# 7 Series

# pH/Conductivity Portable Meter

# Manual

**PH 7 Portable pH Meter** ☐

**COND 7 Portable Cond. Meter** ☐

**PC 7 Portable pH/Cond. Meter** ☐

**Table of Contents**

**1. Introduction**

Thanks for purchasing 7 series portable pH/Conductivity meter.

This meter is perfect combination of the most advanced electronics, sensor technology and software design, and is the most cost effective portable electrochemical meter suited for industrial and mining enterprises, power plant, water treatment engineering, environmental protection industry, etc, especially suited for application in field.

In order to use and maintain the instrument properly, please read the manual thoroughly before use.

To improve instrument performance constantly, we reserve the right to change the manual and accessories without giving notice in advance.

1.1. Measurement parameters

| Measurement parameters | pH7 | COND7 | PC7 |
|---|---|---|---|
| pH/mV | √ | | √ |
| Conductivity | | √ | √ |
| Temperature | √ | √ | √ |

1.2. Basic features

● The microprocessor-based portable meter features automatic calibration, automatic temperature compensation, function set-up, self-diagnostics, automatic power-off and low voltage display.

● The meter's digital filter improves measurement speed and accuracy. There is reading stability display.

● The package includes portable case, meter, electrode, standard solutions and all accessories, convenient to use in field.

● The meter is dust-proof and water-proof, meeting the IP57 rating.

● Temperature calibration function.

1.3. pH measurement features (suited for model PH7 and PC7)

● 1-3 point automatic calibration, the meter provides calibration guide and automatic checking function.

● The meter is able to recognize up to 8 types of pH standard buffer solutions. There are four options of standard buffer solution: USA series, NIST series and customer-defined solution set-up.

● The meter provides reading stability criteria.

1.4. Conductivity measurement features (suited for model COND7 and PC7)

● 1-4 point automatic calibration, the meter provides calibration guide and automatic checking function.

● The meter is able to recognize up to 4 types of conductivity standard solutions. There is

customer-defined solution set-up.

## 2. Specifications

2.1. Main specifications

| | | Specifications | Models |
|---|---|---|---|
| **pH** | Range | （0.00 ~ 14.00） pH | PH 7<br>PC 7 |
| | Resolution | 0.1/0.01 pH | |
| | Accuracy | ±0.01 pH ±1digit | |
| | Temperature compensation | （0 ~ 100）°C （manual or automatic） | |
| | Multi-point calibration | 1-3 point | |
| | Buffer value | USA: 1,68 - 4,00 - 7,00 - 10,01pH<br>NIST: 1,68 - 4,01 - 6,86 - 9,18pH<br>2 value CUSTOMER | |
| **mV** | Range | ±1,000mV | |
| | Resolution | 1mV | |
| | Accuracy | ±0.1% FS ±1digit | |
| **Conductivity** | Range | Conductivity: 0~200 mS/cm(divided into four ranges):<br>（0~199.9）µS/cm ;  （200~1999) µS/cm ;<br>（2.00~19.99）mS/cm;  （20.0~199.9）mS/cm | C0ND 7<br>PC 7 |
| | Resolution | 0.1/1µS/cm   0.01/0.1 mS/cm | |
| | Accuracy | ±1.0% FS ±1digit | |
| | Temperature compensation | （0 ~ 80）℃ （manual or automatic） | |
| | Electrode constant | 0.1 / 1 / 10 cm$^{-1}$ | |
| | Multi-point calibration | 1-4 point | |
| | Standard solution | 84 µS/cm, 1413 µS/cm, 12.88, 111,9 mS/cm<br>1 customer value | |
| **Temperature** | Range | 0~100°C | PH 7<br>C0ND 7<br>PC 7 |
| | Resolution | 0.1℃ | |
| | Accuracy | ±0.5℃±1digit | |
| **Reading stability criteria** | | **Low**:1.2mV/10 sec., **Medium**:0.6mV/10 sec.,<br>**High**:0.3mV/10 seconds | PH 7<br>PC 7 |

2.2. Other specifications:

| Power | AAA batteries × 3 (1.5V× 3) |
|---|---|
| **IP rating** | IP57 |

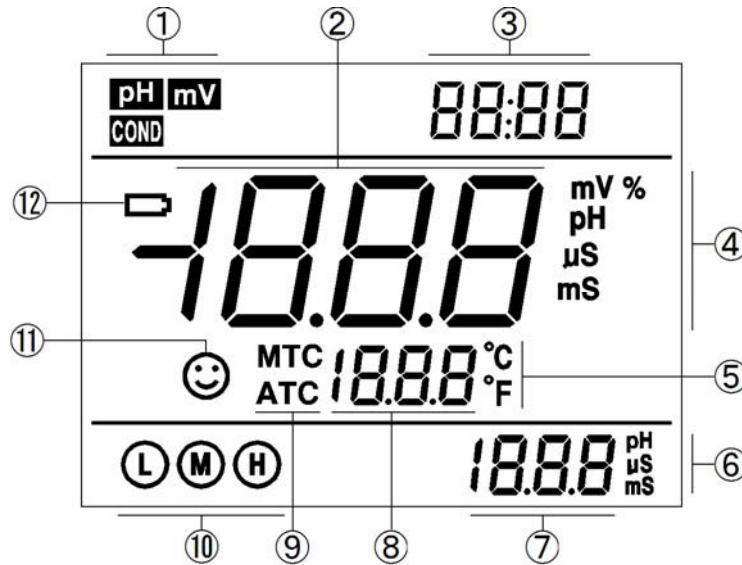| Dimension & Weight | Meter: (86×196×33 )mm / 335g |
|---|---|

## 3. Instrument description

3.1. LCD display：



Diagram-1

(1) — Parameter mode icons

(2) — Measurement reading

(3) — Prompts of special display mode

(4) — Units of measurement

(5) — Temperature units (°C and °F)

(6) — Units of pH and conductivity calibration value（appears with (7)）

(7) — pH and conductivity calibration value（appears with (6)），and prompts of special display mode

(8) — Temperature value（appears with (5)），and prompts of special display mode

(9) — Temperature compensation icons

ATC — automatic temperature compensation, MTC — manual temperature compensation

(10) — Calibration guide icon

(11) — Stability icon of readings

(12) — Low battery icon, when this icon appears, please renew the battery

3.2. Keypad functions
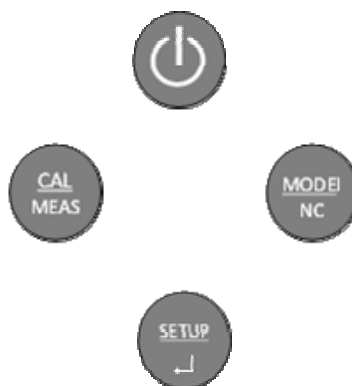


Diagram-2

### 3.2.1. Keypad operations

Momentary press ----- <1.5 seconds ,    Long press ----- >1.5 seconds.

### 3.2.2. Turn on the meter

Press ⏻ to turn on the meter: LCD full display → display some parameters → display the last measurement mode.

### 3.2.3. Turn off the meter

In the measurement mode, press ⏻ and hold for 2 seconds to turn off the meter.

***Note: In the calibration mode or the parameter set-up mode, pressing ⏻ is invalid. Please press CAL/MEAS key to return to the measurement mode, then press ⏻ to turn off the meter.***

Chart -1 Keypad operations and descriptions

| Keypad | Operations | Descriptions |
|---|---|---|
| ⏻ | Momentary press | ● In the power-off mode, press this key to turn on the meter |
| | Long press | ● In the measurement mode, press and hold this key for 2 seconds to turn off the meter. |
| MODE INC | Momentary/long press | ● PH7 pH meter: press this key to select measurement mode: pH → mV,<br>● PC7 pH/Conductivity meter: press this key to select measurement mode: pH → mV → COND<br>● <u>In the mode of manual temperature compensation (MTC), when press and hold this key, the temperature value flashes, then press this key to change the temperature value (only one direction),</u> and press SETUP to confirm<br>● In the parameter set-up mode, press this key to change the serial number of the main menu and the submenu (only one direction)<br>● In the submenu mode, press this key to change parameters and set-up (only one direction) |
| CAL MEAS | Momentary press | ● In the measurement mode, press this key to enter in the calibration mode<br>● In the calibration mode or the parameter set-up mode, press this key to return to the measurement mode |
| SETUP ↵ | Momentary press | ● In the measurement mode, press this key to enter in the parameter set-up main menu<br>● In the calibration mode, press this key to make calibration<br>● In the parameter set-up mode, press this key to select programs |

### 3.3. Meter socket

Electrode socket uses BNC and RCA. The following Chart-2 is socket for model PH7, COND7 and PC7:

Chart-2 Sockets for Meters

| Models | Photos | Description |
|--------|--------|-------------|
| PH7 pH meter |  | •BNC socket (right) — connect pH electrode or ORP electrode,<br>•RCA socket (middle) — connect temperature probe |
| COND7 Conductivity meter |  | •BNC socket (left) — Connect conductivity electrode,<br>•RCA socket (middle) — Connect temperature probe |
| PC7 pH/Conductivity meter |  | •BNC socket (right) — connect pH electrode or ORP electrode,<br>•BNC socket(left) — connect conductivity electrode,<br>•RCA socket (middle) — connect temperature probe |

### 3.4. Reading stability display mode

When the measuring value is stable, smiley icon ☺ appears on LCD, see Diagram – 3. If the smiley icon ☺ does not appear or flash, please do not get the reading value or make calibration until the measuring value is stable.
Per parameter P1.6, there are 3 criteria for stability standard:

$nor$ (Normal), $HI$ (High) and $Lo$ (Low). The factory default is set "Normal". "High" is set for stability for longer time, "Low" is set for stability for shorter time. User can select suitable stability criteria according to different testing requirement.
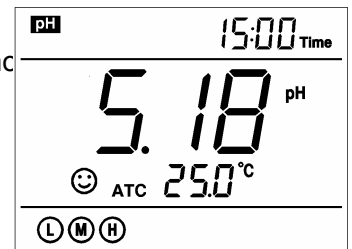


Diagram- 3

### 3.5. Automatic power-off

The meter will be power-off after the meter stops operation for 20 minutes.

## 4.    pH measurement

### 4.1. pH electrode information

The meter matches 201T-F plastic three-in-on combination pH electrode with built-in temperature sensor to realize automatic temperature compensation. Electrode housing adopts polycarbonate engineering plastics which is corrosion and impact resistant. The BNC socket of electrode connects pH socket, RCA socket connects temperature socket. When dip the electrode in the solution, please stir the solution briefly and allow it to stay in the solution until a stable reading is reached.

### 4.2. pH calibration consideration

### 4.2.1. Standard buffer solution

The meter uses two series of standard buffer solution: USA series and NIST series, and also customer-defined solution. Please see Chart - 3 for the two series of standard buffer solution. For customer-defined solution, please select it per parameter P1.1 and refer to clause 7.3 for details.

Chart - 3 pH standard buffer solution series

| Icons | | pH standard buffer solution series | |
|---|---|---|---|
| | | USA   series | NIST series |
| Three-point calibration | (L) | 1,68 pH and 4.00 pH | 1,68 pH and 4.01 pH |
| | (M) | 7.00 pH | 6.86 pH |
| | (H) | 10.01 pH | 9.18 pH |

### 4.2.2. Three-point calibration

The instrument can perform 1-3 point calibration. 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 – 4. During the calibration process, the instrument displays the electrode slope of acidity range and alkalinity range respectively.

Chart - 4 Three-point calibration mode

| | USA standard | NIST standard | Icons | Suited range |
|---|---|---|---|---|
| One-point calibration | 7.00 pH | 6.86 pH | (M) | Accuracy $\leqslant$ ±0.1pH |
| Two-point calibration | 7.00 pH and 4.00 pH or 1,68 pH | 6.86 pH and 4.01 pH or 1,68 pH | (L) (M) | Range<7.00pH |
| | 7.00 pH and 10.01 pH | 6.86 pH and 9.18 pH | (M) (H) | Range>7.00pH |
| Three-point calibration | 7.00 pH, 4.00 pH or 1,68 pH, 10.01 pH | 6.86 pH, 4.01 pH or 1,68 pH, 9.18 pH | (L) (M) (H) | Large Range |

### 4.2.3. Calibration intervals

Calibration intervals depend on the sample, the electrode performance, and the required accuracy. For high accuracy measurements (≤ ±0.02pH), the meter should be calibrated immediately before taking a measurement. For general accuracy (≥±0.1pH), the meter can be calibrated and used for approximately one week before the next calibration.

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 (pH<2) or alkaline solutions (pH>12)

(c) After measuring a solution that contains fluoride or a concentrated organic solution

(d) If the solution's temperature differs greatly from the calibration solution temperature

4.3. pH meter calibration ( take an example of three-point calibration)
4.3.1. Press (CAL/MEAS) key to enter into the calibration mode, "CAL 1"
blinks at the top right of LCD and "7.00 pH "blinks at the bottom right of
LCD, indicating using pH 7.00 buffer solution to make the 1st point calibration.

4.3.2. Rinse pH electrode in pure water, allow it to dry, and submerge it in
pH7.00 buffer solution. Stir the solution briefly and allow it to stay in the
buffer solution until a stable reading is reached. The meter's display will
show scanning and locking process of calibration buffer solution at the
bottom right of LCD. **Er 2** displays if press (SETUP) key before the value
is locked. See chart – 5.

4.3.3. When the meter locks 7.00 pH, stable ☺ icon displays on LCD.
Press (SETUP) key to calibrate the meter. **End** icon appears after
calibration is done. The 1st point calibration is finished, meanwhile,
the meter's display will show at the top right a blinking CAL2, and show at the
bottom right blinking 4.00pH and 10.01pH alternately, indicating using
pH4.00 or pH10.01 buffer solution to make the 2nd point calibration.

4.3.4. Take out pH electrode，rinse it in pure water, allow it to dry, and
submerge it in pH4.00 buffer solution. Stir the solution briefly and allow it to
stay in the buffer solution until a stable reading is reached. The meter's
display will show scanning and locking process of calibration buffer solution
at the bottom right of LCD. When the meter locks 4.00 pH, stable ☺ icon
displays on LCD. Press (SETUP) key to calibrate the meter. **End** icon and
**electrode slope of acidity range** display after calibration is done, meanwhile,
the meter's display will show at the top right a blinking CAL3, and show at the
bottom right blinking 10.01pH, indicating using pH10.01 buffer solution to make
the 3rd point calibration.

4.3.5. Take out pH electrode，rinse it in pure water, allow it to dry, and
submerge it in pH10.01 buffer solution. Stir the solution briefly and allow it to
stay in the buffer solution until a stable reading is reached. The meter's display
will show scanning and locking process of calibration buffer solution at the
bottom right of LCD. When the meter locks 10.01 pH, stable ☺ icon displays
on LCD.
Press (SETUP) key to calibrate the meter. **End** icon and **electrode slope of
alkalinity range** display after calibration is done. The meter goes to the
measurement mode, displays stable measuring value and calibration guide icons.
Please see Diagram – 4 for the above calibration process.



Diagram- 4

4.3.6. During the calibration process, press (CAL/MEAS) key to exit from the calibration mode. The meter can
perform one-point, two-point and three-point calibration. Calibration guide icons appear on LCD.

4.4. Customer-defined calibration (take an example of 1.60pH and 6.50pH calibration solution)
4.4.1. Select **CUS** per parameter P1.1 (please refer to clause 7.3 for customer-defined solution). The
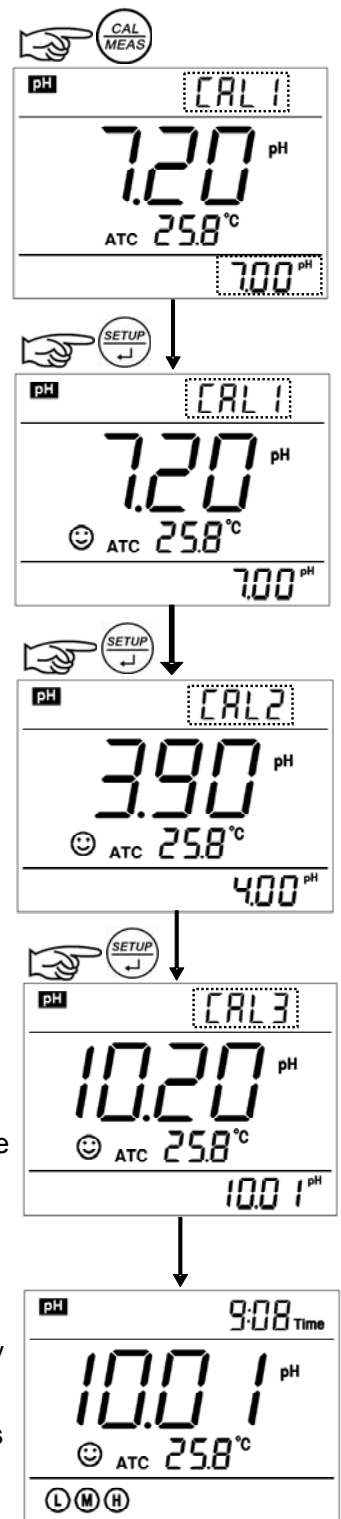
meter enters into Customer-defined calibration mode. Press (CAL/MEAS) key, the meter's display show a blinking **CAL1** icon at the top right of LCD, indicating the meter enters into the 1st point customer-defined calibration.

4.4.2. Rinse pH electrode in pure water, allow it to dry, and submerge it in pH1.60 buffer solution. Stir the solution briefly and allow it to stay in the buffer solution until a stable reading is reached. For automatic temperature compensation (ATC), the temperature value does not blink. When press (SETUP) key, the main value blinks. Press (MODE/INC) key to adjust the main value to 1.60, then press (SETUP) key to calibrate the meter. After calibration is done, LCD at the top right shows blinking **CAL2** icon, indicating the meter enters into the 2nd point customer-defined calibration.

*Note: For manual temperature compensation (MTC), when LCD displays the stable measuring value and (☺) icon, press (SETUP) key, then the temperature value blinks, press (MODE/INC) key to adjust the temperature value, and press (SETUP) key to confirm it. Then the main value blinks. Follow the above procedures to adjust the main value and calibrate the meter.*

4.4.3. Rinse pH electrode in pure water, allow it to dry, and submerge it in pH 6.50 buffer solution. Stir the solution briefly and allow it to stay in the buffer solution until a stable reading is reached. For automatic temperature compensation (ATC), the temperature value does not blink. When press (SETUP) key, the main value blinks. Press (MODE/INC) key to adjust the main value to 6.50, then press (SETUP) key to calibrate the meter. After calibration is done, the meter goes to the measurement mode. For customer-defined calibration, LCD does not show electrode calibration guide icons.

*Note: For manual temperature compensation (MTC), when LCD displays the stable measuring value and (☺) icon, press (SETUP) key, then the temperature value blinks, press (MODE/INC) key to adjust the temperature value, and press (SETUP) key to confirm it. Then the main value blinks. Follow the above procedures to adjust the main value and calibrate the meter.*

4.4.4. 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 customer-defined calibration.

(b) The value set in "Customer-defined" is at a fixed temperature. The meter has to perform calibration and measurement at the same temperature to avoid large error. The meter cannot recognize customer-defined calibration solution.

4.5. Sample test

4.5.1. Rinse pH electrode 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 which is pH value of tested solution.

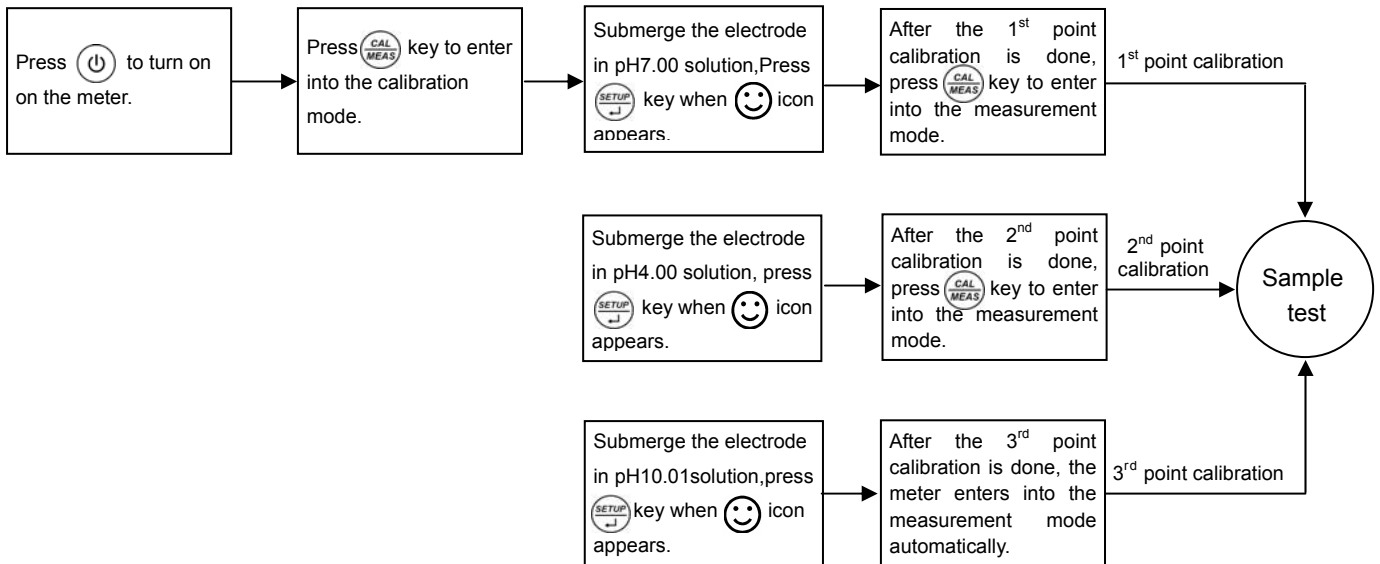Diagram – 5 is the calibration and measurement process of pH meter

| Press (⏻) to turn on on the meter. | → | Press (CAL/MEAS) key to enter into the calibration mode. | → | Submerge the electrode in pH7.00 solution,Press (SETUP) key when (☺) icon appears. | → | After the 1ˢᵗ point calibration is done, press (CAL/MEAS) key to enter into the measurement mode. | 1ˢᵗ point calibration |

| Submerge the electrode in pH4.00 solution, press (SETUP) key when (☺) icon appears. | → | After the 2ⁿᵈ point calibration is done, press (CAL/MEAS) key to enter into the measurement mode. | 2ⁿᵈ point calibration |

| Submerge the electrode in pH10.01solution,press (SETUP) key when (☺) icon appears. | → | After the 3ʳᵈ point calibration is done, the meter enters into the measurement mode automatically. | 3ʳᵈ point calibration |

Sample test

Diagram – 5 Calibration and measurement process of pH meter

## 4.5.2. Self-diagnosis information

During the process of calibration and measurement, the meter has self-diagnosis functions, indicating the

relative information as below, please refer to chart – 5.

Chart – 5 Self-diagnosis information of pH measurement mode

| Display Icons | Contents | Checking |
|---|---|---|
| Er 1 | Wrong pH buffer solution or the recognition of calibration solution out of range | 1.Check whether pH buffer solution is correct.<br>2.Check whether the meter connects the electrode well.<br>3.Check whether the electrode is damaged. |
| Er2 | Press (SETUP) key when measuring value is not stable during calibration. | Press (SETUP) key when (☺) icon appears |
| Er3 | During calibration, the measuring value is not stable for ≥3min. | 1.Check whether there are bubbles in glass bulb.<br>2.Replace with new pH electrode. |
| Er4 | Electrode zero electric potential out of range (<-60mV or >60mV) | 1.Check whether there are bubbles in glass bulb.<br>2.Check whether pH buffer solution is correct.<br>3.Replace with new pH electrode. |
| Er5 | Electrode slope out of range （<85% or >110%） | |
| Er6 | pH measuring range out of range （<0.00 pH or >14.00pH） | 1.Check whether the electrode is suspended.<br>2.Check whether the meter connects the electrode well.<br>3.Check whether the electrode is damaged |

## 4.5.3. pH temperature principle
The closer the temperature of the sample solution to the calibration solution, the more accurate readings.

### 4.5.4. Factory default setting

For factory default setting, please refer to parameter P1.5 (Item 7.3). Per parameter P1.5, all calibration data is deleted and the meter restores to the theory value (zero electric potential of pH is 7.00, the slope is 100%). Some functions restore to the original value (refer to appendix -1). When calibration or measurement fails, please restore the meter to factory default setting and then perform re-calibration or measurement. Please note once set the factory default, all the data deleted will not be retrievable.

### 4.6. pH electrode maintenance

### 4.6.1. Daily maintenance

The soaking solution contained in the supplied protective bottle is used to maintain activation in the glass bulb and junction. Loosen the capsule, remove the electrode and rinse in pure water before taking a measurement. Insert the electrode and tighten the capsule after measurements to prevent the solution from leaking. If the soak solution is turbid or moldy, replace the solution.

The electrode should not be soaked in pure water, protein solution or acid fluoride solution for long periods of time. In addition, do not soak the electrode in organic silicon lipids.

For best accuracy, always keep the meter clean and dry, especially the meter's electrode and electrode jack. Clean with medical cotton and alcohol if necessary.

### 4.6.2. Calibration buffer solution

For calibration accuracy, the pH of the standard buffer solution must be reliable. The buffer solution should be refreshed often, especially after heavy use.

### 4.6.3. Protect glass bulb

The sensitive glass bulb at the front of the combination electrode should not come in contact with hard surfaces. Scratches or cracks on the electrode will cause inaccurate readings. Before and after each measurement, the electrode should be washed with pure water and dried. Do not clean the glass bulb with a tissue for it will affect the stability of the electrode potential and increase the response time. The electrode should be thoroughly cleaned if a sample sticks to the electrode. Use a solvent if the solution does not appear clean after washing.

### 4.6.4. Renew glass bulb

Electrodes that have been used over a long period of time, will become ageing. Submerge the electrode in 0.1mol/L hydrochloric acid for 24 hours, then wash the electrode in pure water, then submerge it in soaking solution for 24 hours.

The method to prepare 0.1mol/L hydrochloric acid: dilute 9mL hydrochloric acid in pure water to 1000mL. For serious passivation, submerge the bulb in 4% HF (hydrofluoric acid) for 3-5 seconds, and wash it in pure water, then submerge it in the soaking solution for 24 hours to renew it.

### 4.6.5. Clean contaminated glass bulb and junction (please refer to Chart-6)

Chart – 6 Clean contaminated glass bulb and junction

| Contamination | Abluent |
|---|---|
| Inorganic metal oxide | Dilute acid less than 1mol/L |
| Organic lipid | Dilute detergent (weak alkaline) |
| Resin macromolecule | Dilute alcohol, acetone, ether |
| Proteinic haematocyte sediment | Acidic enzymatic solution (saccharated yeast tablets) |

| Paint | Dilute bleacher, peroxide |
|---|---|

*Note: The electrode housing is polycarbonate. When use abluent, take cautions on carbon tetrachloride, trichlorethylene, tetrahydrofuran, acetone, etc which will dissolve the housing and invalidate the electrode.*

**5. mV value measurement:**

5.1. Press (MODE/INC) key, and switch the meter to mV measurement mode. Connect ORP electrode (need purchase it separately) and dip it in sample solution, stir the solution briefly and allow it to stay in the solution until ☺ icon appears and get the reading which is ORP value.

ORP means Oxidation Reduction Potential. The unit is mV.

5.2. Notes

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 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, then wash it in pure water, then submerge it in the 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 the soaking solution for 6 hours.

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

**6.  Conductivity Measurement:**

6.1. Conductivity electrode information

6.1.1. Conductivity electrode

Model 2301T-F plastic conductivity electrode with constant K=1.0 and built-in temperature sensor, can realize automatic temperature compensation. The electrode housing is polycarbonate plastic which is corrosion resistant and impact resistant. BNC jack of electrode connects to the meter's conductivity input jack, RCA jack connects temperature jack. When submerge the conductivity electrode in solution, stir the solution briefly to eliminate the air bubbles and improve response and stability.

6.1.2. Conductivity electrode constant

The meter matches conductivity electrodes of three constants: K=0.1, K=1.0 and K=10.0. Please refer to chart-7 for measuring range. Set constant per parameter P2.1 and refer to clause 7.4.

Chart – 7 Electrode constant and measuring range

| Range | ＜20 μS/cm | 0.5 μS/cm~100 mS/cm | | | ＞100mS/cm |
|---|---|---|---|---|---|
| Conductivity electrode constant | K=0.1 cm$^{-1}$ | K=1.0 cm$^{-1}$ | | | K=10 cm$^{-1}$ |
| Standard solution | 84μS/cm | 84 μS/cm | 1413 μS/cm | 12.88 mS/cm | 111.9 mS/cm |

6.2. Conductivity calibration

6.2.1. Conductivity calibration solutions

The meter uses conductivity standard solution of USA series. The meter can recognize the standard solution automatically, can perform one-point or multi-point calibration (the maximum is four-point calibration). The calibration guide icons at the bottom left of LCD correspond to the four standard values. See chart – 8:

Chart – 8 Conductivity standard solution series

| Calibration guide icons | Calibration solution series | Range |
|---|---|---|
| Ⓛ | 84 μS/cm | 0-200 μS/cm |
| Ⓜ | 1413 μS/cm | 200-2,000 μS/cm |
| Ⓗ | 12.88 mS/cm | 2-20 mS/cm |
| | 111.9 mS/cm | 20-200 mS/cm |

6.2.2. Calibration intervals

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

(b) Normally perform calibration per month.

(c) For high accuracy measurements or large temperature deviation from the reference temperature (25°C), perform calibration per week.

(d) Use conductivity standard solution to check whether there is error. Perform calibration for large error.

(e) For new electrode or factory default setting, perform 3-point or 4-point calibration. Choose closer standard solution to the sample solution to perform 1- point or 2-point calibration. For example: 1413 μS/cm standard solution is suited for range 0-2,000 μS/cm.

6.2.3 1-point and multi-point calibration

For 1-point calibration after 3-point or 4-point calibration, the previous calibration value in the same range will be replaced, meanwhile, the meter will show the calibration guide icon of this point, other two calibration guide icons will be deleted, but the chip will reserve the last calibration data. When choose multi-point calibration, perform calibration from low to high concentration to avoid standard solution of low concentration being contaminated.

### 6.2.4. Reference temperature

Reference temperature of factory default is 25°C. Other reference temperature can also be set for range 15°C – 30°C. Select per parameter P2.5 and see clause 7.4.

### 6.2.6. Temperature coefficient

The temperature compensation coefficient of the meter setting is 2.0%. However, the conductivity temperature coefficient is different for solutions of a different variety and concentration. Please refer to chart – 9 and the data collected during testing. Set per parameter P2.6. and see clause 7.4.

***Note: When the coefficient for the temperature compensation is set to 0.00 (no compensation), the measurment value will be based on the current temperature.***

Chart -9 Temperature compensation coefficient of special 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 |

### 6.2.7. Avoid contamination of standard solution

Conductivity standard solution has no buffer. Please avoid being contaminated during usage. Submerge the electrode in standard solution before wash the electrode and allow it dry. Please renew conductivity standard solution frequently especially for standard solution of low concentration 84µS/cm. The contaminated standard solution can affect accuracy.

6.3. Conductivity calibration (take an example of calibration with 1413µS/cm)

6.3.1. Rinse pH electrode in pure water, allow it to dry, wash with a little of standard solution and submerge it in standard solution. Stir the solution briefly and allow it to stay in the solution until a stable reading is reached.

6.3.2. Press (CAL/MEAS) key to enter into the calibration mode.
The meter's display will show blinking "**std**" at the top right, and scanning and locking process of calibration solution at the bottom right.
**Er 2** appears if press (SETUP) key before the value is locked. See chart – 10.

6.3.3. When the meter locks 1413 µS, stable ☺ icon displays on LCD.
Press (SETUP) key to calibrate the meter. **End** icon appears after calibration is done. The meter returns to the measurement mode and LCD shows (M) icon at the bottom left. See Diagram – 6 for the above calibration process.

6.3.4. If return from calibration mode without calibration, press (CAL/MEAS) key to return to the measurement mode without calibration.

6.3.5. For multi-point calibration, please repeat clause 6.3.1-6.3.3 until all the calibration is done. The meter can repeat calibration in the same calibration solution until the stable value is reached.

6.4. Customer-defined calibration (take an example of 10.50µS/cm standard solution)



Diagram- 6

6.4.1. Select CUS per parameter P2.2 (please refer to clause 7.4 for customer-defined solution). The meter enters into customer-defined calibration mode. When press (CAL/MEAS), LCD shows blinking CUS at the top right, indicating that the meter enters into customer-defined calibration.

6.4.2. Rinse the electrode in pure water, allow it to dry, and submerge it in 10.50 µS/cm standard solution. Stir the solution briefly and allow it to stay in the solution until a stable reading is reached and ☺ icon appears on LCD.

6.4.3. When press (SETUP) key, the measuring value blinks. "CUS" icon appears at the right top of the screen. Press (MODE/INC) key to adjust the measuring value to 10.50 µS/cm, and press (SETUP) key to calibrate the meter. After the calibration is done, the screen shows "End" icon and returns to the measurement mode. For customer-defined calibrat(MODE/INC) the electrode calibration guide icons do not appear in conductivity measurement mode.

Note: When there is no temperature sensor and manual temperature compensation (MTC) is adopted, the temperature value blinks when press (SETUP) key, press        key to adjust the temperature value, and when press   (SETUP) key, conductivity value blinks.

6.4.4. Only 1-point calibration for customer-defined calibration. The value set in "customer-defined" is at a fixed temperature. There is no regulations of temperature coefficient and reference temperature. The
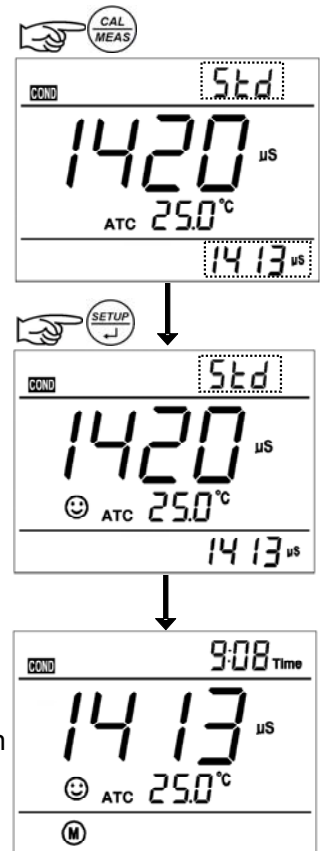
meter has to perform calibration and measurement at the same temperature to avoid large error. The meter cannot recognize customer-defined calibration solution.

## 6.5. Sample test

6.5.1. Rinse conductivity electrode 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, then get the reading value which is the conductivity value of the solution.

6.5.2. During the process of calibration and measurement, the meter has self-diagnosis functions, indicating the relative information as below: chart – 10.

Chart – 10 Self-diagnosis information of conductivity measurement mode

| Display Icons | Contents | Checking |
|---|---|---|
| $Er\ 1$ | Wrong conductivity calibration solution or the meter recognition of calibration solution out of range | 1. Check whether conductivity calibration solution is correct.<br>2. Check whether the meter connects the electrode well.<br>3. Check whether the electrode is damaged. |
| $Er2$ | Press (SETUP) key when measuring value is not stable during calibration. | Press (SETUP) key when ☺ icon appears |
| $Er3$ | During calibration, the measuring value is not stable for ≥3min. | 1. Shake the electrode to eliminate bubbles in electrode head.<br>2. Replace with new pH electrode. |

6.5.3 Factory default setting

For factory default setting, please refer to parameter P2.8 (Item 7.4). Per parameter P2.8, all calibration data is deleted and the meter restores to the theory value. Some functions restore to the original value (refer to appendix -1). When calibration or measurement fails, please restore the meter to factory default setting and then perform re-calibration or measurement. Please note once set the factory default, all the data deleted will not be retrievable.

## 6.6. Conductivity electrode maintenance

6.6.1. Always keep the conductivity electrode clean. Before taking a measurement, rinse the electrode in pure water and 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 until a stable reading is reached. For conductivity electrode which keeps dry, soak the electrode in pure water for 5-10 minutes. Rinse the electrode in pure water after measurement.

6.6.2. The interaction pole of Model 2301T-F conductivity electrode is coated with platinum black to minimize electrode polarization and expand measuring range. Do not polish the surface of platinum black, only stir the electrode in pure water to avoid damage of the platinum black coating. Clean organic stain on the electrode in warm water with detergent, or alcohol.

6.6.3. If the electrode coated with platinum black is invalid, immerse it in 10% nitric acid solution or 10% hydrochloric acid solution for 2 minutes, then rinse the electrode in pure water. If the electrode still does

not work, re-coat platinum black, or replace with a new conductivity electrode.

## 7. **Parameter setting**

7.1. Main menu

In the measurement mode, press (SETUP) key to enter in P1.0, then press (MODE INC) to switch to main menu: P1.0→P2.0→P6.0. Please refer to chart – 7.

P1.0: pH parameter setting menu,

P2.0: Conductivity parameter setting menu,

P6.0: Basic parameter setting menu.

7.2.Submenu

7.2.1. In P1.0 mode, press (SETUP) key to enter in submenu P1.1 of pH parameter setting, then press (MODE INC) key to switch among submenu: P1.1→P1.4→P1.6, see Diagram – 7.

7.2.2. In P2.0 mode, press (SETUP) key to enter in submenu P2.1 of conductivity parameter setting, then press (MODE INC) key to switch among submenu: P2.1→P2.2→P2.5→P2.6, see Diagram– 7.
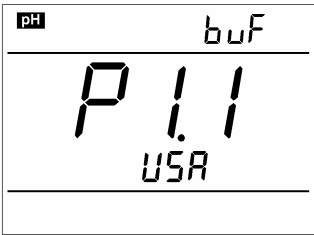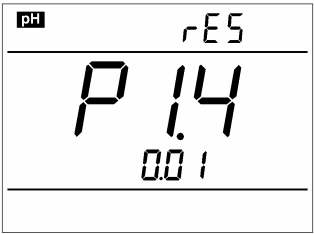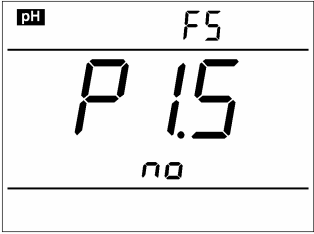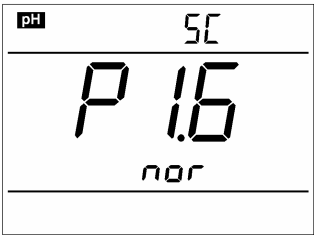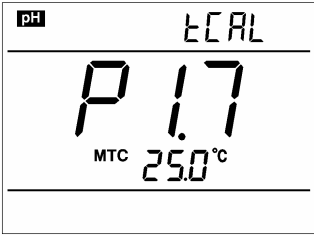
7.2.3. In P6.0 mode, press (SETUP) key to enter in submenu P6.1 of basic parameter setting, see Diagram – 7.

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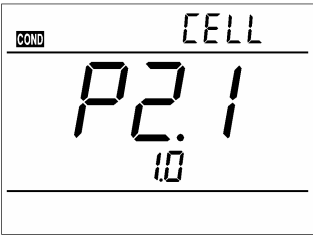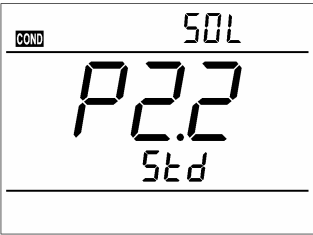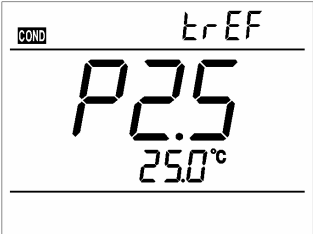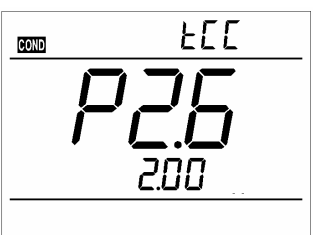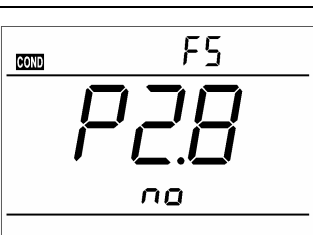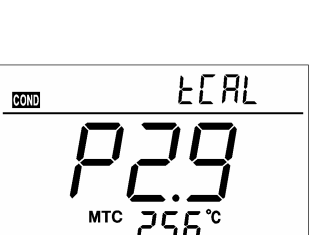
## Diagram – 7 Main menu and submenu of parameter setting
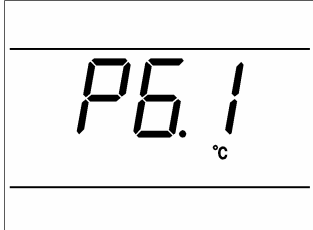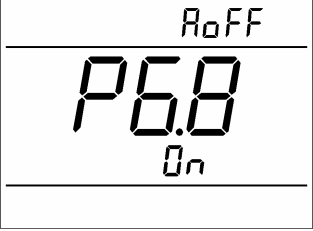
Main menu of parameter setting



Submenu of pH parameter setting

| | |
|---|---|
| **P1.1** Select pH standard solution | |
| **P1.4** Select resolution | |
| **P1.5** Restore to factory setting | |
| **P1.6** Set stability criteria | |
| **P1.7** Temperature calibration | |

Submenu of Cond. parameter setting

| | |
|---|---|
| **P2.1** Select electrode constant | |
| **P2.2** Select conductivity standard solution | |
| **P2.5** Select reference temp. | |
| **P2.6** Adjust temperature compensation factor | |
| **P2.8** Restore to factory setup | |
| **P2.9** Temperature calibration | |

Submenu of basic parameter setting

| | |
|---|---|
| **P6.1** Select temperature unit | |
| **P6.8** Automatic power-off setup | |

7.3. Submenu of pH parameter setting (press (MODE/INC) key to switch)

| | |
|---|---|
| **pH** buF<br><br>P 1.1<br><br>USA | **P1.1. – Select pH standard solution (USA-NIST-CUS)**<br>1. In P1.0 mode, press (SETUP↵) to enter in P1.1, refer to the left Diagram.<br>2. When press (SETUP↵) key, **USA** blinks, press (MODE/INC) key to select blinking NIST→CUS. When parameter blinks, press (SETUP↵) to confirm ( USA series: 1,68 pH, 4.00 pH, 7.00 pH, 10.01 pH, NIST series: 1,68 pH, 4.01 pH, 6.86 pH,  9.18 pH, CUS – customer-defined).<br>3. After confirm parameter, press (MODE/INC) key to enter in P1.4 mode, or press (CAL/MEAS) key to return to the measurement mode. |
| **pH** rES<br><br>P 1.4<br><br>0.01 | **P1.4. – Select resolution (0.01 – 0.1)**<br>1. Press (SETUP↵) key, **0.01** blinks, press (MODE/INC) key, **0.1** blinks, when parameter blinks, press (SETUP↵) key to confirm.<br>2. After confirm parameter, press (MODE/INC) key to enter in P1.6 mode, or press (CAL/MEAS) to return to the measurement mode. |
| **pH** FS<br><br>P 1.5<br><br>no | **P1.5. – Restore factory setting (No – Yes)**<br>1. Press (SETUP↵) key, No blinks, press (MODE/INC) key, Yes blinks, press (SETUP↵) key to confirm, the meter returns to the measurement mode.<br>No – Do not restore, Yes – Restore to factory setting.<br>2. Press (MODE/INC) key to enter in mode P1.6, or press (CAL/MEAS) key to return to the measurement mode. |
| **pH** SC<br><br>P 1.6<br><br>nor | **P1.6. – Set reading stability criteria (Normal – High – Low)**<br>1. Press (SETUP↵) key, **nor** blinks. Press (MODE/INC) key, **Hi** blinks, then press (MODE/INC) key, **Lo** blinks. When parameter blinks, press (SETUP↵) to confirm.<br>Nor – Normal, Hi – High, Lo – Low.<br>2. Press (MODE/INC) key to enter in mode P1.7, or press (CAL/MEAS) to return to the measurement mode. |
| **pH** tCAL<br><br>P 1.7<br><br>MTC 25.0℃ | P1.7. – Temperature Calibration ( Calibration range ±5℃)<br><br>1. Press (SETUP↵) key, the temperature value blinks, press (MODE/INC) key to adjust the temperature value, press (SETUP↵) key to confirm.<br><br>2. When parameter is confirmed, press (CAL/MEAS) key to return to the measurement mode.<br>Note: When make calibration, insert the temperature probe in the standard temperature source (eg. thermostatic bath) and calibrate until the display value is stable. The calibration range is ±5℃. When set up "Yes" in P1.5, the temperature value restores to factory setting. |

7.4. Submenu of conductivity parameter setting (press (MODE/INC) key to switch)

| | |
|---|---|
| COND CELL<br>P2.1<br>1.0 | **P2.1. – Select electrode constant (1.0-10.0-0.1)**<br>1. In P2.0 mode, press (SETUP) key to enter in P2.1 mode, please refer to the left Diagram.<br>2. Press (SETUP) key, **1.0** blinks, then press (MODE/INC) key to select blinking 10.0→0.1, when parameter blinks, press (SETUP) key to confirm.<br>3. After confirm the parameter, press (MODE/INC) key to enter in P2.2 mode, or press (CAL/MEAS) key to return to the measurement mode. |
| COND SOL<br>P2.2<br>Std | **P2.2. – Select conductivity standard solution**<br>**(Standard: 84µS/cm,1413µS/cm,12.88 mS/cm,111.9 mS/cm – CUS)**<br>1. Press (SETUP) key, **Std** blinks, then press (MODE/INC) key, **CUS** blinks. When parameter blinks, press (SETUP) key to confirm.<br>Std – Standard series, CUS – customer defined.<br>2. After confirm the parameter, press (MODE/INC) key to enter in P2.5 mode, or press (CAL/MEAS) key to return to the measurement mode. |
| COND trEF<br>P2.5<br>25.0℃ | **P2.5. – Select reference temperature (15.0°C-30.0°C)**<br>1. Press (SETUP) key, 25.0°C blinks, then press (MODE/INC) key to adjust temperature value 15.0-30.0, press (SETUP) key to confirm.<br>2. After confirm parameter, press (MODE/INC) key to enter in P2.6 mode, or press (CAL/MEAS) key to return to the measurement mode. |
| COND tCC<br>P2.6<br>2.00 | **P2.6. – Adjust temperature compensation coefficient (0.00-9.99%)**<br>1. Press (SETUP) key, 2.00 blinks, press (MODE/INC) key to adjust temperature compensation coefficient 0.00 – 9.99, press (SETUP) key to confirm.<br>2. After confirm the parameter, press (MODE/INC) key to enter in mode P2.8 or press (CAL/MEAS) key to return to the measurement mode. |
| COND FS<br>P2.8<br>no | P2.8. – Restore to factory setting (No – Yes)<br>1. Press (SETUP) key, No blinks, press (MODE/INC) key, Yes blinks, press (SETUP) key to confirm, the meter return to the measurement mode.<br>No – Do not restore, Yes – Restore to factory setting.<br>2. When confirm the parameter, press (MODE/INC) key to enter in mode P2.9, or press (CAL/MEAS) key to return to the measurement mode. |
| COND tCAL<br>P2.9<br>MTC 25.6℃ | P2.9 – Temperature Calibration ( Calibration range ±5℃)<br>1. Press (SETUP) key, the temperature value blinks, press (MODE/INC) key to adjust the temperature value, press (SETUP) key to confirm.<br>2. When parameter is confirmed, press (CAL/MEAS) key to return to the measurement mode.<br>Note: When make calibration, insert the temperature probe in the standard temperature source (eg. thermostatic bath) and calibrate until the display value is stable. The calibration range is ±5℃. When set up "Yes" in P2.8, the temperature value restores to factory setting. |

7.5. Submenu of standard parameter setting

| | |
|---|---|
| **P6.1**<br>℃ | **P6.1. Select temperature unit (°C—°F).**<br>1. In P6.0 mode, press (SETUP) key to enter in P6.1 mode, please refer to the left Diagram. Press (SETUP) key, °C blinks, then press (MODE/INC) key, °F blinks. When parameter blinks, press (SETUP) key to confirm.<br>2. When parameter is confirmed, press (MODE/INC) key to enter in mode P6.8 or press (CAL/MEAS) key to return to the measurement mode. |
| AoFF<br>**P6.8**<br>On | P6.8 – Automatic power-off setup (On-Off)<br>1. Press (SETUP) key, On blinks, press (MODE/INC) key, Off blinks. When parameter blinks, press (SETUP) key to confirm.<br>On – turn on automatic power-off, Off – turn off automatic power-off.<br>2. After confirm the parameter, press (CAL/MEAS) key to return to the measurement mode. |

8. Meter Kits

| No. | Include | Quantity | pH 7 | COND 7 | PC 7 |
|---|---|---|---|---|---|
| 1.1 | PH 7 portable pH meter | 1 set | ✓ | | |
| 1.2 | CD 7 portable conductivity meter | 1 set | | ✓ | |
| 1.3 | PC 7 portable pH/conductivity meter | 1 set | | | ✓ |
| 2.1 | 201T-F plastic three-in-on pH electrode | 1 pc | ✓ | | ✓ |
| 2.2 | 2301T-F plastic conductivity electrode | 1 pc | | ✓ | ✓ |
| 3.1 | pH standard buffer solution (4.00/7.00pH/mL) | 1 bottle each | ✓ | | ✓ |
| 3.2 | Conductivity calibration solution (1413 µS/cm/12.88 mS/cm /mL) | 1 bottle each | | ✓ | ✓ |
| 4.1 | Portable case | 1 pc | ✓ | ✓ | ✓ |
| 4.2 | Manual | 1 book | ✓ | ✓ | ✓ |

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9. Warranty

We warrant this instrument to be free of defects in parts and workmanship for **one year** from date of shipment (a six month limited warranty applies to sensors and cables). If it should become necessary to return the instrument for service during or beyond the warranty period, the sender is responsible for shipping charges, freight, insurance and proper packaging to prevent damage in transit. This warranty does not apply to defects resulting from action of the user such as misuse, improper wiring, operation outside of specification, improper maintenance or repair, or unauthorized modification.

Appendix I: Parameter setting & Factory default setting

| Modes | Prompts | Parameter setting items | Abbreviation | Description | Restore to factory default |
|---|---|---|---|---|---|
| P1.0 pH | P1.1 | Select pH buffer solution | buF | USA－NIST－CUS | USA |
| | P1.4 | Select resolution | rES | 0.01－0.1 | 0.01 |
| | P1.5 | Restore to factory default setting | FS | No－Yes | No |
| | P1.6 | Set reading stability criteria | SC | Normal—High—Low | Normal |
| | P1.7 | Temperature calibration | tCAL | Calibration range $\pm 5$℃ | Factory default value |
| P2.0 Cond. | P2.1 | Select electrode constant | CELL | 1.0－10.0－0.1 | 1.0 |
| | P2.2 | Select conductivity standard solution | SOL | USA－CUS | USA |
| | P2.5 | Select reference temperature | trEF | 15~30℃ | 25℃ |
| | P2.6 | Adjust temperature compensation coefficient | tCC | 0.00~9.99 | 0.20 |
| | P2.8 | Restore to factory default setting | FS | No－Yes | No |
| | P2.9 | Temperature calibration | tCAL | Calibration range $\pm 5$℃ | Factory default value |
| P6.0 Basic Parameters | P6.1 | Select temperature unit | / | ℃－℉ | ℃ |
| | P6.8 | Automatic Power-off setup | AoFF | On－Off | On |

| Modes | Prompts | Code and abbreviation | In English | Description |
|---|---|---|---|---|
| P1.0 pH | P1.1 | buF | Standard buffers | Standard buffer solution |
| | P1.4 | rES | Resolution | Resolution |
| | P1.5 | FS | Factory default setting | Factory default setting |
| | P1.6 | SC | Stability criteria | Set up reading stability criteria |
| | P1.7 | tCAL | Temperature Calibration | Temperature Calibration |
| P2.0 Conductivity | P2.1 | CELL | Cell | Constant Cell |
| | P2.2 | SOL | Calibration solution | Calibration solution |
| | P2.5 | trEF | Reference temperature | Reference temperature |
| | P2.6 | tCC | Temperature compensation coefficient | Temperature compensation coefficient |
| | P2.8 | FS | Factory default setting | Factory default setting |
| | P2.9 | tCAL | Temperature Calibration | Temperature Calibration |
| P6.0 Basic parameters | P6.1 | / | | |
| | P6.8 | AoFF | Automatic Power-off | Automatic Power-off |

Appendix III: Self-diagnosis information

| Icons | Self-diagnosis information | pH | Conductivity |
|---|---|---|---|
| Er 1 | Wrong pH buffer solution or the meter recognition of calibration solution out of range | ✓ | ✓ |
| Er2 | Press (SETUP) key when measuring value is not stable during calibration | ✓ | ✓ |
| Er3 | During calibration, the measuring value is not stable for ≥3min. | ✓ | ✓ |
| Er4 | Electrode zero electric potential out of range (<-60mV or >60mV) | ✓ | |
| Er5 | Electrode slope out of range (<85% or >110%) | ✓ | |
| Er6 | pH measuring range out of range (<-2.00 pH or >16.00pH) | ✓ | |