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# Introduction

Thanks for purchasing 50+ series benchtop 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 laboratory and industry.

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.

## Measurement parameters

Measurement parameters	pH50+DHS	COND 51+	PC52+DHS
pH/mV	√		√
Conductivity/TDS		√	√
Temperature	√	√	√

## Basic features

- The microprocessor-based benchtop meter features automatic calibration, automatic temperature compensation, function set-up, self-diagnostics and low voltage display.
- The meter's digital filter improves measurement speed and accuracy. There is reading stability display.
- The package includes, meter, electrode, standard solutions and all accessories, convenient to use in laboratory.
- The meter is dust-proof and water-proof, meeting the IP54 rating.
- Temperature calibration function.
- Selection of parameters to be display (only for PC52+DHS)

## pH measurement features (suited for model pH50+DHS and PC52+DHS)

- 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 three options of standard buffer solution: USA series, NIST series and customer-defined solution set-up.
- The meter provides reading stability criteria.
- Icons show the suited range also for Customer calibration
- The meter recognizes DHS Sensor

## Conductivity measurement features (suited for model COND51+ and PC52+DHS)

- 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.
- TDS measurement

# Data sheet

	Specifications		Models
pH	Range	( 0.00 ~ 14.00 ) pH	pH 50+ PC 52+
	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 NIST: 1,68 - 4,01 - 6,86 - 9,18pH 2 value CUSTOMER	
mV	Range	±1000mV	
	Resolution	1mV	
	Accuracy	±0.1% FS ±1digit	
Conductivity	Range	Conductivity: 0~200 mS/cm (divided into four ranges): ( 0~199.9 ) µS/cm ; (200~1999) µS/cm ; ( 2.00~19.99 ) mS/cm; ( 20.0~199.9 ) mS/cm	COND 51+ PC 52+
	Resolution	0.1/1µS/cm 0.01/0.1 mS/cm	
	Accuracy	±2.0% FS	
	Temperature compensation	( 0 ~ 80 ) °C ( manual or automatic )	
	Electrode constant	0.1 / 1 / 10 cm <sup>-1</sup>	
	Multi-point calibration	1-4 point	
	Standard solution	84 µS/cm, 1413 µS/cm, 12.88, 111,9 mS/cm 1 customer value	
TDS	Range	0~100 g/L	
	Resolution	1% f.s.	
	TDS factor	0.4 ~ 1.0	
Temperature	Range	0~100°C	pH 50+ COND 51+ PC 52+
	Resolution	0.1°C	
	Accuracy	±0.5°C ±1digit	
Reading stability criteria		<b>Low:</b> 1.2mV/10 sec., <b>Medium:</b> 0.6mV/10 sec., <b>High:</b> 0.3mV/10 seconds	pH 50+ PC 52+
Power		5V DC /220V	pH 50+ COND 51+ PC 52+
IP rating		IP54	
Dimension & Weight		Meter: (160×185×70) mm / 550g	

# Instrument Description

## LCD Backlight Display

Type of parameter

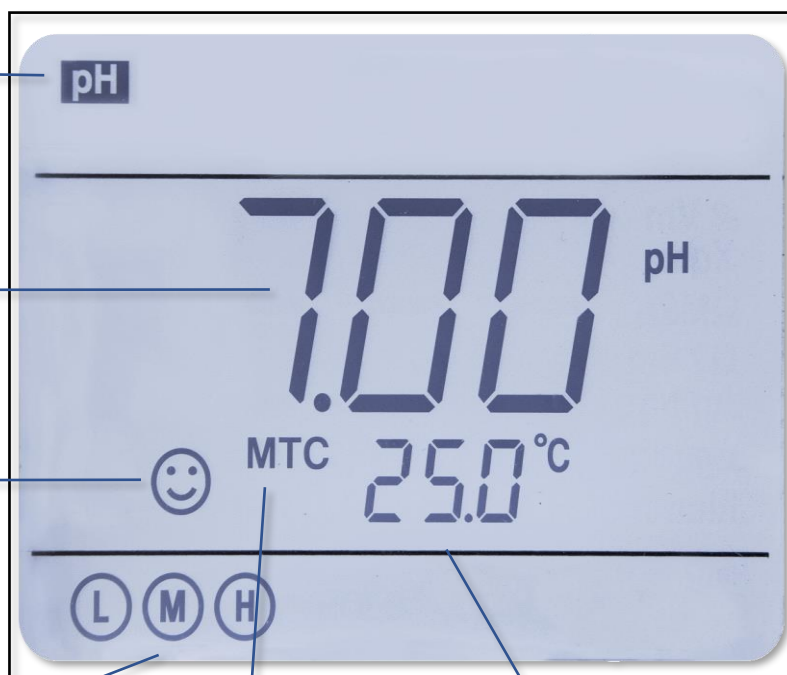
Measured value

Stability Icon

Calibration guide icon

Temperature probe connected  
(ATC)


Temperature value




## Keypad Functions

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



### Turn on the meter








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

### 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, press  for return to the measurement mode, then press  to turn off the meter.

Keypad	Operations	Descriptions
	Momentary press	<ul style="list-style-type: none"> <li>In the power-off mode, press this key to turn on the meter</li> <li>In the calibration mode or the parameter set-up mode, press this key to return to the measurement mode</li> </ul>
	Long press	In the measurement mode, press and hold this key for 2 seconds to turn off the meter.
	Momentary press	<ul style="list-style-type: none"> <li>pH50+DHS: press this key to select measurement mode: pH → mV,</li> <li>COND51+: press this key to select measurement mode: COND→TDS</li> <li>PC52+DHS pH/Conductivity meter: press this key to select measurement mode: pH → mV → COND → TDS</li> </ul>
	Momentary press	In the measurement mode, press this key to enter in the calibration mode
	Momentary press	<ul style="list-style-type: none"> <li>In the measurement mode, press this key to enter in the parameter set-up main menu</li> <li>In the calibration mode, press this key to confirm calibration</li> <li>In the parameter set-up mode, press this key to select programs</li> </ul>
	Long press	In the mode of manual temperature compensation (MTC), when press and hold these keys, the temperature value flashes, then press these keys to modify the temperature value, and press  to confirm
	Momentary press	In the setup menu and submenu, these keys increase and decrease the value of the selected parameter (up and down direction)

## Meter Connections

Models	Photos	Description
pH50+DHS		<ul style="list-style-type: none"> <li>•BNC socket— pH electrode or ORP electrode</li> <li>•Banana 4mm—reference electrode</li> <li>•RCA socket —temperature probe</li> <li>•5V DC—Power supply</li> </ul>
COND 51+		<ul style="list-style-type: none"> <li>•BNC socket— conductivity electrode</li> <li>•RCA socket — temperature probe</li> <li>•5V DC—Power supply</li> </ul>
PC52+DHS		<ul style="list-style-type: none"> <li>•BNC socket —pH electrode or ORP electrode</li> <li>•Banana 4mm—reference electrode</li> <li>•BNC socket— conductivity electrode</li> <li>•RCA socket— temperature probe</li> <li>•5V DC—Power supply</li> </ul>

## Stability indication

When the measuring value is stable, smiley icon ☺ appears on LCD.

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.

In the parameter P1.6, there are 3 criteria for stability standard:

**NOR** -Normal (default)





**HI** -High (longer time)  
time.)

**Lo** - Low (shorter

User can select suitable stability criteria according to different testing requirement.

## Parameter selection

Only for PC52+DHS, enter in the setup menu P6.6, one by one the parameters blinks on the top left of the LCD;

press  and  keys for choose Yes (parameter enabled) or No (parameter disable). Then press  key to confirm. Press  key to return in measurement mode.

## DHS Technology

DHS technology, developed by Giorgio Bormac company, allows to save calibration data inside the memory of the pH electrode.

It is possible to calibrate the XS DHS electrode in laboratory, in ideal conditions, using a XS DHS meter.

Calibration data, like date, slope, model and batch number, are memorized inside the electrode.

Moving this electrode on another XS meter DHS compatible, the electrode is ready for high quality measurement, extremely safety and without a new calibration.

Simply useful: XS Meters DHS compatible recognize automatically If a XS sensor DHS is connected.

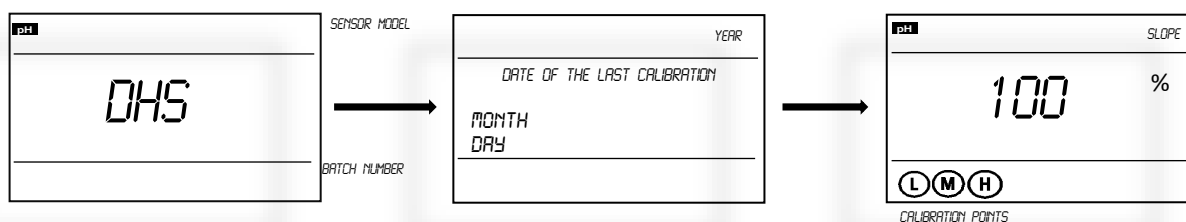
If not, the instrument will work as a standard pH meter.

And the same is for the electrode: Is possible to connect a XS sensor DHS on a standard XS meter (NO DHS compatible) It will work as a standard pH electrode.

XS DHS sensors use just a BNC plug for the pH, and a RCA/Cinch plug for the temperature, exactly the same connectors of the standard XS electrodes.

And It hasn't the battery, so It is possible to stock the electrode as normal one.

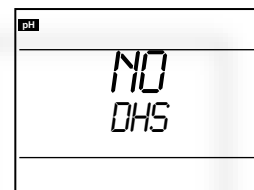
After connecting the XS electrode DHS, meter will recognize It automatically, and display sequentially:



To calibrate the DHS sensor, follow the calibration procedure at page 10 (pH meter calibration).

When the DHS electrode is disconnected, display shows:

DHS activation and disabling occur only in measurement mode.





# pH Measurement




## pH electrode information

On this meter is possible to use electrode with integrated temperature sensor else link two different probes for pH and temperature.

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.









## pH calibration consideration - Standard buffer solution

The meter uses two series of standard buffer solution: USA series and NIST series, and also customer-defined solution. Please see the table below for the two series of standard buffer solution. For customer-defined solution, please select it in setup menu parameter P1.1.

Icons		pH standard buffer solution series	
		USA series	NIST series
Three-point calibration		1,68 pH and 4.00 pH	1,68 pH and 4.01 pH
		7.00 pH	6.86 pH
		10.01 pH	9.18 pH

## Three-point calibration

The instrument can perform 1-3 point calibration. The first point of calibration must be 7.00 pH (or 6.86 pH) standard solution, then select other standard solution to perform the second and the third point calibration; the meter is able to recognize the buffer solutions in analysis. During the calibration process, the instrument displays the slope of acidity range and alkalinity range respectively.

	USA standard	NIST standard	Icons	Suited range
One-point calibration	7.00 pH	6.86 pH		Accuracy $\leq \pm 0.1\text{pH}$
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	 	Range < 7.0 0pH
	7.00 pH and 10.01 pH	6.86 pH and 9.18 pH	 	Range > 7.0 0pH
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	  	Large Range


## Calibration Intervals

Calibration intervals depend on the sample, the electrode performance, and the required accuracy. For high accuracy measurements ( $\leq \pm 0.02\text{pH}$ ), the meter should be calibrated immediately before taking a measurement. For general accuracy ( $\geq \pm 0.1\text{pH}$ ), 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 ( $\text{pH} < 2$ ) or alkaline solutions ( $\text{pH} > 12$ )
- (c) After measuring a solution that contains fluoride or a concentrated organic solution

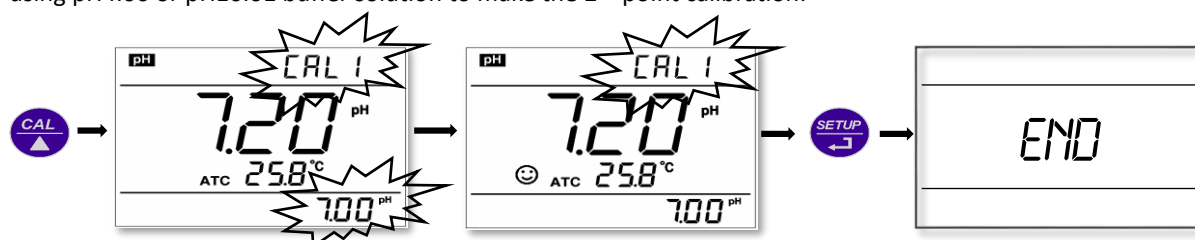
## pH Meter Calibration

Press  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 1<sup>st</sup> point calibration.



Rinse pH electrode in pure water, allow it to dry, and submerge it in pH 7.00 buffer solution. Stir the solution gently and leave it 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  key before the value is stable.

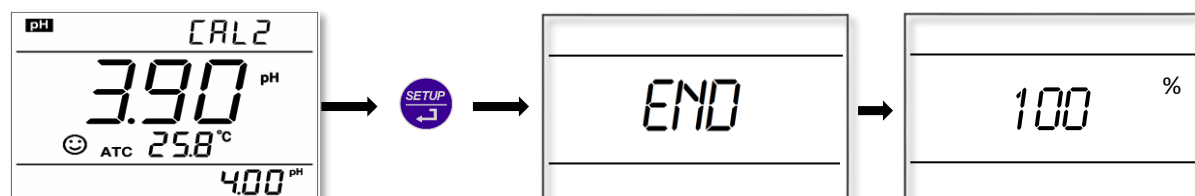
When the meter locks 7.00 pH, stable  icon displays on LCD. Press  key to calibrate the meter. "End" icon appears after calibration is done. After the 1<sup>st</sup> point calibration, the meter's display will show at the top right a blinking CAL2, and show at the bottom right blinking 4.00pH and 10.01pH alternately, indicating using pH4.00 or pH10.01 buffer solution to make the 2<sup>nd</sup> point calibration.





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, stability  icon displays on LCD. Press  key to calibrate the meter. Display shows "End" and slope.

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 3<sup>rd</sup> point calibration.




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 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 appears on LCD. Press  key to calibrate the meter.


Display shows "End" icon and slope. Then the meter goes automatically to the measurement mode, displays stable measuring value and calibration guide icons.







During the calibration process, press  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.






## Customer calibration


### example of 1.60pH and 6.50pH calibration solution




Select **CUS** in the setup menu P1.1; the meter enters into Customer-defined calibration mode. Press  key, the meter's display shows a blinking **CAL1** icon at the top right of LCD, indicating the meter enters into the 1<sup>st</sup> point customer-defined calibration.






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  key, the main value blinks.


Press  and  keys to adjust the main value to 1.60, then press  key to calibrate the meter. After calibration is done, LCD at the top right shows blinking **CAL2** icon, indicating the meter enters into the 2<sup>nd</sup> point customer-defined calibration.




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

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  key, the main value blinks.

Press  and  keys to adjust the main value to 6.50, then press  key to calibrate the meter. After calibration is done, the meter goes to the measurement mode.

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

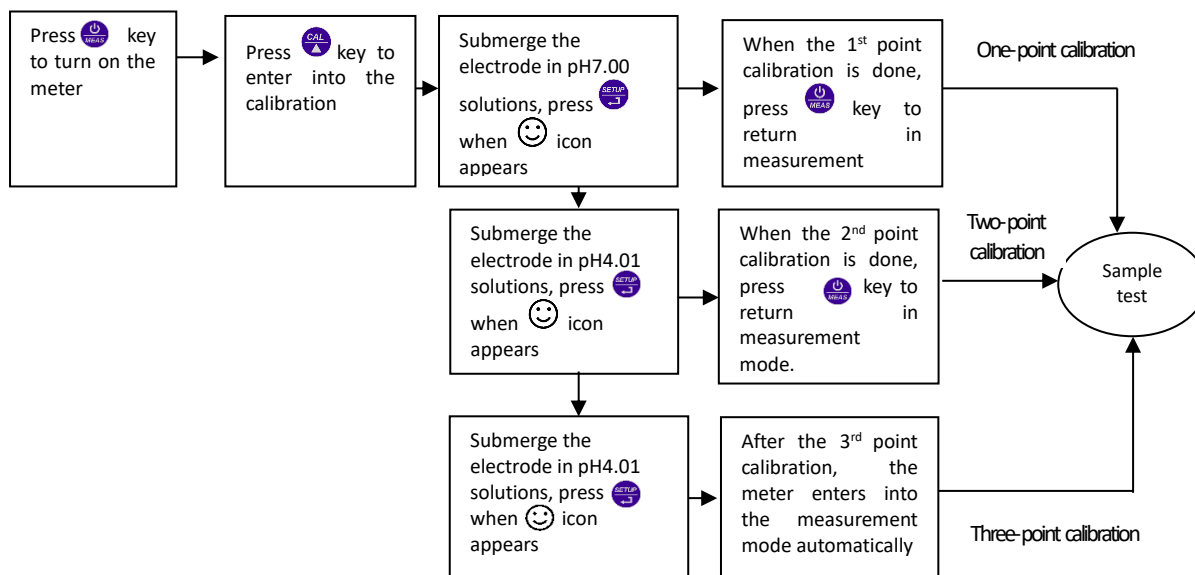
The meter can perform 1-2 point customer-defined calibration. When the 1<sup>st</sup> point calibration is done, press  key, the meter exits from calibration mode. This is one-point customer-defined calibration. As for the standard calibration, the meter show on the LCD one or more icons indicating the suited range

User's pH buffer	Icons show on the display
6.5 – 7.5	
< 6.5	
> 7.5	



## Measurement

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.

*the calibration and measurement process of pH meter*



## Self-diagnosis information

Display Icons	Contents	Checking
<i>Er 1</i>	Wrong pH buffer solution or the recognition of calibration solution out of range	1.Check whether pH buffer solution is correct. 2.Check whether the meter connects the electrode well. 3.Check whether the electrode is damaged.
<i>Er 2</i>	Press  key when measuring value is not stable during calibration.	Press  key when ☺ icon appears
<i>Er 3</i>	During calibration, the measuring value is not stable for ≥3min.	1.Check whether there are bubbles in glass bulb. 2.Replace with new pH electrode.
<i>Er 4</i>	Electrode zero electric potential out of range (<-60mV or >60mV)	1.Check whether there are bubbles in glass bulb. 2.Check whether pH buffer solution is correct. 3.Replace with new pH electrode.
<i>Er 5</i>	Electrode slope out of range (<85%or >110%)	
<i>Er 6</i>	pH measuring range out of range (<0.00 pH or >14.00pH)	1.Check whether the electrode is suspended. 2.Check whether the meter connects the electrode well. 3.Check whether the electrode is damaged

## Factory default setting

For factory default setting, please refer to parameter P1.5. 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.

## pH electrode maintenance

### 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.

### 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.

### 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.

### Regenerate 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 30 seconds, then wash the electrode in pure water, then submerge it in soaking solution for 24 hours.

*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 bleach, peroxide

**Note:** if 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.

## mV measurement

Press  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 gently and

leave it solution until  icon appears, and get the reading which is ORP value.

ORP means Oxidation Reduction Potential. The unit is mV.

### Orp

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.

### 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:

- 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.
- 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.
- 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.

## Conductivity

### Conductivity cell

Two-ring cells with built-in temperature sensor can be used on this instrument. The conductivity cell uses a BNC connector while the temperature probe uses an RCA connector. When submerge the conductivity electrode in solution, stir the solution briefly to eliminate the air bubbles and improve response and stability.




### Conductivity cell constant

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

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

## 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.

Calibration guide icons	Calibration solution series	Range
	84 $\mu\text{S/cm}$	0-200 $\mu\text{S/cm}$
	1413 $\mu\text{S/cm}$	200-2,000 $\mu\text{S/cm}$
	12.88 $\text{mS/cm}$	2-20 $\text{mS/cm}$
	111.9 $\text{mS/cm}$	20-200 $\text{mS/cm}$

## Calibration intervals

- The meter is calibrated before leaving the factory and can generally be used right out of the box.
- Normally perform calibration per month.
- For high accuracy measurements or large temperature deviation from the reference temperature (25°C), perform calibration per week.
- Use conductivity standard solution to check whether there is error. Perform calibration for large error.
- 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  $\mu\text{S/cm}$  standard solution is suited for range 0-2,000  $\mu\text{S/cm}$ .

## 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.

## 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.

## Temperature coefficient

The temperature compensation coefficient of the meter setting is 1.91%. However, the conductivity temperature coefficient is different for solutions of a different variety and concentration. Set per parameter P2.6.

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

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


## 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.


## Conductivity Calibration

*example of calibration at 1413μS/cm*

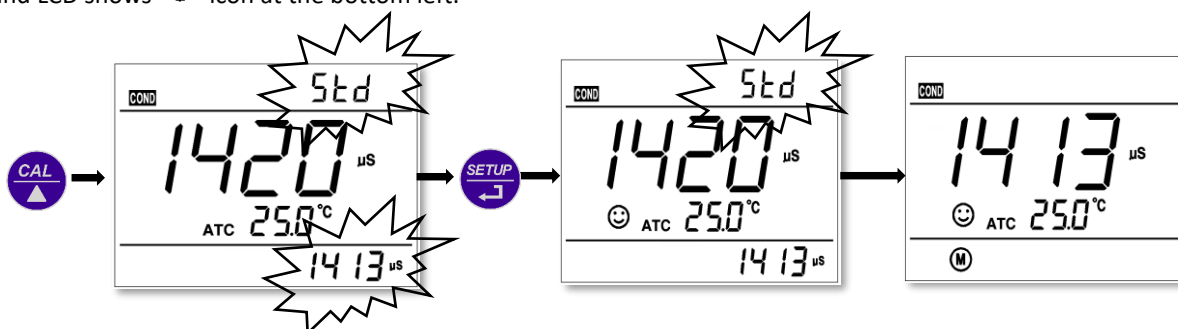
Rinse conductivity electrodes in pure water, allow it to dry, wash with a little of standard solution and submerge it in standard solution. Stir the solution briefly and allow it to stay in the solution until a stable reading is reached.


Press  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  key before the value is stable.

When the meter locks 1413 μS, stability icon displays on LCD. Press  key to calibrate the meter. End icon appears after calibration is done. The meter returns to the measurement mode

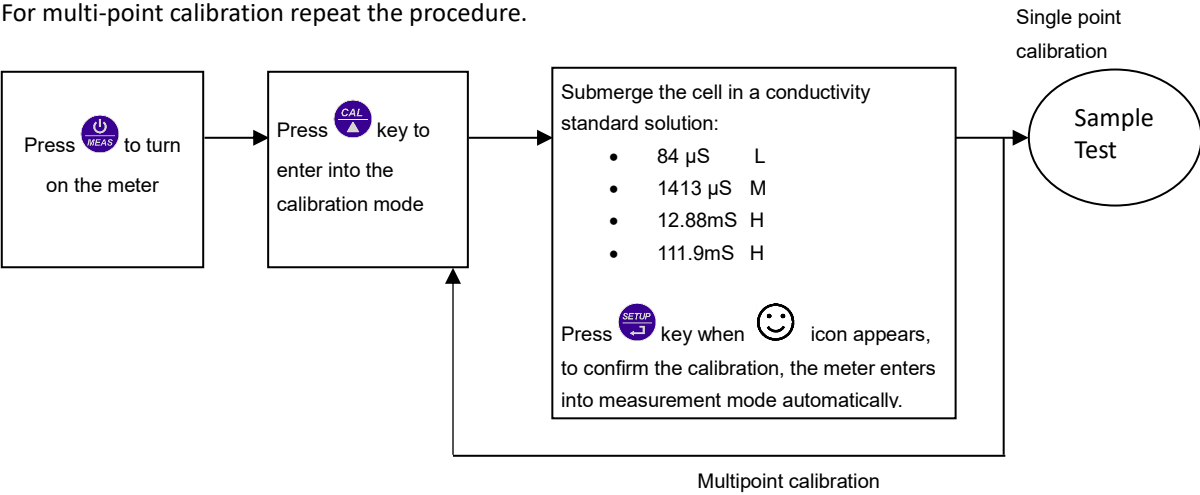
and LCD shows  icon at the bottom left.



If return from calibration mode without calibration, press  key to return to the measurement mode without calibration.








For multi-point calibration repeat the procedure.







## Customer calibration

*example of calibration at 147 $\mu$ S/cm*




Select CUS in the setup menu P2.2; the meter enters into customer-defined calibration mode. When press  LCD shows blinking CUS at the top right, indicating that the meter enters into customer-defined calibration. Rinse the electrode in pure water, allow it to dry, and submerge it in 147  $\mu$ S/cm standard solution. Stir the solution briefly and allow it to stay in the solution until a stable reading is reached and stability icon appears on LCD.

When press  key, the measuring value blinks. “CUS” icon appears at the right top of the screen. Press  and  key to adjust the measuring value to 147  $\mu$ S/cm, and press  key to calibrate the meter. After the calibration is done, the screen shows “End” icon and returns to the measurement mode.

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

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.




As for the standard calibration, also in customer calibration the meter show on the LCD one icon indicating the suited range.

Display icon	Suited range
	< 1300 $\mu$ S/cm
	1300 - 1500 $\mu$ S/cm
	> 1500 $\mu$ S/cm

## Measure

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 stability icon appears on LCD, then get the reading value which is the conductivity value of the solution.

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

Display Icons	Contents	Checking
<i>Er 1</i>	Wrong conductivity calibration solution or the meter recognition of calibration solution out of range	1.Check whether conductivity calibration solution is correct. 2.Check whether the meter connects the electrode well. 3.Check whether the electrode is damaged.
<i>Er 2</i>	Press  key when measuring value is not stable during calibration.	Press  key when  icon appears
<i>Er 3</i>	During calibration, the measuring value is not stable for $\geq 3$ min.	1.Shake the electrode to eliminate bubbles in electrode head. 2.Replace with new conductivity electrode.

### Factory default setting

For factory default setting, please refer to 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.

### Conductivity electrode maintenance

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.

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.

### Relations between TDS and conductivity

TDS and conductivity is linear related, the conversion factor is 0.40-1.00. Adjust per parameter P3.1. The factory default setting is 0.71. The meter can only be calibrated in Conductivity mode and not TDS mode. After calibration of conductivity, the meter can switch from conductivity to TDS.




Adjust TDS conversion factor per parameter P3.1 according to the data collected during testing.

Common used TDS conversion factors

Conductivity of solution	TDS conversion factor
0-100 $\mu\text{S}/\text{cm}$	0.60
100-1,000 $\mu\text{S}/\text{cm}$	0.71
1-10 $\text{mS}/\text{cm}$	0.81
10-100 $\text{mS}/\text{cm}$	0.94

## Setup Menu

### Main menu

In the measurement mode, press  key to enter in P1.0, then press  and  to slide the main menu: **P1.0**→**P2.0**→**P3.0**→**P6.0**.




**P1.0**: pH parameter setting menu,




**P2.0**: Conductivity parameter setting menu,


**P3.0**: TDS parameter setting




**P6.0**: Basic parameter setting menu.

### Submenu

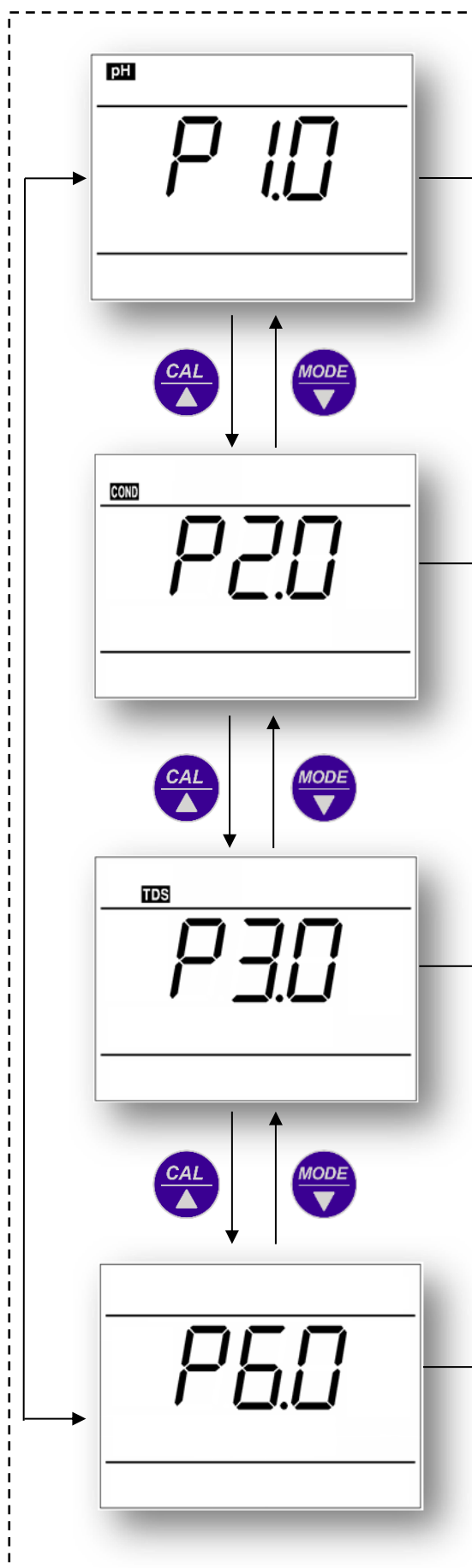
In **P1.0** mode, press  key to enter in submenu P1.1 of pH parameter setting, then press  and  keys to switch among submenu: **P1.1**→**P1.4**→**P1.5**→**P1.6**→**P1.7**.

In **P2.0** mode, press  key to enter in submenu P2.1 of conductivity parameter setting, then press  and  keys to switch among submenu: **P2.1**→**P2.2**→**P2.5**→**P2.6**→**P2.8**→**P2.9**.

In **P3.0** mode, press  key to enter in submenu P3.1 to adjust TDS factor.

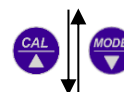
In **P6.0** mode, press  key to enter in submenu P6.1 of basic parameter setting, then press  and  keys to switch among submenu: **P6.1**→**P6.6**.

## 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 conductivity parameter setting

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

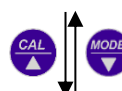


## Submenu of TDS parameter setting

- P3.1 Adjust TDS factor

## Submenu of basic parameter setting


- P6.1 Select temperature unit
- P6.6 Parameters selection



## 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±5°C	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	1.91
	P2.8	Restore to factory default setting	FS	No—Yes	No
	P2.9	Temperature calibration	tCAL	Calibration range±5°C	Factory default value
P3.0 TDS	P3.1	Adjust TDS factor	FACT	0.40~1.00	0.71
P6.0 Basic Parameters	P6.1	Select temperature unit	/	°C—°F	°C
	P6.6	Parameters selection	PARAM	No/Yes for each parameter	Yes

## Appendix II: 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	√	√
Er 2	Press  key when measuring value is not stable during calibration	√	√
Er 3	During calibration, the measuring value is not stable for ≥3min.	√	√
Er 4	Electrode zero electric potential out of range (<-60mV or >60mV)	√	
Er 5	Electrode slope out of range (<85% or >110%)	√	
Er 6	pH measuring range out of range (<0.00 pH or >14.00pH)	√	

### Appendix III: Abbreviation Glossary

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
P3.0 TDS	P3.1	FACT	TDS factor	TDS factor
P6.0 Basic parameters	P6.1	/		Temperature Unit
	P6.6	PARAM	Parameters	Select Parameters