



Portable Water Hardness Meter LMPHM-A100

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1. Introduction

Portable Water Hardness Meter LMPHM-A100 comes with a solid-state ion selective electrode and LCD display. Manual temperature calibration improves the measurement accuracy of hardness meter. Stored data can be transferred into computer by using USB communication interphase. System menu allows setting the 7 parameters which includes the number of calibration points, stability condition, hold function, auto-power off. Stability indicator automatically indicate current measurement status.

2. Features

- Portable hardness meter is suitable for outdoor applications
- Automatic temperature compensation provides accurate readings over the entire range
- Automatic power off effectively conserves battery shelf lif
- Setup menu allows stability criteria and number of calibration points
- 2 to 5 points calibration system with low to high concentration extent
- Expanded memory can store up to 500 sets of data
- Multi-mode power scheme (battery, power adapter, computer's USB port) ensures to use the meter smoothly

3. Specifications

Model No.	LMPHM-A100
Range (Concentration)	0.05 to 200mmol/L
Range (German Degree)	0 to 1122°dH
Range (English Degree)	0 to 1404°e
Range (French Degree)	0 to 2000°fH
Range (CaCO ₃)	0 to 19999 mg/L
Range (CaO)	0 to 11220 mg/L
Range (Boiler)	0 to 400mmol/L
Range (Ca ²⁺)	0 to 8020 mg/L
Resolution	0.001, 0.01, 0.1, 1
Accuracy	±1% F.S.
Calibration Points	2 to 5 points
Calibration Solutions	0.01, 0.1, 1, 10, 100mmol/L
Temperature Range	0 to 105°C
Temperature Resolution	0.1°C
Temperature Accuracy	±0.5°C
Offset Calibration	1 point
Calibration Range	Reading ±10°C
Temperature Compensation	0 to 50°C, manual or automatic
Stability Criteria	Low or high
Calibration Due Alarm	1 to 31 days or off
Auto-Power Off	10, 20 or 30 minutes after last key pressed
Memory	Stores up to 500 data sets
Output	USB communication interface
Connector	BNC, 3.5 mm jack socket
Display	Custom LCD (80×60mm)
Power	3×1.5V AA batteries or DC5V power adapter
Battery Life	Approximately 150 hours (turn off the backlight)
Dimensions(L×W×H)	170×85×30 mm
Weight	300 g

4. Applications

It is used in testing hardness level of tap water, drinking water and testing across food, research centers and industries

5. Installation

5.1 Display

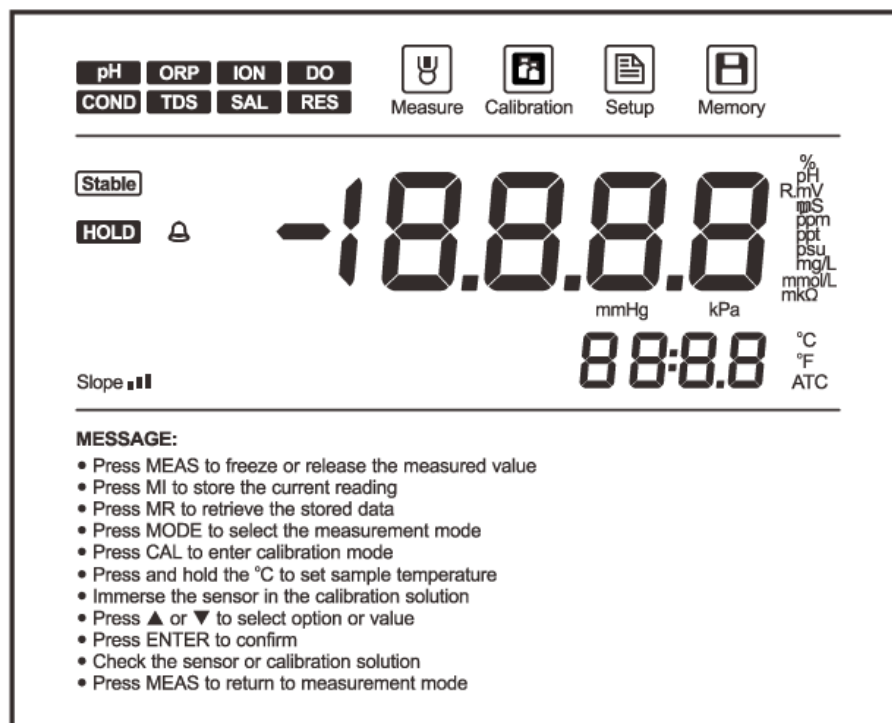


Figure-1

Icon	Description
	Indicates that the meter is in the measurement mode
	Indicates that the meter is in the calibration mode
	Indicates that the meter is in the setup mode
	Indicates that you are viewing the stored readings, or a reading is stored in the memory.
Slope	If the electrode slope exceeds the allowed range after calibration, the icon automatically disappears.
	If the meter has not been recalibrated within a specified period, the icon automatically shows.
ATC	Indicates that the automatic temperature compensation is enabled
Stable	Shown when the measurement is stable

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HOLD	Shown when the reading is locked
pH	pH mode
ORP	Oxidation reduction potential (ORP) mode
ION	Ion concentration mode
COND	Conductivity mode
TDS	Total dissolved solids (TDS) mode
SAL	Salinity mode
RES	Resistivity mode
DO	Dissolved oxygen mode

5.2 Keypad

Key	Function
	Switch the meter on or off.
	Lock or unlock the measurement.
	Exit the calibration, settings, and data logs and return to the measurement mode.
	Select the measurement mode.
	Press and hold the key to enter the temperature setting.
	Start calibration.
	Press and hold the key to enter the setup menu.
	Store the current reading in memory.
	Increase value or scroll up through a list of options.
	View the data log or calibration log.
	Decrease value or scroll down through a list of options.
	Confirm the calibration or displayed option.
	Press and hold the key to switch the backlight on or off.

5.3 Connectors

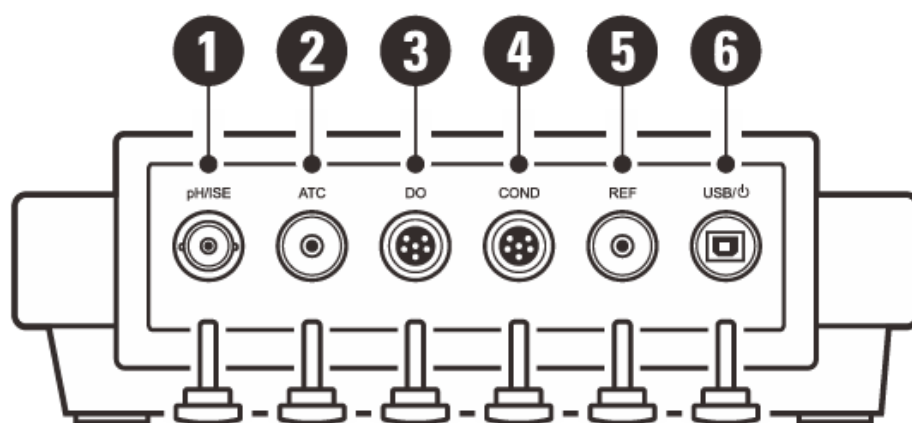


Figure-2

1.	Socket for pH, ORP, or ion selective electrode (BNC)
2.	Socket for temperature probe (3.5 mm jack)
3.	Socket for dissolved oxygen electrode (6-pin DIN)
4.	Socket for conductivity electrode (6-pin DIN)
5.	Socket for reference electrode (3.5 mm jack)
6.	USB-B interface to the power adapter or computer

6. Operations

6.1 Before use

- 1) Connect the water hardness electrode to the meter.
- 2) Remove the protective cap and soak the electrode in a 10 mmol/L standard solution for about 10 minutes.

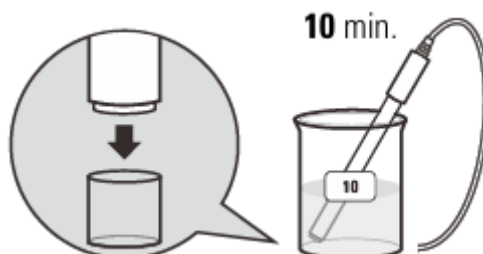


Figure-3

Selecting the Measurement Mode

The meter contains 8 water hardness measurement modes. Press the Mode key, and the display will show the corresponding icon and enter the selected measurement mode.

LCD Display	Measurement Mode	Measurement Unit
ION	Ion concentration	mmol/L
CaCO ₃	CaCO ₃	mg/L
CaO	CaO	mg/L
Boiler	Boiler	mmol/L
Ca ²⁺	Ca ²⁺	mg/L
°fH	French degree	°fH
°dH	German degree	°dH
°e	English degree	°e

Note: The meter allows entering the setup menu or performing the calibration in the ION mode only.

6.2 Water Hardness Settings

The meter contains 1 measurement setting and 7 general settings in the setup menu.

Menu Item	Option and Description	
CAL	Calibration Points: Set the number of calibration points.	
	...5	2 to 5 points (default 2 points)

6.3 Temperature Compensation

To get accurate measurements, we recommend that all of the standards and samples be at the same temperature. If you want to enable the temperature compensation, use either of the following two methods.

Automatic Temperature Compensation

Connect the temperature probe to the meter, the ATC icon appears on the display, and the meter is now switched to the automatic temperature compensation mode.

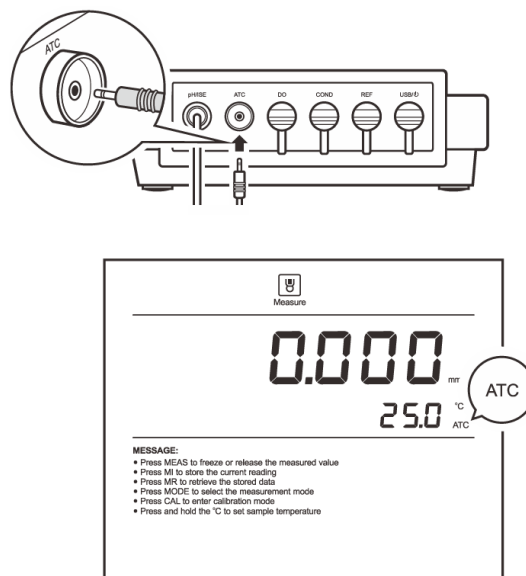


Figure-4

Manual Temperature Compensation

If the meter does not detect a temperature probe, the degrees Celsius icon (°C) will show on the display, indicating the meter is switched to the manual temperature compensation mode. To set the temperature value, follow the steps below.

- 1) Press and hold the °C key to enter the temperature setting.
- 2) Press the ▲ / ▼ key to modify the temperature value.
- 3) Press the Enter key to save.

i Pressing and holding the ▲ / ▼ key will make the value change faster.

6.4 Water Hardness Calibration

The water hardness meter allows 2 to 5 points of calibration with standard solutions. Acceptable calibration points include the following options.

Measurement Unit	Calibration Points
mol/L	0.001, 0.01, 0.1
mmol/L	0.001, 0.01, 0.1

For better accuracy, we recommend adding the ionic strength adjuster (ISA) to all of the standards and samples, and selected calibration points cover the anticipated range of the samples. A typical addition would be 2 ml of ISA to 100 ml of standard and sample.

Calibrating the meter

- 1) Press the **Mode** key until the display shows the meter entering the ion concentration measurement mode.

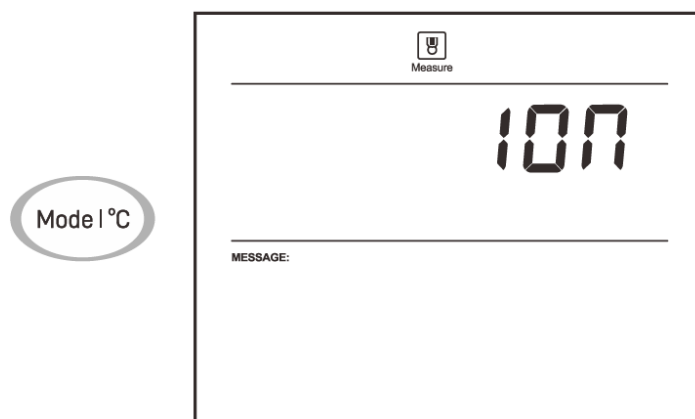


Figure-5

- 2) Press the **Cal** key to enter the calibration mode, and the display shows 0.001 mmol/L / CAL1.
- 3) Press the **▲/▼** key to select the first calibration point (e.g., 0.01 mol/L); the meter will automatically perform the calibration from the low to high concentrations.

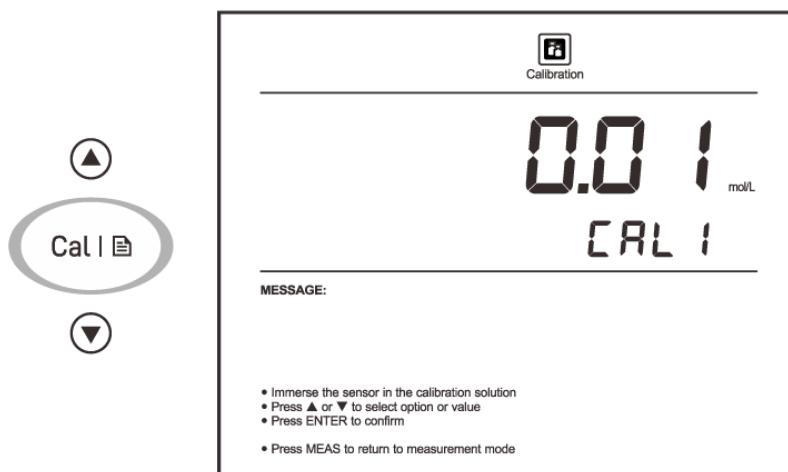


Figure-6

- i** The meter is packaged with 10 and 100 mmol/L standard solutions, and its related calibration points are 0.01 and 0.1 mol/L.
1 mol/L = 1000 mmol/L

- 4) Rinse the water hardness electrode with deionized water, then rinse with a small amount of standard solution. Place the electrode (and temperature probe) into the standard solution (e.g., 10 mmol/L), and stir gently to create a homogeneous solution.

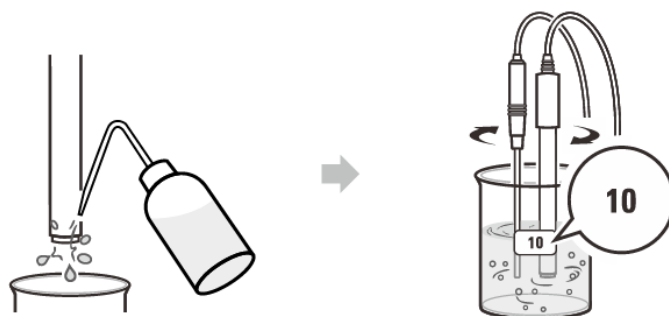


Figure-7

- 5) Press the Enter key, and the Calibration icon begins flashing.

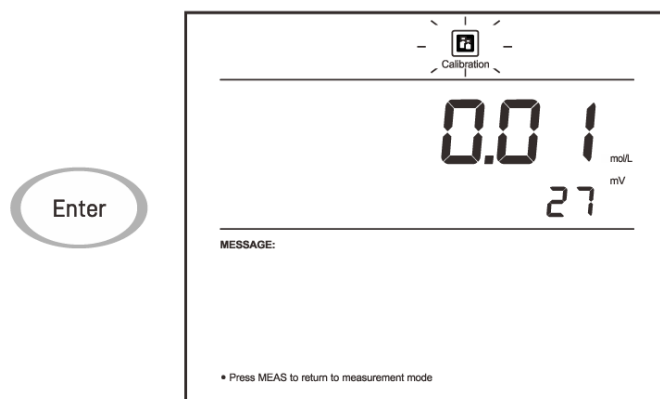


Figure-8

- 6) When the reading has stabilized, the display will show 0.1 mol/L/CAL2. The meter prompts you to continue with the second point calibration.

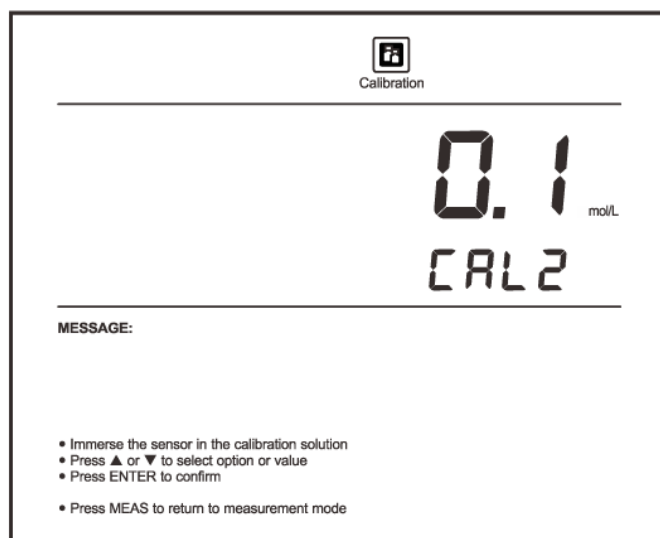


Figure-9

- 7) Rinse the water hardness electrode with deionized water, then rinse with a small amount of standard solution. Place the electrode (and temperature probe) into the next standard solution and stir gently.

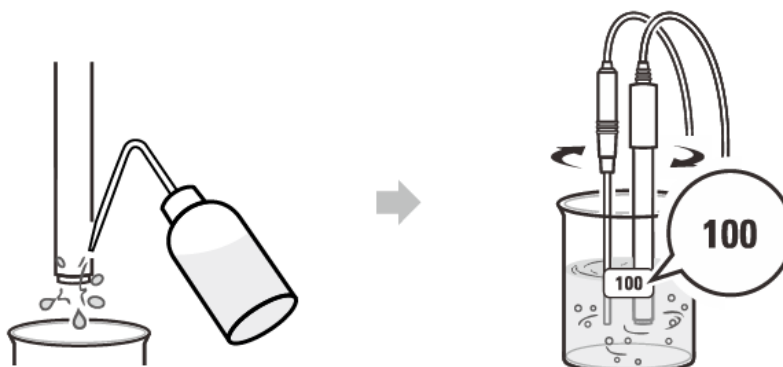


Figure-10

- 8) Press the Enter key, and the Calibration icon begins flashing.

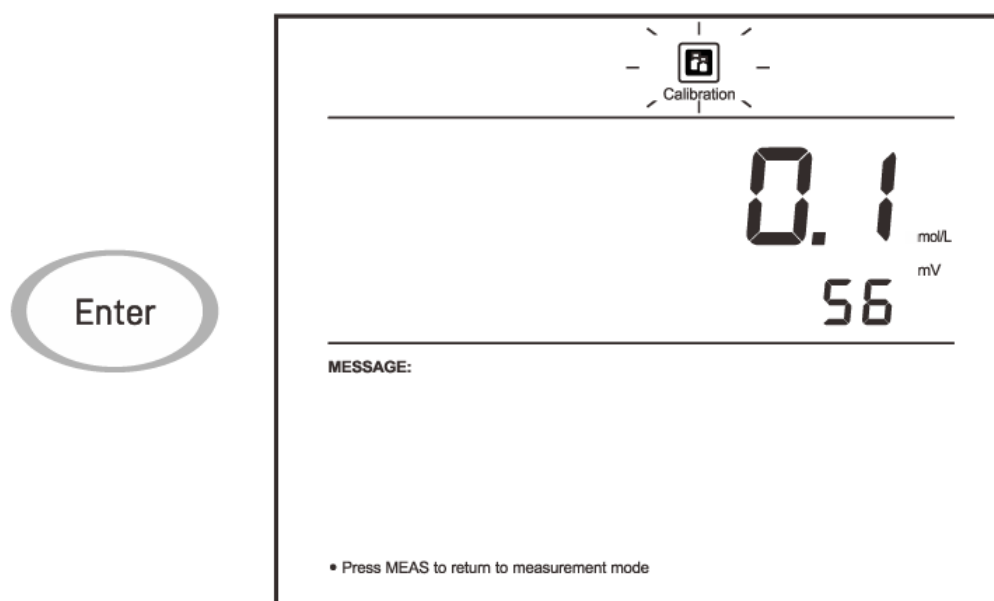


Figure-11

- 9) When the reading has stabilized, the display will show CAL3. The meter prompts you to continue with the third point calibration.
10) Repeat steps 7 and 8 above until the meter shows. Calibration is completed.

i To exit the calibration without saving changes, press the Meas key.

Viewing the Calibration Log

- 1) Press the **MR** key in the measurement mode and press the ▼ key until the meter shows / (Electrode).
- 2) Press the **Enter** key, and the meter shows the last calibration date.

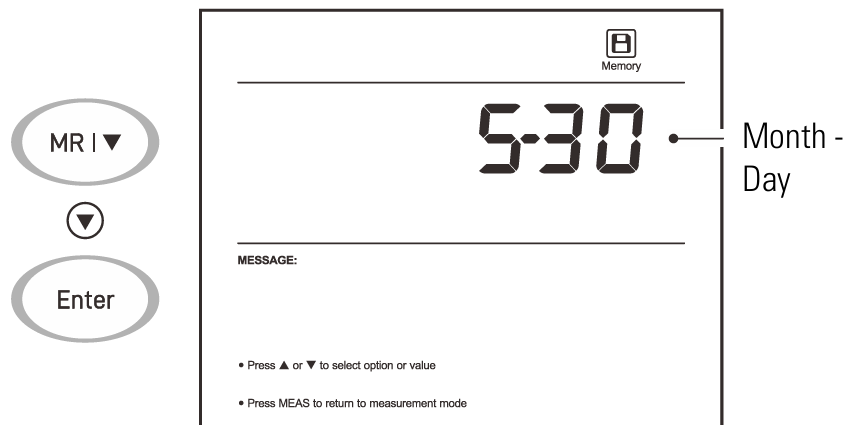


Figure-12

- 3) Press the ▼ key to view the calibration point and mV value.

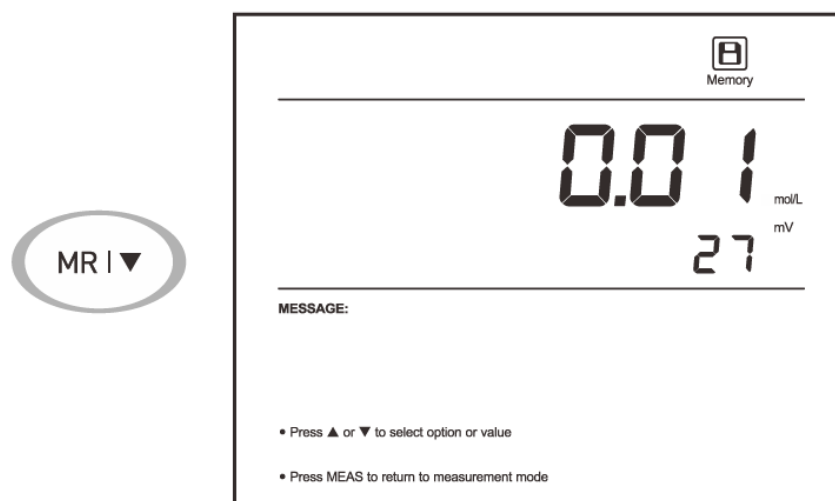


Figure-13

- 4) Press the ▼ key to view the next data set.
- 5) To exit the calibration log, press the Meas key.

i If the meter is not calibrated with standard solutions, the display will show ---- only.

6.5 Water Hardness Measurement

- 1) Rinse the water hardness electrode with deionized water. Place the electrode (and temperature probe) into the sample solution and stir gently.

Note: The ion-sensitive membrane and liquid junction must be completely immersed in the solution.

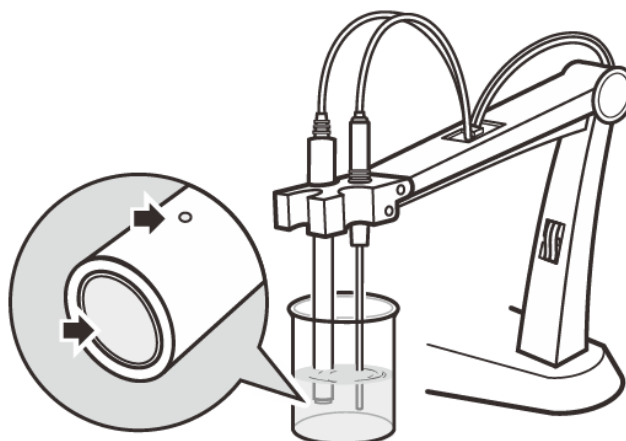


Figure-14

- 2) If the Auto-Hold option in the setup menu is enabled, the meter will automatically sense a stable reading and lock the measurement; the **HOLD** icon appears on the display. Press the  key to resume measuring. If the option is disabled, the meter will continuously measure and update the readings.

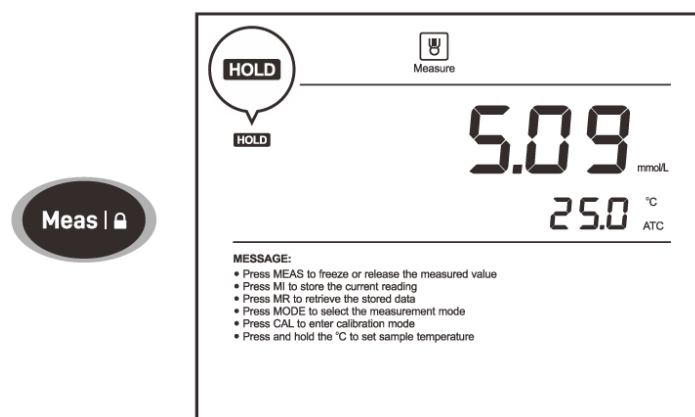


Figure-15

- 3) Wait for the measurement to stabilize and record the reading.
- 4) When all of the samples have been measured, rinse the electrode with deionized water.

-  During the measurement process, never wipe the ion-sensitive membrane; blot dry with a lint-free tissue to remove water drops on the electrode.
- If the meter is not calibrated with the connected electrode, the display will always show 0.000.
- If the meter shows ----, indicating the measurement exceeds the range, remove the electrode from the sample immediately.

7. Maintenance

Electrode Maintenance

- 1) Rinse the water hardness electrode thoroughly with deionized water after use, wipe clean with a lint-free tissue, then replace the protective cap and store the electrode in a dry, cool, and well-ventilated area.
- 2) Never scratch the ion-sensitive membrane on the bottom of the electrode.
- 3) If the electrode response becomes sluggish, soak the electrode in 10 mmol/L standard solution for at least 1 hour.

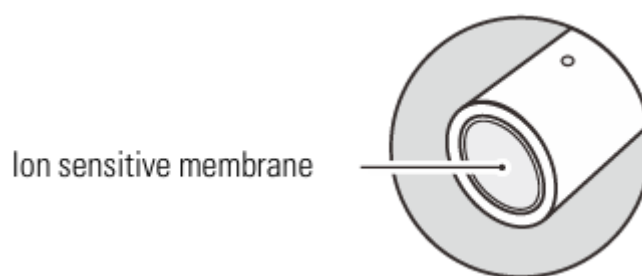


Figure-16

Preparation of Standard Solution (100 mmol/L)

- 1) Half-fill a 1-liter volumetric flask with deionized water and add 14.7 grams of analytical-grade calcium chloride ($\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$) reagent.
- 2) Swirl the volumetric flask gently to dissolve the reagent and fill to the mark with deionized water.
- 3) Cap and upend the volumetric flask several times to mix the solution.

8. Troubleshooting

Fault	Cause and Corrective Action
----	The electrode dried out. Soak the pH electrode in 3M KCL solution for about 30 minutes. Soak the ion-selective electrode in 100 ppm standard solution for about 30 minutes. Soak the conductivity electrode in tap water for about 10 minutes.
	Measurement exceeded the maximum range. Check the electrode and sample.
Drifting erratic readings	Check the electrode to see whether it is clogged, contaminated, or broken.
Err	pH buffer problem. Use freshly prepared buffer solutions to calibrate the meter.
	The electrode has expired. Replace the pH electrode.
	DO electrolyte solution is depleted. Refilling electrolyte solution.
	The zero-oxygen solution is contaminated. Replace the calibration solution.