



pH Meter LB-12PHM

Index

Sr.no	Title	Page no
1.	Introduction	2
2.	Features	2
3.	Specifications	3
4.	Applications	3
5.	Instrument Introduction	4
6.	Operations	5
7.	Maintenance	10
8.	Accessories	13
9.	Replacement	14

1. Introduction

pH Meter LB-12PHM offers precise measurement capabilities for both pH and dissolved oxygen levels across a range of aqueous solutions. Its integrated chip facilitates automatic calibration and temperature compensation, enhancing the tester's reliability. Real-time monitoring through a smart electrode status display further ensures accuracy. With a quick polarization time of 3-5 minutes, dissolved oxygen measurements are both rapid and precise. Additionally, smart data storage and communication functionalities add further value to the product.

2. Features

1. pH Meter with touch screen display
2. Intelligent microprocessor chip
3. Wireless bluetooth printing
4. Polarographic DO electrode
5. Automatic buffer recognition
6. Extensive data storage

3. Specifications

Model No.	LB-12PHM
pH Measurement Range	-1.999 to 19.999 pH
pH Resolution	0.1/0.01/0.001 pH
pH Accuracy	Electrode: ± 0.02 pH
pH Input Current	$\leq 2 \times 10^{-12}$ A
pH Input Impedance	$\geq 3 \times 10^{12} \Omega$
pH Stability	± 0.02 pH/3h
pH Temperature Compensation	0 to 100 °C, auto or manual
mV Measurement Range	-1999.00 to 1999.00 mV
mV Resolution	0.1 mV
mV Accuracy	$\pm 0.05\%$ FS
DO Measurement Range	0 to 20 mg/L (ppm) / 0 to 200%
DO Resolution	0.1/0.01 mg/L (ppm) / 1/0.1%
DO Accuracy	Electrode: ± 0.10 mg/L, Meter: ± 0.40 mg/L
DO Response Time	≤ 30 s (25°C, 90% response)
DO Residual Current	≤ 0.1 mg/L
DO Temperature Compensation	0 to 45 °C (automatic)
DO Salinity Compensation	0 to 45 ppt (automatic)
DO Pressure Compensation	80 to 105 kPa (automatic)
DO Electrode Type	Polarographic
Temperature Range	-10 to 110 °C
Temperature Resolution	0.1 °C
Temperature Accuracy	5 to 60 °C: ± 0.4 °C, Others: ± 0.8 °C
Calibration mode	Automatic
Calibration points	Up to 3 points
Display	7-inch colored capacitive touch screen
Data Storage	1000 sets
Power	12V (110 to 220V, 50 to 60Hz adapter)
Communication	USB, RS232, Bluetooth
Ambient environment	Temperature: 5 to 40 °C, Humidity: 5 to 85%, IP grade: IP54
External dimension (W × D × H)	215 × 170 × 40 mm
Packing dimension (W × D × H)	475 × 430 × 75 mm
Net weight	0.6 Kg
Gross weight	3 Kg

4. Applications

pH Meter is widely used across water treatment plants, aquaculture, food and beverages, environmental testing, pharmaceuticals, research, and development.

5. Instrument Introduction

5.1 LCD Display

- ①---Parameter mode
- ②---Measuring value
- ③---Time
- ④---Measurement unit
- ⑤---Temp. measuring value
- ⑥---Tips
- ⑦---Stability icon

5.2 Interface Diagram

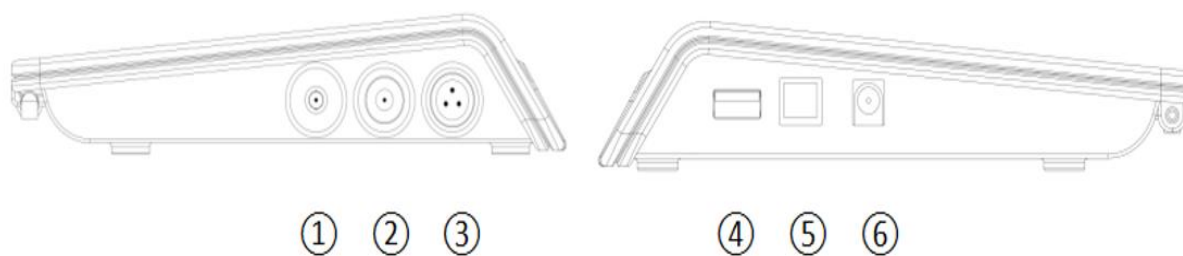


Figure-1

- ① Temperature probe
- ② pH electrode
- ③ Conductivity electrode, not available for pH meter
- ④ USB
- ⑤ Data cable
- ⑥ Power

6. Operations

6.1 Operation Keys

- 1) **【ON/OFF】** Switch key
- 2) **【CAL】** Calibration key, Left direction key
 - Under measuring mode, press the key to enter into calibration mode.
 - Under setting mode, the key is a Left-direction key.
- 3) **【SAVE】** Records saving, Records query, Right direction key
 - Under measuring mode, short-press the key to store measuring data, long press the key to check stored data.
 - Under setting mode, the key is a Right direction key.
- 4) **【ESC/PRN】** Print, Return key
 - Under measuring mode, it is used as a print key.
 - Under non-measuring mode, it is used as a return key.
- 5) **【SET】** System setting
Under measuring mode, the system setting interface can be entered through the key.

6.2 pH Measurement

1) Preparation Work

- Press **【ON/OFF】** key to turn it on, then warm up for 10 minutes.
- Check pH electrode glass bulb is kept wet or not, if the glass bulb is damaged, then the electrode will not work properly. If the glass bulb's surface is dry, it needs to be immersed in a potassium chloride solution for 24 hours.
- Insert the pH electrode and the temperature electrode into the corresponding interface.

2) Instrument Calibration

- Press **【CAL】** to enter calibration mode, C1 is displayed to indicate the 1st point calibration.
- Wash the pH electrode and temperature probe in purified water, make them dry, immerse them into pH6.86 buffer solution, shake the electrodes, and place them static, press **【OK】** after stability icon appears.
- When 6.86 is displayed, press **【OK】** to confirm the 1st point calibration, then C2 is displayed to enter the 2nd point calibration or press **【ESC/PRN】** to exit calibration mode.
- Wash the pH electrode and temperature probe in purified water and dry them, immerse them into pH4.00 buffer solution, shake the electrodes, and place them static, press **【OK】** after stability icon appears.
- When 4.00 is displayed, press **【OK】** to confirm the 2nd point calibration, then C3 is displayed to enter the 3rd point calibration. or press **【ESC/PRN】** to exit calibration mode.

- Wash the pH electrode & temperature probe in purified water and dry them, immerse them into the pH9.18 buffer solution, shake the electrodes, and place them static, press **【OK】** after stability icon appears.
- When 9.18 is displayed, press **【OK】** to confirm the 3rd point, meanwhile exit calibration mode to enter measuring mode, the display screen will show “ L M H ” at the same time, which means the three-point calibration is completed.

3) pH Solution Measurement

Immerse the pH electrode and temperature probe into the measured solution after washing and drying them, shake the electrodes, and place them static. when the stability icon is displayed, then read the pH value.

Note: According to the principle of pH isothermal measurement, the closer the temperature of the measured solution is to the temperature of the buffer solution, the higher the measurement accuracy will be.

6.3 Parameter Setting in pH Measurement

Press **【SET】** to enter into setting mode, press **【UP】** or **【DOWN】** to choose P1-P12, and press **【OK】** to enter the selected setting mode. Press **【ESC/PRN】** to return to measuring mode.

Prompt	Parameter setting	Remark
P1	Export data to Excel	Insert USB drive, press 【OK】 to export data. If not, an error will be prompted.
P2	Set system time	
P3	Clear records	
P4	Temp. unit	°C, °F
P5	Check machine code	The code displayed on the screen is the machine code.
P6	APP authorization code	
P7	Restore to factory setting	When 8888 is displayed on the screen, press 【OK】 to restore to the factory setting.
P8	Manual temp. compensation	
P9	Bluetooth mode	Bluetooth, APP
P10	pH resolution	0.1, 0.01
P11	pH standard buffer solution	USA (Europe & U.S.A series): 1.68, 4.00, 7.00, 10.01, 12.45 pH NIS (NIST series): 1.68, 4.01, 6.86, 9.18, 12.45 pH
P12	Ammonia pure water compensation	“OFF” No compensation. “H2O” Purified water pH compensation. “nH3” Ammonia pure water compensation.

6.4 mV Measurement

- 1) Under pH measuring mode, press **【DOWN】** to choose mV measurement mode.
- 2) Connect the ORP combination electrode or ion combination electrode, wash the electrode in pure water, keep it dry, and immerse it in the measured solution.
- 3) Shake the electrodes and place them static; when the stability icon is displayed, then read the mV value.

6.5 DO Measurement

1) Preparation work

- Press the ON/OFF key to turn on, and press DOWN to choose units.
- Check the DO electrode, as shown in the picture, and check whether there are bubbles in the electrode diaphragm cap (except for small bubbles).
- If there are large bubbles, screw off the diaphragm cap and add electrolyte again, then screw it on and connect it to the Meter for polarization for 15min.

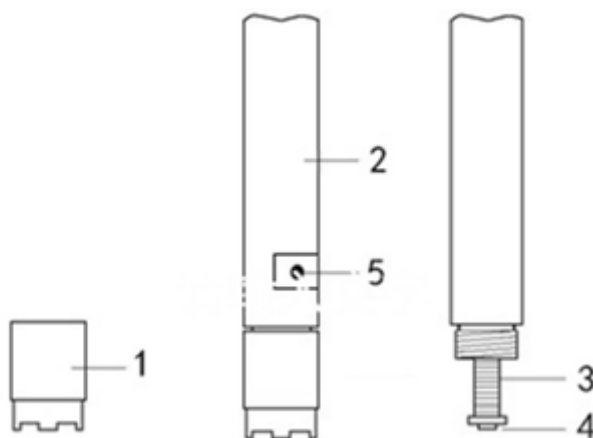


Figure-2

1. Diaphragm cap
2. DO electrode
3. Anode
4. Cathode (gold)
5. Temperature probe

2) Instrument calibration

- Press the CAL key to enter calibration mode, "CAL" is displayed, place the DO electrode in the air for 3 to 5 minutes vertically, when the measured value is stable and appear Stability icon, then press OK, to show 100%.
- If the measurement value is unstable, the user has to wait a few more minutes, and then press the CAL key to enter calibration mode until it is completely stable.
- After calibration, the Meter will show "L" represents that 0% oxygen has been calibrated. "M" means that 100% oxygen has been calibrated.

3) Water sample test

Measuring in flowing water (water flow rate >5cm/s)

Inserting DO electrodes into the water, the water surface should exceed the position of the temperature probe (silver circle) on the electrode, and the electrode and water flow direction should be 45 to 75 degrees, with slight shaking, lasting 3 to 5 minutes to show stable reading.

Measuring in static water

Insert the DO electrode into the water, and the water surface should exceed the position of the temperature probe (silver circle) on the electrode, and the electrode and the water surface are 45 to 75 degrees, the electrode can be moved quickly in the water. Move at a speed of more than 5cm/s, lasting for 3-5min until a stable reading is displayed.

Testing in slower-moving water

According to **pH Solution Measurement**, the electrode moves slightly faster.

6.6 Parameter Setting in DO Measurement

Press **【SET】** to enter setting mode, press **【UP】** or **【DOWN】** to choose **P1-P12**, and press **【OK】** to enter the selected setting mode. Press **【ESC/PRN】** to return to measuring mode.

Prompt	Parameter setting item	Remark
P1	Export data to Excel	When the USB drive is connected, press OK to export data. If not, an error will be prompted.
P2	System date setting	
P3	Clear record-setting	
P4	Temp. unit setting	°C, °F
P5	Check machine code	The code displayed on the screen is the machine code.
P6	APP Authorization code setting	
P7	Restore to factory setting	When 8888 is displayed on the screen, press OK to restore to the factory setting.
P8	Manual temp. compensation setting	
P9	Bluetooth mode setting	Bluetooth, APP
P10	DO resolution setting	0.1/0.01
P11	Salinity Compensation setting	
P12	Atmospheric pressure compensation setting	

6.7 Zero Oxygen Calibration

Generally, zero oxygen calibration is only needed when the electrode is replaced, the diaphragm cap is replaced or has not been used for a long time. After zero oxygen calibration, full-scale calibration is required, the zero oxygen calibration is not required at ordinary times.

- 1) Preparation of 250ml anaerobic water: weigh 500mg sodium sulfite (Na_2SO_3) in a 250ml beaker, add 250ml pure water to stir and dissolve (a small amount of divalent cobalt salt can be added as a catalyst), and anaerobic water is effective within 24 hours.
- 2) The DO electrode needs to be connected to the Meter and polarized for 15 min.
- 3) Put the electrode into oxygen-free water, and press CAL to enter calibration mode, "CAL" will be displayed, wait for 3-5 minutes, when the stability icon appears, press OK to display "0%", then wash the electrode with pure water, and place it vertically in the air for 3-5 minutes, when the stability icon appears, press OK to display "100%", at the same time, "CAL" disappears, the calibration is over and enter measurement mode, at this time, "L" and "M" is displayed, indicate that 0% and 100% have been calibrated.
- 4) If the Meter displays $\leq 0.02\text{mg/L}$ within 5min, it indicates that the response speed and residual current of the Meter are good, and zero oxygen calibration is not necessary.
- 5) If the Meter displays $\geq 0.15\text{mg/L}$ after 5min, it indicates that the response speed of the Meter is slow and the residual current is high, replace the diaphragm cap, or screw off the diaphragm cap, wipe the gold surface of the cathode with polishing paper, then wipe the cathode surface with a clean flannel or paper towel, clean the electrode with pure water and shake dry, add some electrolyte into the diaphragm cap, reassemble and screw tightly, then zero oxygen and full-scale calibration will be carried out again.

6.8 Salinity Setting

The Meter has the function of manual salinity compensation. Before setting the salinity compensation value, the salinity value of the tested liquid should be measured by a salinity meter, then the test value should be input into the Meter. **Refer to P11** for the specific setting steps.

6.9 Pressure Setting

The Meter has the function of air pressure manual compensation. When the air pressure varies greatly in the place where the Meter is used, it is suggested to set it up again according to the value of the standard barometer or the altitude of different areas (see parameter **Table I** and **Table II**) to ensure the accuracy of air pressure compensation. **See P12** for the steps of air pressure setting.

7. Maintenance

7.1 pH Measurement Maintenance

- 1) Calibration times depend on the sample, electrode performance, and required accuracy. For higher accurate measurement ($\leq \pm 0.02\text{pH}$), it should be calibrated immediately with a highly accurate standard buffer solution for general accuracy measuring ($\geq \pm 0.1\text{pH}$), it can be used for almost one week or longer time after being calibrated.
- 2) The Meter must be recalibrated in the following situations:
 - New changed or unused electrodes for a long time.
 - After measuring acid ($\text{pH} < 3$) or alkaline ($\text{pH} > 10$) solution.
 - After measuring the solution which contains fluoride and concentrated organic solution.
 - The solution's temperature is much different from the calibration temperature.
- 3) There is an electrode soaking solution in the protective bottle at the front of the pH electrode, which can protect the glass blub, when measuring, open the bottle cap, pull out the electrode and wash it with pure water, insert the electrode into the bottle and tighten the cap to prevent the exudation of the solution. If the soaking liquid in the protection bottle is found to be turbid or mildewed, clean it in time and replace the new soaking liquid.
- 4) It is not allowed to soak in pure water, protein solution, and acid fluoride solution for a long time, and prevent getting touch with organic grease.
- 5) When the Meter is calibrated with a standard buffer solution of known PH value, the buffer solution pH value should be reliable to improve the measurement accuracy. The buffer solution should be changed in time after repeated use.
- 6) Always keep the meter clean and dry, especially for the socket of the meter and electrode; otherwise, it may lead to measurement error or failure.
- 7) The sensitive glass bulb at the front of the combination electrode should not touch with hard things, and any broken and friction will make the electrode invalid. Before and after measuring, the electrode should be washed with purified water, and dry electrode after washing, do not wipe the glass bulb with a paper towel, as it will affect the stability of electrode potential and enlarge response time. After the measurement in the viscous sample, the electrode shall be repeatedly washed with pure water several times to remove the sample stuck on the glass film, or first cleaned with the appropriate solvent.
- 8) If the electrode is used for a long time, or the solution under test contains substances that are likely to contaminate sensitive glass bulbs or block the liquid interface, the electrode will be passivated. The phenomenon is that the sensitivity gradient is reduced, the response is slow, and the reading is inaccurate. The following measures can be taken according to different situations:
 - **The glass bulb is contaminated and aging:** Soak the electrode in 0.1mol/L diluted hydrochloric acid for 24h, clean it with pure water, then soak it with electrode soaking solution for 24h. If the passivation is serious, soak the electrode bulb in 4%HF (hydrofluoric acid) solution for (3 to 5) s, clean it with pure water, and then soak it in the electrode soaking solution for 24h to make it new.

- **Cleaning of glass bulb and liquid interface contamination:**

Contamination	Abluent
Inorganic metal oxide	Diluted acid less than 1mol/L
Organic lipidic matter	Dilute detergent (weakly alkaline)
Resin macromolecule matter	Dilute alcohol, acetone, ether
Protein blood deposit	Acidic enzyme solution (such as dried yeast)
pigments substance	Dilute bleach solution, peroxide

- 9) The service life of a pH electrode is about one year, but if the service condition is bad or the maintenance is improper, the service time of the Meter will be shortened, and the electrode should be replaced in time after aging or failure.
- 10) When the Meter is abnormal, restore it to factory settings, then calibrate and measure again.

7.2 DO Measurement Maintenance

- 1) The air temperature and the temperature of the measured water body should be close ($\leq 10\text{ }^{\circ}\text{C}$). If the temperature difference is big, the electrode should be immersed in the measured water for about 10 minutes. After that, it can be calibrated accordingly.
- 2) The Meter must be polarized and calibrated after each start-up, so the Meter should not be turned off during use. (The Meter's automatic shutdown function is turned off at the factory).
- 3) Temperature has a big influence on the measured value in DO measurement because the temperature probe of the DO electrode is mounted on the outer shell of the electrode and contacts the water directly instead of in the electrolyte inside the electrode, the sensing ability of the two electrodes to the temperature of the water body is different.
- 4) Generally, it takes 3-5 minutes to make the temperature of the temperature electrode and the actual temperature of the electrolyte inside the electrode reach agreement.
- 5) Therefore, the reading time must be more than 3 minutes, otherwise big error will occur, especially when the difference between electrode temperature and water temperature is big, so the reading time should be extended.
- 6) Atmospheric pressure has a great influence on the DO test (see attached **tables I and II**). The meter has a manual pressure compensation function, and the measured value can be corrected by pressure compensation to ensure accuracy.
- 7) The DO electrode cannot be tested in static water; otherwise, it will lead to low test results.
- 8) During measurement, bubbles should not accumulate on the surface of the sensitive film where the DO electrode is in contact with water; otherwise, the test accuracy will be affected.

- 9) There should be no bubbles in the electrolyte inside the electrode (except for smaller bubbles), otherwise, the speed and measurement accuracy will be affected. In case of large bubbles, screw off the diaphragm cap and add electrolyte before screwing on.
- 10) The sensitive film surface of the DO electrode should be kept wet to prevent the electrolyte at the cathode from drying up and affecting the electrode performance.
- 11) For the temperature probe installed on the DO electrode, the liquid level must be higher than the temperature probe height during measurement, otherwise, the inaccuracy of the temperature test results is too big a deviation of the final measurement results.
- 12) When the Meter is abnormal, set P7 to make it return to the factory setting, and then make calibration and test.

8. Accessories

Standard Accessories

- Electrode holder
- Electrodes

9. Replacement

Replace Diaphragm Cap

The diaphragm cap should be replaced in time according to the following steps when the electrode response time is long and the measured value deviates or the sensitive membrane of the DO electrode is wrinkled, cracked, or damaged.

- 1) Unscrew diaphragm cap.
- 2) Clean the electrode without a diaphragm cap with pure water and dry it off.
- 3) Use a clean flannelette or paper towel to wipe the cathode surface slightly (gold pieces).
- 4) Take a new diaphragm cap and inject the electrolyte slowly without bubbles. If bubbles are found, the bubbles should be eliminated.
- 5) Place the diaphragm cap on the table, place the electrodes vertically, select and rotate slowly clockwise, and finally tighten the diaphragm cap forcefully.
- 6) Check that there are no bubbles in the electrolyte (except for smaller bubbles), otherwise, it should be reassembled.
- 7) When using and replacing the diaphragm cap, do not touch the sensitive membrane with your hands, because sweat and grease from the skin can affect the quality of the membrane and reduce oxygen permeability.



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