

pHS-220 Series

Benchtop pH Meters

User Manual



Copyright © 2024 Guangdong Rainstin Instruments Co., Ltd. All rights reserved

The specifications and information mentioned in this manual are for reference only and are subject to change without notice. Unless otherwise agreed, this manual is for guidance only, and all statements and information herein do not constitute any form of warranty.

© Walter Technologies (HK) Limited — For Authorized Use Only

Declaration

The functions described in this manual are specific to the entire pHS-220 series of benchtop pH meters. The specific functions and parameters available depend on the model you purchased and its configuration.

We have carefully compiled this manual, but we cannot guarantee that the content is entirely accurate. We are not responsible for any losses caused to users due to the information provided in this manual. Furthermore, our products, including this manual, are constantly being improved, and we reserve the right to modify the manual without prior notice.

User Notice

To ensure the design performance and longevity of this product, anyone using or maintaining this product must strictly follow the guidelines in this manual. By carefully reading and understanding this manual, you will be able to fully grasp the product's functions, operation, and maintenance methods.

Precautions

The pHS-220 series of benchtop pH meter is a precision testing instrument. Please adhere to proper usage and maintenance practices to ensure optimal instrument performance.

- The instrument should be used and stored in a suitable environment.
- Avoid severe shaking, collisions, and pulling during transport and use.

Contents

1. Product Introduction.....	1
1.1 Overview	1
1.2 Technical Specifications.....	3
1.3 Instrument Appearance.....	4
2. Installation and Safety Precautions.....	7
2.1 Installation.....	7
2.2 Safety Precautions	7
3. Disclaimer and Warranty.....	9
3.1 Disclaimer	9
3.2 Warranty.....	9
4. Instrument Operation.....	10
4.1 Connecting the Electrode	10
4.2 Powering on the Instrument	11
4.3 Instrument Settings.....	11
4.4 Calibration.....	13
4.5 Automatic Recognition of Standard Buffer Solutions	15
4.6 Sample Measurement.....	15
4.7 Data Storage	16
4.8 Recalling Stored Readings.....	16
4.9 Data Printing and Transfer	16
4.10 Data Deletion.....	17
4.11 Restore Factory Settings.....	17
4.12 Temperature Compensation.....	18
4.13 Power Off and Storage	18
5. Maintenance and Care.....	20
6. Packing List.....	21
7. Appendix.....	22

1. Product Introduction

1.1 Overview

The **pHS-220 Series Benchtop pH Meters** are high-precision laboratory instruments designed for accurate pH, mV, and temperature measurements across a wide range of water analysis applications. Equipped with intelligent electrode management technology and advanced stability algorithms, the meters deliver fast, reliable results with exceptional ease of use.

With full support for pure water and ultrapure water measurement, IP54 splash protection, large data storage, and Bluetooth data transfer, the pHs-220 series offers a robust and user-friendly solution for routine laboratory water quality testing, education, environmental monitoring, and industrial quality control.

Key Features:

- **High measurement accuracy and stability:** Supports pH measurement of pure water and ultrapure water, significantly reducing data drift and instability caused by electrode contamination and interference.
- **Intelligent Electrode Management Technology:** Automatically recognizes intelligent electrodes and transfers calibration data from the electrode chip to the meter, ensuring safer data handling and minimizing errors.
- **Flexible Electrode Holder:** Newly designed holder allows one-handed operation and vertical movement, enabling the electrode to be positioned precisely for optimal measurement performance, faster testing, and reduced risk of sample spillage or electrode damage.
- **High Compatibility:** The instrument is compatible with single combination electrodes, high-precision intelligent 3-in-1 electrodes, and standard 3-in-1 electrodes.

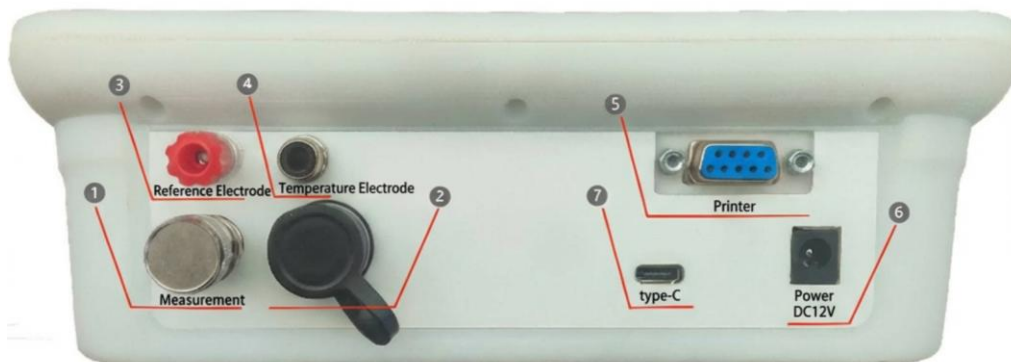
- **User-Friendly Interface:** The 7-inch full-view LCD screen with an intuitive menu guide allows for easy operation and effortless switching between measurement functions.
- **IP54 Protection Rating:** Depending on the instrument, electrode, and connection, the housing is protected against water splashes and allows cleaning with a damp cloth.
- **Ease of Measurement:** All operations—including measurement, calibration, and data storage—can be performed with a single key press for simplicity and convenience.
- **Versatile Data Storage and Transfer Options:** Measurement data can be printed directly or transferred via Bluetooth to the dedicated mobile app for data transmission, storage, or deletion.
- **Consistent High-Quality Standards:** The ergonomic design ensures the instrument fits seamlessly with the operator's workflow, providing comfort and efficiency during use.

© Walter Technologies (HK) Limited – For Authorized Use Only

1.2 Technical Specifications

Item	pHS-220A	pHS-220B	pHS-220C
pH			
Measurement Range	-2.00 ~ 20.00 pH		
Minimum Resolution	0.01 pH	0.005 pH	0.001 pH
Accuracy	±0.01 pH	±0.005 pH	±0.001 pH
Temperature Compensation Range	0°C to 100°C (Automatic/Manual)		
Calibration Function	5-point calibration		
mV			
Measurement Range	-2000.0 ~ +2000.0 mV		
Minimum Resolution	0.1 mV		
Accuracy	±0.1 mV		
Temperature			
Measurement Range	—	-5.0–105.0 °C	
Minimum Resolution	—	0.1 °C	
Accuracy	—	±0.1 °C	
Electrode Recognition	—		Yes
Calibration Points	3-point	5-point	
Basic Parameters			
Data Storage	Optional	999 sets	
Bluetooth Transfer	Optional	Standard	
Stored Data	Measurement value, unit, temperature, time		
Power Supply	AC 90–240 V input, DC 12 V output (adapter included)		
Auto Power Off	Yes		
Power-loss Protection	Yes		
Factory Reset	Yes		
Dimensions (L × W × H)	203 × 163 × 70 mm		
Weight (kg)	1.08		
Operating Temperature	5–45 °C		
Operating Humidity	≤95%		
Protection Rating	IP54		

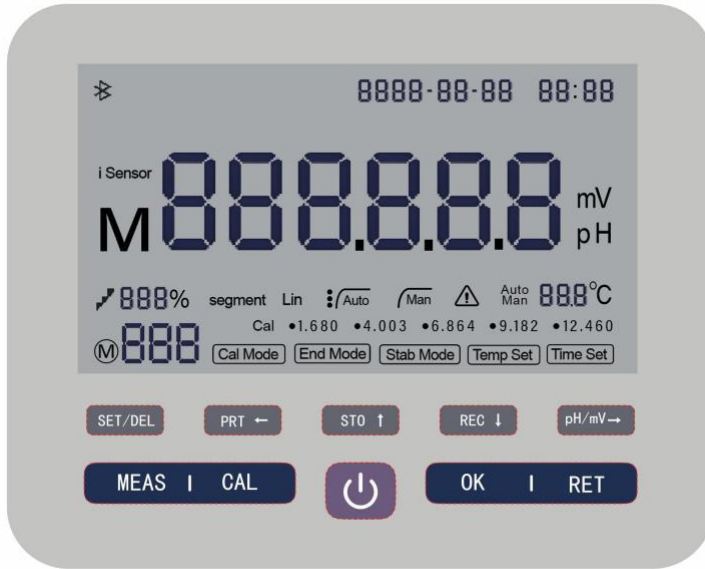
1.3 Instrument Appearance



1. BNC Socket – Input for mV/pH signal.
2. 6-pin aviation connector – For electrode recognition and temperature input by combination (3-in-1) electrode.
3. Reference Electrode Socket.
4. Temperature Electrode Socket.
5. RS232 printer interface – For connecting to a printer for data output.
6. DC power socket – 12V dedicated power input.
7. Type-C interface – Used by the manufacturer for firmware upgrades and maintenance.

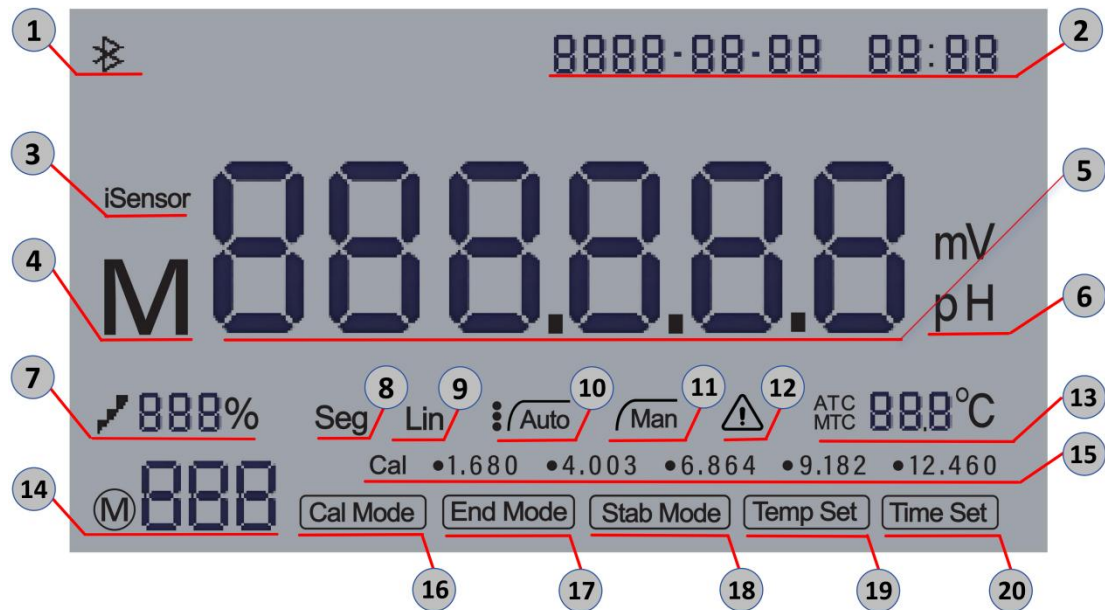
1.3.1 Key Control

This product adopts a button-based operation mode. There are 10 control buttons on the instrument panel.



Button	Name	Function
	Power Key	Short press to power on or off the instrument
	Calibration Key	Press to enter calibration mode and confirm calibration.
	Measurement Key	Short press to start or stop measurement
	Confirm Key	Performs different functions depending on the operation (see "Operating Procedures")
	Return Key	Short press to return to the measurement interface; long press to restore factory settings
	Settings/Delete Key	Short press to enter the settings menu or delete selected stored data
	Print/Left Key	Short press to print the current or stored data; also serves as the left direction key
	Store/Up Key	Short press to manually store measurement data; also serves as the up direction key
	Recall/Down Key	Short press to view stored data; also serves as the down direction key
	PH/mV/Right Key	Switch between pH/mV measurement modes; also serves as the right direction key

1.3.2 Display Description



1. Bluetooth Connection Indicator
2. Date and Time
3. Intelligent Electrode Indicator
4. Data Storage Icon
5. Measurement value display
6. Measurement Unit display
7. Electrode Status Icon:
 - a) Electrode in good condition (slope 95–105%)
 - b) Electrode requires cleaning (slope 94–90%)
 - c) Electrode faulty — maintenance or replacement needed (slope 89–80%)
8. Segmented Calibration Mode
9. Linear Calibration Mode
10. Automatic Stability Judgment Standards: 3-point (strict), 2-point (normal), 1-point (fast)
11. Manual Stability Judgment Mode
12. Warning Indicator
13. Manual / Automatic Temperature Compensation Indicator
14. Stored Data Number
15. Calibration Buffer Group or Standard Solution Type
16. Calibration Mode: Enter calibration settings
17. Endpoint Mode: Select manual or automatic endpoint detection
18. Stability Mode: Select stability standard under automatic mode
19. Temperature Mode Setting: Select manual or automatic temperature compensation
20. Time Setting: Modify date and time after entering the setting mode

2. Installation and Safety Precautions

2.1 Installation

2.1.1 Unboxing

Carefully unbox the instrument, and store the external packaging, certificate of compliance, and user manual in a safe place. Connect the 12V DC power supply to the instrument's compatible socket.

2.1.2 Holder Installation

The electrode holder can be installed on the right side of the instrument based on usage. The height of the electrode holder can be adjusted according to personal preference. Use tools to secure the holder.

2.2 Safety Precautions

2.2.1 Operator Protection Measures

Never operate the instrument in explosive environments, as the instrument's casing is not airtight and could pose an explosion risk due to sparks or corrosive gases.

2.2.2 Handling Chemicals or Solvents

Follow the supplier's operating instructions and laboratory safety procedures when using chemicals or solvents.

2.2.3 Operator Safety Precautions

Do not separate the instrument's casing. Only authorized service personnel are allowed to service the instrument. Any liquid splashed onto the instrument should be immediately wiped off, as some solvents may cause casing corrosion.

2.2.4 Avoid Environmental Factors

Avoid the following environmental factors:

- Severe vibration
- Prolonged exposure to direct sunlight
- Atmospheric humidity above 95%
- Presence of corrosive gases
- Ambient temperature below 0°C or above 45°C
- Strong electric fields or magnetic fields

© Walter Technologies (HK) Limited — For Authorized Use Only

3. Disclaimer and Warranty

3.1 Disclaimer

1. The specifications and information mentioned in this manual are for reference only and are subject to change without notice.
2. Please read the safety instructions carefully before using the instrument. The company is not responsible for accidents caused by improper operation.
3. This product is intended for use in professional fields. Operators must have relevant knowledge and skills. Accidents caused by misuse are not covered.

3.2 Warranty

1. All products undergo strict inspection before shipment and are covered by a one-year free warranty for quality issues.
2. During the warranty period, if problems arise due to improper operation, unsuitable environment, human error, accidents, or improper storage/transportation, the company may charge repair costs.
3. For out-of-warranty instruments, paid repair and service are available.
4. Warranty does not apply under the following conditions:
 - a. Unauthorized disassembly, modification, or repair.
 - b. Repairs by non-authorized personnel.
 - c. Tampering or breaking of anti-disassembly seals.
 - d. Use of non-original consumables causing malfunctions.
 - e. Products purchased through unauthorized channels.
 - f. Improper use or operation in unsuitable environments.

4. Instrument Operation

4.1 Connecting the Electrode

4.1.1 Electrode Connection

When connecting the pH or temperature electrode to the instrument, first remove the protective cap from the pH socket on the instrument interface, then connect the electrode and ensure that the connector is fully inserted.

If using a combination (3-in-1) electrode with a built-in temperature sensor or an independent temperature electrode, connect the additional cable to the ATC connector.

Rotate the BNC connector to ensure the electrode is firmly connected to the instrument.

4.1.2 Intelligent Combination Electrode Connection

When using an intelligent 3-in-1 electrode, connect the additional cable to the 6-pin aviation connector. Align the red mark on the plug with the socket, insert it, and listen for a “click” sound to ensure it is securely locked.

During startup, calibration, or measurement, the calibration data stored inside the electrode will automatically transfer from the chip to the instrument and be used for subsequent measurements.

Note: Always power off the instrument before disconnecting the electrode to prevent data transmission errors between the instrument and the electrode identification chip.

4.1.3 Intelligent Combination Electrode Instructions

The instrument adopts intelligent electrode management technology, which provides safer and more reliable data transmission with minimized errors.

After connecting an intelligent electrode, the instrument automatically recognizes it. Calibration data, electrode slope, and other information stored in the electrode are automatically transferred to the instrument. This allows users to easily monitor electrode

condition and determine whether recalibration, cleaning, or replacement is needed.

After calibration, the data are automatically transferred from the instrument to the electrode's internal chip. Each electrode can store up to five sets of recent calibration data, ensuring the latest calibration is always retained and automatically applied in subsequent measurements.

4.2 Powering on the Instrument

Press the "Power" button; the device will emit a short "beep" to indicate it has powered on.

The instrument will automatically detect the connected electrodes.

The display will show the date, time, Bluetooth status, intelligent electrode indicator (if a 3-in-1 intelligent electrode is connected), measurement values, measurement units, temperature (manual or automatic, in °C), electrode performance (%), calibration mode (linear or segmented), stability mode (auto or manual), number of stored data points, and calibration points.

The backlight turns on automatically at startup and will switch off after 10 minutes of inactivity to enable the screen saver mode. Press any key to reactivate the screen backlight.

4.3 Instrument Settings

Press the "SET/DEL" key to enter the setup mode.

Use the Left or Right key to select among the following modes: Calibration Mode, Endpoint Mode, Stability Judgment Mode, Temperature Setting, and Time Setting.

4.3.1 Calibration Mode

Press the "SET/DEL" key — "Cal Mode" will flash. Press the "OK" key to enter the mode.

The instrument provides two calibration modes that can be selected using the direction key:

- **Segmented Mode:**

The calibration curve is composed of linear segments connecting each calibration point. For higher accuracy, it is recommended to use this mode.

- **Linear Mode:**

The calibration curve is determined by linear regression. It is recommended for samples with large pH variations.

After selecting the desired mode, the instrument automatically exits to the setup interface

4.3.2 Endpoint Mode

After selecting “End Mode” using the direction key, press “OK” to enter.

The instrument provides two types of endpoint modes that can be selected using the direction key.

- **Automatic Endpoint Mode:**




The instrument determines the end of the measurement based on the connected electrode and the selected stability standard. This ensures simple, fast, and accurate measurement.

- **Manual Endpoint Mode:**

The user manually decides when to end the measurement.

4.3.3 Stability Judgment Mode


Use the direction key to select “Stab Mode” and press “OK” to enter.

Use any direction key to choose  Strict,  Normal, or  Fast stability criteria.


Stability standards for pH and mV measurements:

Mode	Criterion
Strict	Signal variation ≤ 0.03 mV within 8 s, or ≤ 0.1 mV within 30 s
Normal	Signal variation ≤ 0.1 mV within 6 s
Fast	Signal variation ≤ 0.1 mV within 4 s

4.3.4 Temperature Setting

When the instrument does not detect a temperature probe, Manual mode  appears on the screen. In this case, manually enter the sample temperature. The temperature value can be set between $-55\text{ }^{\circ}\text{C}$ to $125\text{ }^{\circ}\text{C}$. Stabilize the electrode in water/air at a known temperature.

Press the direction key to select “Temp Set” and then “OK.” The detected temperature will flash on the display. Use the left or right arrow key to select the digit to edit (flashing), and the up/down keys to increase or decrease the value. Press “OK” to save and automatically exit.

When using a 3-in-1 electrode with a built-in temperature probe or a separate temperature probe, the display will show , and manual temperature setting is not required

4.3.5 Time Setting

Press the direction key to select “Time Set,” then press “OK” to enter.

Use the left/right arrow keys to select the digit to edit (flashing). Use the up/down keys to adjust the date (Year–Month–Day) and time (24-hour format).

4.4 Calibration

4.4.1 pH Calibration

The instrument allows 1–5 point calibration. Calibration can only be performed in calibration mode.

Five standard buffer solutions are available: pH 1.680, 4.003, 6.864, 9.182, and 12.460.

For each buffer, the instrument automatically determines whether a temperature electrode is connected and selects the corresponding temperature compensation method.

4.4.2 One-Point pH Calibration

1. Place the electrode in the standard buffer solution. Press the “CAL” key to enter

calibration mode; all calibration values appear on the screen.

2. Once the signal is stable, the instrument follows the preselected endpoint mode.

3. Automatic Endpoint Mode:

The instrument automatically identifies the standard buffer solution and flashes its value. When the reading stabilizes, a “beep” sound indicates that calibration is complete. The result appears on the screen. Press “OK” to save and exit automatically.

4. Manual Endpoint Mode:

The instrument automatically identifies and flashes the standard buffer type. After confirming the corresponding buffer and waiting for stability, press “OK” key manually. The calibration result is displayed. Then long press “OK” key until a “beep” sound to save and exit.

5. To cancel calibration, press the “RET” key to abort and return to the measurement interface.

Note: One-point calibration only corrects the electrode’s zero potential. If a multi-point calibration has previously been performed, the instrument uses the stored slope value; otherwise, it applies the theoretical slope (-59.1 mV/pH).

4.4.3 Multi-Point pH Calibration

The instrument supports up to 5-point calibration.

1. Perform steps ①–② as described in One-Point Calibration.
2. Rinse the electrode with deionized water.
3. Place the electrode into the next buffer solution.

- **Automatic Endpoint Mode:**

The instrument automatically identifies the buffer, flashes its value, waits for stability, and beeps when calibration is complete. Press “OK” to record the result.

- **Manual Endpoint Mode:**

The instrument flashes the identified buffer type. After stabilization, press

“OK.” The result is displayed and recorded.

4. Repeat steps ②–③ for all remaining buffers.

After completing all (up to 5) calibration points, the instrument automatically displays the calibration data and slope. In manual mode, long press “OK” key until a “beep” sound to save and exit.

5. To cancel calibration, press “RET” to abort and return to measurement mode.



4.5 Automatic Recognition of Standard Buffer Solutions



The instrument can automatically recognize preset standard buffer solutions (pH 1.680, 4.003, 6.864, 9.182, 12.460). During calibration, the instrument automatically detects and displays the buffer solution being used.

This feature allows calibration to be performed in any order with the preset pH buffer solutions.

4.6 Sample Measurement

Place the electrode in the sample and press the “MEAS” key to start the measurement.

The display shows the sample’s measured value. The stability icon   flashes, indicating that the measurement is in progress.

Once the measurement stabilizes according to the selected stability criterion, the stability icon   stops flashing.

- If Automatic Endpoint Mode is selected, the measurement stops automatically once stable, and the reading is locked.
- If Manual Endpoint Mode is selected, press the “OK” key to manually stop the measurement and lock the reading.

Note: After the reading is locked, if the pH value of the test sample fluctuates by more than ± 0.2 pH, the lock will be automatically released.

4.7 Data Storage

The instrument can store up to 999 sets of measurement data. Stored data are numbered and displayed in the format M* on the screen.

When a measurement reaches the endpoint, the screen will display "Store". Press the "STO" key to save the current reading.

After saving, the display shows M1 for the first record, and M999 when 999 measurements have been stored.

When the memory is full (M999), new data will overwrite the oldest record.

4.8 Recalling Stored Readings

Press the "REC" key to retrieve stored data from memory. Use the Up/Down arrow keys to scroll through the stored results (M1–M999 indicates the record number; M0 is the starting point).

Press the "RET" key to return to the measurement interface.

4.9 Data Printing and Transfer

All data stored in the instrument's memory can be transferred to a printer to print. The operation step as below:

1. Connect the RS232 cable between the instrument and the printer's corresponding ports.
2. Locate the data to be printed in memory and press the "PRT" key to print the corresponding content.

The printout includes:

- Measurement date and time
- Measured value
- Measurement temperature
- Electrode slope
- Calibration mode type
- Endpoint mode type
- Stability judgment type

3. For some printers, adjust the following communication parameters:

- Baud Rate: 9600
- Data Bits: 8
- Stop Bit: 1
- Parity: None
- Handshake: None

4.10 Data Deletion

To delete stored data, press the “REC” key to access stored records. Then long press the “SET/DEL” key until a “beep” sound is heard — this clears all data in memory.


4.11 Restore Factory Settings


The instrument can restore factory settings with one key, clearing all stored calibration and measurement data.

In the measurement interface, long press the “RET” key until a “beep” sound is heard. The instrument will automatically erase all data and return to factory defaults.

4.12 Temperature Compensation

It is recommended to use either a built-in or independent temperature electrode.

If a temperature electrode is connected, the screen displays “AUTO” along with the sample temperature (see figure )

If no temperature probe is connected, Manual icon  is displayed, and the sample temperature must be entered manually (refer to “Temperature Setting” in Instrument Setup).

The instrument accepts only NTC 10 kΩ temperature electrodes. In pH measurement mode, the instrument uses the temperature value to calculate the temperature-compensated electrode slope and displays the pH value corresponding to the current temperature

4.13 Power Off and Storage

4.13.1 Power Off

After use, press the “Power” key to turn off the instrument. Wipe the instrument and probe surface with tissue (do not touch the membrane).

Remove the electrode:

- For BNC connectors, unscrew and remove.
- For aviation connectors, first unlock the protective lock before removing the electrode.

After removal, place protective caps on both the BNC and aviation connector sockets.

4.13.2 Instrument Storage

Store the instrument in a clean, dry, and shaded environment. Avoid direct sunlight and temperatures below 0 °C.

When not in use, it is recommended to turn off the power switch. Power on the instrument once per week to check for stability, and prepare calibration solution once per month to

test the electrode performance and maintain its accuracy.

4.13.3 Instrument Transportation

When transporting the instrument to a new location, please follow these precautions:

- Handle the instrument carefully to avoid damage. Improper transport may cause malfunction.
- Disconnect the power plug and all connected cables.
- Remove the electrode holder.
- Use the original packaging for long-distance transportation to ensure protection.
- If the original packaging is unavailable, use alternative protective packaging that ensures safe transport.

4.13.4 Waste Disposal

This device must not be disposed of as household waste. Please follow relevant regulations for proper disposal. Dispose of this product at designated collection points for electrical and electronic equipment in accordance with local laws.

If you have questions, contact the relevant authorities or your equipment distributor.

When transferring this device to another user (for private or professional use), this requirement must also be communicated.

5. Maintenance and Care

Do not attempt to disassemble the instrument housing. The meter does not require any special maintenance. Simply wipe the housing occasionally with a damp cloth and replace the batteries when depleted.

The housing is made of Acrylonitrile-Butadiene-Styrene/Polycarbonate (ABS/PC). This material can be corroded by certain organic solvents such as toluene, xylene, and methyl ethyl ketone (MEK). If any of these solvents are accidentally spilled on the housing, wipe them off immediately.

Electrode Maintenance:

1. Always store the pH electrode in an appropriate filling solution.
2. To maintain maximum accuracy, promptly rinse off any filling solution that adheres or crystallizes on the outside of the electrode using distilled water.
3. Always store the electrode according to the manufacturer's instructions and prevent it from drying out.

If the electrode slope decreases rapidly or the response becomes sluggish, follow the troubleshooting steps below according to the type of contamination:

After any of the above treatments, the electrode must be recalibrated before use.

Problem	Solution
Contamination by oily or greasy substances	Clean the electrode membrane with cotton soaked in acetone or soapy water to remove the oil.
Dried-out pH electrode membrane	Immerse the electrode tip in 0.1 M HCl solution and leave it overnight.
Protein contamination on the pH electrode junction	Immerse the electrode in a pepsin + HCl cleaning solution to remove the contamination.
Sulfide contamination (Ag_2S deposits) on the pH electrode	Immerse the electrode in a thiourea solution to remove the contamination.

After any of the above treatments, the electrode must be recalibrated before use.

Note: Please handle and dispose of all cleaning or filling solutions according to local regulations for toxic or corrosive materials.

6. Packing List

Item	Number
Benchtop pH Meter	1
Electrode Holder	1
Combination Electrode	1
Power Cable	1
User Manual	1
Certificate of Conformity	1
Warranty Card	1

© Walter Technologies (HK) Limited — For Authorized Use Only

7. Appendix

pH Values of Standard Buffer Solutions at Different Temperatures

Temperature (°C)	Oxalate Buffer	Tartrate Buffer	Phthalate Buffer	Phosphate Buffer	Borate Buffer	Calcium Hydroxide Buffer
0	1.67	N/A	4.00	6.98	9.46	13.42
5	1.67	N/A	4.00	6.95	9.40	13.21
10	1.67	N/A	4.00	6.92	9.33	13.00
15	1.67	N/A	4.00	6.90	9.27	12.81
20	1.68	N/A	4.00	6.88	9.22	12.63
25	1.68	3.56	4.01	6.86	9.18	12.45
30	1.69	3.55	4.01	6.85	9.14	12.30
35	1.69	3.55	4.02	6.84	9.10	12.14
40	1.69	3.55	4.04	6.84	9.06	11.98

© Walter Technologies (HK) Limited - For Authorized Use Only