

PH950 Benchtop pH Meter

Instruction Manual

PH950 Benchtop pH Meter



EC950 Benchtop Cond. Meter



PC950 Benchtop pH/Cond. Meter



APERA INSTRUMENTS (Europe) GmbH

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1 INTRODUCTION

Thank you for purchasing our PH950 Benchtop pH Meter.

Before using this meter, please read the operation manual carefully in order to help use and maintain it correctly. On the basis of improving instrument of performance constantly, we reserve the right of changing the content of this manual and accessories in case of not notifying in advance.

This meter is a perfect combination with advanced electronic technology, sensor technology and software design, and is the most cost effective benchtop meter which is suitable for pH and conductivity measurement of water solution in laboratory.

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 & 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 rotating 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) °C (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) °C (Auto. or Manual)	
	Cell constant	0.1 / 1 / 10 cm ⁻¹	
Temp.	Measuring Range	0~100°C	PH950 EC950 PC950
	Resolution	0.1° C	
	Accuracy	±0.5°C±1 digit	

2.2 Other technical parameters

Data Storage	PH950, EC950: 100 groups; PC950: 200 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

<p style="text-align: center;">pH measurement interface</p>  <p>The screenshot shows the 'MEAS-pH' interface. At the top left is the title 'MEAS-pH' and a storage icon with the number '6'. The main display shows a large '9.65 pH' value. Below it, the temperature is '25.0°C ATC'. A '99%' stability indicator is shown on the left. At the bottom, there are calibration solution icons for 4.02, 7.02, and 10.01. A 'HOLD' icon and a smiley face icon are on the right. A '5' icon is at the bottom right.</p>	<ul style="list-style-type: none"> ①—pH measurement 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
<p style="text-align: center;">Conductivity measurement interface</p>  <p>The screenshot shows the 'MEAS-Cond' interface. At the top left is the title 'MEAS-Cond' and a storage icon with the number '12'. The main display shows a large '0.00 uS/cm' value. Below it, the temperature is '25.0°C ATC'. At the bottom left, parameters are shown: '1.0 25.0°C 2.00%'. At the bottom, there are calibration solution icons for 14, 14.13, 12.81, and 11.14. A 'HOLD' icon and a smiley face icon are on the right. A '5' icon is at the bottom right.</p>	<ul style="list-style-type: none"> 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
<p style="text-align: center;">TDS measurement interface</p>  <p>The screenshot shows the 'MEAS-TDS' interface. At the top left is the title 'MEAS-TDS' and a storage icon with the number '12'. The main display shows a large '0.00 mg/L' value. Below it, the temperature is '25.0°C ATC'. At the bottom left, the factor is 'Factor: 0.71'. At the bottom, there are calibration solution icons for 14, 14.13, 12.81, and 11.14. A 'HOLD' icon and a smiley face icon are on the right. A '5' icon is at the bottom right.</p> <p>①—TDS measurement ②—TDS factor 0.71</p>	<p style="text-align: center;">Salinity measurement interface</p>  <p>The screenshot shows the 'MEAS-Salt' interface. At the top left is the title 'MEAS-Salt' and a storage icon with the number '8'. The main display shows a large '0.00 ppt' value. Below it, the temperature is '25.0°C ATC'. At the bottom left, the factor is 'Factor: 0.50'. At the bottom, there are calibration solution icons for 14, 14.13, 12.81, and 11.14. A 'HOLD' icon and a smiley face icon are on the right. A '5' icon is at the bottom right.</p> <p>①—Salinity measurement ②—Salinity factor 0.5</p>
<p style="text-align: center;">pH/Cond. measurement interface</p>  <p>The screenshot shows the 'MEAS-pH/Cond' interface. It is split into two columns. The left column shows '9.65 pH' at '25.0°C ATC' with a '99%' stability indicator and calibration icons for 4.02, 7.02, and 10.01. The right column shows '0.00 uS/cm' at '25.0°C ATC' with parameters '1.0 25.0°C 2.00%' and calibration icons for 14, 14.13, 12.81, and 11.14. Both columns have 'HOLD' and smiley face icons. A '5' icon is at the bottom right.</p>	<p style="text-align: center;">mV measurement interface</p>  <p>The screenshot shows the 'MEAS-mV' interface. At the top left is the title 'MEAS-mV' and a storage icon with the number '6'. The main display shows a large '-150 mV' value. Below it, the temperature is '25.0°C MTC'. At the bottom, there are calibration solution icons for 14, 14.13, 12.81, and 11.14. A 'HOLD' icon and a smiley face icon are on the right. A '5' icon is at the bottom right.</p>

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” sound 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	<ul style="list-style-type: none"> ● Power supply switch
	Short press	Press key to select measurement mode: <ul style="list-style-type: none"> ● PH950: pH→mV ● EC950: Cond→TDS→Salt ● PC950: pH→mV→Cond→TDS→Salt→pH/Cond
	Long press	<ul style="list-style-type: none"> ● Press key to enter temperature regulation mode
	Long press	<ul style="list-style-type: none"> ● In measurement mode, press key to enter in the calibration mode
	Short press	<ul style="list-style-type: none"> ● Cancel operation and return to measurement mode;
	Short press	<ul style="list-style-type: none"> ● 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.
	Short press	<ul style="list-style-type: none"> ● In measurement mode: press key to store measuring value, press key to recall; ● In recall(RM) mode: press or 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
	Long press	● Store stirrer speed
	Short press	● Rotate according to the stored speed
	Short press	● Press key to change rotating 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

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— $\Phi 4$ 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— $\Phi 2.5$ power socket (inside “+” outside “-”) connect with DC9V adapter.
- ⑦— $\Phi 2$ power socket, connect with stirrer.

3.4 Display mode

3.4.1 Reading stable display mode

When the measuring value is stable, smiley icon  appears 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 stably display for more than 10 seconds, the meter will lock the value automatically and display **HOLD** icon. see Diagram – 4(b). In **HOLD** mode, press  key to cancel auto lock.

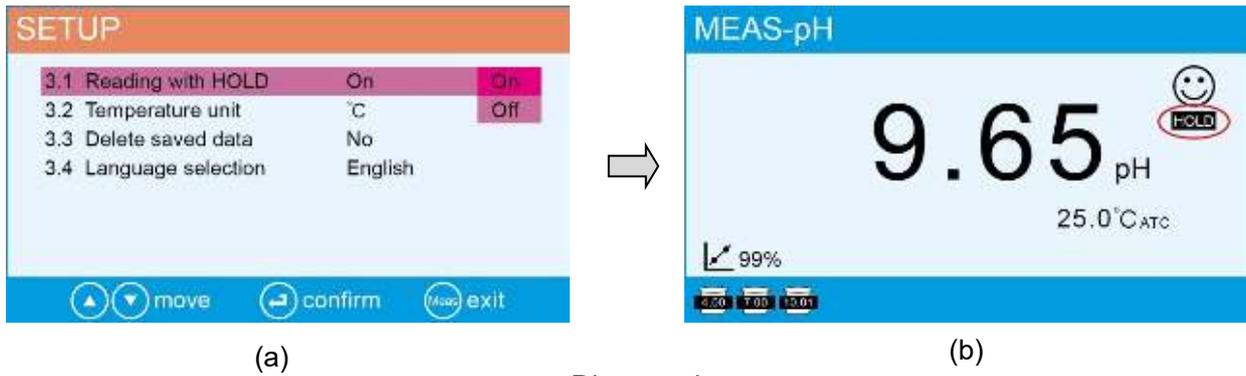


Diagram-4

3.5 Data storage, recall and delete

3.5.1 Storage

Press key to store, icon 12 displays 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 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 key, meter will display stored 12 groups measuring value, see Diagram – 5(b), press or 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 key, see Diagram – 5(d) to delete all stored value.



Diagram-5

3.6 Manual adjust temperature

In MTC mode, long press **MODE** key to enter temperature regulation mode. Press **▲/M+** or **▼/M-** 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

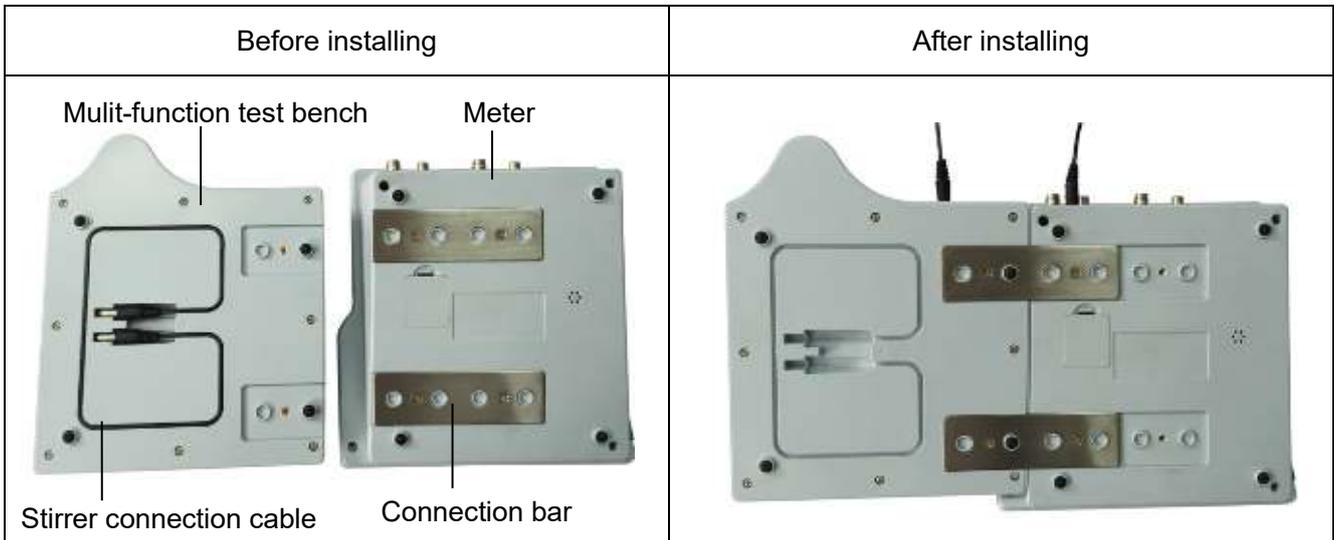


Diagram-6

3.8 Installation of flexible electrode holder

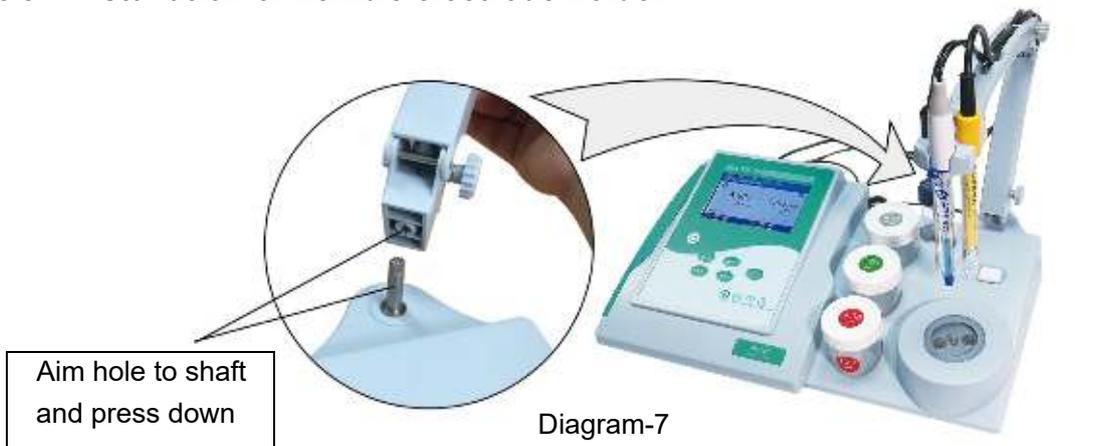


Diagram-7

3.9 Use forms of multi-function test bench



(a) Siamesed using

(b) Separation using (maximum distance 35cm)

Diagram-8

4 PH MEASUREMENT

4.1 pH calibration related information

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. The detail of custom-defined solution, see clause 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		4.00pH	4.01 pH	4.00 pH
		7.00 pH	6.86 pH	6.86 pH
		10.01 pH	9.18 pH	9.18 pH

Note: calibration indication icons are example of USA series.

4.1.2 Three-point calibration

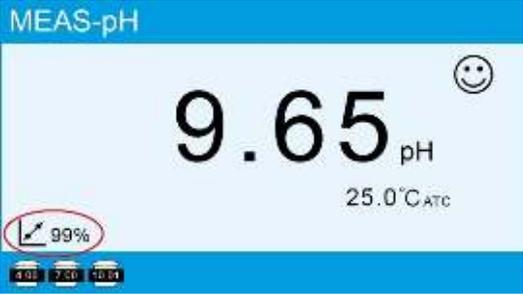
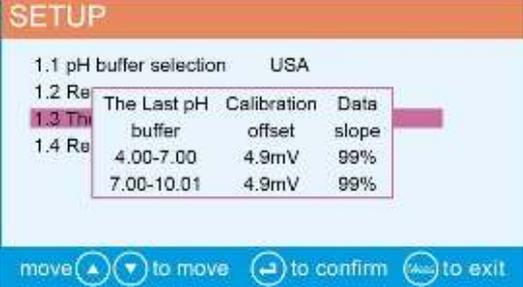
The instrument can perform 1~3 point calibration. In three-point calibration mode, the first point calibration must use 7.00 pH (or 6.86 pH) standard solution, then select other standard solution to perform the second and the third point calibration. See chart – 3.

Chart -3 Three-point calibration mode

	USA standard	NIST standard	CH standard	Calibration indication icons	Applicable range
One-point calibration	7.00 pH	6.86 pH	6.86 pH		Accuracy $\leq \pm 0.1\text{pH}$
Two-point calibration	7.00 pH and 4.00pH	6.86 pH and 4.01pH	6.86 pH and 4.00pH		<7.00 pH
	7.00 pH and 10.01pH	6.86 pH and 9.18pH	6.86 pH and 9.18pH		>7.00 pH
Three-point calibration	7.00pH, 4.00pH and 10.01 pH	6.86pH, 4.01pH and 9.18 pH	6.86pH, 4.00pH and 9.18 pH		0~14.00pH

Note: calibration indication icons are example of USA series.

4.1.3 Calibration information display

	<p>1. Automatically display electrode slope in measurement interface</p> <ul style="list-style-type: none"> ● Display average slope after two or three point calibration ● Do not display slope after one point calibration
	<p>2. Display last calibration data in pH submenu clause 1.3</p>

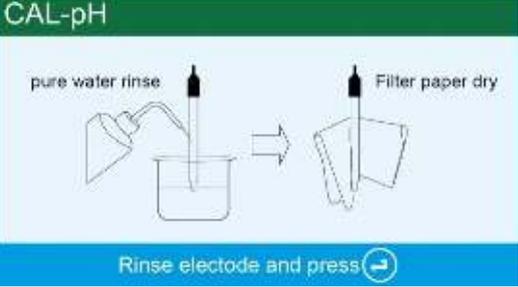
4.1.4 Calibration intervals

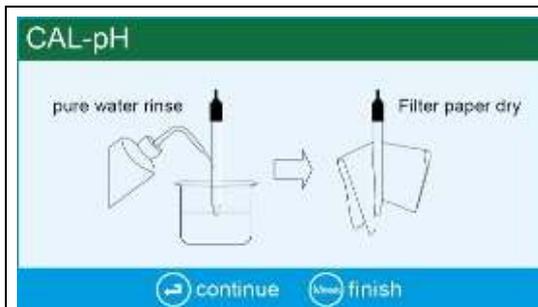
Calibration intervals depend on the sample, the probe performance, and the required accuracy. For high accuracy measurements ($\leq \pm 0.02\text{pH}$), the meter should be calibrated before taking a measurement. For general accuracy ($\geq \pm 0.1\text{pH}$), after one time calibration, the meter can be used for approximately one week or longer.

The meter must be recalibrated in the following situations:

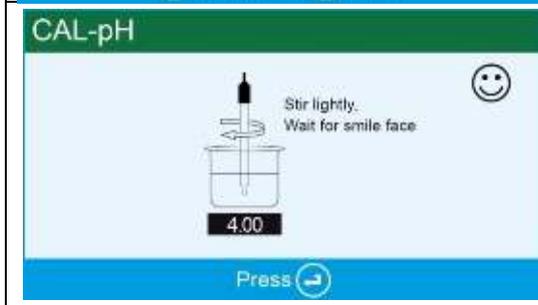
- (a) New probe or probe that is unused for a long period of time
- (b) After measuring acids solution ($\text{pH} < 2$) or alkaline solutions ($\text{pH} > 12$)
- (c) After measuring solution that contains fluoride or strong organic solution
- (d) If the solution's temperature differs greatly from that of the calibration solution

4.2 pH meter calibration (take three-point calibration as an example)

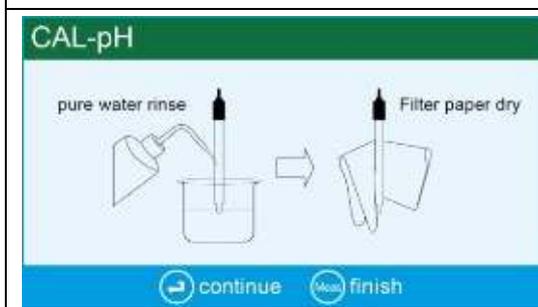
	<p>Long press  key to enter calibration mode, as shown in left graph. Rinse pH probe in pure water, allow it to dry by shaking or filter paper. Press  key to confirm.</p>
	<p>Submerge probe in pH7.00 buffer solution. Stir the solution briefly and allow it to stay in the buffer solution until  appears. Press  key to make calibration.</p>



Rinse pH probe in pure water, allow it to dry by shaking or filter paper. Press **SETUP** key to confirm. If only need one point calibration, press **CAL MEAS** key to return to measurement mode.



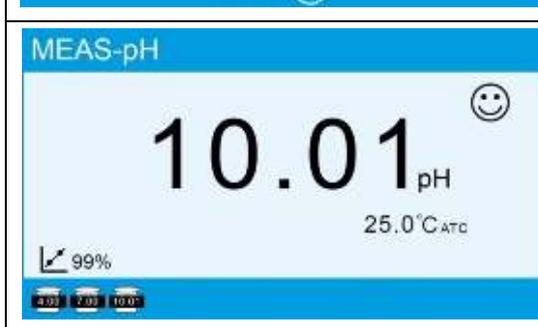
Submerge probe in pH4.00 buffer solution. Stir the solution briefly and allow it to stay in the buffer solution until ☺ appears. Press **SETUP** key to make calibration.



Rinse pH probe in pure water, allow it to dry by shaking or filter paper. Press **SETUP** key to confirm. If only need two point calibration, press **CAL MEAS** key to return to measurement mode.



Submerge probe in pH10.01 buffer solution. Stir the solution briefly and allow it to stay in the buffer solution until ☺ appears. Press **SETUP** key to make calibration.

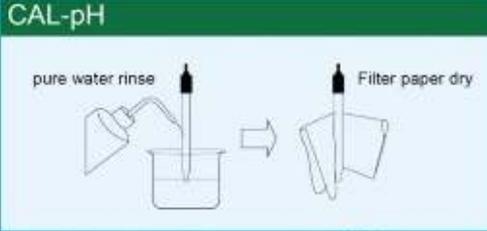
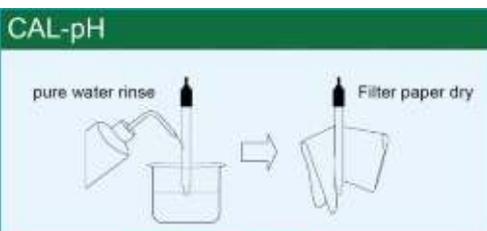


Calibration completed, instrument goes back to measurement mode.

4.3 Custom-defined calibration (take 2.00pH and 7.30pH calibration solution as example)



1. Select User in parameter set 1.1, press **CAL MEAS** key to return to measurement mode.

 <p style="text-align: center;">Rinse electrode and press </p>	<p>2. Long press  key to enter calibration mode, as shown in left graph. Rinse pH probe in pure water, allow it to dry by shaking or filter paper. Press  key to confirm.</p>
 <p style="text-align: center;">adjust  confirm </p>	<p>3. Submerge probe in pH2.00 buffer solution. Stir the solution briefly and allow it to stay in the buffer solution until  appears. Press  or  key to adjust measuring value to 2.00pH. Press  key to make calibration.</p>
 <p style="text-align: center;">continue </p>	<p>4. Rinse pH probe in pure water, allow it to dry by shaking or filter paper. Press  key to confirm. If only need one point calibration, press  key to return to measurement mode.</p>
 <p style="text-align: center;">adjust  confirm </p>	<p>5. Submerge probe in pH7.30 buffer solution. Stir the solution briefly and allow it to stay in the buffer solution until  appears. Press  or  key to adjust measuring value to 7.30pH. Press  key to make calibration.</p>
	<p>6. Calibration completed, instrument goes back to measurement mode.</p>

Notes

- (a) The meter can perform 1-2 point custom-defined calibration. When the 1st point calibration is done, press  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 custom-defined calibration solution $\leq 1\text{pH}$, the differential between two calibration solution $\geq 1\text{pH}$, otherwise the meter will display self-diagnostic error.
- (c) The pH value of custom-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.

4.4 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. 2. Check if the connection between meter and probe is good 3. Check if the probe is failed
no stable	Press  key when measuring value is not stable.	Press  when  icon appears
electrode error	The measuring value is not stable for long time (≥ 3 min)	1. Check the probe bulb and make sure there is no air bulb in it 2. Replace the pH probe with a new one

Note: “electrode error” also includes the situation of electrode aging.

4.5 Solution measurement

4.5.1 Rinse pH probe in pure 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 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.

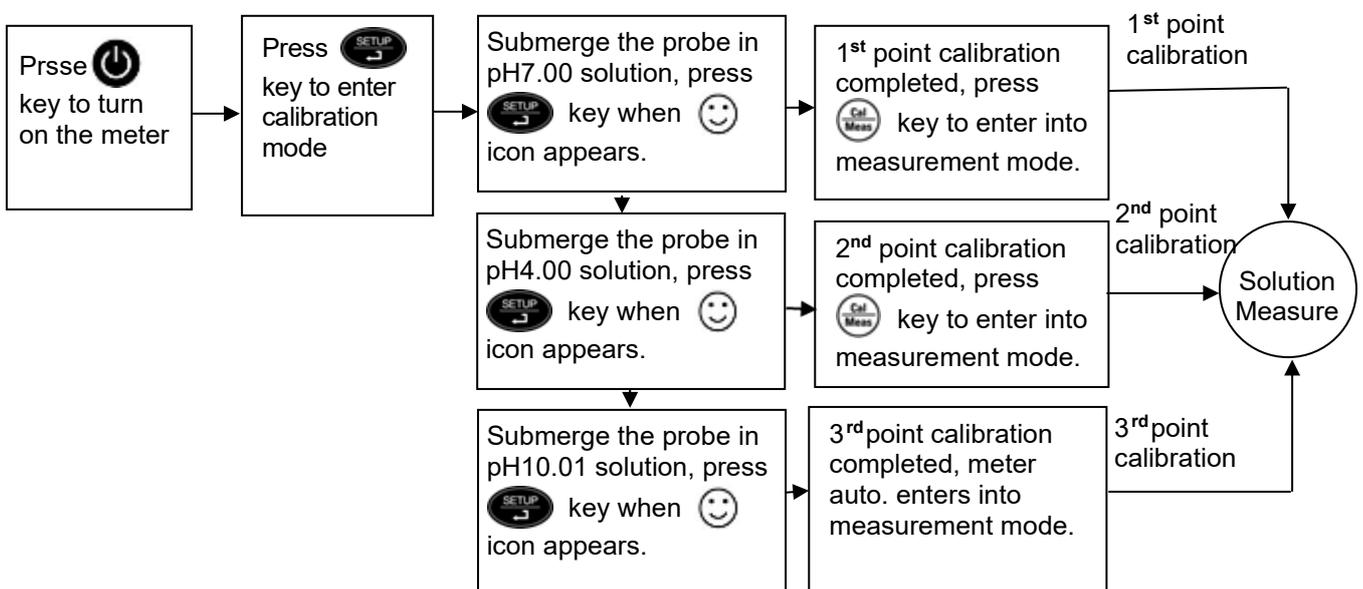


Diagram-10

4.5.2 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.

4.5.3 Restore to factory default setting

Instrument has factory default setting function, please refer to parameter setting clause 1.4 (see Diagram-11). With this function, all calibration data is deleted and the meter will be calibrated to the theory value (pH value of zero electric potential is 7.00, the slope is 100%). Some function settings restore to the original value (refer to clause 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

4.6 pH probe maintenance

4.6.1 Daily maintenance

There is right amount 3M KCl solution in protection bottle of electrode front-end. Electrode tip is soaked inside it to keep glass bulb and junction activated. When measuring, unscrew the cap and pull out electrode. Rinse off with pure water and it can be used. After using, insert the electrode and screw bottle cap to avoid solution leakage. If find muddy, signs of mould in the solution of protection bottle, the bottle should be washed in time and replace new soaking solution. 3M KCl solution preparation: take 22.4g KCl reagent and dissolve it in 100ml pure water.

The probe should not be soaked in pure water, protein solution or acid fluoride solution for long periods of time. In addition, do not soak the probe in organic grease lipids. For best accuracy, always keep the meter, especially the connectors of the meter and probe clean and dry. If polluted, clean it with medical cotton and absolute alcohol, then allow it dry.

4.6.2 Buffer solution

The instrument was demarcated by buffer solution which has known pH value. For better measurement accuracy, the buffer solution used should be fresh. The buffer solution should be replaced after frequent usage.

4.6.3 Clean

The probe should be thoroughly cleaned after testing in sticky samples, to remove the samples cling to glass membrane. Or wash the probe with proper solvent, then scour off the solvent with pure water.

5 MV MEASUREMENT

5.1 ORP measurement

Press  key, and switch the meter to mV measurement mode. Connect ORP probe (need to purchase it separately) and dip it in sample solution, stir the solution briefly and allow it to stay in the solution until  icon appears. The reading 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 probe quality or measuring value, use ORP standard solution to test mV value and see whether ORP probe or meter works properly.

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

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

5.3 Ion potential measurement

Connect ion probe and dip it in sample solution, stir the solution briefly and allow it to stay in the solution until 😊 icon appears. The reading obtained is potential value of ion probe. If ion probe 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 probes should be make measurement at same time.

6 CONDUCTIVITY MEASUREMENT

6.1 Conductivity probe information

6.1.1 Matching conductivity probe

The meter includes one plastic conductivity probe (Model 2401T-F, K=1.0). With built-in temperature sensor, the meter can realize automatic temperature compensation. BNC plug of the probe is connected to the meter’s conductivity socket while RCA plug is connected to the Temp socket. When the probe 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 probe constant

The meter can use with conductivity probes 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 clause 2.1.

Chart -5 Probe constant and measuring range

Measuring Range	<20 $\mu\text{S}/\text{cm}$	0.5 $\mu\text{S}/\text{cm}$ ~100mS/cm			> 100mS/cm
Conductivity probe constant	K=0.1 cm^{-1}	K=1.0 cm^{-1}			K=10 cm^{-1}
Standard solution	84 $\mu\text{S}/\text{cm}$	84 $\mu\text{S}/\text{cm}$	1413 $\mu\text{S}/\text{cm}$	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 1~4 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 $\mu\text{S/cm}$	146.6 $\mu\text{S/cm}$
	1413 $\mu\text{S/cm}$	1408 $\mu\text{S/cm}$
	12.88 mS/cm	12.85 mS/cm
	111.8 mS/cm	111.3 mS/cm

Note: calibration indication icons are example of Standard series.

6.2.2 Calibration intervals

- The meter is calibrated before leaving the factory and can generally be used right out of the box.
- Normally, performing calibration once a month is recommended.
- For high accuracy measurement or larger temperature deviation from the reference temperature (25°C), performing calibration once a week is recommended.
- Use conductivity standard solution to check the probe. Perform calibration if the error is big.
- When use a new probe 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 $\mu\text{S/cm}$ standard solution is suitable for measuring range 0-20 mS/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 clause 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 various kinds of solution and concentration. Please refer to chart – 7 and the data collected during testing and set up the parameter in clause 2.5.

Note: When the temperature compensation coefficient is set to 0.00 , meaning no temperature compensation, the measurement value will be based on the current temperature.

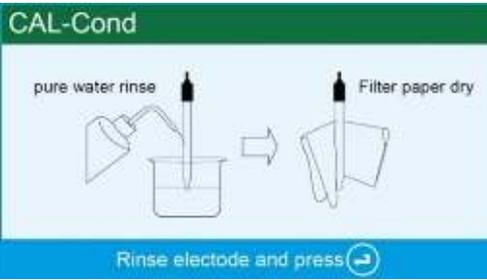
Chart -7 Temperature compensation coefficient of certain solutions

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

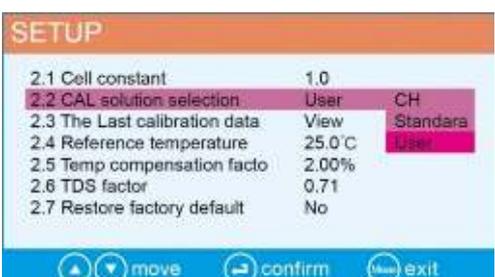
6.2.5 Avoid contamination of standard solution

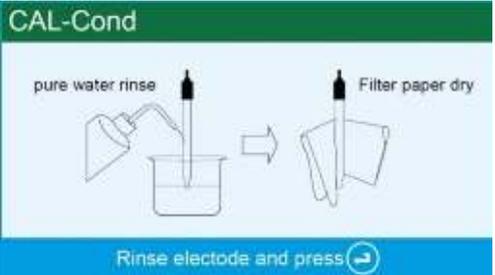
Conductivity standard solution has no buffer. Please avoid being contaminated during usage. Before submerging the probe in standard solution, please wash the probe and allow it dry. Please do not use the same cup of conductivity standard solution frequently, especially for standard solution of low concentration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

6.3 Conductivity meter calibration (take $1413\mu\text{S}/\text{cm}$ calibration as an example)

 <p>CAL-Cond</p> <p>pure water rinse</p> <p>Filter paper dry</p> <p>Rinse electrode and press </p>	<p>1. Long press  key to enter calibration mode, as shown in left graph. Rinse pH probe in pure water, allow it to dry by shaking or filter paper. Press  key to confirm.</p>
 <p>CAL-Cond</p> <p>Stir lightly, Wait for smile face </p> <p>1413</p> <p>Press </p>	<p>2. Submerge probe in $1413\mu\text{S}/\text{cm}$ solution. Stir the solution briefly and allow it to stay in the buffer solution until  appears. Press  key to make calibration.</p>
 <p>MEAS-Cond</p> <p>1415 $\mu\text{S}/\text{cm}$ </p> <p>23.8°C ATC</p> <p>1.0 25.0°C 2.00%</p>	<p>3. Calibration completed, instrument goes back to measurement mode.</p>
<ul style="list-style-type: none"> ● For multi-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  key, meter will return to measurement mode. ● Press  key to switch measurement mode Cond→TDS→Salt. 	

6.4 Custom-defined calibration (take $10\mu\text{S}/\text{cm}$ standard solution as an example)

 <p>SETUP</p> <p>2.1 Cell constant 1.0</p> <p>2.2 CAL solution selection User CH</p> <p>2.3 The Last calibration data View Standard</p> <p>2.4 Reference temperature 25.0°C User</p> <p>2.5 Temp compensation factor 2.00%</p> <p>2.6 TDS factor 0.71</p> <p>2.7 Restore factory default No</p> <p>  move  confirm  exit</p>	<p>1. Select User in parameter setting clause 2.2, press  key to return to measurement mode.</p>
---	---

	<p>2. Long press  key to enter calibration mode, as shown in left graph. Rinse probe in pure water, allow it to dry by shaking or filter paper. Press  key to confirm.</p>
	<p>3. Submerge probe in 10μS/cm standard solution. Stir the solution briefly and allow it to stay in the buffer solution until  appears. Press  or  key to adjust measuring value to 10.00μS/cm. Press  key to make calibration.</p>
	<p>Calibration completed, instrument goes back to measurement mode.</p>
<ul style="list-style-type: none"> ● Only 1-point calibration for custom-defined calibration. The conductivity value of custom-defined solution is a value 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.



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 probe is good 3. Check if the probe is failed
no stable	Press  key when measuring value is not stable.	Press  when  icon appears
electrode error	The measuring value is not stable for long time (≥ 3 min)	1. Shake the probe to eliminate bubbles in probe head. 2. Replace conductivity probe with a new one

6.6 Solution measurement

6.6.1 Rinse conductivity probe in pure 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.

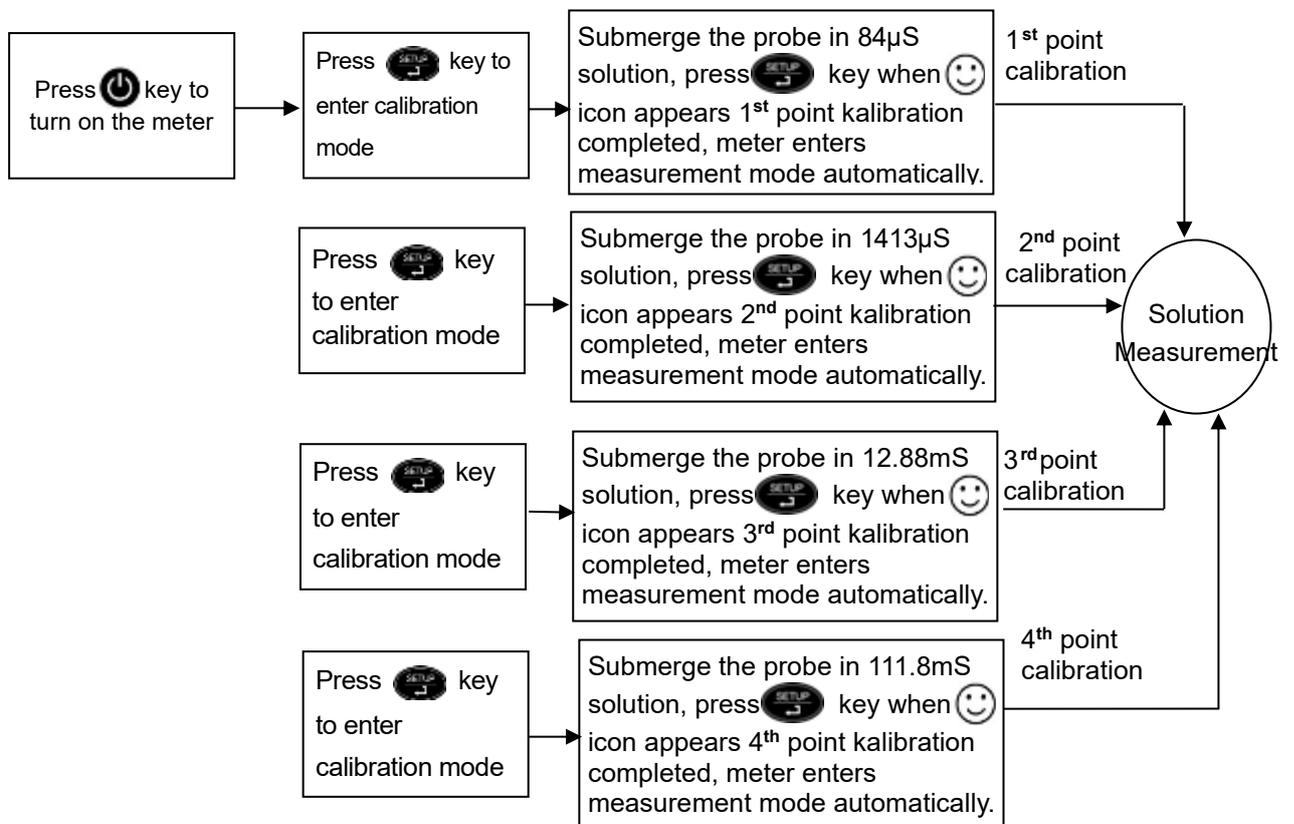


Diagram-13

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 clause 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 clause 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 $\mu\text{S}/\text{cm}$	0.60
100~1000 $\mu\text{S}/\text{cm}$	0.71
1~10 mS/cm	0.81
10~100 mS/cm	0.94

6.6.3 Restore to factory default setting

Instrument has factory default setting function, please refer to parameter setting clause 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 clause 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 probe maintenance

6.7.1 Always keep the conductivity probe clean. Before taking a measurement, rinse the probe in pure water and allow it dry, then rinse it in the sample solution. When submerge the probe 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 sensitive rod of Model 2401T-F conductivity probe is coated with platinum black to minimize probe polarization and expand measuring range. The platinum black coating of the probe adopts advanced electroplating technology. This not only increases the surface roughness, but also improves probe measurement performance. And the coating is tight and firm, it can be washed by soft brush. This increases the the service life of probe a lot.

7 PARAMETER SETTING

7.1 Main menu and submenu

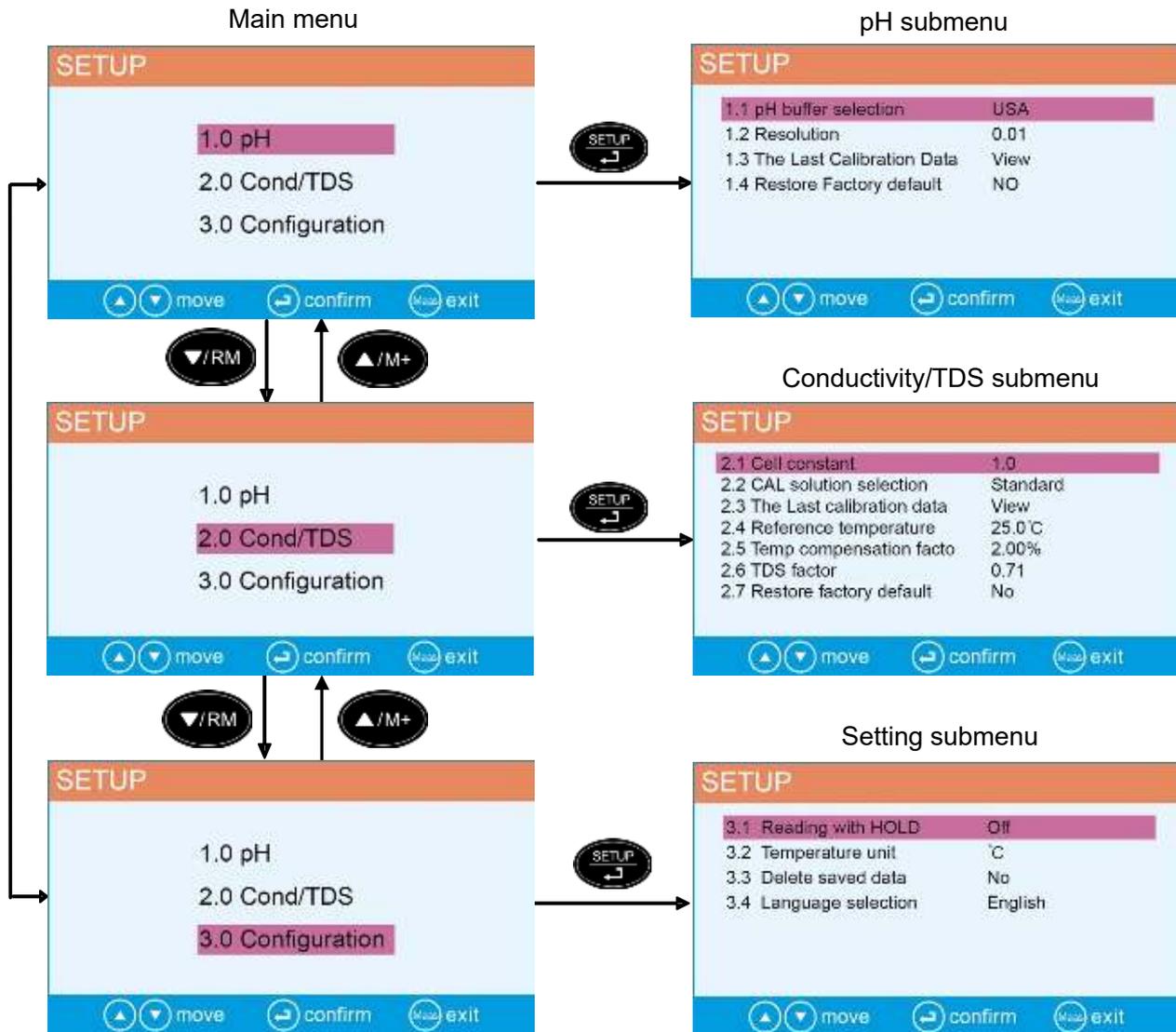


Diagram-15

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°C	25°C
	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	°C - °F	/
	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,  icon appears in the bottom right corner of LCD screen. At this time the rotating speed is zero. Press  or  key to increase or decrease rotating speed. Press and hold key for fast changing.

8.1.3  key operation: long press  key for 3 seconds to store rotating speed. At this time stirrer icon turns to , then press  and  key to change rotating speed. The icon turns to , When using stirrer, press  key to switch  and  two kinds of rotating speed. When using

 — Show this icon when turn on meter, it also indicates the adjusted rotating speed.

 — It indicates the stored rotating speed.

8.1.4 For required rotating speed, press  key to store. Next time turn on meter and press  key to stir with this 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 plane of 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 rotating speed, please don't long press  key, otherwise zero rotating speed will be stored. In this case, please press  key to store once more.

9 WARRANTY

We warrant this instrument to be free from defects in material and workmanship and agree to repair or replace free of charge, at option of APERA INSTRUMENTS(Europe) GmbH, any malfunctioned or damaged product attributable to responsibility of APERA INSTRUMENTS(Europe) GmbH for a period of THREE YEARS (SIX MONTHS for the probe) from the delivery.

This limited warranty does not cover any damages due to:

Transportation, storage, improper use, failure to follow the product instructions or to perform any preventive maintenance, modifications, combination or use with any products, materials, processes, systems or other matter not provided or authorized in writing by us, unauthorized repair, normal wear and tear, or external causes such as accidents, abuse, or other actions or events beyond our reasonable control.

10 METER KITS

	Description	Quantity	PH950	EC950	PC950
1	PH950 pH meter	1	✓		
2	EC950 conductivity meter	1		✓	
3	PC950 pH/conductivity meter	1			✓
4	606 multi-function stirrer(includes flexible electrode holder)	1	✓	✓	✓
5	LabSen211 glass pH combination electrode	1	✓		✓
6	MP500 temperature probe	1	✓		✓
7	2401T-F conductivity probe (ATC,K=1.0)	1		✓	✓
8	pH buffer solution (4.00/7.00/10.01pH/50mL)	1 bottle each	✓		✓
9	Conductivity standard solution (84μS/1413μS/12.85mS/50mL)	1 bottle each		✓	✓
10	Stirrer connection cable	1	✓	✓	✓
11	9V power adapter	1	✓	✓	✓
12	Small round bottle		3pcs	3pcs	6pcs
13	L200 stirrer bead		3pcs	3pcs	6pcs
14	Instruction manual	1	✓	✓	✓
15	Quick manual	1	✓	✓	✓

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