950 Series Benchtop pH/Conductivity Meter

Instruction Manual

PH950 Benchtop pH Meter ☐

EC950 Benchtop Cond. Meter ☐

PC950 Benchtop pH/Cond. Meter ☐

v1.0

TABLE OF CONTENTS

1   Introduction

Thank you for purchasing our 950 Series Benchtop pH/Cond. Meter.
Before using this meter, please read the operation manual carefully in order to help use and maintain it correctly.

This product is a great combination of advanced electronic technology, sensor technology and user-friendly software design, made for laboratory pH and conductivity measurement for scientific research and quality control.

1.1   Measurement Parameter

Measurement parameter	PH950	EC950	PC950
pH/mV	√		√
Cond./TDS/Salinity		√	√
Temperature	√	√	√

1.2   Basic Features

- TFT color display, large size, ultra legible.
- Operating navigation expressed by graphic and text, more convenient to use.
- Multi language operating system (English, German, Spanish & Simplified Chinese)
- Meter can configure with 606 multi function test bench which is combined by intelligent stirrer and flexible electrode holder. It can hold solution bottles, electrodes and stirrer beads. Stepless speed regulation intelligent stirrer, it can also store ratation speed.
- Smiling icon indicates the reading stability, including automatical lock on function.
- With built-in microprocessor chip, the meter has intelligent functions like automatic calibration, automatic temperature compensation, function setting, self-diagnostic information and storage.
- PC950 meter can measure and display pH & conductivity value at same time.

1.3   pH Measurement Features

- 1~3 point automatic calibration with calibration instruction and automatic checking functions.
- Automatically recognize pH buffer solution. 3 series buffer solution selectable: USA series, NIST series and CH, as well as custom-defined solution.
- Automatically display electrode slope.

1.4   Conductivity Measurement Features

- 1~ 4 point automatic calibration with calibration instruction and automatic checking functions.
- Automatically recognize conductivity standard solution. 2 series standard solution selectable: USA and CH, as well as custom-defined solution.
- With conductivity, TDS and salinity three measurement modes, can switch to display the results.

2 Specifications

2.1 Technical Parameters

	Technical Parameters		Model
pH	Measuring Range	(0.00 ~ 14.00) pH	PH950 PC950
	Resolution	0.1/0.01 pH	
	Accuracy	±0.01 pH ±1 digit	
	Temperature Compensation Range	(0 ~ 100) ℃ (Auto. or Manual)	
	Calibration point	1~3 points	
mV	Measuring Range	±2000mV	
	Resolution	1mV	
	Accuracy	±0.1% FS ±1 digit	
Cond.	Measuring Range	Conductivity: 0~200 mS/cm, divided into five ranges, automatically switch measuring range. (0~19.99) μS/cm; (20.0~199.9) μS/cm; (200~1999) μS/cm; (2.00~19.99) mS/cm; (20.0~199.9) mS/cm TDS: (0 ~ 100) g/L; Salinity: (0 ~ 100) ppt	EC950 PC950
	Resolution	0.01/0.1/1μS/cm 0.01/0.1 mS/cm	
	Accuracy	±1.0% FS ±1 digit	
	Temperature Compensation Range	(0 ~ 50) ℃ (Auto. or Manual)	
	Cell constant	0.1 / 1 / 10 cm^{-1}	
Temp.	Measuring Range	0~100℃	PH950 EC950 PC950
	Resolution	0.1℃	
	Accuracy	±0.5℃±1 digit	

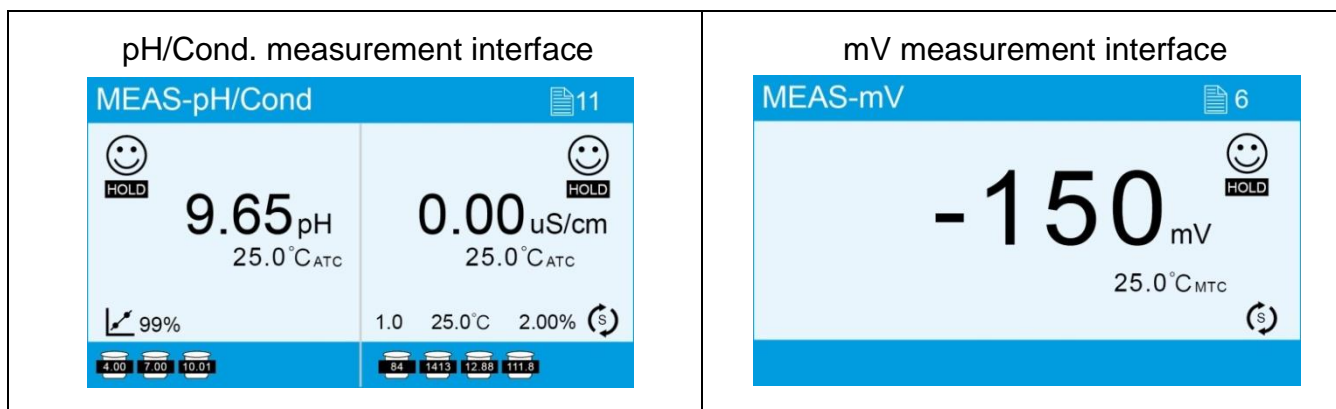## 2.2 Other Parameters

Data Storage	100 groups
Storage Content	Number, measuring value and temperature value
Power	DC9V/600mA
Dimension & Weight	Meter: (360×235×100)mm / 1.7kg

3 Instrument Description

3.1 LCD Display

pH measurement interface
 	
① — MEAS-pH   📄 6 — ⑩
     ☺ HOLD — ⑨ ⑧
② — **9.65** pH
③ — 25.0°C ATC — ⑦
④ — 🗠 99%   (S) — ⑥
⑤ — [4.00] [7.00] [10.01]
	① — pH measurment
	② — pH measuring value
	③ — Temperature measuring value
	④ — pH electrode slope
	⑤ — Calibration solution indication icon
	⑥ — Stirrer icon
	⑦ — Temperature compensation icon,
	     MTC-manual temperature compensation
	     ATC-auto. temperature compensation
	⑧ — Auto. lock on icon
	⑨ — Stable reading icon
	⑩ — Storage icon and number

Conductivity measurement interface
 	
① — MEAS-Cond   📄12
     ☺ HOLD
0.00 uS/cm
25.0°C ATC
② — 1.0   25.0°C   2.00%   (S)
③ — [84] [1413] [12.88] [111.8]
	① — Conductivity measurement
	② — Conductivity parameter：
	     1.0 — conductivity cell constant
	     25.0°C — reference temperature
	     2.00% — temperature compensation
	         coefficient
	③ — Calibration solution indication icon

TDS measurement interface
 	
① — MEAS-TDS   📄12
     ☺ HOLD
0.00 mg/L
25.0°C ATC
② — Factor: 0.71   (S)
 	
① — TDS measurement   ② — TDS factor 0.71
	Salinity measurement interface
	
	① — MEAS-Salt 📄 8
	     ☺ HOLD
	0.00 ppt
	25.0°C ATC
	② — Factor: 0.50 (S)
	
	① — Salinity measurment ② — Salinity factor 0.5

pH/Cond. measurement interface	mV measurement interface
MEAS-pH/Cond ☰11 ☺ HOLD **9.65**pH 25.0°C ATC ☺ HOLD **0.00** uS/cm 25.0°C ATC ⤢ 99% 1.0 25.0°C 2.00% Ⓢ [4.00] [7.00] [10.01] [84] [1413] [12.88] [111.8]	MEAS-mV ☰6 ☺ HOLD **-150** mV 25.0°C MTC Ⓢ

3.2 Keypad Functions
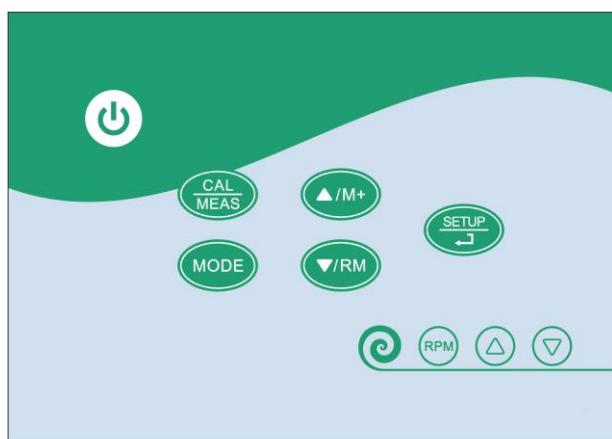
Diagram-1

Keypad operation mode

Short press—Press key and holding time<2s, buzzer makes a "di" sound;

Long press—Press key and holding time>2s, buzzer makes a "di" sould when pressing the button,

another "di" sound will ring after holding the key 2 seconds.

Chart -1　Keypad operations and functions

Keypad	Operations	Functions
⏻	Short press	● Power supply switch
MODE	Short press	Press key to select measurement mode: ● PH950: pH→mV ● EC950: Cond→TDS→Salt ● PC950: pH→mV→Cond→TDS→Salt→pH/Cond
	Long press	● Press key to enter temperature regulation mode
CAL MEAS	Long press	● In measurement mode, press key to enter in the calibration mode
	Short press	● Cancel operation and return to measurement mode;

SETUP	Short press	• In measurement mode: press key to enter parameter set-up main menu; • In calibration mode: press key to conduct calibration; • In main menu mode: press key to enter in submenu; • In submenu mode: press key to enter in parameter set-up; • In parameter set-up mode: press key to confirm parameter; • In temperature regulation mode: press key to confirm temperature value.
▲/M+ ▼/RM	Short press	• In measurement mode: press ▲/M+ key to store measuring value, press ▼/RM key to recall; • In recall(RM) mode: press ▼/RM or ▲/M+ key to turn page; • In menu mode: press key to select items; • In temperature regulation mode: press key to change temperature value, hold key for fast changing.
⊚	Short press	• Stirrer switch
(RPM)	Long press	• Store stirrer speed
	Short press	• Rotate according to the stored speed
△ ▽	Short press	• Press key to change ratation speed, hold key for fast changing.

3.3 Meter Sockets
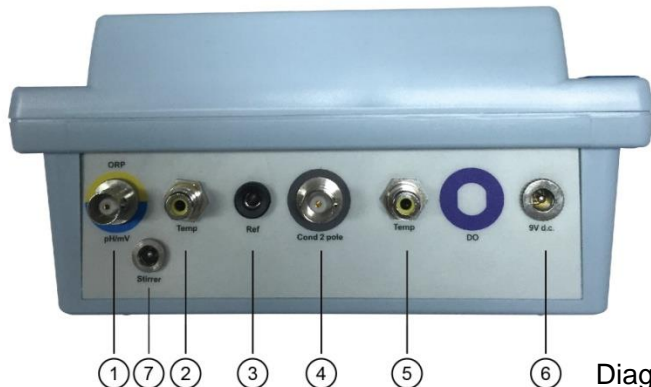
Model	Meter Sockets
PH950	① ② ③ ⑥ ⑦
EC950	④ ⑤ ⑥ ⑦
PC950	① ② ③ ④ ⑤ ⑥ ⑦

① ⑦ ② ③ ④ ⑤ ⑥ Diagram-2

①— BNC socket, connect with pH combination electrode and ORP combination electrode.

②— RCA socket, connect with temperature sensor (for pH measurement).

①+②—BNC+RCA socket, connect with pH/ATC 3-in-1 combination electrode.

③— Φ4 banana socket, connect with reference electrode.

④— BNC socket, connect with conductivity cell.

⑤— RCA socket, connect with temperature sensor (for conductivity measurement).

④+⑤— BNC+RCA socket, connect with Cond/ATC cell.

⑥— Φ2.5 power socket (inside "＋" outside "－") connect with DC9V adapter.

⑦— Φ2 power socket, conntect with stirrer.

3.4 Display Mode

3.4.1 Reading stable display mode

When the measuring value is stable, smiley icon ☺ stays on LCD screen, see Diagram – 3. If the smiley icon ☺ does not appear or flash, please do not get readings or make calibration until the measuring value is stable.
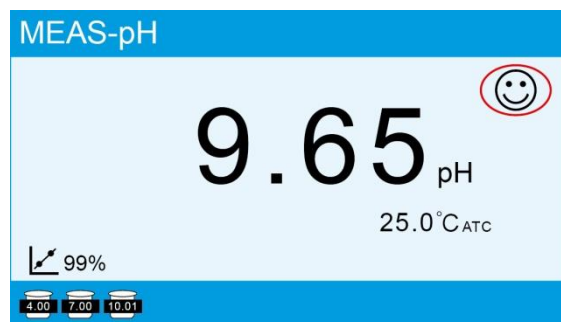

Diagram-3

3.4.2 Auto. lock on display mode

In parameter set 3.1, set "Reading with HOLD" to "ON", when ☺ icon stays for more than 10 seconds, the meter will lock the value automatically and display **HOLD** icon. see Diagram – 4(b). In **HOLD** mode, press ⊙ CAL/MEAS key to cancel auto lock.
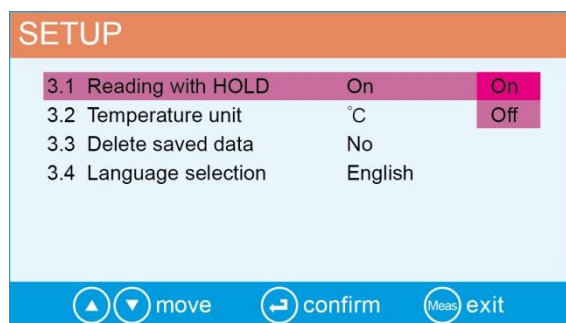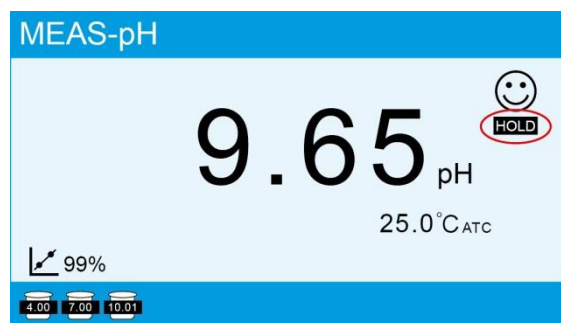
(a)　　　　　　　　　　　　　　　　　　　　(b)

Diagram-4

3.5 Data Storage, Recall and Delete

3.5.1 Storage

Press ⊙(▲/M+) key to store, icon 📄12 isplays on the top right corner of LCD screen which means it's the 12ᵗʰ group data, see Diagram – 5(a); Each meter can store 100 groups data. For single parameter display mode, 1 serial number corresponds to 1 group measuring vale. For dual parameter display mode (means pH+Cond. meter display mode), 1 serial number corresponds to 2 groups measuring value (pH + conductivity). So for this type of meter, actual store data is 100 groups, but storage number will be less than 100. If press ⊙(▲/M+) key again when storage value is full, icon 📄Full will flicker, see Diagram –5(c) to indicate store memory is already full and need to be deleted for new store value.

3.5.2 Recall

Press ⊙(▼/RM) key, meter will display stored 12 groups measuring value, see Diagram – 5(b), press ⊙(▲/M+) or ⊙(▼/RM) key to turn page. Every page displays 8 groups data.

3.5.3 Delete

Data need to be deleted when storage memory is full, otherwise no more data can be stored. In parameter setting 3.3 select "Yes" and press ⊙(SETUP) key, see Diagram – 5(d) to delete all stored value.
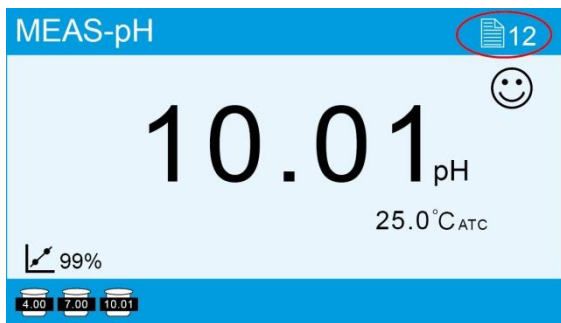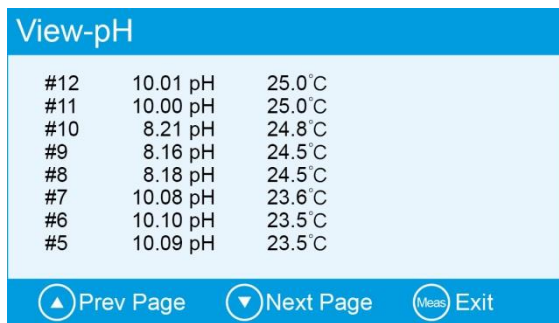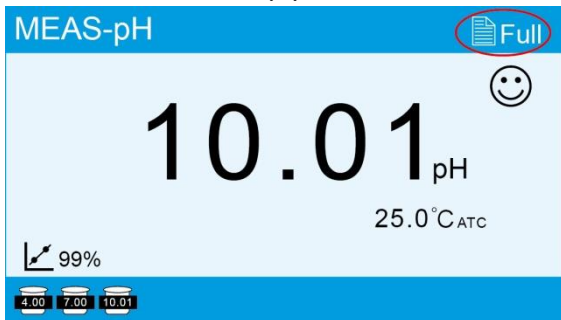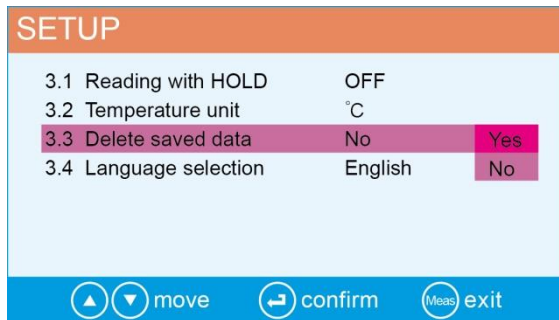
MEAS-pH 📄12 ☺ **10.01** pH 25.0°C ATC ⚡99% [4.00][7.00][10.01]	View-pH #12 10.01 pH 25.0°C #11 10.00 pH 25.0°C #10 8.21 pH 24.8°C #9 8.16 pH 24.5°C #8 8.18 pH 24.5°C #7 10.08 pH 23.6°C #6 10.10 pH 23.5°C #5 10.09 pH 23.5°C ▲Prev Page ▼Next Page (Meas) Exit
(a)	(b)
MEAS-pH 📄Full ☺ **10.01** pH 25.0°C ATC ⚡99% [4.00][7.00][10.01]	SETUP 3.1 Reading with HOLD OFF 3.2 Temperature unit °C 3.3 Delete saved data No Yes 3.4 Language selection English No ▲▼ move ↵ confirm (Meas) exit
(c)	(d)

Diagram-5

3.6 Manual Temperature Compensation

In MTC mode, long press (MODE) key to enter temperature adjustment mode. Press (▲/M+) or (▼/RM) key to adjust temperature value. Press and hold the key for fast adjustment. Press (SETUP ↵) key to confirm and return to measurement mode.

3.7 Install Meter with Multi-function Test Bench

Before installing	After installing
Mulit-function test bench Meter Stirrer connection cable Connection bar	
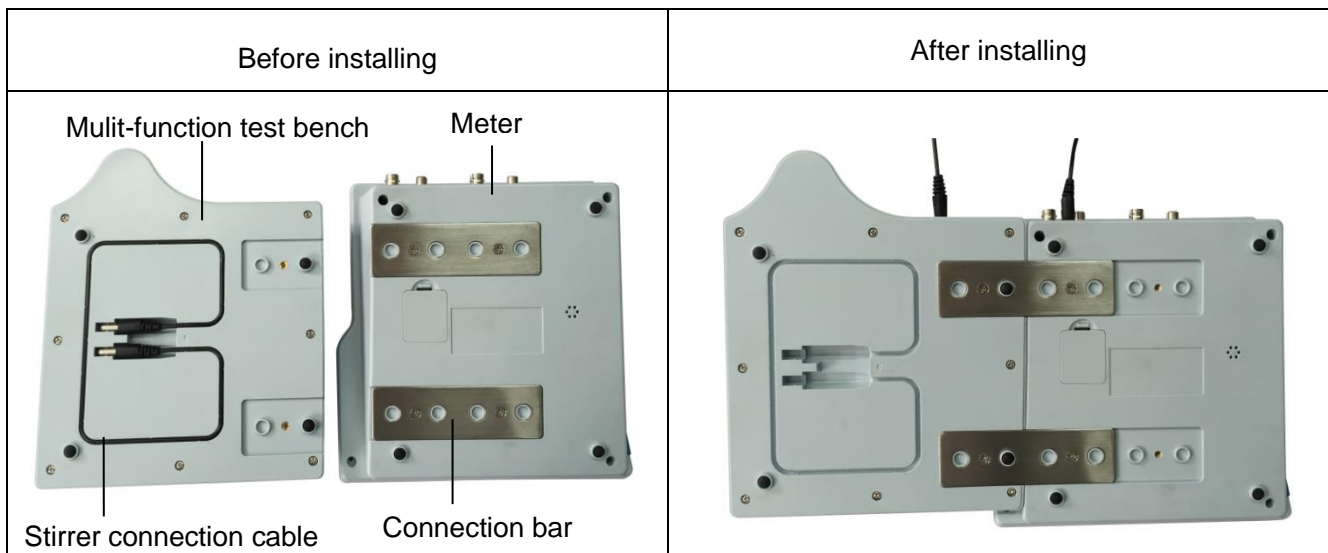
Diagram-6

3.8 Installation of Flexible Electrode Holder

Aim hole to shaft
and press down
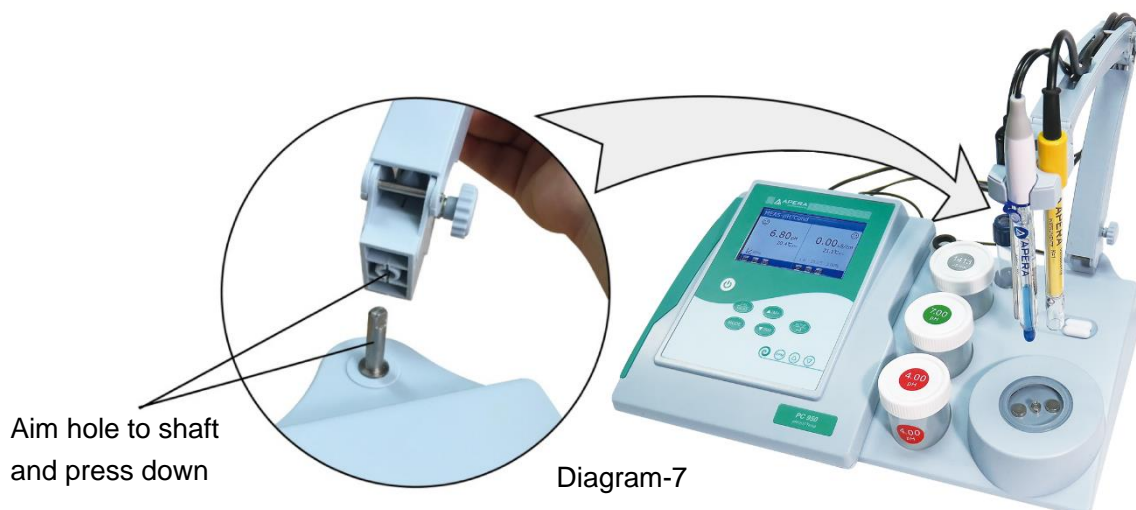
Diagram-7

3.9 Mulit-function Test Bench

(a) Combo mode   (b) Separate use (maximum distance 35cm)

Diagram-8

4   pH Measurement

4.1   pH Electrode Information

4.1.1   pH Electrode

The meter comes with the LabSen 211 pH combination electrode, and a MP500 temperature electrode, which enables the automatic temperature compensation. This electrode is only suitable for pH measurement of general water solutions and TRIS buffers. For other specific applications, please refer to **Section 4.7** to find the right pH electrodes. A 3M KCL storage bottle comes with the electrode, which is for storing the electrode when not in use to keep the sensitivity of the electrode.

4.1.2   Electrode Features

- Unique LabSen® Impact-resistant blue glass membrane (see diagram on the right), there is no danger of electrode breakage during normal use.
- Blue gel inner solution, does not flow and will never cause an air bubble inside the bulb.
- Long-life reference system with better stability and longer service life.

Measuring Range	(0-14) pH	Electrolyte	3M KCL
Temperature Range	(-5~100) ℃	Soaking Solution	3M KCL
Shaft Material	Lead-free Glass	Electrode Dimension	(Φ12×120) mm
Membrane Shape	Cylindrical	Connector	BNC
Reference	Long Life	Cable	Φ3×1m
Junction	Ceramic		

4.1.4 *Use and Maintenance*

1) Prior to measurement, remove the rubber plug to maintain pressure of the reference solution, keep consistent flow rate of reference solution and stable potentials of junction.

2) After a long period of usage, the reference solution will run low. Whenever the level falls to 1/2 height of the electrode, add 3M KCL solution to the refilling hole by a syringe or pipette.

3) The connector of the electrode should be kept clean and dry. If contaminated, please clean it with medical cotton and absolute alcohol and blow dry to prevent the short circuit of the electrode and slow reaction of electrode.

4) The electrode measuring tip should be stored in the storage bottle containing storage solution when not in use to keep the membrane hydrated and junction unblocked. When measuring, please unscrew the bottle cap, pull out the electrode and rinse it with deionized water. After using, please put the electrode back into the bottle and screw tight the cap. Clean the bottle and replace the storage solution if the storage solution gets turbid and mildewed. The electrode should never be stored in pure water (deionized/distilled water) or buffer solutions.

5) The electrode should be thoroughly cleaned after testing in sticky samples, to remove the residue on glass membrane. Users wash the electrode with proper solvent or warm soap water, then rinse off the solvent with deionized water.

6) Please avoid measuring dehydrated medium like strong acid or alkaline solution, absolute ethyl alcohol and concentrated sulfuric acid. In case of measuring such solution, please try to reduce the immersion time and clean it carefully after use.

7) After 1-year of use, we recommend replace the aged electrode to achieve the best accuracy.

4.2 Information regarding pH Calibration

4.1.1 Standard buffer solution

The instrument adopts three series standard buffer solution, USA, NIST and CH series, and also custom-defined solution. Please see Chart – 2 for the three series of standard buffer solution. For the detail of customer-defined solution, see Section 7.3.

Chart -2 pH standard buffer solution series

Calibration indication icons		pH standard buffer solution series		
		USA series	NIST series	CH series
Three-point calibration	4.00	4.00pH	4.01 pH	4.00 pH
	7.00	7.00 pH	6.86 pH	6.86 pH
	10.01	10.01 pH	9.18 pH	9.18 pH

Note: calibration indication icons are example of USA series.

4.1.2 Three-point calibration

Every series of standard solutions have 5 types of solutions. Users can select 1 to 3 types to perform 1 to 3 points of calibration. Here is the selection rules (take USA series as an example):

1) 1-point calibration: only 7.00 pH is allowed.

2) 2-point calibration: the first point calibration must use 7.00 pH; for the second point calibration, if testing acidic solutions, please use 4.00 pH or 1.68 pH (choose one of them; if sample pH is lower than 2.0, we recommend to use 1.68 pH); if testing alalined solutions, please use 10.01 pH or 12.45 pH (choose one of them; if sample pH is higher than 12 pH, we recommend to use 12.45 pH)

3) 3-point calibration: the first point calibration must use 7.00 pH; for the second point calibration, please use 4.00 pH or 1.68 pH (choose one of them; if sample pH is lower than 2.0, we recommend to use 1.68 pH); for the third point calibration, please use 10.01 pH or 12.45 pH (choose one of them; if sample pH is higher than 12 pH, we recommend to use 12.45 pH)

See chart – 3 for the detailed calibration rules.

Chart -3 Three-point calibration mode

	USA standard	NIST standard	CH standard	Calibration indicators	Applicable range
1-point calibration	7.00 pH	6.86 pH	6.86 pH	7.00	Accuracy ≤±0.1pH
2-point calibration	1) 7.00 pH 2) 4.00 or 1.68 pH	1) 6.86 pH 2) 4.01 or 1.68 pH	1) 6.86 pH 2) 4.00 or 1.68 pH	4.00 7.00	<7.00 pH (Strong acid use 1.68 pH)
	1) 7.00 pH 2) 10.01 or 12.45 pH	1) 6.86 pH 2) 9.18 or 12.45 pH	6.86 pH 9.18 or 12.45 pH	7.00 10.01	>7.00 pH (strong alkaline use 12.45 pH)
3-point calibration	1) 7.00 pH 2) 4.00 or 1.68 pH 3) 10.01 or 12.45 pH	1) 6.86 pH 2) 4.01 or 1.68 pH 3) 9.18 or 12.45 pH	1) 6.86 pH 2) 4.00 or 1.68 pH 3) 9.18 or 12.45 pH	4.00 7.00 10.01	0-14.00pH (Strong acid use 1.68 pH; strong alkaline 12.45 pH)

Note: calibration indication icons are example of USA series.

4.1.3 Calibration information display

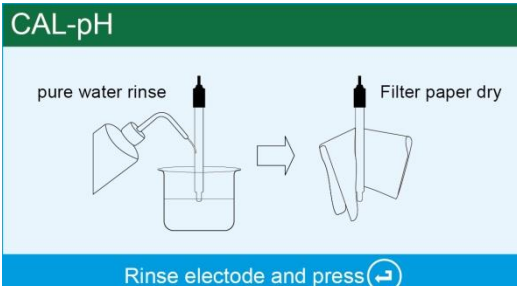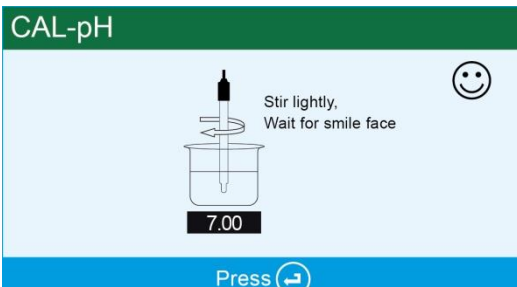|	
MEAS-pH 9.65_{pH} ☺ $25.0°C_{ATC}$ 📈 99% `4.00` `7.00` `10.01`	• Automatically display electrode slope in measurement interface • Display average slope after two or 3-point calibration • Dose not display slope after 1-point calibration

SETUP
 	
1.1 pH buffer selection   USA
1.2 Re
1.3 The
	The Last pH Calibration Data
	1.4 Re buffer offset slope
	   4.00-7.00 4.9mV 99%
	   7.00-10.01 4.9mV 99%
	
	move (▲)(▼) to move (↵) to confirm (Meas) to exit
		Display last calibration data in pH submenu Section 1.3
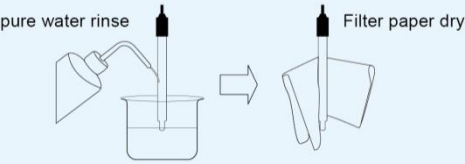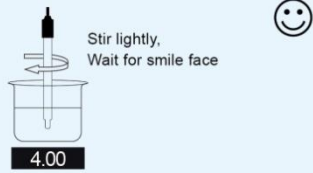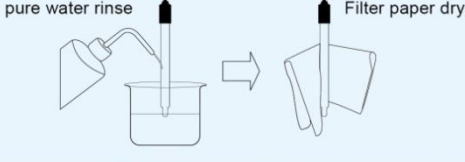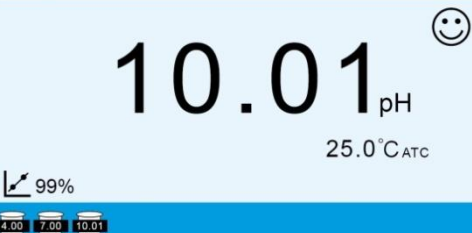
4.1.4 Calibration Frequency

Calibration frequency depend on the sample, the electrode performance, and the required accuracy. For high ccuracy measurements (≤ ±0.02pH), the meter should be calibrated before taking a measurement. For general accuracy (≥±0.1pH), after calibration, the meter can be used for approximately one week or longer. The meter must be recalibrated in the following situations:

(a) New electrode or electrode that is unused for a long period of time

(b) After measuring acids solution (pH<2) or alkaline solutions (pH>12)

(c) After measuring solution that contains fluoride or strong organic solution

(d) If the solution's temperature differs greatly from that of the calibration solution
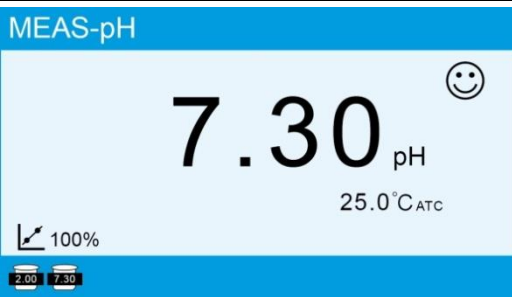
4.3 pH meter calibration (take 3-point calibration as an example)

CAL-pH pure water rinse Filter paper dry ⇨ Rinse electode and press (↵)	1. Long press [CAL/MEAS] key to enter calibration mode, as shown in the left graph. Rinse pH electrode in deionized water, allow it to dry by shaking or with filter paper. Press [SETUP/↵] key to move on.
CAL-pH ☺ Stir lightly, Wait for smile face `7.00` Press (↵)	2. Submerge electrode in pH7.00 buffer solution. Stir the solution briefly and allow it to stay in the buffer until ☺ appears and stays. Press [SETUP/↵] key to perform calibration.

CAL-pH pure water rinse ⟶ Filter paper dry (↵) continue (Meas) finish	3. Rinse pH electrode in deionized water, remove excess water by shaking or with filter paper. Press (SETUP ↵) key to confirm. If only need 1-point calibration, press (CAL MEAS) key to return to measurement mode.
CAL-pH ☺ Stir lightly, Wait for smile face 4.00 Press (↵)	4. Submerge electrode in pH 4.00 buffer solution. Stir the solution briefly and allow it to stay in the buffer until ☺ appears and stays. Press (SETUP ↵) key to perform calibration.
CAL-pH pure water rinse ⟶ Filter paper dry (↵) continue (Meas) finish	5. Rinse pH electrode in deionized water, remove excess water by shaking or with filter paper. Press (SETUP ↵) key to confirm. If only need 2-point calibration, press (CAL MEAS) key to return to measurement mode.
CAL-pH ☺ Stir lightly, Wait for smile face 10.01 Press (↵)	6. Submerge electrode in pH10.01 buffer solution. Stir the solution briefly and allow it to stay in the buffer until ☺ appears and stays. Press (SETUP ↵) key to perform calibration.
MEAS-pH ☺ 10.01_{pH} $25.0°C_{ATC}$ 📈 99% 4.00 7.00 10.01	Calibration completed, instrument goes back to measurement mode.

4.4 Customer-defined calibration (take 2.00 and 7.30pH calibration solutions as an example)

SETUP 1.1 pH buffer selection — User — CH 1.2 Resolution — 0.01 — USA 1.3 The Last Calibration Data — View — NIST 1.4 Restore Factory default — NO — User (▲)(▼) move (⏎) confirm (Meas) exit	1. Select User in parameter set 1.1, press **CAL/MEAS** key to return to measurement mode.
CAL-pH pure water rinse Filter paper dry Rinse electode and press (⏎)	2. Long press **CAL/MEAS** key to enter calibration mode, as shown in left graph. Rinse pH electrode in deionized water, remove excess water by shaking or with filter paper. Press **SETUP/⏎** key to confirm.
CAL-pH ☺ **2.00** pH 25.0°C ATC (▲)(▼) adjust (⏎) confirm (Meas) exit	3. Submerge electrode in pH 2.00 buffer solution. Stir the solution briefly and allow it to stay in the buffer solution until ☺ appears and stays. Press **▲/M+** or **▼/RM** key to adjust measuring value to 2.00pH. Press **SETUP/⏎** key to perform calibration.
CAL-pH pure water rinse Filter paper dry (⏎) continue (Meas) finish	4. Rinse pH electrode in deionized water, remove excess water by shaking or with filter paper. Press **SETUP/⏎** key to confirm. If only need 1-point calibration, press **CAL/MEAS** key to return to measurement mode.
CAL-pH ☺ **7.30** pH 25.0°C ATC (▲)(▼) adjust (⏎) confirm (Meas) exit	5. Submerge electrode in pH7.30 buffer solution. Stir the solution briefly and allow it to stay in the buffer solution until ☺ appears and stays. Press **▲/M+** or **▼/RM** key to adjust measuring value to 7.30 pH. Press **SETUP/⏎** key to perform calibration.

MEAS-pH 7.30 _{pH} ☺ 25.0°C_{ATC} ↗ 100% 2.00 7.30	6. Calibration completed, instrument goes back to measurement mode.

Notes

(a) The meter can perform 1-2 point customer-defined calibration. When the 1st point calibration is done, press (CAL/MEAS) key, the meter exits from calibration mode. This is one-point custom-defined calibration.

(b) The meter does not have the function to recognize custom-defined calibration solution. But it requires the error of customer-defined calibration solution ≤1pH, the differential between two calibration solution ≥1pH, otherwise the meter will display self-diagnostic error.

(c) The pH value of customer-defined solution is a value in a certain fixed temperature. The meter has to perform calibration and measurement at the same temperature to avoid big error.

(d) In manual temperature compensation mode, the temperature value should be adjusted before making calibration. It can not be adjusted during calibrating process.

4.5 Self-diagnostic Information

During the process of calibration and measurement, the meter has self-diagnosis functions, and will indicate the relative information, see chart – 4. Diagram- 9 is the display interface of self-diagnostic information.
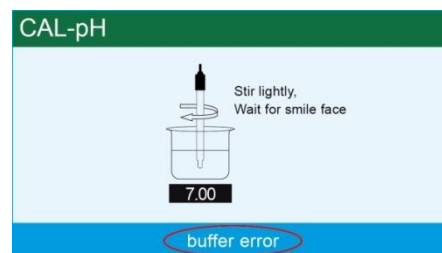
Diagram-9

Chart -4 Self-diagnostic information of pH measurement mode

Self-diagnostic information	Description	Check up
buffer error	Wrong pH buffer solution or exceed the recognition range of the meters	1. Check if the pH buffer solution is correct, contaminated, or expired. 2. Check if the connection between meter and electrode is good. 3. Check if the electrode is failed.
not stable	Press (SETUP) key when measuring value is not stable.	Press (SETUP) when ☺ icon appear and stays.
electrode error	The measuring value is not stable for long time (≥3min)	1. Store the pH electrode in the storage solution over night and check again. 2. If still not working, replace the aged/worn pH electrode.

Note: "electrode error" includes the situation of electrode aging, wear and tear.

4.6 Measurement

4.6.1 Rinse pH electrode in deionized water, allow it to dry, and submerge it in tested solution. Stir the solution briefly and allow it to stay in the tested solution until ☺ icon appears and stays on LCD and a stable reading is reached. The reading is the pH value of tested solution. Diagram–10 is the calibration and measurement process of pH meter.

Diagram-10
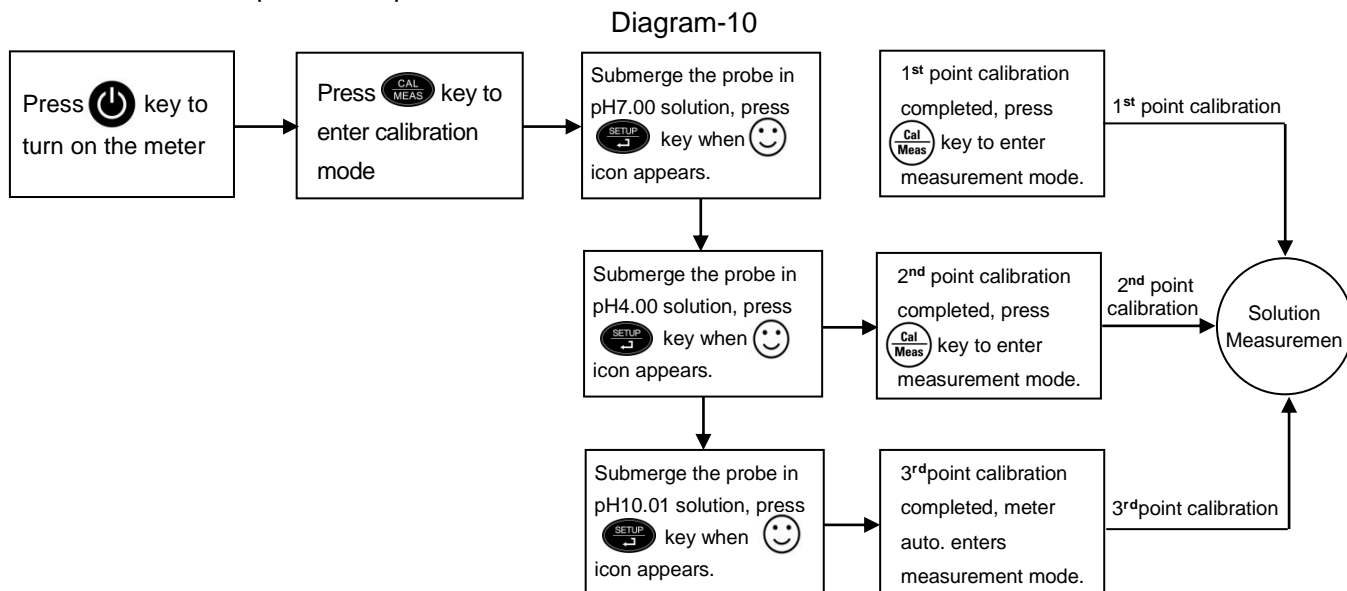
4.6.2 pH isothermal measurement principle

The closer the temperature of the sample solution to the calibration solution, the more accurate readings will be. Please be aware of this principle.

46.3 Restore to factory default setting

Instrument has has factory default setting function, pleas referto parameter setting Section 1.4 (see Diagram-11). With this function, all calibration data is deleted and the meter will be calibrated to the theory value(pH valueof zero electric potential is 7.00, the slope is 100%).Some function settings restore to the original value (refer to Section 7.2).
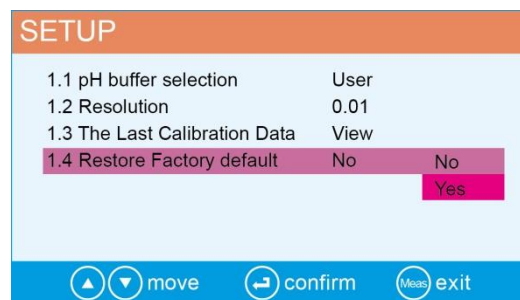
When calibration or measurement fails, please restore the meter to factory default setting and then perform re-calibration or measurement. Please note all the data deleted will not be retrievable if the meter is restored to factory default setting.

Diagram-11

4.7 Recommended pH Electrodes for Specific Applications

Application	Ideal Apera pH Electrodes to Use with PH700 Meter
General water solutions	LabSen 211, LabSen 213
Beverage, beer, or wine analysis	LabSen 211, LabSen 213
Cosmetics	LabSen 851-1, LabSen 851-3
Dairy products (milk, cream, yogurt, mayo, etc.)	LabSen 823, LabSen 821
High-Temperature liquid (up to 100˚C)	LabSen 213, LabSen 211
Low-temperature liquid	LabSen881
Meat	LabSen 763
Micro sample testing	LabSen 241-6, LabSen 241-3
Purified Water (Low ion concentration samples)	LabSen 803, LabSen 813
Soil	LabSen 553
Solid or semi-solid samples (cheese, rice, fruit, etc.)	LabSen 753
Strong acid samples	LabSen 831
Strong alkalined samples	LabSen 841
Surface test (skin, paper, carpet, etc.)	LabSen 371
Titration	LabSen 223, LabSen 221
TRIS buffer solutions	LabSen 211, LabSen 213, LabSen 223
Viscous liquid samples	LabSen 851-3, LabSen851-1
Wastewater or emulsion	LabSen 333, LabSen 331

* Visit http://aperainst.com/electrodes contact us at 1-614-285-3080 for more details.

5 mV measurement

5.1 ORP measurement

Press (MODE) key and switch the meter to mV measurement mode. Connect ORP electrode (sold separately, SKU: AI1303) and dip it in sample solution, stir the solution briefly and allow it to stay in the solution until (☺) icon appears and stays. Thereading obtained is ORP value.ORP stands for Oxidation Reduction Potential. It means oxidation reduction potential of solution. ORP is the measurement index for the oxidation reduction ability of wate solution. Its unit is mV.

5.2 Notes for ORP measurement

5.2.1 ORP measurement does not require calibration. When the user is not sure about ORP electrode quality or measuring value, use ORP standard solution to test mV value and see whether ORP electrode or meter works properly.

5.2.2 Clean and activate ORP electrode: After the electrode has been used over long period of time, the platinum surface of the ORP electrode will get polluted which causes inaccurate measurement and slow response. Please refer to the following methods to clean and activate ORP electrode:

(a) For inorganic pollutant, submerge the electrode in 0.1mol/L dilute hydrochloric acid for 30 minutes, wash it in deionized water, and then submerge it in electrode soaking solution for 6 hours.

(b) For organic or lipid pollutant, clean the platinum surface with detergent, then wash it in deionized water, then submerge it in electrode soaking solution for 6 hours.

(c) For heavily polluted platinum surface on which oxidation film is formed, polish the platinum surface with toothpaste, then wash it in deionized water, then submerge it in electrode soaking solution for 6 hours.

5.3 Ion potential measurement

Connect ion electrode and dip it in sample solution, stir the solution briefly and allow it to stay in the solution until ☺ icon appears and stays. The reading obtained is potential value of ion electrode. If ion electrode is combination type, only need to insert it into "pH/mV" socket. If it's not combination type, proper reference electrode should be selected and insert it to "REF" socket. Two probles should be make measurement at same time.

6   Conductivity Measurement

6.1   Conductivity electrode information

6.1.1 Matching conductivity electrode

The meter includes one glass conductivity electrode (Model 2401T-F, K=1.0). With built-in temperature sensor, the meter can achieve automatic temperature compensation. BNC plug of the electrode is connected to the meter's conductivity socket while RCA plug is connected to the Temp socket. When the electrode is submerged in solution, stir the solution briefly to eliminate the air bubbles and in this way, a stable measurement will be reached fast.

6.1.2 Conductivity electrode constant

The meter can use with conductivity electrodes with three constants (K=0.1, K=1.0 and K=10.0). Please refer to chart-5 for the measuring range. Instrument constant can be set in parameter setting Section 2.1.

Chart -5 Electrode constant and measuring range

Measuring Range	＜20 µS/cm	0.5µS/cm~100mS/cm			＞100mS/cm
Conductivity electrode constant	K=0.1 cm^{-1}	K=1.0 cm^{-1}			K=10 cm^{-1}
Standard solution	84µS/cm	84µS/cm	1413 µS/cm	12.88 mS/cm	111.8 mS/cm

6.2   Conductivity calibration related information

6.2.1 Conductivity calibration solutions

The meter uses Standard series and CH series conductivity solution. The meter can recognize the standard solution automatically and perform 1 to 4 point calibration. The calibration icons at the bottom left of LCD screen is corresponding to four built-in standard values. See chart – 6.

Chart -6 Conductivity standard solution series

Icons	Standard calibration solution	CH conductivity solution
84	84 µS/cm	146.6µS/cm
1413	1413 µS/cm	1408µS/cm
12.88	12.88 mS/cm	12.85mS/cm
111.8	111.8 mS/cm	111.3mS/cm

Note: calibration indication icons are example of Standard series.

6.2.2 Calibration Frequency

(a) The meter is calibrated before leaving the factory and can generally be used right out of the box.

(b) Normally, performing calibration once a month is recommended.

(c) For high accuracy measurement or larger temperature deviation from the reference temperature (25°C), performing calibration once a week is recommended.

(d) Use conductivity standard solution to check the electrode. Perform calibration if the error is big.

(e) When use a new electrode for the first time, or the meter has restored to factory default setting, 3-point or 4-point calibration is recommended. For everyday use, standard solution closer to the sample solution can be chosen to perform 1- point or 2-point calibration. For example: 1413 µS/cm standard solution is suitable for measuring range 0-20mS/cm.

6.2.3 Reference temperature

Factory set reference temperature is 25°C. Other reference temperature can also be set within the range 15°C~30°C. Set up reference temperature in parameter setting Section 2.4

6.2.4 Temperature coefficient

Factory set temperature compensation coefficient of the meter is 2.0%. However, the conductivity temperature coefficient is different from that of varous kinds of solution and concentration. Please refer to chart – 7 and the data collected during testing and set up the parameter in Section 2.5.

Note: When the temperature compensation coefficient is set to 0.00 , meaning no temperature compensation, the measurment value will be based on the current temperature.
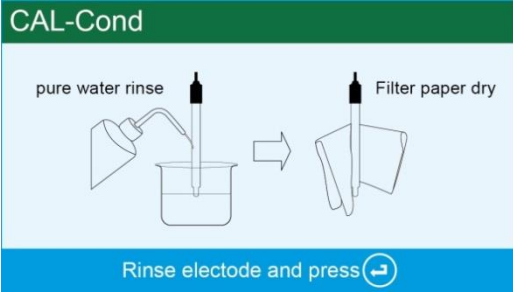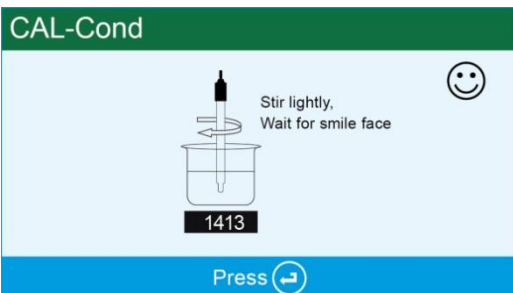
Chart -7 Temperature compensation coefficient of certain solutions

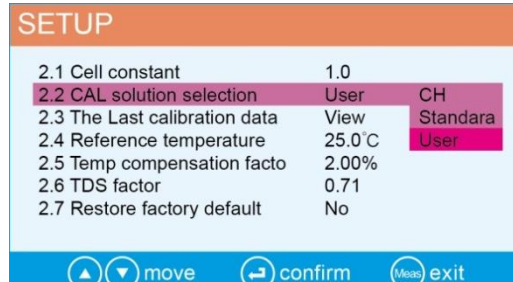| Solution	Temperature compensation coefficient
NaCl solution	2.12 %/℃
5% NaOH solution	1.72 %/℃
Dilute ammonia solution	1.88 %/℃
10% hydrochloric acid solution	1.32 %/℃
5% sulfuric acid solution	0.96 %/℃

6.2.5 Avoid contamination of standard solution

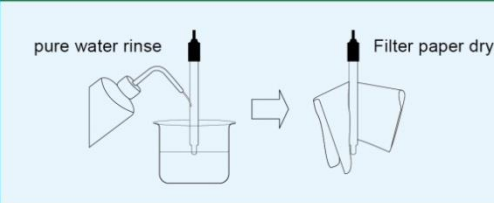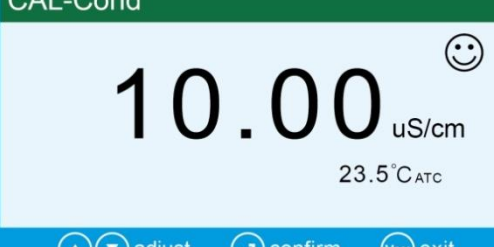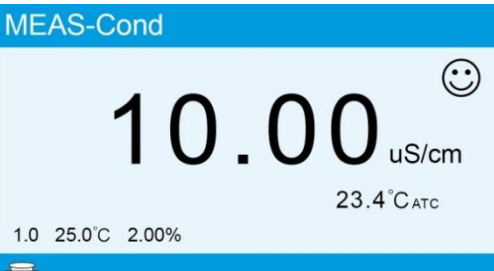Conductivity standard solution has no buffer. Please avoid being contaminated during usage. Before submerging the electrode in standard solution, please wash the electrode and allow it dry. Please do not use the same cup of conductivity standard solution frequently, especially for standard solution of low concentration 84µS/cm. The contaminated standard solution will affect accuracy of measurements.

6.3 **Conductivity meter calibration** (take 1413μS/cm calibration as an example)

CAL-Cond pure water rinse ⟶ Filter paper dry Rinse electrode and press ⏎	1. Long press [CAL/MEAS] key to enter calibration mode, as shown in left graph. Rinse pH electrode in deionized water, allow it to dry by shaking or filter paper. Press [SETUP ⏎] key to confirm.
CAL-Cond ☺ Stir lightly, Wait for smile face 1413 Press ⏎	2. Submerge electrode in 1413μS/cm solution. Stir the solution briefly and allow it to stay in the buffer solution until ☺ appears and stays. Press [SETUP ⏎] key to make calibration.
MEAS-Cond ☺ **1415** uS/cm 23.8°C ATC 1.0 25.0°C 2.00% 1413	3. Calibration completed, instrument goes back to measurement mode.

- For mulit-point calibration, please repeat above 1~3 step until all the calibration is done. The meter can perform calibration in same calibration solution until the value displayed is stable and repeatable.
- To quit calibration mode, please [CAL/MEAS] key, meter will return to measurement mode.
- Press [MODE] key to switch measurement mode **Cond→TDS→Salt.**

6.4 **Custom-defined calibration** (take 10μS/cm standard solution as an example)

SETUP 2.1 Cell constant 1.0 2.2 CAL solution selection User CH 2.3 The Last calibration data View Standara 2.4 Reference temperature 25.0°C User 2.5 Temp compensation facto 2.00% 2.6 TDS factor 0.71 2.7 Restore factory default No ▲ ▼ move ⏎ confirm (Meas) exit	1. Select User in parameter setting Section 2.2, press [CAL/MEAS] key to return to measurement mode.

CAL-Cond pure water rinse → Filter paper dry Rinse electode and press ⏎	2. Long press CAL/MEAS key to enter calibration mode, as shown in left graph. Rinse electrode in deionized water, allow it to dry by shaking or filter paper. Press SETUP ⏎ key to confirm.
CAL-Cond ☺ **10.00** uS/cm 23.5°C ATC ▲ ▼ adjust ⏎ confirm Meas exit	3. Submerge electrode in 10μS/cm standard solution. Stir the solution briefly and allow it to stay in the buffer solution until ☺ appears. Press ▲/M+ or ▼/RM key to adjust measuring value to10.00μS/cm. Press SETUP ⏎ key to make calibration.
MEAS-Cond ☺ **10.00** uS/cm 23.4°C ATC 1.0 25.0°C 2.00% 10.00uS	Calibration completed, instrument goes back to measurement mode.

- Only 1-point calibration for custom-defined calibration. The conductivity value of custom-defined solution is avalue in a certain fixed temperature. There is no regulation of temperature coefficient and reference temperature. The meter has to perform calibration and measurement at the same temperature to avoid large error.
- The meter does not have the function to recognize custom-defined calibration solution.
- In manual temperature compensation mode, the temperature value should be adjusted before making calibration. It can not be adjusted during calibrating process.

6.5 Self-diagnostic information

During the process of calibration, the meter has self-diagnosis functions, and will indicate the relative information, see chart – 8. Diagram- 12 is the display interface of self-diagnostic information.
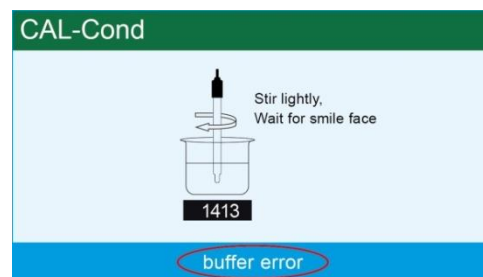
CAL-Cond

Stir lightly,
Wait for smile face

1413

buffer error

Diagram-12

Chart -8 Self-diagnostic information of conductivity measurement mode

Self-diagnostic information	Description	Check up
buffer error	Wrong conductivity calibration solution or exceed recognition range of the meter	1. Check if conductivity solution is correct. 2. Check if the connection between meter and electrode is good 3. Check if the electrode is failed
no stable	Press (SETUP) key when measuring value is not stable.	Press (SETUP) when ☺ icon appears stays
electrode error	The measuring value is not stable for long time (≥3min)	1.Shake the electrode to eliminate bubbles in electrode head. 2.Replace the aged/worn conductivity electrode

6.6 Solution measurement

6.6.1 Rinse conductivity electrode in deionized water, allow it to dry, and submerge it in the sample solution. Stir the solution briefly and allow it to stay in the sample solution until a stable reading is reached and ☺

icon appears on LCD screen. The reading got is the conductivity value of the solution. Diagram – 13 is the calibration and measurement process of conductivity.
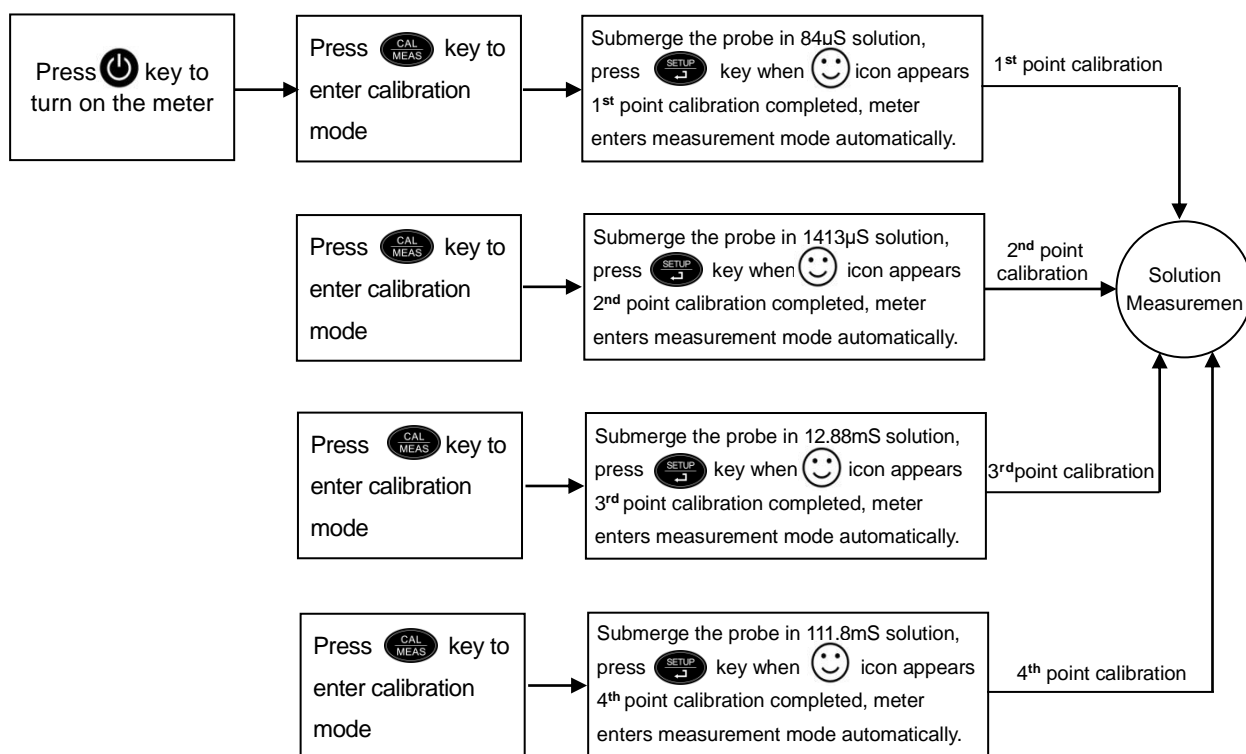

Diagram-13

6.6.2 Relationship among TDS, salinity and conductivity

The conversion coefficient between TDS and conductivity is 0.40~1.00 which can be adjusted in parameter setting Section 2.6 Factory default setting is 0.71. The conversion coefficient between salinity and conductivity is 0.5. So the meter only needs to be calibrated in conductivity mode, then switch to TDS and salinity mode. Customers can adjust TDS conversion coefficient in parameter setting Section 2.6 according to testing data and experience. Please refer to chart-9 for some frequently-used conductivity and TDS conversion coefficients. Just for your reference.

Chart -9 Conversion coefficient between conductivity and TDS

Conductivity of solution	TDS conversion coefficient
0~100 µS/cm	0.60
100~1000 µS/cm	0.71
1~10 mS/cm	0.81
10~100 mS/cm	0.94

6.6.3 Restore to factory default setting

Instrument has has factory default setting function,please refer to parameter setting Section 2.7 (see Diagram-14).With this function, all calibration data is deleted and the meter will be calibrated to the theory value. Some function settings restore to the original value (refer to Section 2.7). When calibration or measurement fails, please restore the meter to factory default setting and then perform re-calibration or measurement. Please note all the data deleted will not be retrievable if the meter is restored to factory default setting.
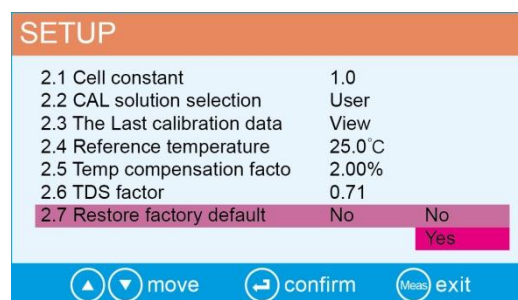

Diagram-14

6.7 Conductivity Electrode Maintenance

6.7.1 Always keep the conductivity electrode clean. Before taking a measurement, rinse the electrode in deionized water and allow it dry, then rinse it in the sample solution. When submerge the electrode in solution, stir the solution briefly to eliminate air bubbles and allow it to stay in the solution until a stable reading is reached.

6.7.2 The sensor of Model 2401T-F conductivity electrode is coated with platinum black to minimize electrode polarization and expand measuring range. The platinum black coating of the electrode adopts advanced electroplating technology. This not only increases the surface roughness, but also improves electrode measurement performance. And the coating is tight and firm, it can be washed by soft brush. This increases the the service life of electrode a lot.
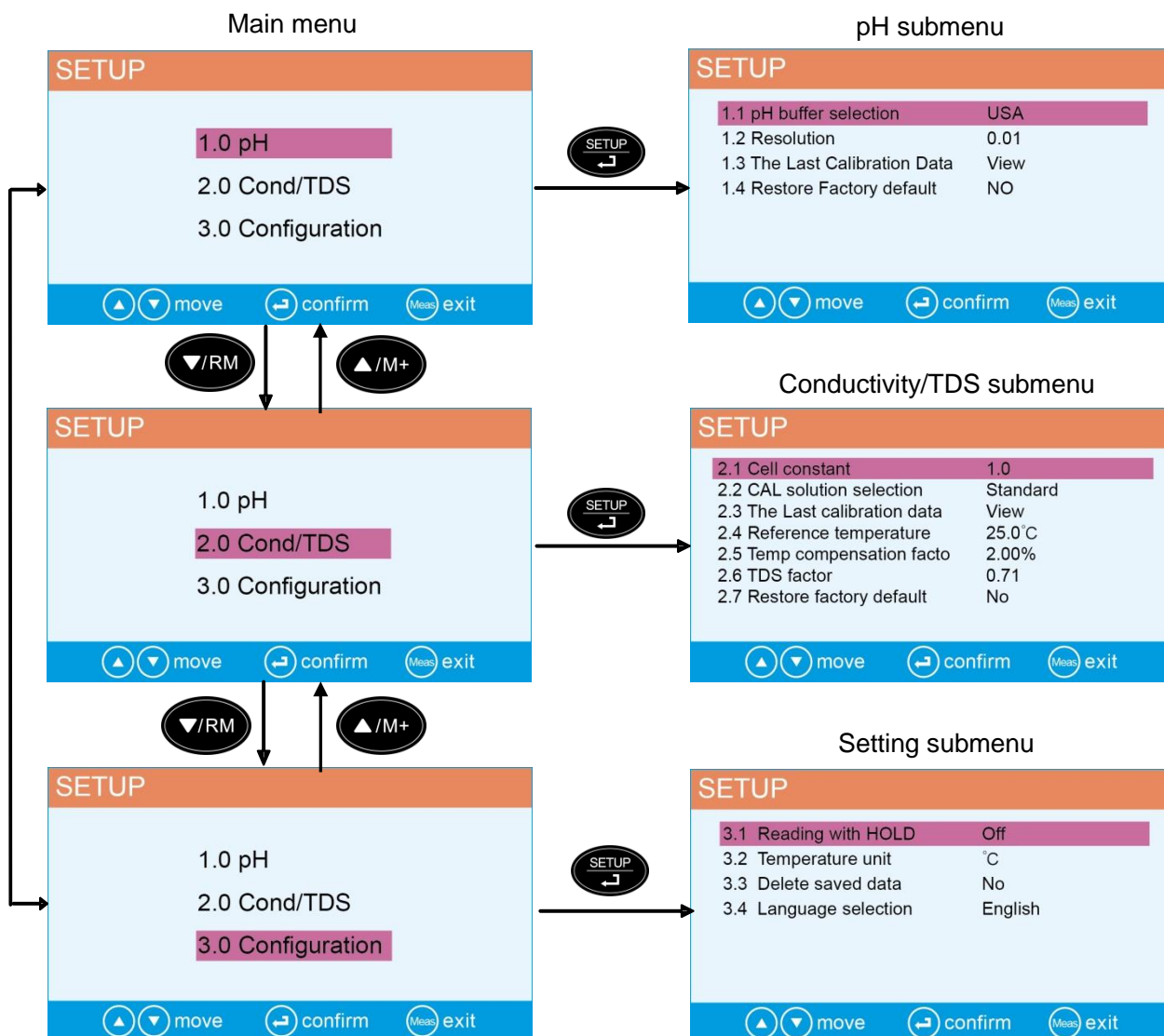
7 Parameter Setting

7.1 Main Menu and Submenu

Main menu

pH submenu

Conductivity/TDS submenu

Setting submenu

Diagram-15

7.2 Operation

Press ⟨SETUP⟩ key to open main menu→press ⟨▲/M+⟩ or ⟨▼/RM⟩ key to select main menu items→press ⟨SETUP⟩ key to open main menu item (submenu)→press ⟨▲/M+⟩ or ⟨▼/RM⟩ key to select submenu items(parameter)→ press ⟨SETUP⟩ key to open parameter→press ⟨▲/M+⟩ or ⟨▼/RM⟩ key to select parameter items or parameter value→press ⟨SETUP⟩ key to confirm→press ⟨CAL/MEAS⟩ key to return to measurement mode. Please follow the operating indication in the bottom of LCD screen when operate it.

7.3 Content of parameter setting

Main menu	Serial number	Parameter setting items	Setting content	Factory default
1.0 pH	1.1	pH buffer selection	CH-USA-NIST-User	USA
	1.2	Resolution	0.01-0.1	0.01
	1.3	The last calibration data	View	/
	1.4	Restore factory default	No-Yes	No
2.0 Cond./TDS	2.1	Cell constant	10-1.0-0.1	1.0
	2.2	CAL solution selection	CH-Standard-User	Standard
	2.3	The last calibration data	View	/
	2.4	Reference temperature	15~30℃	25℃
	2.5	Temp compensation factor	0.00~10.00%	2.0%
	2.6	TDS factor	0.40~1.00	0.71
	2.7	Restore factory default	No-Yes	No
3.0 Configuration	3.1	Reading with HOLD	On-Off	/
	3.2	Temperature unit	℃-℉	/
	3.3	Delete saved data	Yes/No	/
	3.4	Language selection	中文-English-Deutsch	/

8 Stirrer

8.1 Operation

8.1.1 Insert two ends of stirrer connection cable to the socket of meter and stirrer.

8.1.2 Press ⊚ key to turn on, (s) icon appears in the bottom right corner of LCD screen. At this time the ratation speed is zero. Press (△) or (▽) key to increase or decrease ratation speed. Hold the key for fast changing.

8.1.3 (RPM) key operation: Hold (RPM) key for 3 seconds to store ratation speed. At this time stirrer icon turns to (H), then press (△) and (▽) key to change ratation speed. The icon turns (s) When using stirrer, press (RPM) key to switch (H) and (s) between two ratation speeds. When using

(s) — this icon shows up when turn the meter is powered on, it also indicates the adjusted ratation speed.

(H) — It indicates the stored ratation speed.

8.1.4 For required ratation speed, press (RPM) key to store the speed. Next time, turn on the meter and press (RPM) key to stir with the specific speed.

8.2 Specification

Speed adjustable range	0 ～ 2300 revolution per minute (no-load)
Working surface diameter	Φ100mm
Maximum stir capacity	1000ml

8.3 Notes

8.3.1 If the bottom of the beaker is not smooth, it will cause vibration when stirring, even unable to stir. In this case, please replace a qualified beaker.

8.3.2 At zero ratation speed, please don't long press (RPM) key, otherwise zero ratation speed will be stored. In this case, please press (△) key to store once more.

9   What's in the Kit

	Description	Quantity	PH950	EC950	PC950
9.1	PH950 pH meter	1	√		
9.2	EC950 conductivity meter	1		√	
9.3	PC950 pH/conductivity meter	1			√
9.4	606 multi-function stirrer(includes flexible electrode holder)	1	√	√	√
9.5	LabSen211 glass pH combination electrode	1	√		√
9.6	MP500 temperature electrode	1	√		√
9.7	2401T-F conductivity electrode (ATC,K=1.0)	1		√	√
9.8	pH buffer solution (4.00/7.00/10.01pH/50mL)	1 bottle each	√		√
9.9	Conductivity standard solution (84μS/1413μS/12.85mS/50mL)	1 bottle each		√	√
9.10	Stirrer connection cable	1	√	√	√
9.11	9V power adapter	1	√	√	√
9.12	Small round bottle		3pcs	3pcs	6pcs
9.13	L200 stirrer bead		3pcs	3pcs	6pcs
9.14	Instruction manual	1	√	√	√