9 -
5.2 Key Functions .....	- 11 -
5.3 Instrument Settings .....	- 12 -
5.3.1 Switch On/Off.....	- 12 -
5.3.2 Instrument Settings.....	- 13 -
5.4 Calibration .....	- 17 -
5.4.1 Prepare electrodes .....	- 17 -
5.4.2 pH electrode Calibration .....	- 17 -
5.5 Measurement.....	- 21 -
5.5.1 Measurement preparation.....	- 21 -
5.5.2 Measurement .....	- 21 -
6 Maintenance and Troubleshooting .....	- 24 -
6.1 Maintenance.....	- 24 -
6.2 Electrode usage and maintenance.....	- 25 -
6.3 Troubleshooting.....	- 27 -
7 Technical Support .....	- 28 -

Accessories.....	- 28 -
8 Appendix.....	- 30 -
Appendix 1.....	- 30 -

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# 1 Introduction

## 1.1 Introduction

PH200E pH meter is a laboratory pH measuring instrument, which can be widely used in universities, environmental protection, medicine, food, health, geological prospecting, metallurgy, marine exploration and other fields, common acid rain detection, industrial wastewater, surface water, drinking Water, beverages, daily chemical products, textiles, etc. All these fields require pH measurement.

### ✧ **General Features**

- High resolution LCD display screen, 6.0 inches.
- The instrument displays electrode slope and data stability mark.
- Multi-reading feature allows auto-read and continuous-read.
- Support electrode calibration function, up to 3-point calibration.
- Support automatic calibration function, automatic identification of three pH standard buffer solutions: 4.01pH, 7.00pH and 10.01pH.
- Support manual calibration function, custom standard solution.
- Automatic/Manual temperature compensation ensures accurate results.
- Support data storage, deletion and review, 50 sets storage of measurement results.
- With power failure protection function, support to factory settings.
- IP54 protection.

## 1.2 Technical Specification

Table 1-1 Meter specifications

Model		EZ-101
pH level		0.01pH
mV	Range	(-1999~1999)mV
	Minimum resolution	1mV
	Electronic unit indication error	±0.1%(FS)
	Electronic unit repeatability	1mV
	Electronic unit input current	≤1×10 <sup>-12</sup> A
	Electronic unit input impedance	≥1×10 <sup>12</sup> Ω
pH	Range	(0~14.00)pH
	Minimum resolution	0.01pH
	Electronic unit indication error	±0.01pH
	Electronic unit repeatability	0.005pH
	Instrument indication error	±0.02pH
	Instrument repeatability	0.01pH
Temperature	Range	(-5.0~110.0) ℃
	Minimum resolution	0.1 ℃
	Electronic unit indication error	±0.2 ℃
	Instrument indication error	±0.4 ℃(0.0 ℃~60.0 ℃), ±1.0 ℃(Other range)
Work environment		Ambient temperature: (0~40) ℃ Relative humidity: not more than 85%
Dimensions(L×B×H), Weight(kg)		242mm×195mm×68mm, About 0.9kg
Power supply		AC Adapter,100-240V AC input, DC9V output

## 1.3 Function Introduction

Table 1-2 Main functions

Function		Explanation
Basic function	Backlight Power	●
	Reset settings	●
	Power failure protection	●
	Anti-interference automatic recovery	●
	Automatic shutdown	●
	Protection	IP54
Reading function	Default balance settings	●
	Auto-lock reading	●
	Reading Mode	auto-read and continuous-read
Data management	Data storage	50 Sets
	View	●
	Delete	●
pH/mV Measurement	PH electrode status/performance display	Electrode slope
	Multi-point calibration	3
	Automatic identification of standard solutions	1 group standard solution
	Custom standard solution	Manual identification of standard solutions
	Automatic temperature compensation	●
	Manual temperature compensation	(0 ℃~60 ℃)
Temperature function	Temperature unit	℃

● Equipped

## 2 Safety Notices

Please read the entire contents of this manual carefully before use, and please keep this manual properly. The user **MUST** use the instrument following this manual to avoid damage to the user and equipment.

Before using the meter, **READ** the following notes:

- **DO NOT DISASSEMBLE** the device for inspection or repair.
- To prevent electric shock or damage to the device, **DO NOT** place cables and connectors in any liquid, wet or corrosive environment.
- Please use the defaulted power adapter.
- **DO NOT** use it if the power cord is damaged (the wire is exposed or broken).
- **DO NOT** use in flammable and explosive environments.
- **DO NOT** use if the user finds any abnormalities such as damage or deformation of the device.

The following identifiers will be used in this manual.



### 【TIPS】

Tips help to use the meter.

### 3 Terms Explanation

- **pH Slope:** The amount of potential change generated by each 1 pH change, expressed in mV/pH or by 100% Theoretical Slope (PTS).  
 $\text{pH} = -\log[\text{H}]$ , where [H] means molar concentration (mol/L) of H ions.
- **E0 of pH:** Also known as "zero potential", usually refers to the potential value at pH 7;
- **One-point calibration:** Calibration with a standard solution.
- **Two-point calibration:** Calibration with two standard solutions.
- **Multi-point calibration:** Calibration with more than two standard solutions.

## 4 Overview and Installation

### 4.1 Overview

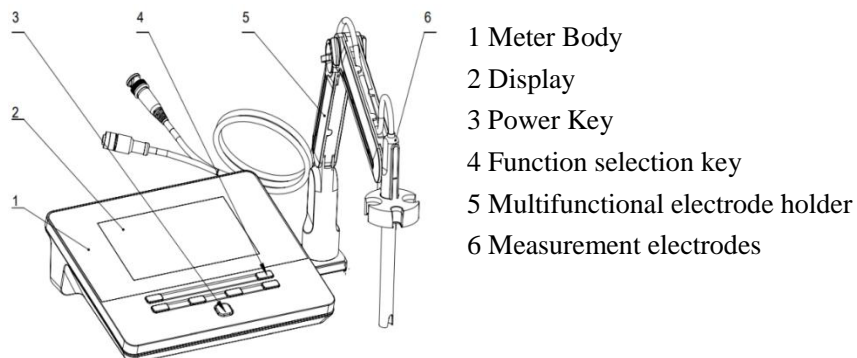


Figure 4-1 Overview-Front View

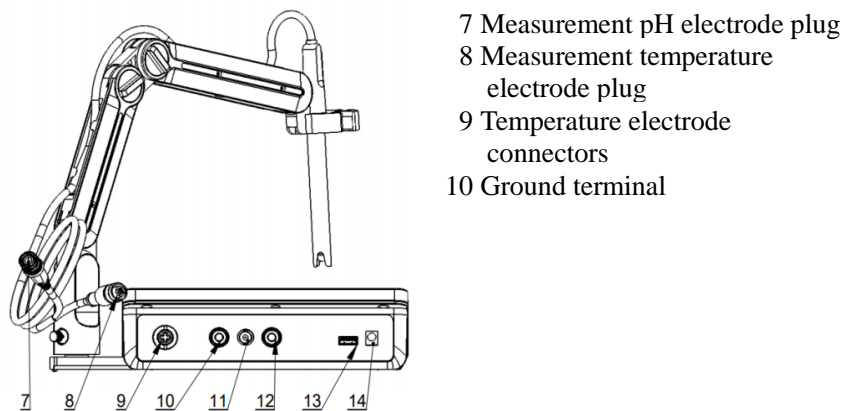
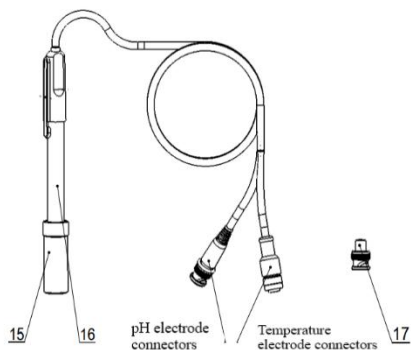


Figure 4-2 Overview- Back View



- 11 Measurement electrode connectors
- 12 Reference electrode connectors
- 13 Meter debug port
- 14 DC9V power socket
- 15 Electrode protection cap
- 16 pH electrodes
- 17 Q9 short-circuit plug

Figure 4-3 Electrodes and connectors

## 4.2 Instrument installation

### 4.2.1 Multifunctional electrode holder mounting

- 1) Pull out the electrode holder fixing plate on the right side of the meter.
- 2) Insert the multifunctional electrode holder into the fixed shaft of the electrode holder fixed extractor plate.
- 3) Tighten the set screw at the bottom of the electrode holder.

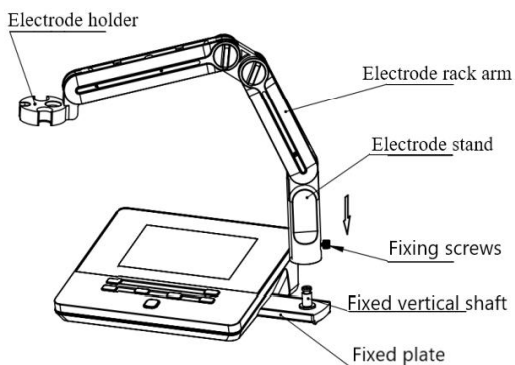


Figure 4-4 Installation of the multifunctional electrode holder

### **4.2.2 Electrode installation**

- 1) Mount the pH electrode on the electrode holder,
- 2) Find the interface of temperature electrode and measurement electrode on the back of pH meter, unplug Q9 short circuit plug.
- 3) Insert pH electrode's temperature electrode and pH electrode plug into the corresponding electrode connector respectively.

## 5 Instrument Operation

### 5.1 Screen Icons

The meter uses segment LCD as the display, and the overall design is as follows: the left is the main functional area, including the measurement function, calibration function, setting function, and viewing function; the upper part displays the status prompt area; the middle is the measurement result area, including pH value, temperature value; The lower right corner is the current percent slope.

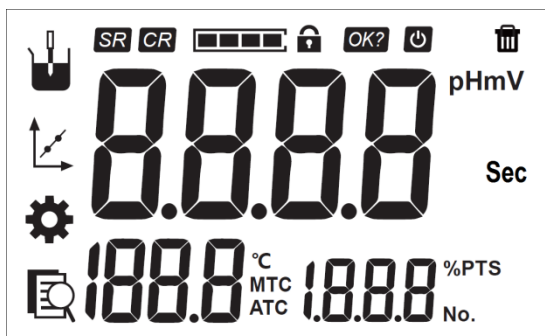










Fig. 5-1 Screen icons explanation

Table 5-1 Symbol Explanation

No.	Symbol	Explanation	Note
1	<b>SR</b>	Auto-read	Display during balance measurement
2	<b>CR</b>	continuous-read	Display during continuous measurement
3		Reading state	All four segments are lit up in stable state

No.	Symbol	Explanation	Note
4		Reading is locked	In the auto-read mode, when the reading is stable, end the measurement, the result has locked.
5		Confirm the option	Display when user confirmation is required
6		Automatic shutdown	Display when automatic shutdown is enabled
7		Delete measurement result	
8	mV	mV result unit	Unit: mV
9	pH	pH result unit	Unit: pH
10	Sec	Time unit	Unit:Sec
11	℃	Temperature	Unit: ℃
12	ATC	Automatic temperature compensation	Represented by character string ATC
13	MTC	Manual temperature compensation	Represented by character string MTC
14	No.	Serial number	Represented by character string No.
15	%PTS	Percentage slope value	Represented by character string %PTS
16		Measurement	
17		Calibration	
18		Setting	
19		View the result	

## 5.2 Key Functions

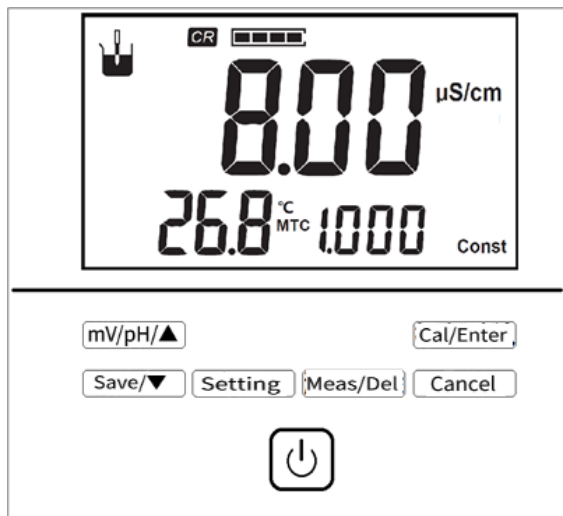

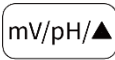




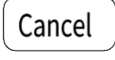


Figure 5-2 Instrument keys

The meter adopts tact power button, the instrument has 7 keys in total, the specific functions are as follows:



Table 5-2 Key Function Explanation

No.	Key	Explanation	Note
1		Power key	<ul style="list-style-type: none"> <li>■ Switch on the meter by press and release the key.</li> <li>■ Switch off the meter by press and hold the key for more than 3 seconds and release.</li> <li>■ Backlight adjustment key when Switch on the meter.</li> </ul>

No.	Key	Explanation	Note
2		mV/pH/Up	<ul style="list-style-type: none"> <li>■ Switch mV and pH display in measurement state.</li> <li>■ The value increases when the function is set.</li> <li>■ Move while viewing functions.</li> </ul>
3		Save/Up	<ul style="list-style-type: none"> <li>■ Store measurement results.</li> <li>■ The value decreases when setting the function.</li> <li>■ Move when viewing functions.</li> </ul>
4		Setting	<ul style="list-style-type: none"> <li>■ Enter the setting function in the measurement state.</li> <li>■ Set manual temperature in calibration state.</li> </ul>
5		Measurement/Delete	<ul style="list-style-type: none"> <li>■ Repeat the next measurement during balance measurement.</li> <li>■ When viewing the results, delete the measurement result.</li> </ul>
6		Calibration/Enter	<ul style="list-style-type: none"> <li>■ Enter the calibration function during measurement.</li> <li>■ Confirm some function.</li> </ul>
7		Cancel	<ul style="list-style-type: none"> <li>■ Give up some function.</li> </ul>

## 5.3 Instrument Settings

### 5.3.1 Switch On/Off

After installing the multi-function electrode holder and pH electrode, connect the power supply, and press  to start. The meter performs self-test, and then enters the measurement state. After use, the user can press  and

hold the key for more than 3 seconds to switch off.

Table 5-3 Characters displayed on the power operation interface

No.	Character display	Explanation
1	U3E	Switch On, Software Version
2	OFF	Switch Off



**【TIPS】**

- Before switching on each time, please check the electrode sockets on the back of the meter, and make sure that they are connected with measuring electrodes or short-circuit plugs, otherwise it may damage the high-resistance components of the meter and bring you unnecessary losses.
- When the meter is not in use, the short-circuit plug should also be connected to avoid damage to the meter due to the open circuit of the meter input.
- If the meter is not used for a long time, please disconnect the power
- The socket of the meter must be kept clean and dry, and should not be in contact with acid, alkali or salt solution.

### 5.3.2 Instrument Settings

The meter supports a variety of functions, including setting the reading mode, setting the temperature value, viewing the stored results, setting the automatic switch-off time, factory reset, etc. The user presses the "Setting" key, the meter will display the setting logo, SEL and serial number, the user presses up and down key to adjust, press the enter key to select.

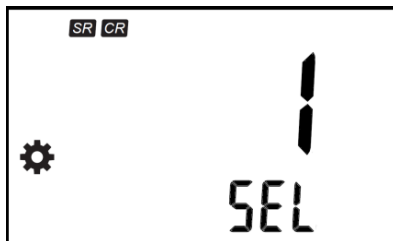



Fig. 5-3 Setting function display

Table 5-4 Set function list in the measurement status

No.	Explanation	Note
1	Reading Mode Settings	Flashing display <b>SR CR</b>
2	Temperature Settings	Flashing show °C
3	View the data	Flashing display 
4	Automatic shutdown settings	Flashing display “APD”(Auto Power Down)
5	Reset settings	Flashing display “rSt” (Reset)and “dFt” (Default)

### 5.3.2.1 Reading Mode Settings

The meter provides two reading modes, including continuous reading and auto reading.

- Continuous reading: The instrument displays real-time measurement results. User can end the measurement at any time and save the last result.
- Auto-reading: The measurement reached the balance, and the meter locked the reading result. Balance condition is that the results fluctuates within 0.6mV for 4 sec. In the auto-reading mode, press the “Meas/Del” to test the next one sample.

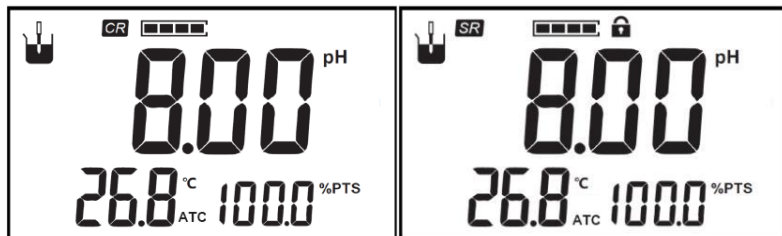


Figure 5-4 Two reading modes display

**【TIPS】**

In the measurement state, long press the "Meas/Del" key to switch the reading mode.

### 5.3.2.2 Temperature Settings

The meter supports the connection of temperature electrodes, which can be automatically compensated. If the user does not connect the temperature electrode, the user needs to use a thermometer to measure the temperature of the solution. Press the "Setting" key to select the temperature setting function, press the "Cal/Enter" key, and adjust the temperature to the specified temperature value.



Figure 5-5 Setting temperature value display

### 5.3.2.3 View the data

The meter supports storage of measurement results, up to 50 sets are allowed to be stored. In the measurement state, press the "Cal/Setting" key to select the function of viewing stored results, the meter first displays the total number of stored results, and then displays the latest stored data, as shown in the figure, you can press the up and down key to view each stored result. In the viewing state, press the "Cal/Setting" key to switch the display of pH and mV value results.

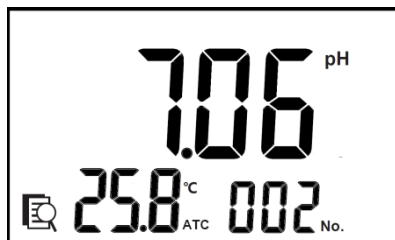


Figure 5-6 Viewing the storing results

If the user wants to delete the measurement results, there are two deletion methods: single deletion or all deletion, the user presses the up and down key to select the deletion method, dELonE 1 means to delete a single data, dEL All 2 means to delete all data, after selecting, press the "Cal/Enter" key to delete stored data.



#### 【TIPS】

- In the measurement state, long press the "Save/▼" key to enter the function of viewing stored results.
- When viewing no stored result, the interface displays the character "nuLL", which means Null Stored Result.

### **5.3.2.4 Automatic shutdown settings**

The meter provides auto shutdown function. When the meter is not using and set the auto shutdown, the meter switches off automatically. There are six options: off, 300 Sec, 600 Sec, 1200 Sec, 1800 Sec, and 3600 Sec.

### **5.3.2.5 Reset settings**

When the meter is not working. Users can reset the meter from the default's backup. The default setting includes the electrode slope as 100%, the temperature as 25.0 °C, continuous reading mode, automatic shutdown as close etc. All data will be deleted after resetting.

## **5.4 Calibration**

### **5.4.1 Prepare electrodes**

Before using the pH electrode, please pay attention to the following items:

- Pull out the electrode protection cap at the bottom end of the pH electrode, and pull down the rubber sleeve at the upper end of the electrode to expose the small hole at the upper end.
- Clean the electrodes with distilled water.
- For details on the use and storage of the pH electrode, please refer to the electrode instruction manual.

### **5.4.2 pH electrode Calibration**

The pH electrode has a certain drift in different use environments or when it has not been used for a long time, resulting in different electrode slopes and zero points. It needs to be re-calibrated with a standard buffer solution.

If the user needs to perform multi-point calibration, multiple standard

solutions must be prepared in advance. If only one point calibration is required, only one standard buffer solution is required.

One-point calibration is suitable for the situation where the measurement accuracy is not high. At this time, the percentage slope of the electrode is taken as 100%. Two-point or multi-point calibration is usually used to improve pH measurement accuracy.

Generally, when the meter is used continuously, it is recommended to calibrate once a day.

Table 5-5 Characters displayed on the calibration operation interface

No.	Character display	Explanation
1	Auto	Display when the standard solution is automatically identified, indicating Auto Recognition.
2	Non	Display when the standard solution is manually identified, indicating Manual Recognition.
3	Err	Display when calibration fails, indicating Error.
4	OH	Display when the confirmation is valid during calibration, indicating OK.
5	End	Display when calibration is completed.

The meter supports automatic identification of standard buffer solutions, and can identify three standard solutions of 4.01pH, 7.00pH, and 10.01pH. Users can refer to the appendix to prepare pH standard buffer solution, or purchase market standard buffer solutions.

Prepare 1-3 standard buffers and deionized water as required to start

calibration. The calibration steps are as follows (for reference):

- 1) In the measurement state, press the "Cal/Enter" key to enter the electrode calibration state (the default is automatic identification mode, the word "Auto" is displayed).
- 2) Wash the pH electrode repeatedly with distilled water, put it in a certain standard buffer solution (such as 7.00pH standard buffer solution), the instrument displays pH value and temperature value (such as 7.00pH, 25.0 °C).
- 3) If the meter is not connected to a temperature electrode, you need to use a thermometer to measure the temperature value of the standard solution, press the "Setting" key and set the current temperature value (such as 25.2 °C) with the up and down key, and press the "Cal/Enter" key to complete the temperature value input.
- 4) Wait for the reading to stabilize, press the "Cal/Enter" key, and the meter stores the calibration data and displays the calibration result, that is, the nominal pH value at 25.2 °C.

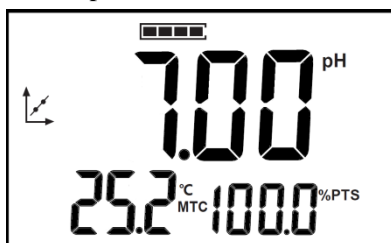


Figure 5-7 Calibration display

- 5) When performing multi-point calibration, repeat the process above to calibrate the remaining calibration points. The meter supports up to 3-point calibration. When the user finishes calibrating 3 standard solutions, the meter will automatically end the calibration and return

to the measurement state. If the user only needs to calibrate 1~2 points, you can manually press the "Cancel" key to terminate the calibration.

If the user uses a non-standard pH buffer solution to calibrate the electrode, the user must know the relationship between the pH value of the non-standard solution and the temperature in advance, that is, the nominal pH at a certain temperature, and then control the temperature of the constant temperature tank to make the standard solution reach specified temperature value.

Calibration steps are as follows (for reference):

- 1) Place the standard solution in a constant temperature tank, in which the temperature is controlled to a certain temperature value,
- 2) Press the "Cal/Enter" key to enter the calibration state, and long press the "Meas/Del" key to switch to manual identification mode and display the word "Non",
- 3) Press the up and down key to set the nominal pH value at the current temperature,
- 4) If the meter is not connected to the temperature electrode, press the "Setting" key and set the current temperature value by pressing the up and down key, and press the "Enter" key to complete the temperature value input,
- 5) After the data is stable, press the "Enter" key to complete the calibration.

**【TIPS】**

Standard buffer solutions are usually obtained in two ways, users can prepare or purchase standard solutions by themselves

- Customized: Please refer to appendix to prepare pH standard buffer
- Purchase standard buffers: Users can also directly purchase certified standard buffers produced by professional manufacturers, very convenient. In order to facilitate the use of users and reduce a lot of work for users to prepare standard solutions, our company produces and prepares pH standard buffer solutions, which users can purchase directly. It is very convenient to calibrate the electrode with a standard solution before measurement.

## **5.5 Measurement**

### **5.5.1 Measurement preparation**

Before measurement, the user should understand the properties and attributes of the substance (sample) to be measured; the method of routine testing; know the basic operation and application of the meter; know the use and maintenance of conventional electrodes.

The user needs to prepare the sample first, or the standard solution that needs to re-calibrate the electrode, etc.

### **5.5.2 Measurement**

After pH electrode calibration, pH value and potential value of the

solution can be normally measured

The meter supports two reading modes: continuous measurement mode and balanced measurement mode. If it is a balanced reading mode, after the data is stable, the meter will automatically lock the measurement results (the lock sign will be displayed, and the measurement results will not change); the user can press the "measure" key to start the next measurement. If you need to continuously monitor the pH value and mV value of the solution, you should use the continuous measurement mode.

The measurement steps are as follows (for reference):

- 1) Immerse the electrode in the solution to be measured,
- 2) If the instrument is not connected to a temperature electrode, use a thermometer to measure the temperature value of the current solution, and then manually set the temperature value,
- 3) Wait for the data to stabilize, and then read the measurement results,
- 4) In the measurement state, press the mode key "mV/pH" to switch the mV value or pH value display,

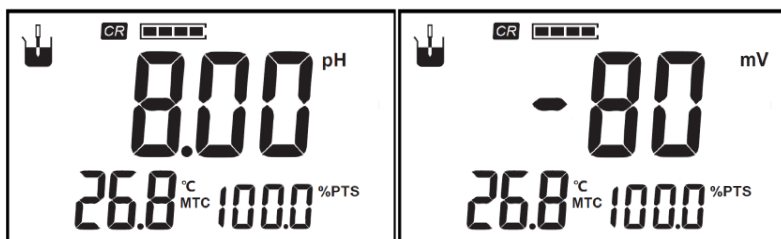


Figure 5-8 Measurement display

5) If necessary, you can press the "Save/▼" key to Save the measurement results.



**【TIPS】**

- To ensure accurate measurement, the sample volume in the container should be sufficient to ensure that the junction of the measuring and the reference electrode is completely immersed in the sample.
- For accurate measurement, it is recommended that users calibrate and measure at the same temperature.

## 6 Maintenance and Troubleshooting

### 6.1 Maintenance

The correct use and maintenance of the meter can ensure the normal and reliable operation of the meter, especially the pH meter, which has a high input impedance and is easily damaged by static electricity and other electromagnetic interference; In addition, it will often come into contact with chemicals, and the use environment is relatively harsh, so reasonable maintenance is required:

When the Q9 interface of the meter is not connected to the electrode, please insert the Q9 short-circuit plug to prevent the meter from being damaged. Please place the Q9 short-circuit plug in a dry and clean environment to prevent the short-circuit plug from being corroded to affect the short-circuit effect.

- If the meter is not used for a long time, please disconnect the power supply.
- The electrode socket of the meter must be kept clean and dry, and should not be in contact with acid, alkali or salt solution.
- The housing material of this meter is sensitive to certain organic solvents such as toluene, xylene, and methyl ethyl ketone (MEK). If liquid enters the housing, it may damage the meter. To clean the meter housing, wipe gently with a towel dampened with water and mild detergent.
- If the meter is not used for a long time, please cover the dust cover.
- When transporting the meter, please abide by the following instructions:
  - Unplug the meter and remove all connected cables.
  - Remove electrode holder.

- To avoid meter damage during long distance transportation, please try to use original packing.

## 6.2 Electrode usage and maintenance

Before using the electrode, you should read the electrode manual carefully to know the type, structure and application scope of the electrode. For composite pH electrodes with plastic shells, the following points should generally be noted:

- The external reference supplement of the composite electrode is 3mol/L potassium chloride solution. The supplement can be added from the small hole at the top of the electrode. When the composite electrode is not in use, the rubber cover should be pulled to prevent the supplement from drying up.
- After removing the electrode protection cap, the sensitive glass bubble of the electrode should be avoided from contacting with hard objects. Any damage or scratching will make the electrode ineffective.
- After the measurement, the electrode protection cap should be covered in time. A small amount of external reference supplement should be placed in the protection cap to keep the electrode bulb moist. Do not immerse the electrode in distilled water for a long time.
- The Q9 short-circuit plug of the electrode should be kept clean and dry to prevent short-circuit by rust, otherwise it will cause measurement inaccuracy or failure.
- Electrodes should avoid long-term immersion in protein solutions and acidic fluoride solutions, and should avoid contact with silicone oil.
- Due to the different electrode materials, please select the appropriate

electrode according to the actual use to avoid damage to the electrode.

- **Repair pH Electrodes:** After long-term use of the electrode, if the slope decreases slightly, the bottom end of the electrode can be immersed in 4% HF (hydrofluoric acid) for (3-5) s, wash with distilled water, and then soak in 0.1 mol/L hydrochloric acid solution to rejuvenate.
- **Clean pH Electrode:** If the measured solution contains substances that are easy to contaminate the sensitive bulb or block the liquid junction and make the electrode passivated, the slope will decrease and the display reading will be inaccurate. If this phenomenon occurs, according to the nature of the contaminant, the electrode should be cleaned with an appropriate solution to regenerate the electrode.

Table 6-1 Reference table of electrode contaminants and cleaning agents

Contaminant	Detergent
Inorganic metal oxide	Less than 1 mole /L of dilute acid
Organic fatty substances	Dilute detergent (weak alkaline)
Resin polymer material	Alcohol, acetone, ether
Protein hemocyte precipitate	5% pepsin +0.1mol/L HCl solution
Pigment substance	Dilute bleach solution, hydrogen peroxide

For more details, see pH electrode instructions.

## 6.3 Troubleshooting

Table 6-2 Common Troubleshooting

No.	Phenomenon	Solutions
1	Not switched on	Check whether the power adapter has voltage output or not.
2	Unable to calibrate	Inaccurate preparation of standard pH buffer solutions or damaged electrodes.
3	The reading jumps back and forth	Check whether there are interfering devices around the detection instrument, please stay away from the interfering devices or shield them.
4	Inaccurate measurements	Check whether the standard pH buffer solution is contaminated, replace the standard pH buffer solution and re-calibrate; if the electrode is contaminated or the clogging liquid junction is blocked, clean it according to the electrode instructions.
5	Slow measurement response	If the glass bulb of the electrode is polluted, clean it according to the electrode manual and the type of contamination. If the temperature of the measured solution is low, it is a normal phenomenon.

## 7 Technical Support

### Accessories

Please refer to the accessories table for purchasing recommendations.

Table 7-1 Meter accessories

Name	Description
E-301-QC pH three composite electrode	Conventional sample measurement
REX-5 Multifunctional Electrode Holder	Hold the electrodes during measurement
Power Adapter	Input: AC 100~240V, Output: DC 9 V

Table 7-2 Optional electrodes (for other models, see the official website for details)

Model Name	Electrode plug	Description
E-201-Z pH composite electrode (Blade spear)	BNC(Q9)	Suitable for special samples such as semi-solid samples, etc.
E-201-P pH Composite Electrode (Flat)	BNC(Q9)	Suitable for flat sample measurement
65-1C pH composite electrode (Glass shell)	BNC(Q9)	Glass shell, resistant to organic corrosion
962103 pH composite electrode (Low maintenance)	BNC(Q9)	Suitable for conventional aqueous solution and general contamination samples
962221 pH Composite Electrode (Ultrapure Water )	S7-BNC(Q9)	Suitable for ultra-low conductivity water samples such as pure water and deionized water

EZ-101 pH Meter Instruction

Model Name	Electrode plug	Description
962121 pH composite electrode (Low conductivity )	S7-BNC(Q9)	Suitable for low conductivity samples with conductivity above 100us/cm
962241 pH Combination Electrode (Blade spear)	BNC(Q9)	Suitable for solid and semi-solid piercing samples
962242 pH Composite Electrode (Flat )	S7-BNC(Q9)	Suitable for surface or droplet samples
962244 pH composite electrode (Slender)	S7-BNC(Q9)	Suitable for trace samples above 0.2mL, or narrow-bore containers
962243 pH composite electrode (Long)	S7-BNC(Q9)	Suitable for large volume container samples
962102 pH composite electrode (Cleanable)	BNC(Q9)	Suitable for highly polluting samples such as emulsions, suspensions, and viscous
962223 pH composite electrode (RoHS )	S7-BNC(Q9)	RoHS Compliant
pH composite electrode (High temp. resistance)	S7-BNC(Q9)	Suitable for high temperature samples

## 8 Appendix

### Appendix 1

pH-Temperature Relationship Table of pH Standard Solutions

Temperature( °C)	1.68	4.01	7.00	10.01
5	1.67	4.00	7.09	10.25
10	1.67	4.00	7.06	10.18
15	1.67	4.00	7.04	10.12
20	1.68	4.00	7.02	10.06
25	1.68	4.01	7.00	10.01
30	1.68	4.01	6.99	9.97
35	1.69	4.02	6.98	9.93
40	1.69	4.03	6.97	9.89
45	1.7	4.04	6.97	9.86
50	1.71	4.06	6.97	9.83