



Portable pH Meter

LMPH-403

Index

Sr.no	Title	Page no
1.	Introduction	2
2.	Features	2
3.	Specifications	3
4.	Applications	4
5.	Instrument Introduction	5
6.	Installation	8
7.	Operations	16
8.	Troubleshooting	44

1. Introduction

Portable pH Meter LMPH-403 is a rugged device that can monitor pH, mV, relative mV, ion concentration and temperature when paired with the appropriate probe. It is an excellent meter for a variety of applications and advanced pH analysis in the field. Calibration can be performed up to 5 points, and 500 data point sets can be stored. Calibration and datalogs can be easily transferred via USB. A custom LCDs the parameters operating in the 0 - 100°C temperature range.

2. Features

- 1 to 5 points calibration with automatic recognition for USA, NIST and DIN buffers
- Automatic electrode diagnosis shows the pH slope and offset
- Automatic temperature compensation ensures accurate readings over the entire range
- Calibration due alarm prompts user to calibrate the meter regularly
- Relative and absolute millivolt modes ensure the reliable ORP measurements
- Auto read function senses and locks the measurement end point
- Setup menu allows setting the pH buffer set, number of calibration points, temperature unit, auto-power off, etc
- Reset function automatically resumes all setting back to the factory defaults
- Expanded memory stores or recalls up to 500 data sets
- USB communication interface for data transfer or connecting a power adapter to meter
- Auto power off effectively conserves battery life
- Multi-mode power scheme
- Ensures durable, rugged performance in outdoor environments

3. Specifications

Model No.	LMPH-403	
pH	Range	-2.000 - 20.000 pH
	Resolution	0.001, 0.01, 0.1pH, selectable
	Accuracy	±0.002pH
	Calibration Points	1 to 5 points
	pH Buffer Options	USA, NIST, DIN, 2 custom buffers
Ion	Range	0.001~19999 (depending on the range of ISE)
	Resolution	0.001, 0.01, 0.1, 1
	Accuracy	±0.5% F.S. (monovalent), ±1% F.S. (divalent)
	Measurement Units	ppm, mg/L, mol/L, mmol/L
	Calibration Points	2 to 5 points
	Calibration Solutions	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000
ORP	mV Range	±1999.9mV
	Relative mV Range	±1999.9mV
	Resolution	0.1, 1mV, selectable
	Accuracy	±0.2mV
	Calibration Points	1 point
Temperature	Range	0 - 105°C/32 - 221°F
	Resolution	0.1°C/0.1°F
	Accuracy	±0.5°C/±0.9°F
	Offset Calibration	1 point, reading ±10°C
Temperature Compensation	0 - 100°C, manual or automatic	
Stability Criteria	Low or high	
Calibration Due Alarm	1 to 31 days or off	
Slope/Offset Display	Yes	
Hold Function	Manual or auto-endpoint	
Auto-Off	10, 20 or 30 minutes after last key pressed	
Memory	500 data sets	
Communication Interface	USB	
Connector	BNC, 3.5 mm jack socket	

Portable pH Meter LMPH-403

Display	Custom LCD (80 × 60 mm)
Battery Life	Approximately 150 hours (Turn off the)backlight
Power Requirements	3 1.5V AA batteries or DC5V power adapter
Dimensions (L×W×H)	170×85×30 mm
Weight	300 g

4. Applications

pH meters are vastly used in various applications such as food and beverage industries, analysis of quick nutrients availability, hydroponics, pH measurement of soil and other soluble solutions.

5. Instrument Introduction

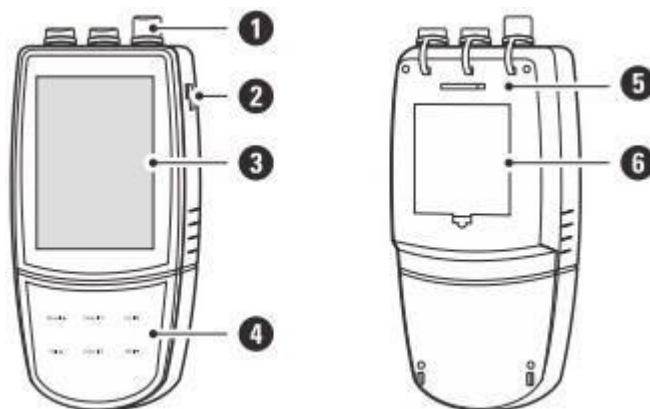


Figure-1

1. Sensor connection
2. Slot for electrode clip
3. Display
4. Membrane keypad
5. Slot for hand strap
6. Battery compartment

Display

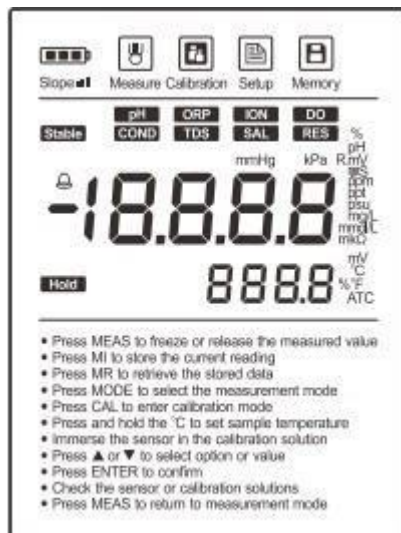


Figure-2

Portable pH Meter LMPH-403

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.
	Low Battery Alarm- The icon automatically disappears when the battery voltage falls below the minimum power requirements.
	Electrode Condition Indicator- The icon automatically disappears if the pH electrode slope exceeds the allowed range after calibration.
	Calibration Due Alarm- The icon automatically shows, if the electrode has not been recalibrated within a specified period.
ATC	Indicates that the automatic temperature compensation is enabled.
Stable	Shown when the measurement is stable.
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.

Keypad

Key	Function
Meas 	- Switch the meter on or off - Lock or unlock the measurement - Exit the calibration, settings, data logs and return to the measurement mode
Mode °C	- Select the measurement mode - Press and hold the key to enter the temperature setting
Cal 	- Start calibration - Press and hold the key to enter the setup menu
MI ▲	- Store current reading to memory - Increase value or scroll up through a list of options
MR ▼	- View the data logs or calibration logs - Decrease value or scroll down through a list of options
Enter 	- Confirm the calibration or displayed option - Press and hold the key to switch the backlight on or off

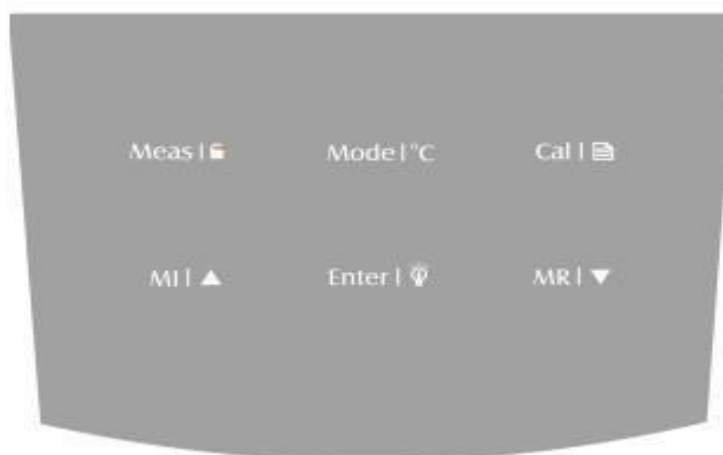


Figure-3

6. Installation

Installing the Batteries

1. Remove the battery compartment cover from the backside of the meter.

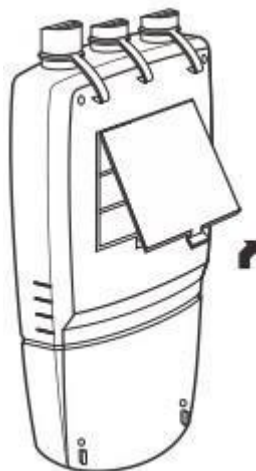


Figure-4

2. Insert three AA alkaline batteries into the battery compartment and note polarity.

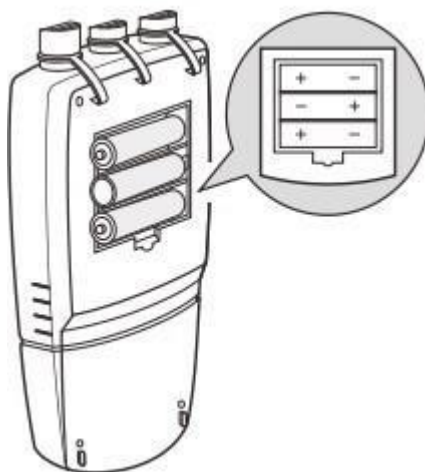


Figure-5

3. Replace the battery compartment cover to its original position and push the limiter until it locks.



Figure-6

Using the Power Adapter

The meter allows the use of the DC 5V power adapter (order code: DCPA5V) or the USB port on the computer as a power supply.

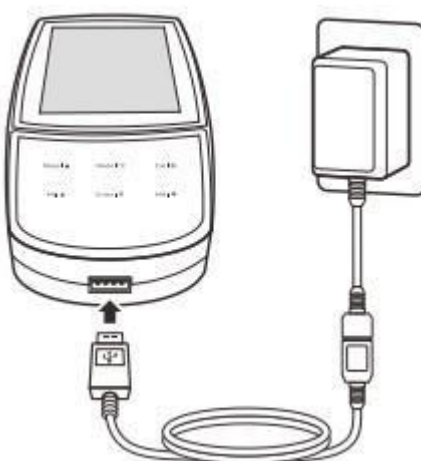


Figure-7

Note: Take out the batteries before connecting an external power supply.

Installing the electrode Clip

The electrode clip is designed for mounting a sensor, but it is not a necessary component for the meter. If users want to install this accessory, insert the electrode clip into the slot on the meter's right.



Figure-8

Switching the meter On and Off

- Press the Meas key and release it to switch on the meter.
- Press and hold the Meas key to switch off the meter.

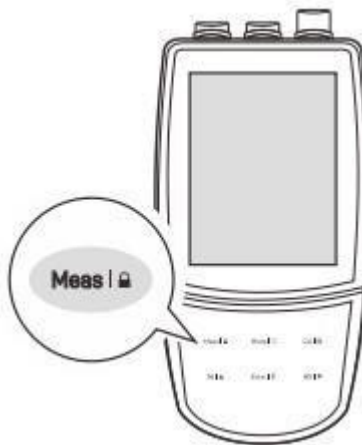


Figure-9

Temperature Calibration

The meter comes with a temperature probe for measurement and temperature compensation. If the measured temperature reading differs from an accurate thermometer's, the probe must be calibrated.

- i** Note the dissolved oxygen electrode has a built-in temperature sensor and does not need to use this probe.
1. Connect the temperature probe to the meter and place it into a solution with a known accurate temperature.
 2. Press and hold the °C key to enter the temperature setting.
 3. Press the ▲ / ▼ key to modify the temperature value.
 4. Press the **Enter** key to save.



Figure-10

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

General Settings

The meter contains an integrated setup menu for customizing the function parameters. In the different modes, the display will show the corresponding menu items. For the general settings, the option will be applied to all modes once the setting is changed.

Menu	Option and Description
STB	Stability Criteria Set when a measurement is recognized as stable. LO Standard (default) HI High accuracy
HOLD	Auto-Hold If enabled, the meter will automatically sense and lock the measurement endpoint. YES Enable NO Disable (default)

OFF	Auto-Power Off If enabled, the meter will automatically switch off if no key is pressed within a specified time period. <table> <tr> <td>...30</td><td>10, 20, 30 minutes</td></tr> <tr> <td>NO</td><td>Disable (default)</td></tr> </table>	...30	10, 20, 30 minutes	NO	Disable (default)
...30	10, 20, 30 minutes				
NO	Disable (default)				
CALL	Calibration Due Reminder Set the calibration interval to activate alarm  . <table> <tr> <td>...31</td><td>1 to 31 days</td></tr> <tr> <td>OFF</td><td>Disable (default)</td></tr> </table>	...31	1 to 31 days	OFF	Disable (default)
...31	1 to 31 days				
OFF	Disable (default)				
DATE	Date and Time Set the date and time for data logs and calibration logs.				
CLR	Clear Stored Data Delete all data logs in the memory. <table> <tr> <td>YES</td><td>Enable</td></tr> <tr> <td>NO</td><td>Disable (default)</td></tr> </table>	YES	Enable	NO	Disable (default)
YES	Enable				
NO	Disable (default)				
Reset	Factory Reset Reset the meter to factory default settings. Note, the meter must be recalibrated. <table> <tr> <td>YES</td><td>Enable</td></tr> <tr> <td>NO</td><td>Disable (default)</td></tr> </table>	YES	Enable	NO	Disable (default)
YES	Enable				
NO	Disable (default)				

Setting a Default Option

1. In the measurement mode, press and hold the key to enter the setup menu.
2. Press the  key to select a menu item.

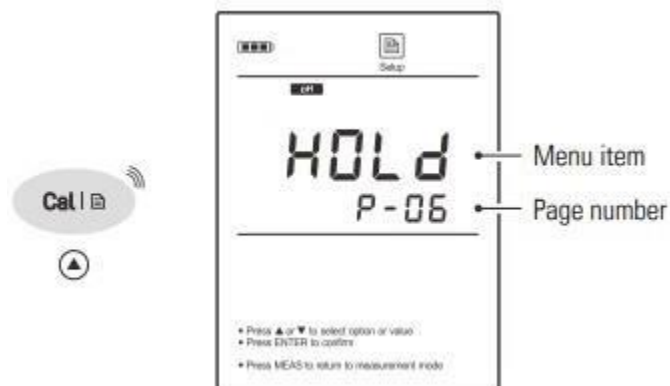


Figure-11

3. Press the Enter key, and the meter shows the current option.

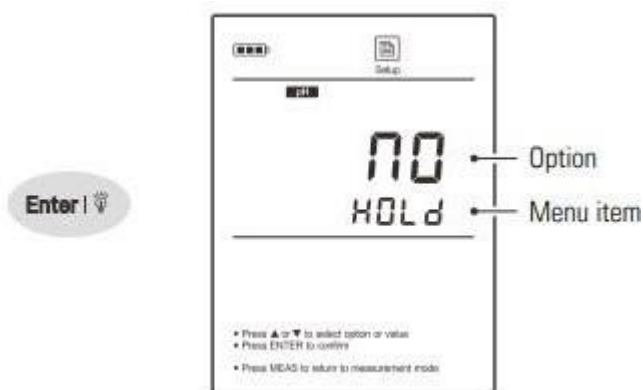


Figure-12

4. Press the ▲/▼ key to select a desired option and press the **Enter** key to save.

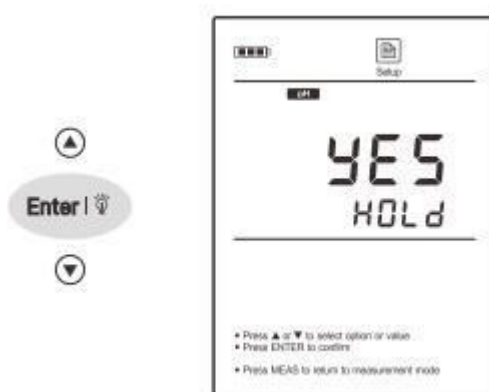


Figure-13

i To exit the setup menu without saving changes, press the **Meas** key.

Setting the Date and Time

1. In the measurement mode, press and hold the key to enter the setup menu.
2. Press the ▼ key until the meter shows (date).



Figure-14

3. Press the Enter key, and the meter shows the current year.

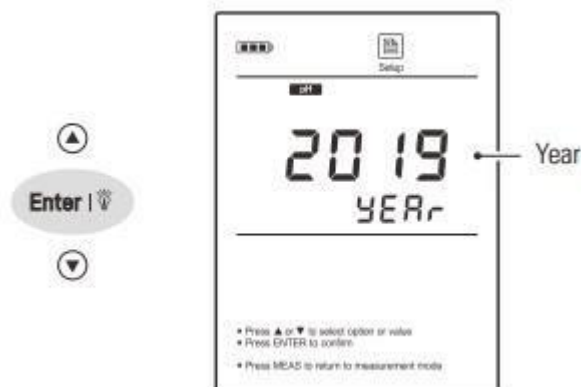


Figure-15

4. Press the ▲/▼ key to set the year and press the **Enter** key to switch to the date and time options.



Figure-16

5. Press the key ▲/▼ to set the month, day, hours, and minutes, and press the **Enter** key to save until the meter returns to the measurement mode.

7. Operations

7.1 pH Calibration and Measurement

Before use preparation of pH buffer solutions

The meter is packaged with the pH 4.01, 7.00, and 10.01 buffer reagents required for calibration.

1. Half-fill a 250 ml volumetric flask with distilled water and add the pH 7.00 buffer reagent.
2. Swirl the volumetric flask gently to dissolve the reagent and fill it to the mark with distilled water.
3. Cap and upend the volumetric flask several times to mix the solution.



Figure-17

- i** The preparation of pH 4.01 and 10.01 buffer solutions is the same as above. Prepared buffer solutions should be stored in hermetically sealed glass containers and avoid direct sunlight.

Connecting the Electrode

1. Take out the pH electrode from the carrying case. Insert the BNC connector into the connector socket on the meter and rotate and push the connector clockwise until it locks.



Figure-18

2. Remove the protective cap from the bottom of the electrode.
3. If tiny air bubbles are present inside the pH-sensitive glass membrane, gently shake the electrode downward to remove air bubbles.

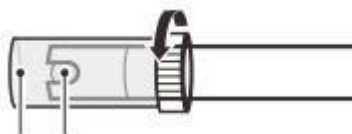


Figure-19

3M KCL solution Ph-sensitive glass membrane

Selecting the Measurement Mode

Press the **Mode** key until the **pH** icon appears on the display, and the meter enters the pH measurement mode.

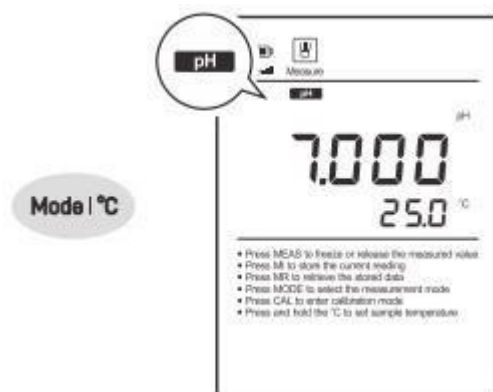


Figure-20

Ph Settings

The meter contains 4 pH settings and 7 general settings in the setup menu.

Menu Item	Option and Description
BUF	pH Buffer Group Set the pH buffer group for calibration and auto-recognition. USA USA (default) NIST NIST DIN DIN USER Custom buffers (any 2 values >1 pH apart)
CAL	Calibration Points Set the number of calibration points. ...5 1 to 5 points (default 3 points)
RESO	Resolution Set the resolution of the pH measurement. 0.001 0.001 (default) 0.01 0.01 0.1 0.1
UNIT	Measurement Unit Set the default temperature unit. °C Degrees Celsius (default) °F Degrees Fahrenheit

If users want to change the current settings, press and hold the key to enter the setup menu. Press the key to select an option and press the **Enter** key to confirm.

- Refer to the **Setting a Default Option** Section for detailed instructions.

Temperature Compensation

For better accuracy, we recommend the use of either a sensor with a built-in or a separate temperature probe. The meter will calculate the pH slope with the measured temperature and show the temperature-compensated readings.

Automatic Temperature Compensation

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



Figure-21

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.

pH Calibration

The meter allows 1 to 5 points of pH calibration. We recommend that you perform at least 2 points of calibration for high-accuracy measurement. The meter will automatically recognize and calibrate to the following standard buffer values.

USA Standard Buffers	pH 1.68, 4.01, 7.00, 10.01, 12.45
NIST Standard Buffers	pH 1.68, 4.01, 6.86, 9.18, 12.45
DIN Standard Buffers	pH 1.09, 4.65, 6.79, 9.23, 12.75

- If the **USER** option is selected, the meter will only allow 2-point calibration. Single-point calibration should only be carried out with pH 7.00, 6.86, or 6.79, otherwise, calibration will not be accepted.
- Make sure to calibrate the meter when attaching a new pH electrode or during first use. Do not reuse the buffer solutions after calibration, as contaminants in the solution will affect the calibration and eventually the accuracy of the measurement.
- For better results, we recommend enabling the automatic temperature compensation. If the manual temperature compensation is selected, all buffer and sample solutions must be at the same temperature, and you have entered the correct temperature value into the meter.
- Stir the standards and samples at a uniform rate that will help you get the most accurate readings.

Single Point Calibration

1. Ensure that users have selected 1-point calibration in the setup menu.
2. Press the Cal key, and the meter shows 7.00/CAL, 6.86/CAL, or 6.79/CAL, depending on the selected pH buffer group.

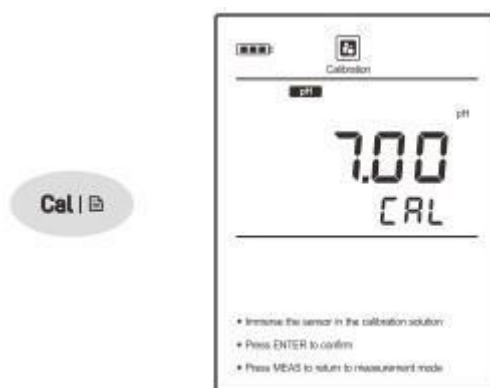


Figure-22

3. Rinse the pH electrode with distilled water, place the electrode (and temperature probe) into the pH 7.00 buffer solution, and stir gently to create a homogeneous solution.
4. Press the **Enter** key, and the Calibration icon begins flashing.

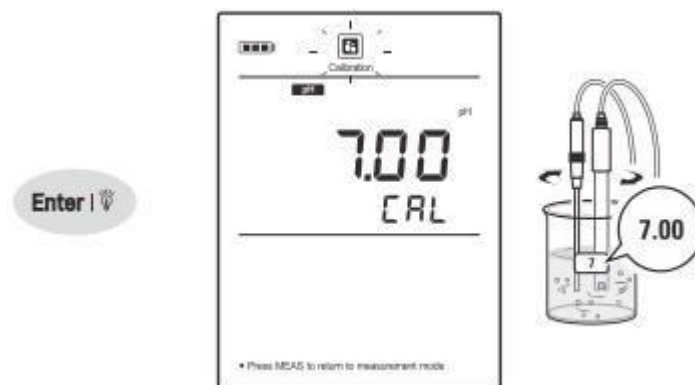


Figure-23

5. When the reading has stabilized, the meter will show and return to the measurement mode.

Multipoint Calibration

1. Ensure that users have selected 2 to 5 points calibration in the setup menu.
2. Repeat steps 1.2 through 1.4 above.
3. When the first calibration point is completed, the display will show /CAL2.
4. The meter prompts you to continue with the second point calibration.



Figure-24

5. Rinse the pH electrode with distilled water and place the electrode (and temperature probe) into the next buffer solution (e.g., pH 4.01).
6. The meter will automatically recognize the buffer solution and begin the calibration, the Calibration icon continuously flashing.



Figure-25



Figure-26

7. When the reading has stabilized, the display will show **End** /CAL3.
8. The meter prompts users to continue with the third point calibration.
9. Repeat step 2.3 above until the meter shows calibration is completed.



Figure-27

pH Calibration with Custom Buffers

1. Ensure that users have selected the option in the setup menu, the custom buffer solutions should be at least 1 pH unit apart from each other.

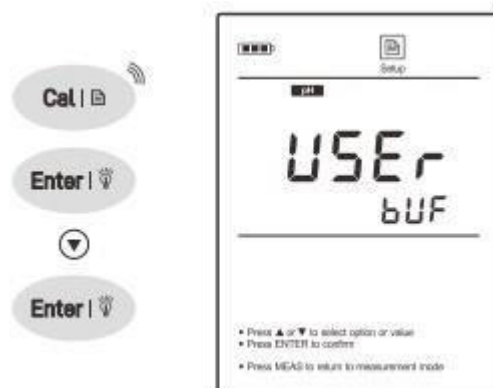


Figure-28

2. Rinse the pH electrode with distilled water, place the electrode (and temperature probe) into the buffer solution, stir gently, and wait until the measurement is stable.
3. Press the **Cal** key, and the meter enters the calibration mode.



Figure-29

4. If necessary, press the key ▲ / ▼ to set the calibration value, and press the Enter key to begin the calibration.

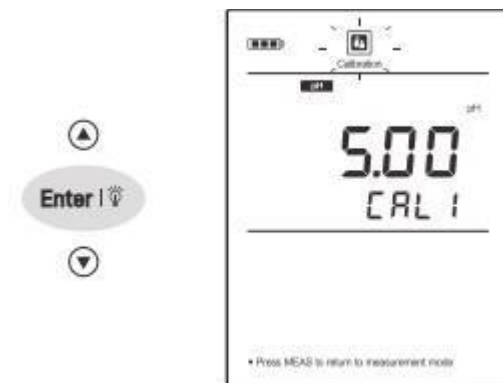


Figure-30

5. When the reading has stabilized, the display will show CAL2. The meter prompts users to continue with the second point calibration.
6. Repeat the steps 3.2 and 3.4 above until the meter shows. Calibration is completed.



- During the calibration, if the display shows ---- indicating the meter is waiting to recognize the pH buffer solution.
- If the display shows indicating the measured mV value for the current calibration point deviates by more than 60 mV from the theoretical value of the pH buffer.
- The calibration will not be accepted, check the pH electrode and buffer solutions.
- If the calculated electrode slope is not between 70% to 110%, the icon will disappear from the display. The pH electrode may need to be replaced.
- To exit the calibration without saving changes, press the Meas key.

Viewing the Calibration Log

1. Press the **MR** key in the pH measurement mode and press the key ▼ until the meter shows **ELE/P-02**
2. Press the Enter key, and the meter shows the last calibration date.

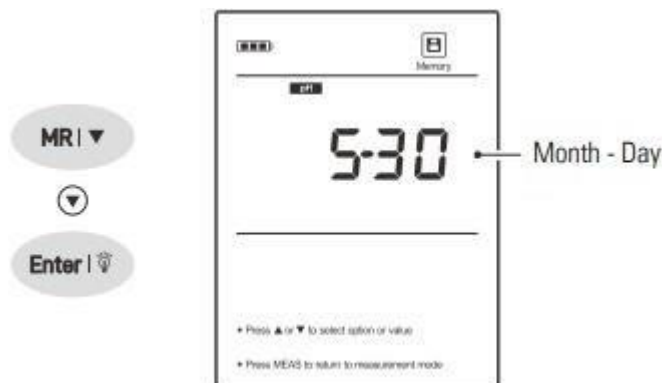


Figure-31

3. Press the ▼ key to view the zero-point offset.

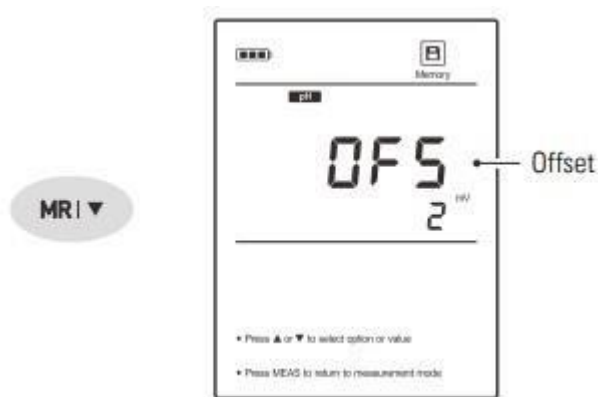


Figure-32

4. Press the ▼ key to view the calibration points and electrode slope.

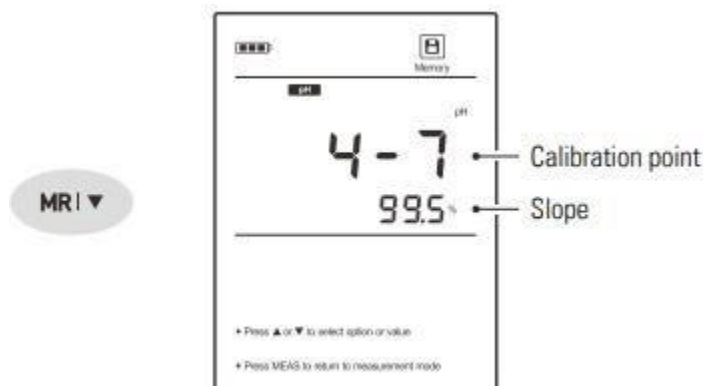


Figure-33

5. To exit the calibration log, press the **Meas** key.

i If the meter is not calibrated or custom buffers are used, the display will show---only.

pH Measurement

1. Rinse the pH electrode with distilled water. Place the electrode (and temperature probe) into the sample solution and stir gently. Note, that the pH-sensitive glass membrane and liquid junction must be completely immersed into the solution.



Figure-34

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

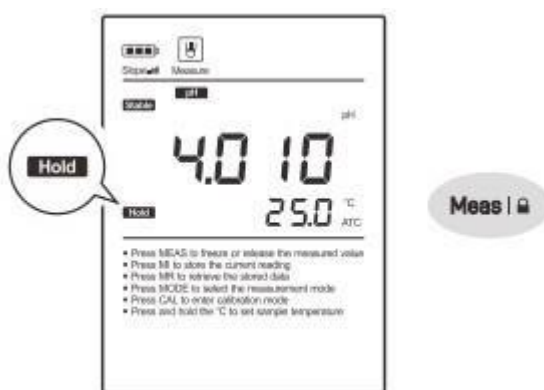


Figure-35

3. Wait for the measurement to stabilize and record the reading.
4. When all of the samples have been measured, rinse the electrode according to the instructions in the **Electrode Maintenance**.



- During the measurement process, never wipe the pH-sensitive glass membrane as this will cause static interference, blot dry with a lint-free tissue to remove waterdrops on the electrode.
- If the meter shows ---- indicating the measurement exceeds the range, remove the electrode from the sample immediately.

- If your sample is pure water, low ionic, or low conductivity water, we recommend measuring the pH in the smallest sample volume possible or adding 0.3 ml of the 3M KCl to 100 ml of the sample solution. Note, that only high-purity KCl can be used.
- To record the measurement at the predefined time intervals.

Electrode Maintenance Cleaning the pH Electrode

Since the pH electrode is susceptible to contamination, thoroughly clean as necessary after each use.

General Cleaning

Rinse the pH electrode with distilled water and soak it in a 3M KCl solution.

Salt Deposits

Dissolve the deposit by immersing the electrode in warm tap water. Rinse the electrode with distilled water and soak it in a 3M KCl solution.

Protein

- (1) Add 1% pepsin to 0.1M HCl solution.
- (2) Place the electrode in the above solution for 15 minutes.
- (3) Rinse the electrode with distilled water and soak it in a 3M KCl solution.

Clogged Liquid Junction

- (1) Heat a diluted KCl solution to 60° C (140° F).
- (2) Place the electrode into the heated solution for 10 minutes.
- (3) Allow the electrode to cool in an unheated KCl solution.

Reactivating the pH electrode

If the pH-sensitive membrane has dried out, the electrode response will become sluggish. Immerse the electrode in a pH 4.01 buffer solution for about 30 minutes to rehydrate. If this fails, the electrode requires activation.

1. Soak the electrode in 0.1M of HCl for 10 minutes.
2. Remove and rinse with distilled water, then place into 0.1M of NaOH for 10 minutes.
3. Remove and rinse again, and soak in 3M KCl solution for at least 6 hours.
4. If these steps fail to restore the response, replace the electrode.

Storing the pH Electrode

- For best results, always soak the electrode in 3M KCl solution.
- If the above solution is not available, use a pH 4.01 buffer solution.
- DO NOT store the electrode in distilled or deionized water which will deplete the hydration layer of the pH-sensitive membrane and render the electrode useless.
- If you do not use the electrode for a period longer than 1 month, store the electrode in a storage solution.

7.2 ORP Calibration and mV Measurement

Before Use

The meter is capable of measuring the oxidation-reduction potential of aqueous solutions by connecting an ORP electrode, the selectable sensor includes the following options.

Connecting the Electrode

1. Select a suitable ORP electrode.
2. Insert the BNC connector into the connector socket on the meter, rotate, and push the connector clockwise until it locks.
3. After the connection is completed, DO NOT pull on the sensor cable. Always make sure that the connector is clean and dry.



Figure-36

4. Remove the protective cap from the bottom of the electrode.



Figure-37

Selecting the Measurement Mode

- **Raw millivolt (mV)**

Press the **Mode** key until the measurement unit mV appears on the display, and the meter enters the absolute mV measurement mode.

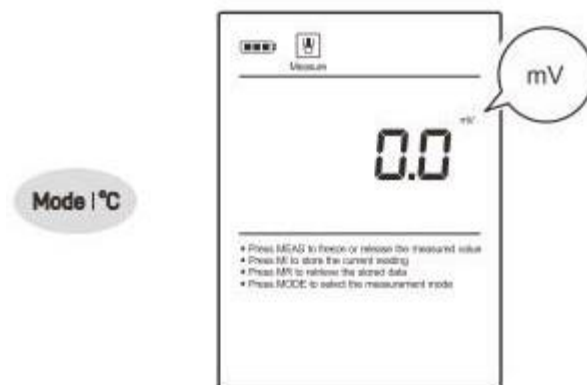


Figure-37

- **Relative millivolt (R.mV)**

Press the Mode key **ORP** until the icon appears on the display, and the meter enters the relative mV measurement mode.

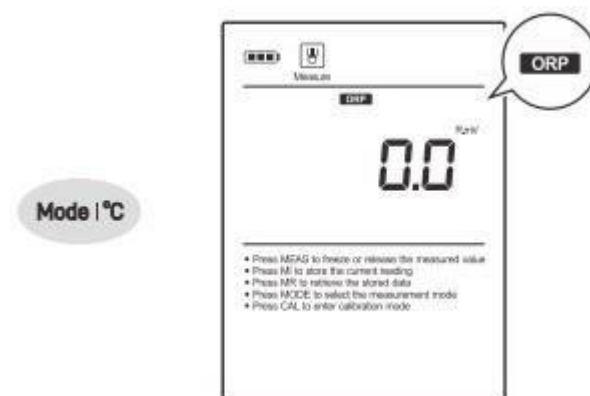


Figure-39

- Note, that the meter only allows entering the setup menu or performing a calibration or viewing the calibration log in the **ORP** mode.

ORP Settings

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

Menu Item	Option and Description
	Resolution Set the resolution of the mV measurement. 0.1 0.1 (default) 1 1

If users want to change the current settings, press and hold the  key to enter the setup menu. Press the key  to select an option and press the **Enter** key to confirm.

 Refer to the Setting a Default Option.

mV Measurement

1. Rinse the ORP electrode with distilled water. Place the electrode into the sample solution and stir gently. Note, that the sensing element and liquid junction must be completely immersed into the solution.

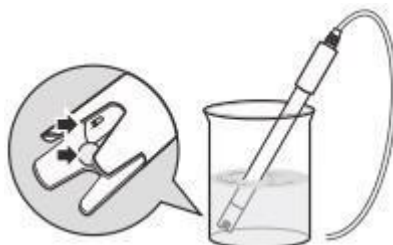


Figure-40

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



Figure-41

4. Wait for the measurement to stabilize and record the reading.
5. When all of the samples have been measured, rinse the electrode with distilled water and soak it in a 4M KCl solution.



- The ORP electrode may give unstable readings in solutions that contain chromous, vanadous, and titanous ions or other ions that are stronger reducing agents than hydrogen or platinum.
- If the meter shows ---- indicating the measurement exceeds the range, remove the electrode from the sample immediately.
- To record the measurement at the predefined time intervals, refer to the Interval Readings section.

ORP Calibration

The meter allows 1-point calibration in the ORP mode, but calibration is not necessary unless an exact readout agreement with a work standard and at a specific ORP value is needed.

1. Rinse the ORP electrode with distilled water.
2. Place the electrode into the standard solution, stir gently, and wait until the measurement is stable.

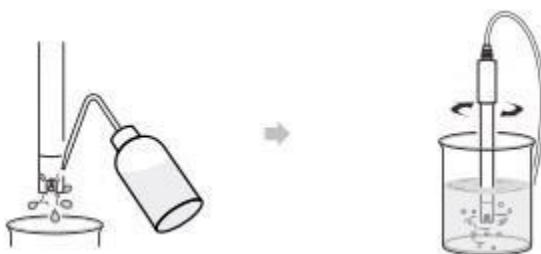


Figure-42

3. Press the Cal key, and the meter enters the calibration mode.

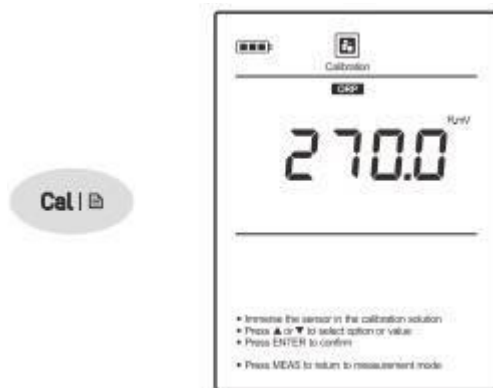


Figure-43

4. If necessary, press the  /  key to set the calibration value.
5. Press the **Enter** key, and the meter will show **End** and return to the measurement mode. Calibration is completed.

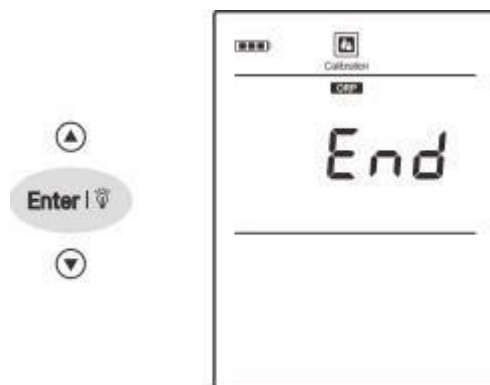


Figure-44

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

Viewing the Calibration Log

1. Press the **MR** key in the ORP measurement mode and press the  key until the meter shows **ELE/P-02**.
2. Press the **Enter** key, and the meter shows the last calibration date.
3. Press the  key to view the offset potential.
4. To exit the calibration log, press the **Meas** key.

 If the meter is not calibrated with a standard solution, the display will show ---only.

Electrode Maintenance

- Rinse the ORP electrode thoroughly with distilled water after use.
- In corrosive chemicals, viscous solutions, and solutions with heavy metals or proteins, take readings quickly and rinse the electrode immediately.
- If the electrode response becomes sluggish, refer to the instructions below to clean the electrode.

(1) Inorganic Deposits

Place the electrode in 0.1M HCl solution for 10 minutes. Rinse the electrode with distilled water and soak it in 4M KCl solution for at least 6 hours.

(2) Oil or Grease

Place the electrode in a detergent such as dishwashing liquid for about 30 minutes. Rinse the electrode with distilled water and soak in 4M KCl solution.

- (3) If the platinum sensing element is severely contaminated, polish the platinum surface gently with an abrasive paper of 600 grids.
- (4) Place the electrode in 0.1M HCl solution for 10 minutes. Remove and rinse with distilled water, then soak in 4M KCl solution for at least 6 hours.
- (5) If the electrode does not restore normal performance, replace the electrode.

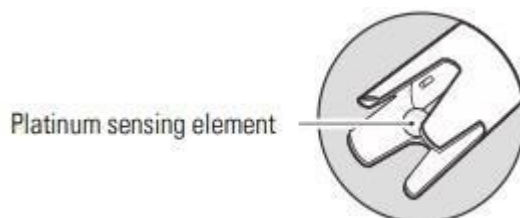


Figure-45

Storing the ORP Electrode

If users do not use the electrode for long periods, store the electrode in a 4M KCl solution or storage solution.

7.3 Ion Calibration and Measurement

Before Use

1. Take out the ion-selective electrode from the carrying case.
2. Remove the protective cap and soak the electrode in 100 ppm standard solution for 10 minutes.

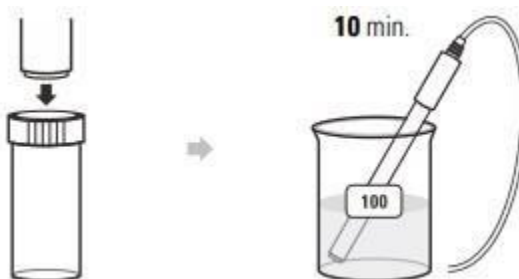


Figure-46

Connecting the Electrode

Insert the BNC connector into the connector socket on a meter and rotate and push the connector clockwise until it locks.



Figure-47

After the connection is completed, DO NOT pull on the sensor cable. Always make sure that the connector is clean and dry.

Selecting the Measurement Mode

Press the **Mode** key until the **ION** icon appears on the display, and the meter enters the ionconcentration measurement mode.



Figure-48

Ion Settings

The meter contains 3 ion settings and 7 general settings in the setup menu.

Menu Item	Option and Description
UNIT	Measurement Unit Set the ion concentration and temperature units.
	ppm Parts per million (default)
	mg/L Milligrams per liter
	mol/L Moles per liter
	°C Degrees Celsius (default)
	°F Degrees Fahrenheit
CAL	Calibration Points Set the number of calibration points.
	... 5 2 to 5 points (default 2 points)
ION	Ionic Valency Set the ion valence of electrode.
	1 Monovalent (default)
	2 Divalent

If users want to change the current settings, press and hold the key to enter the setup menu. Press the key to select an option and press the **Enter** key to confirm.

 Refer to the Setting a Default Option.



If the ion concentration unit has converted, the meter will show **CAL** always and wait for calibration. Press the Cal key and refer to the Ion Calibration section to perform the calibration, the meter will switch to the selected concentration unit when calibration is completed.

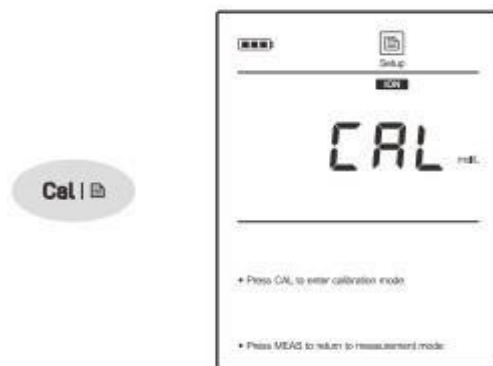


Figure-49

Temperature Compensation

Due to the temperature difference between the standard and sample solutions causing approximately 2% measurement error for every degree centigrade of temperature change, we recommend enabling the temperature compensation during the calibration and measurement.

Automatic Temperature Compensation

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



Figure-50

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.
4. Press the **Enter** key to save

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

Ion Calibration

The meter allows 2 to 5 points of calibration in the ion mode, acceptable calibration points include the following options.

Measurement Unit	Calibration Points
ppm	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000
mg/L	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000
mol/L	0.001, 0.01, 0.1, 1, 10
mmol/L	0.001, 0.01, 0.1

- Before beginning the calibration, ensure that the ionic valency option in the setup menu matches the connected electrode.
- All of the standards and samples should be at the same temperature and calibration points cover the anticipated range of the samples.
- For the low concentration or sample containing the interference ions, we recommend adding the ionic strength adjuster (ISA) to all of the standards and samples.
- A typical addition would be 2 ml ISA to 100 ml of standard and sample.
- For the low-level sodium determination (<1ppm), make sure to use the laboratory plastic beaker as a container.
- Stir the standards and samples at a uniform rate that will help you get the most accurate readings.

Calibrating the Meter

Press the Cal key, and the meter shows 0.001 ppm/CAL1 or mg/L, mol/L, mmol/L, depending on the selected concentration unit.

Press the ▲ key to select the first calibration point (e.g., 100 ppm), and the meter will automatically perform the calibration from the low to high concentrations.

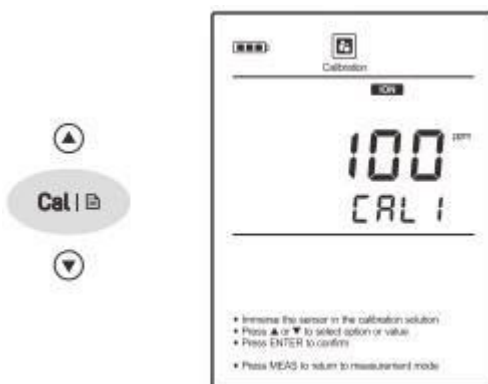


Figure-51

Portable pH Meter LMPH-403

1. Rinse the ion-selective electrode with distilled water, then rinse with a small amount of standard solution. Place the electrode (and temperature probe) into the standard solution, and stir gently to create a homogeneous solution.
2. Press the Enter key, and the Calibration icon begins flashing.



Figure-52

3. When the reading has stabilized, the display will show 1000 ppm /CAL2.
4. The meter prompts you to continue with the second point calibration.



Figure-53

5. Rinse the ion-selective electrode with distilled water, then rinse with a small amount of standard solution.
6. Place the electrode (and temperature probe) into the next standard solution and stir gently.

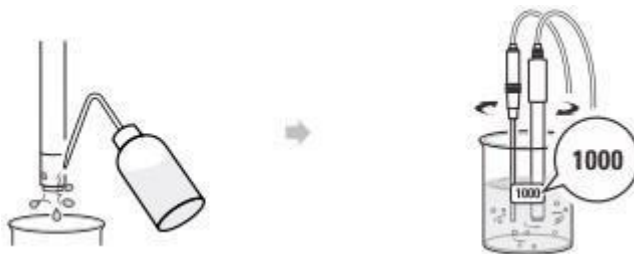


Figure-54

7. Press the Enter key, and the Calibration icon begins flashing.

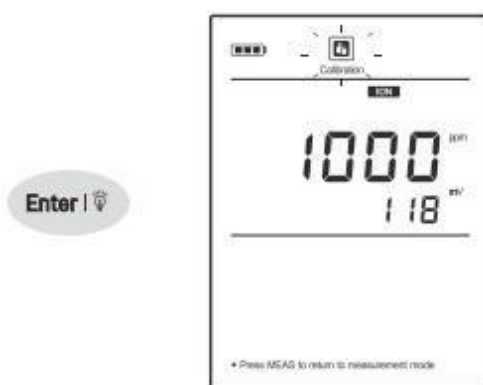


Figure-55

8. When the reading has stabilized, the display will show CAL3.
9. The meter prompts you to continue with third-point calibration.
10. Repeat the steps 1.6 and 1.7 above until the meter shows. Calibration is completed.



Figure-56

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

Viewing the Calibration Log

1. Press the **MR** key in the ion measurement mode and press the **▲** key until the meter shows **ELE/P-02**
2. Press the Enter key, and the meter shows the last calibration date.



Figure-57

3. Press the **▲** key to view the calibration point and mV value.

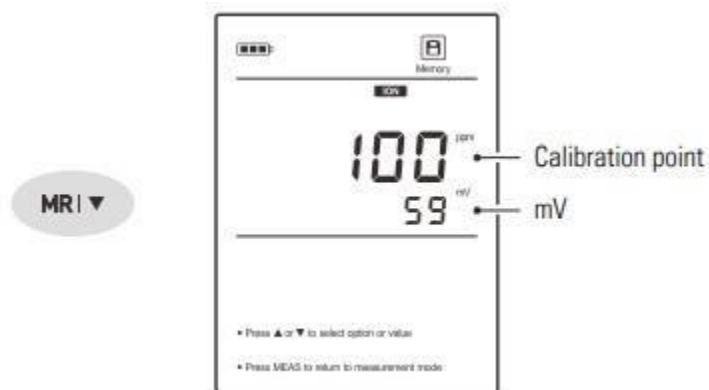


Figure-58

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.

Ion Measurement

1. Rinse the ion-selective electrode with distilled water. Place the electrode (and temperature probe) into the sample solution and stir gently.
2. Note, that the ion-sensitive membrane and liquid junction must be completely immersed in the solution.

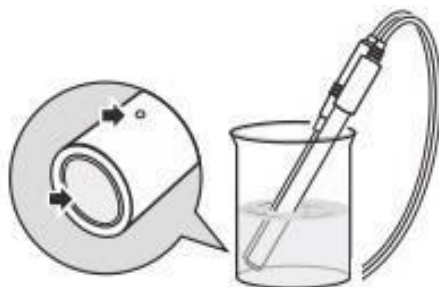


Figure-59

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

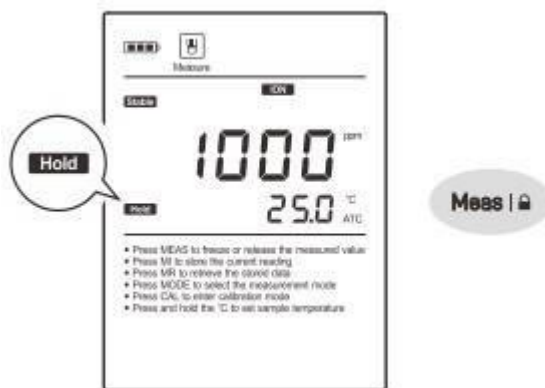


Figure-60

5. Wait for the measurement to stabilize and record the reading.
6. When all of the samples have been measured, rinse the electrode with distilled water.



- During the measurement process, never wipe the ion-sensitive membrane, blot dry with a lint-free tissue to remove waterdrops 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.
- To record the measurement at the predefined time intervals, refer to the Interval Readings.

Electrode Maintenance

- Rinse the ion-selective electrode thoroughly with distilled 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.
- Never scratch the ion-sensitive membrane on the bottom of the electrode.
- If the electrode response becomes sluggish, soak the electrode in 100 ppm standard solution for at least 1 hour.



Figure-61

7.4 Communication

The meter is capable of transferring the data to a computer or importing the data to Excela free DAS software. Before installation, make sure that the Windows 10 operating system has been installed on your computer.

Receiving the Data

1. Connect the USB cable to the meter and click the **DAS_9_Series** icon, the system automatically scans an available communication port and shows a message box "Found a port on your computer".
2. Click the **OK**, the application starts.
3. Click the **Connect**, and the screen shows "Port is connected".
4. Click **OK**, then click Receive, and the stored data will transfer to the computer automatically.

Interval Reading

1. Click the **Interval Recording** option box and select a time option.
2. Do not press any key on the meter during the Interval Readings mode, it will cause communication interruption.



- The first data will be shown on the screen after 1 minute.
- Do not press any key on the meter during the Interval Readings mode, it will cause communication interruption.

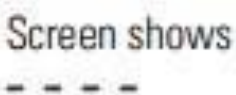
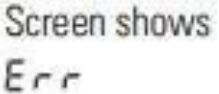
Creating an Excel File

When the transfer is completed, click **Save as Excel**, the readings in the data sheet will automatically convert to an Excel file.



Note, that once the software is closed, all received data will be lost and cannot be recovered.

7. Troubleshooting

Fault	Cause and Corrective Action
	- Electrode dried out. - Soak the pH electrode in 3M KCl solution for about 30 minutes. - Soak the ion-selective electrode in 100ppm 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 whether the electrode is contaminated, clogged, or broken.
	- 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.
	Zero oxygen solution is contaminated. Replace the calibration solution.
The keypad is not working.	Replace the batteries



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