PC950 Benchtop pH/Conductivity Meter

Instruction Manual

PH950 Benchtop pH Meter ☐

EC950 Benchtop Cond. Meter ☐

PC950 Benchtop pH/Cond. Meter ■

APERA INSTRUMENTS (Europe) GmbH

www.aperainst.de

Table of Contents

Notes

- When the meter is connected to PC, do not pull out the USB cable until the meter is turned off. Otherwise, a system crash could occur. To fix the crash, pull out the power cord, put it back in, and reboot the meter.
- Please do NOT pull out the power cord when the meter is turned on.

1. INTRODUCTION

Thank you for purchasing our PC950 Benchtop pH/Conductivity Meter.

Before using this meter, please read the operation manual carefully to help use and maintain it correctly.

1.1 Measurement parameter

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

1.2 Basic features

- TFT color display, large size, ultra legible.
- Operating navigation expressed by graphic and text, more convenient to use.
- Multi language operating system (English, German, Spanish & Chinese)
- 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.
- 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.

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. 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 stirrers (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/12.88mS/50mL)	1 bottle each		√	√
10	Stirrer connection cable	1	√	√	√
11	PCLink-950 Flash Disk	1	√	√	√
12	USB communication cable	1	√	√	√
13	9V power adapter	1	√	√	√
14	Instruction manual	1	√	√	√
15	Quick manual	1	√	√	√

3. SPECIFICATIONS

3.1 Technical parameters

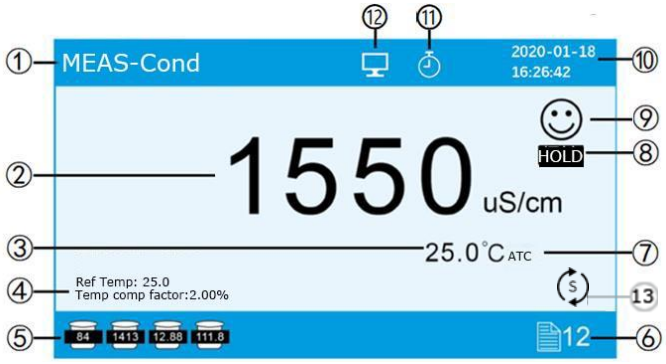
	Technical Parameters		Model
pH	Measuring Range	(0.00 ~ 14.00) pH	PH950 PC950
	Resolution	0.1/0.01 pH	
	Accuracy	±0.01 pH ±1 digit	
	Temperature Compensation Range	(0 ~ 100) °C (Auto. or Manual)	
	Calibration point	1~3 points	
mV	Measuring Range	±2000mV	
	Resolution	1mV	
	Accuracy	±0.1% FS ±1 digit	
Cond.	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℃	PH950 EC950 PC950
	Resolution	0.1°C	
	Accuracy	±0.5°C±1 digit	

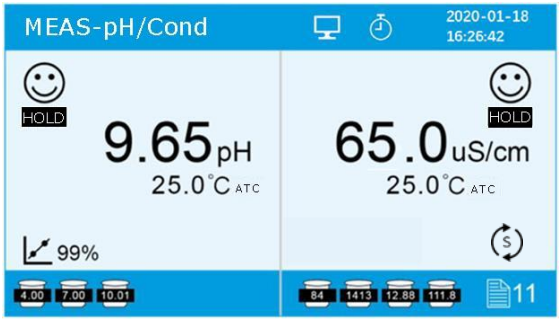
3.2 Other technical parameters

Data Storage	200 groups
Storage Content	Number, measuring value and temperature value
Power	DC9V/600mA
Dimension & Weight	Meter: (195×215×100) mm / 0.9kg

4. INSTRUMENT DESCRIPTION

4.1 LCD display

pH measurement interface  	① pH measurement ② pH measuring value ③ Temperature measuring value ④ pH electrode slope ⑤ Calibration solution indication icon ⑥ Used data storage ⑦ Temperature compensation icon, MTC-manual temperature compensation ATC-auto. temperature compensation ⑧ Auto. lock on icon ⑨ Stable reading icon ⑩ Date and time ⑪ Auto. data log ⑫ Storage icon and number ⑬ Stirrer icon
Conductivity measurement interface  	① Conductivity measurement ② Conductivity measuring value and unit ③ Temperature measuring value ④ Conductivity parameter: 1.0 - conductivity cell constant 25.0°C - reference temperature 2.00% - temperature compensation Coefficient ⑤ Calibration solution indication icon ⑥ Used data storage ⑦ Temperature compensation icon, MTC-manual temperature compensation ATC-auto. temperature compensation ⑧ Auto. Hold ⑨ Stable reading icon ⑩ Date and time ⑪ Auto. data log ⑫ Storage icon and number ⑬ Stirrer icon

TDS measurement interface	Salinity measurement interface
 ① TDS measurement ② TDS factor 0.71	 Salinity factor 0.5
pH/Cond. measurement interface	mV measurement interface
	

4.2 Keypad functions

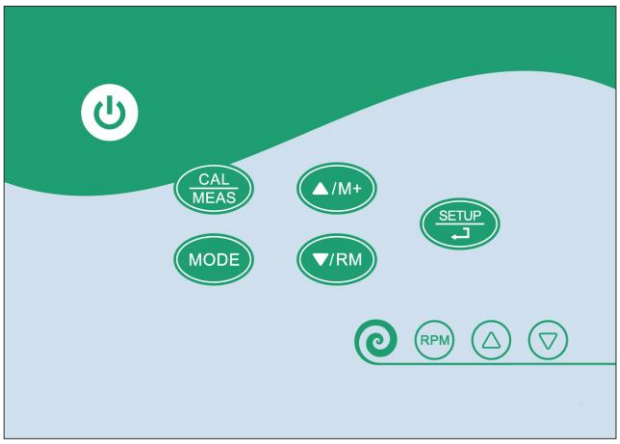


Diagram-1

Keypad operation mode:

Short press—Press key and holding time < 2s, buzzer makes a “di” sound.

Long press—Press key and holding time > 2s, buzzer makes a “di” sould when pressing the button, another “di” sound will ring after holding the key 2 seconds.

Chart -1 Keypad operations and functions

Keypad	Operations	Functions
⏻	Short press	● Power supply switch
MODE	Short press	Press key to select measurement mode: ● PH950: pH→mV ● EC950: Cond→TDS→Salt ● PC950: pH→mV→Cond→TDS→Salt→pH/Cond
	Long press	● Press key to enter temperature regulation mode
CAL MEAS	Long press	● In measurement mode, press key to enter in the calibration mode
	Short press	● Cancel operation and return to measurement mode;
SETUP ↵	Short press	● In measurement mode: press key to enter parameter set-up main menu. ● In calibration mode: press key to conduct calibration. ● In main menu mode: press key to enter in submenu. ● In submenu mode: press key to enter in parameter set-up. ● In parameter set-up mode: press key to confirm parameter. ● In temperature regulation mode: press key to confirm temperature value.
▼/RM ▲/M+	Short press	● In measurement mode: press ▲/M+ key to store measuring value, press ▼/RM key to recall. ● In recall (RM) mode: press ▲/M+ or ▼/RM key to turn page. ● In menu mode: press key to select items; ● In temperature regulation mode: press key to change temperature value, hold key for fast changing.
	Short press	● Stirrer switch
RPM	Long press	● Store stirrer speed
	Short press	● Rotate according to the stored speed
▽ △	Short press	● Press key to change rotating speed, hold key for fast changing.

4.3 Meter sockets

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

① BNC socket, connect with pH- or ORP combination electrode.

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

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

③ Φ4 banana socket, connect with reference electrode.

④ BNC socket, connect with conductivity cell.

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

④+⑤: BNC+RCA socket, connect with Cond/ATC Elektroden.

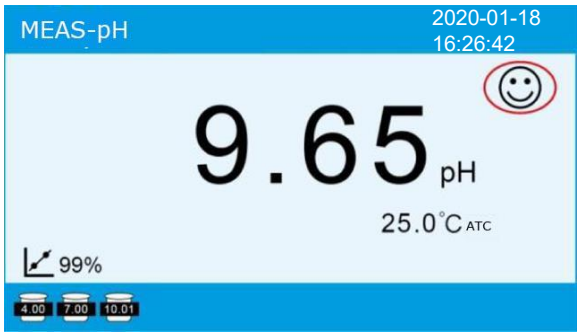
⑥ USB: Connect PC

⑦ Φ2.5 power socket, Connect DC9V adaptor (inside “ + ” outside “ - ”)

4.4 Display mode

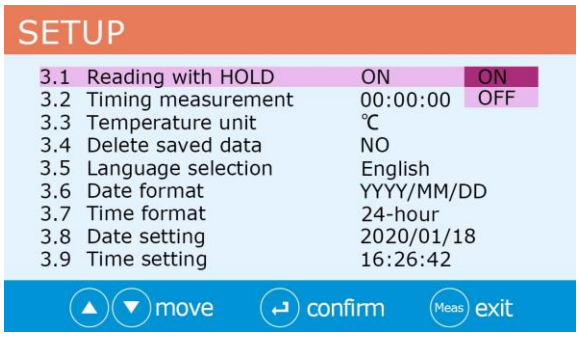
4.4.1 Reading stable display mode

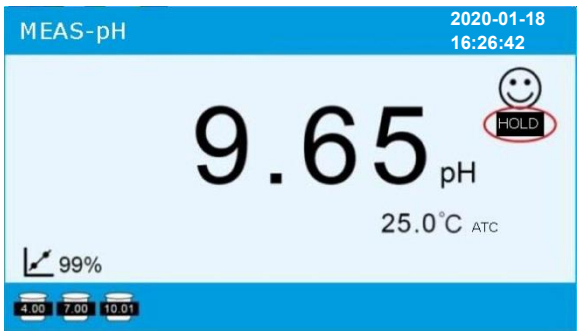
When the measuring value is stable, smiley icon appears on LCD screen, see Diagram – 3. If the smiley icon does not appear or flash, please do not get readings or make calibration until the measuring value is stable.



4.4.2 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 CAL MEAS key to cancel auto lock.





(a). (b).

Diagram-4

4.5 Data storage, recall and delete

4.5.1 Storage

(a) Manual data logger

Set “auto. timing” to “00:00:00”, Press ▲/M+ key to store, icon 6 displays on the down right corner of LCD screen which means it’s the 6th group data, see Diagram – 5(a); Each meter can store 200 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 200 groups, but storage number will be less than 200. If press key again when storage value is full, icon Full will flash, see Diagram –5(c) to indicate store memory is already full and need to be deleted for new store value.

(b) Auto. timing data logger

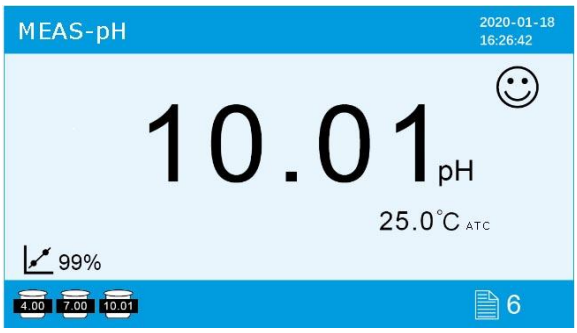
Select “Timer” in parameter setting 3.2 and set the data logging interval time (by all x Seconds or minutes), for example, 3 minutes. In auto timing data logo mode, shows up, press ▲/M+ to start auto. data logger, flashes, the first set of measurement data is stored, then every three minutes one set of data will be stored and the storage number will be automatically increased. Press ▲/M+ again to stop auto. data logger. In this mode, the manual data logging is invalid.

4.5.2 Recall

Press ▼/RM key, meter will display stored 6 groups measuring value, see Diagram – 5(b), press ▲/M+ or ▼/RM key to turn page. Every page displays 8 groups data.

4.5.3 Delete

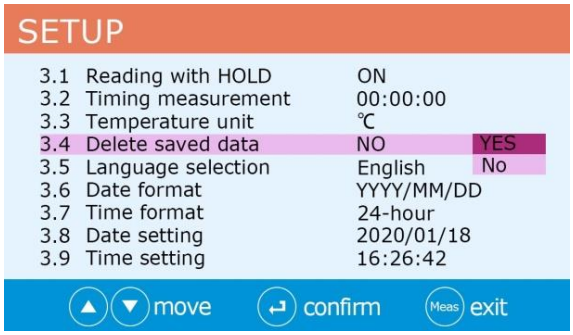
Data need to be deleted when storage memory is full, otherwise no more data can be stored. In parameter setting 3.3 select “Yes” and press SETUP key, see Diagram – 5(d) to delete all stored value. ***Note: when connect the meter via USB cable to store the measured values to the computer, there is no limitation on the number of data storage, either manual or automatic storage.***



(a)

(b)

(C)



(d)

Diagram-5

4.6 Manuals adjust temperature

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

4.7 Install meter with multi-function test bench

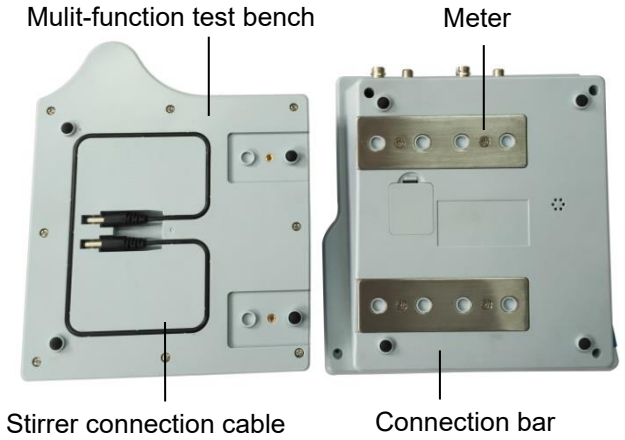
Before installing	After installing
	

Diagram-6

4.8 Installation of flexible electrode holder

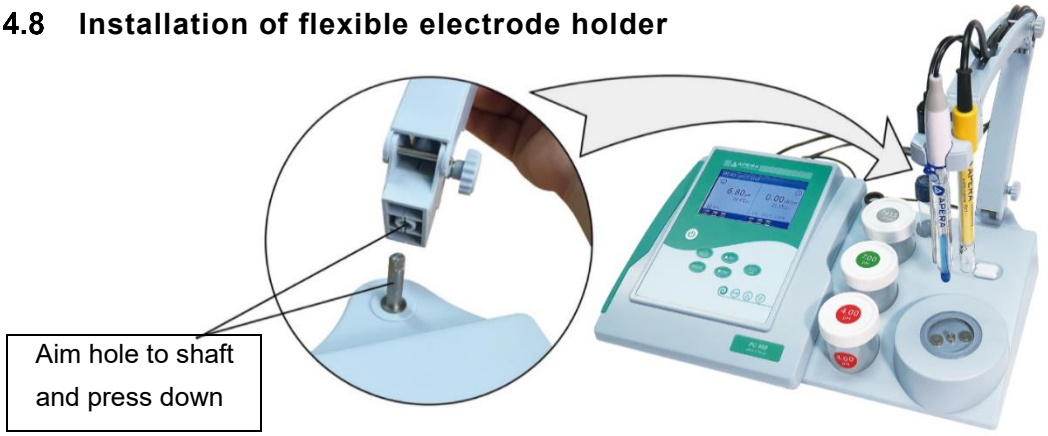
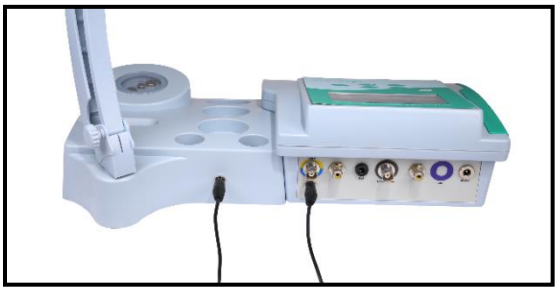


Diagram-7

4.9 Multi-function Test Bench



(a) Combo mode

(b) Separation using (maximum distance 35cm)

Diagram-8

5. PH MEASUREMENT

5.1 Default Electrodes Information

The meter comes with a LabSen 211 pH combination electrode and MP500 temperature probe, which enables the automatic temperature compensation. The LabSen pH electrodes are made with proprietary sensor technologies and premium materials from Switzerland. LabSen 211 pH electrode is designed for high-precision lab and field pH measurement of general water solutions. The electrode is compatible with TRIS buffers.

For testing pH of special samples such as viscous (sticky), strong acidic or alkaline solutions, solutions at high or low temperature (>50˚C or <10˚C), solid samples, turbid solutions, low ion-concentration solutions & etc…specialized pH electrodes are necessary in order to achieve reliable results. Regular pH electrodes in these special applications usually would generate inaccurate and unstable measurements, and may be damaged by the samples, or even be non-applicable for testing at all.

Please refer to Section 10 for ideal pH electrodes to use for other applications.

5.1.1 Features of LabSen 211 pH Electrode

- Built with LabSen S-type hemispherical glass membrane, featuring low resistance (fast response) and high firmness
- No more air bubbles inside the glass membrane thanks to the Swiss blue gel electrolyte.
- The long-life reference system significantly increases measuring stability and extends service life.

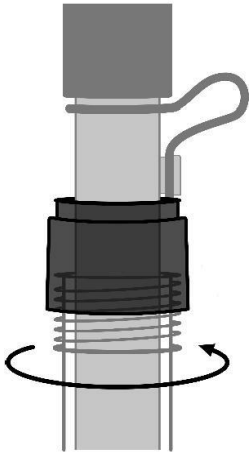
5.1.2 Technical Specifications of the LabSen211 pH Electrode

Measuring Range	0-14 pH
Temperature Range	23 to 212 ˚F (-5 to 100 °C)
Membrane Types	S
Body Material	Lead-free Glass
Reference	Long Life
Junction	Ceramic
Reference Solution	3M KCL
Soaking Solution	3M KCL
Membrane Resistance	<150 MΩ
Electrode Dimension	(Φ12×120) mm
Connector and cable length	BNC/1m

5.1.3 Technical Specifications of the MP500 Temperature Probe

Temperature Range	14 to 230 ˚F (-10 to 110 °C)
Body Material	Stainless Steel
Sensor	30 KΩ thermistor
Probe Dimension	(Φ5×145) mm
Connector	RCA
Connector and cable length	BNC/1m

5.1.4 How to use



1. Insert the blue BNC connector of the electrode to the BNC socket of your pH meter while twisting clockwise until it`s locked, plug the RCA connector into the “TEMP” sockets. Please note not to pull the cables in case of poor contact. Please keep the connectors clean and dry.
2. Before measuring, twist off the storage bottle cap (see graph on the right), pull out the electrode and rinse it off with distilled or deionized water.
3. Unplug the blue rubber plug to maintain a smooth electrolyte flow.
4. Stir the solution briefly to eliminate the air bubbles and in this way, a stable measurement will be reached fast.
5. Perform at least a two-point calibration before measuring after connecting the new electrode to your pH meter.
6. After using, put the electrode back into the storage bottle, twist on the bottle cap, and plug in the refilling hole.

5.1.5 Maintenance

1. When not in use, the electrode should be soaked in the storage bottle containing 3M KCL soaking solution (SKU: AI1107) to keep the glass membrane and junction in a healthy condition. Clean the bottle and replace the soaking solution if it gets contaminated. The electrode should never be stored in pure water such as deionized or distilled water.
2. The reference solution will run low as you use the electrode. Whenever the solution level falls to 1/2 height of the electrode, add 3M KCL solution (SKU: AI1107) to the refilling hole (unplug the blue rubber plug) using a syringe or pipette.
3. The electrode is only as accurate as it is clean. Always thoroughly rinse off the electrode before and after each measurement with pure water in a container or with a wash bottle.
4. For tough contaminants, soak the electrode in Apera cleaning solution (AI1166) for 30 minutes. Then use a soft brush to remove the contaminants. Afterwards, soak the electrode in 3M KCL solution (SKU: AI1107) for at least 1 hour. Rinse it off, then re-calibrate it before using again.
5. The connector of the electrode should be kept clean and dry. If contaminated, please clean it with medical cotton and isopropyl alcohol and blow-dry it to prevent short circuit of the electrode or slow response of the electrode.

6. The electrode should avoid testing strong acid and strong alkali solutions, as well as dehydrating media such as absolute ethanol and concentrated sulfuric acid. If testing such solutions, the immersion time should be minimized, and the electrode should be carefully cleaned after use.
7. Every pH electrode will eventually age and fail. The typical service life of Apera pH electrodes is 12 to 24 months depending on the frequency of usage and how well you keep it clean and properly stored. We recommend replacing your electrode every 12-18 months to ensure the best performance.

5.2 pH calibration related information

5.2.1 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	4.00 or 1.68	pH 4.00 or 1.68	pH 4.01 or 1.68	pH 4.00 or 1.68
	7.00	pH 7.00	pH 6.86	pH 6.86
	10.01 or 12.45	pH 10.01 or 12.45	pH 9.18 or 12.46	pH 9.18 or 12.46

Note: calibration indication icons are example of USA series.

5.2.2 Three-point calibration

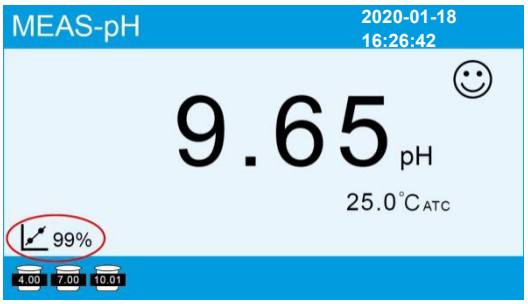
The instrument can perform 1~3 point calibration. In three-point calibration mode, the first point calibration must use 7.00 pH (or 6.86 pH) standard solution, then select other standard solution to perform the second and the third point calibration. See chart – 3. Users can choose two-point calibration of pH 7.00 and pH 1.68 for strong acidic solutions (<pH 2), or pH 7.00 and pH 12.45 for strong alkaline solutions (>pH 12).

Chart -3 Three-point calibration mode

	USA standard	NIST standard	CH standard	Applicable range
One-point calibration	pH 7.00	pH 6.86	pH 6.86	Accuracy ≤± 0.1pH
Two-point calibration	pH 7.00 and pH 4.00/1.68	pH 6.86 and pH 4.01/1.68	pH 6.86 and pH 4.00/1.68	< pH 7.00
	pH 7.00 and pH 10.01/12.45	pH 6.86 and pH 9.18/12.46	pH 6.86 and pH 9.18/12.46	> pH 7.00
Three-point calibration	pH 7.00, pH 4.00/1.68 and pH 10.01/12.45	pH 6.86, pH 4.01/1.68 and pH 9.18/12.46	pH 6.86, pH 4.00/1.68 and pH 9.18/12.46	pH 0 – 14.00

Note: calibration indication icons are example of USA series.

5.2.3 Calibration information display

	1. Automatically display electrode slope in measurement interface • Display average slope after two- or three-point calibration • Dose not display slope after one point calibration
	2. Display last calibration data in pH submenu clause 1.3

5.2.4 Calibration intervals

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

The meter must be recalibrated in the following situations:

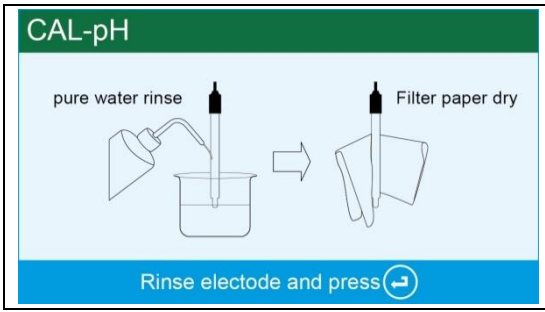
(a) New probe or probe that is unused for a long period of time

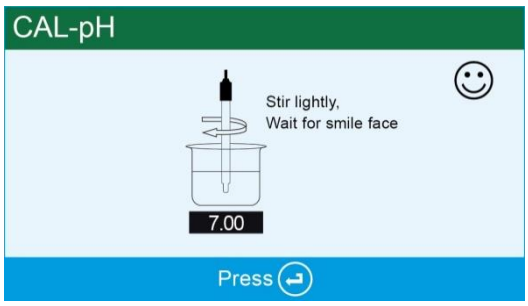
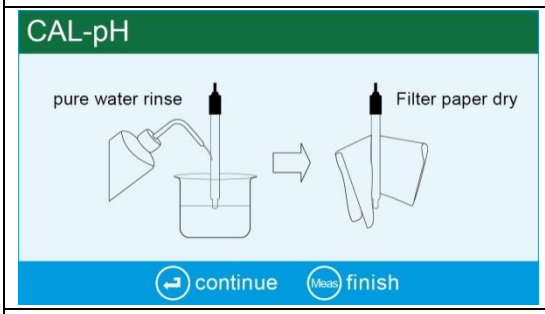
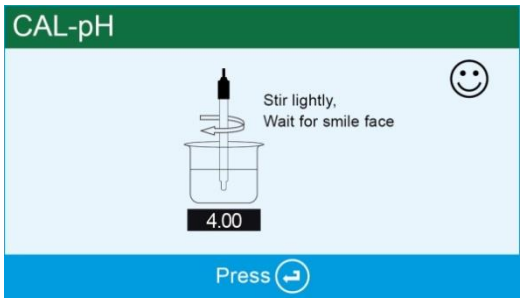
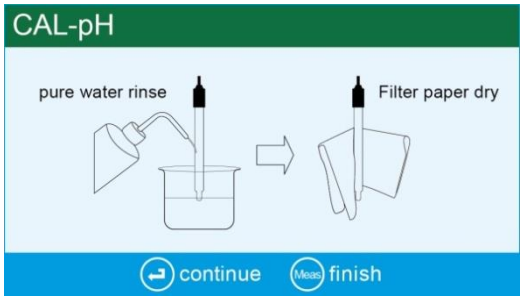
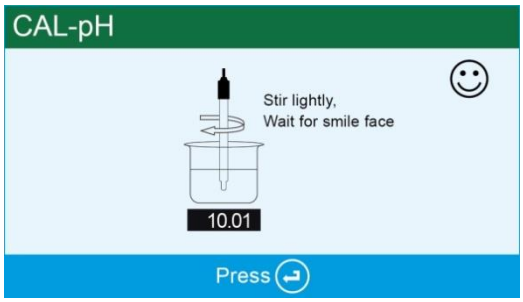
(b) After measuring acids solution (pH<2) or alkaline solutions (pH>12)

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

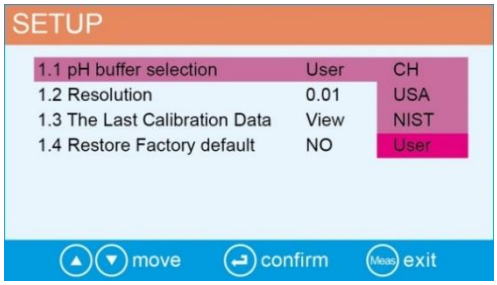
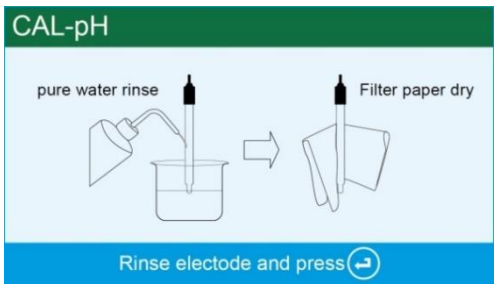
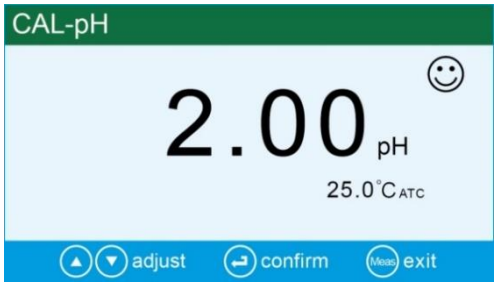
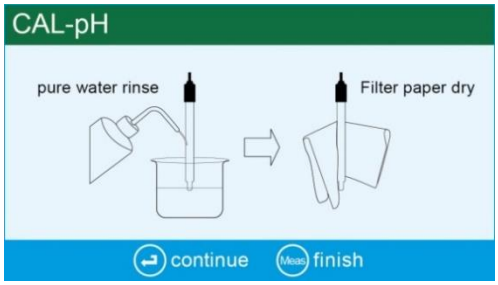
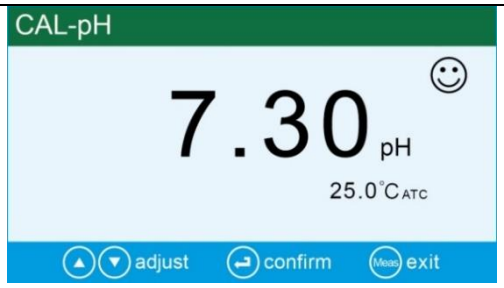
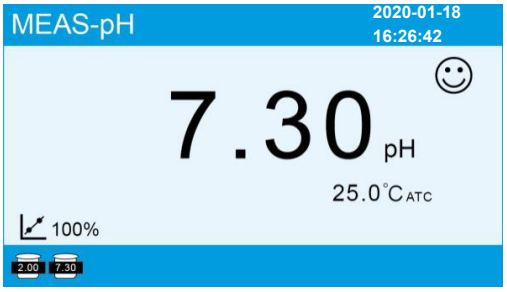
(d) If the solution's temperature differs greatly from that of the calibration solution

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

	Long press CAL MEAS 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 SETUP key to confirm.

	Submerge probe in pH7.00 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 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.

5.4 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.
	2. Long press CAL MEAS 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 SETUP key to confirm.
	3. Submerge probe in pH2.00 buffer solution. Stir the solution briefly and allow it to stay in the buffer solution until ☺ appears. Press ▲/M+ or ▼/RM key to adjust measuring value to 2.00pH. Press SETUP key to make calibration.
	4. 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.
	5. Submerge probe in pH7.30 buffer solution. Stir the solution briefly and allow it to stay in the buffer solution until ☺ appears. Press ▲/M+ or ▼/RM key to adjust measuring value to 7.30pH. Press SETUP key to make calibration.
	6. Calibration completed, instrument goes back to measurement mode.

Notes:

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

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

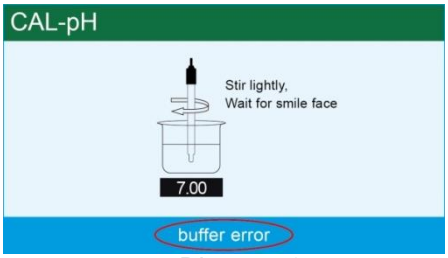


Diagram-9

5.5 Self-diagnostic Information

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

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 SETUP key when measuring value is not stable.	Press SETUP when ☺ icon appears
electrode error	The measuring value is not stable for long time (≥3min)	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.

5.6 Solution measurement

5.6.1 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.

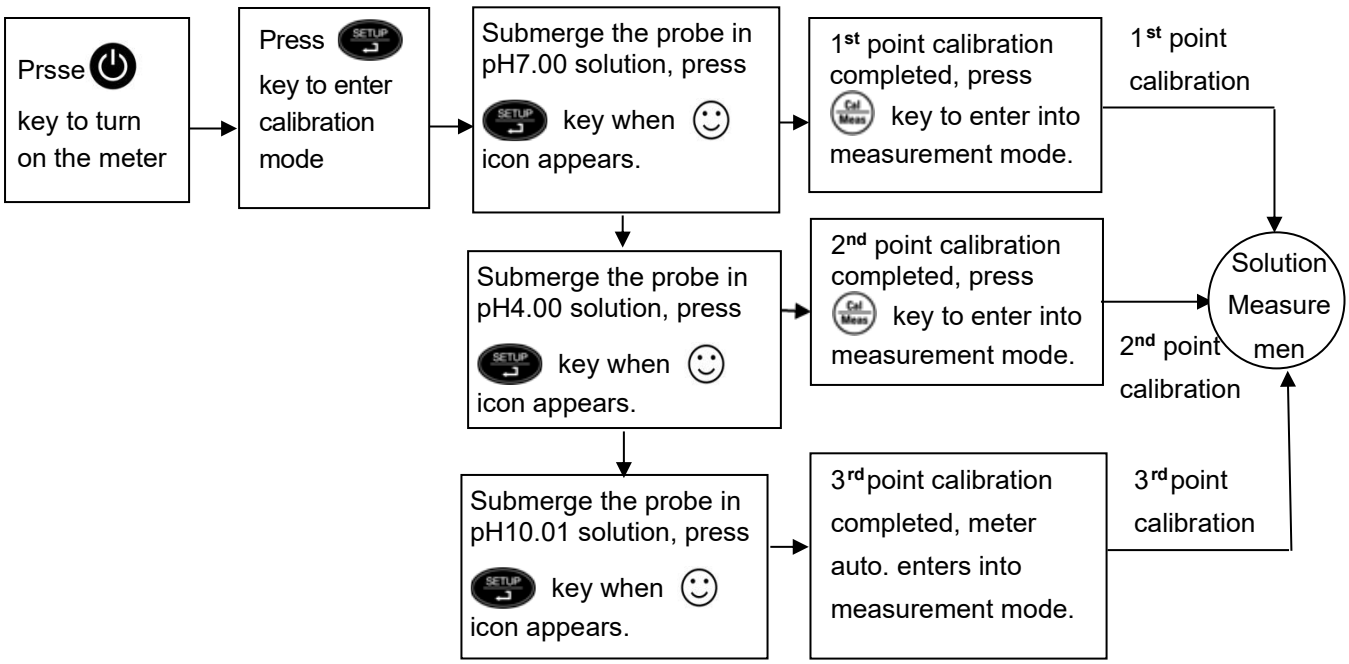


Diagram-10

5.6.2 pH isothermal measurement principle

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

5.6.3 Restore to factory default setting

Instrument has factory default setting function, pleasrefer 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 valueof 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.

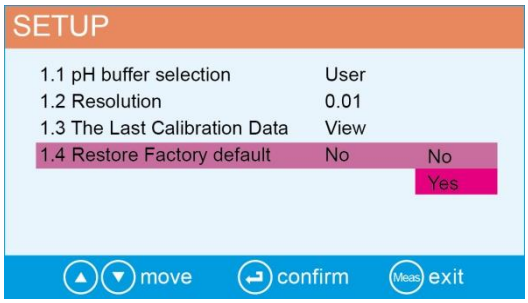


Diagram-11

6. MV MEASUREMENT

6.1 ORP measurement

Press MODE 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. Thereading obtained is ORP value.ORP stands for Oxidation Reduction Potential. It means oxidation reduction potential of solution. ORP is the measurement

index for the oxidation reduction ability of wate solution. Its unit is mV.

6.2 Notes for ORP measurement

6.2.1 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.

6.2.2 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.

6.3 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 probles should be make measurement at same time.

7. CONDUCTIVITY MEASUREMENT

7.1 Conductivity probe information

7.1.1 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.

7.1.2 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 μS/cm	0.5μS/cm~100mS/cm			＞100mS/cm
Conductivity probe constant	K=0.1 cm^{-1}	K=1.0 cm^{-1}			K=10 cm^{-1}
Standard solution	84μS/cm	84μS/cm	1413 μS/cm	12.88 mS/cm	111.8 mS/cm

7.2 Conductivity calibration related information

7.2.1 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	84 μS/cm	146.6μS/cm
1413	1413 μS/cm	1408μS/cm
12.88	12.88 mS/cm	12.85mS/cm
111.8	111.8 mS/cm	111.3mS/cm

Note: calibration indication icons are example of Standard series.

7.2.2 Calibration intervals

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

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

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

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

(e) 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 μS/cm standard solution is suitable for measuring range 0-20mS/cm.

7.2.3 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

7.2.4 Temperature coefficient

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

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

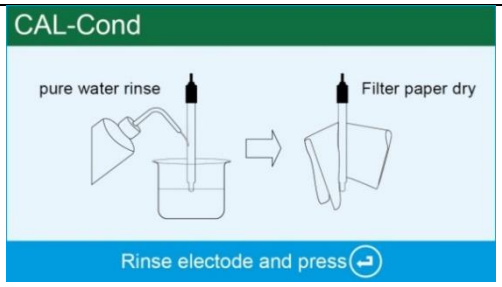
Chart -7 Temperature compensation coefficient of certain solutions

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

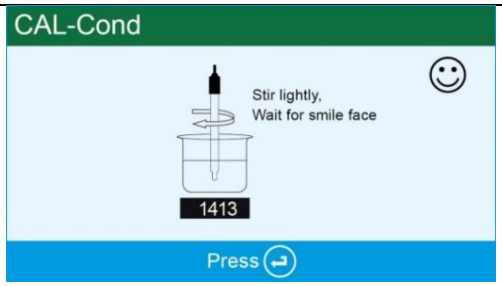
7.2.5 Avoid contamination of standard solution

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 84μS/cm. The contaminated standard solution will affect accuracy of measurements.

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



1. Long press CAL MEAS 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 SETUP key to confirm.

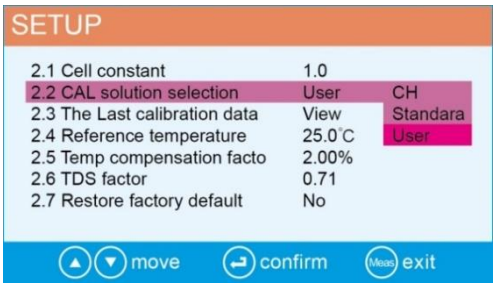


2. Submerge probe in 1413μS/cm solution. Stir the solution briefly and allow it to stay in the buffer solution until ☺ appears. Press SETUP key to make calibration.

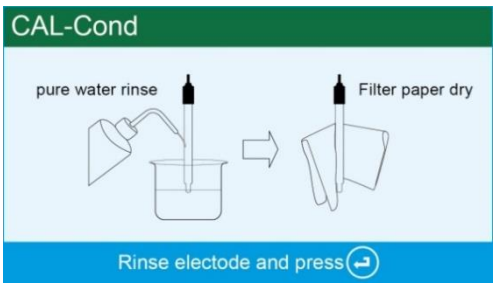
3. Calibration completed, instrument goes back to measurement mode.

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

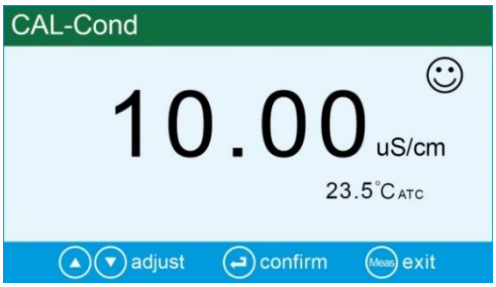
7.4 Custom-defined calibration (take 10μS/cm standard solution as an example)



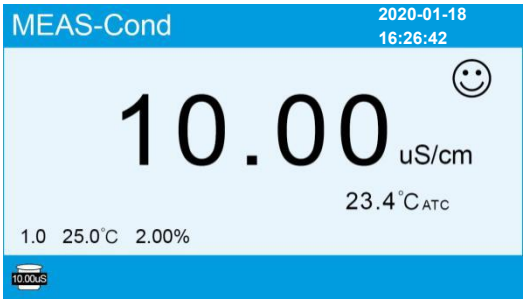
1. Select User in parameter setting clause 2.2, press CAL/MEAS key to return to measurement mode.



2. Long press CAL/MEAS 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 SETUP key to confirm.



3. Submerge probe in 10μS/cm standard solution. Stir the solution briefly and allow it to stay in the buffer solution until ☺ appears. Press ▲/M+ or ▼/RM key to adjust measuring value to10.00μS/cm. Press SETUP key to make calibration.



Calibration completed, instrument goes back to measurement mode.

- Only 1-point calibration for custom-defined calibration. The conductivity value of user-defined solution is a value in a certain fixed temperature. There is no regulation of temperature coefficient or reference temperature. Calibration and measurement must be performed at the same temperature to avoid significant error.
- The meter does not have the function to recognize user-defined calibration solution.
- In manual temperature compensation mode, the temperature value should be adjusted before conducting calibration. It cannot be adjusted during calibrating process.

7.5 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.

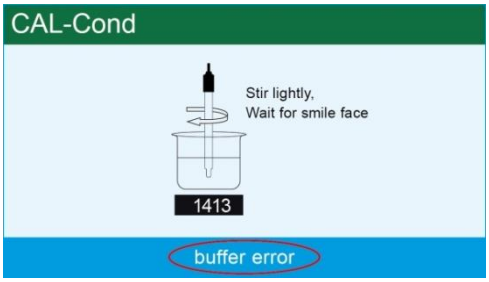


Diagram-12

Chart -8 Self-diagnostic information of conductivity measurement mode

Self-diagnostic	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 SETUP key when measuring value is not stable.	Press SETUP when ☺ icon appears
electrode error	The measuring value is not stable for long time (≥3min)	1.Shake the probe to eliminate bubbles in probe head. 2.Replace conductivity probe with a new one

7.6 Solution measurement

7.6.1 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.

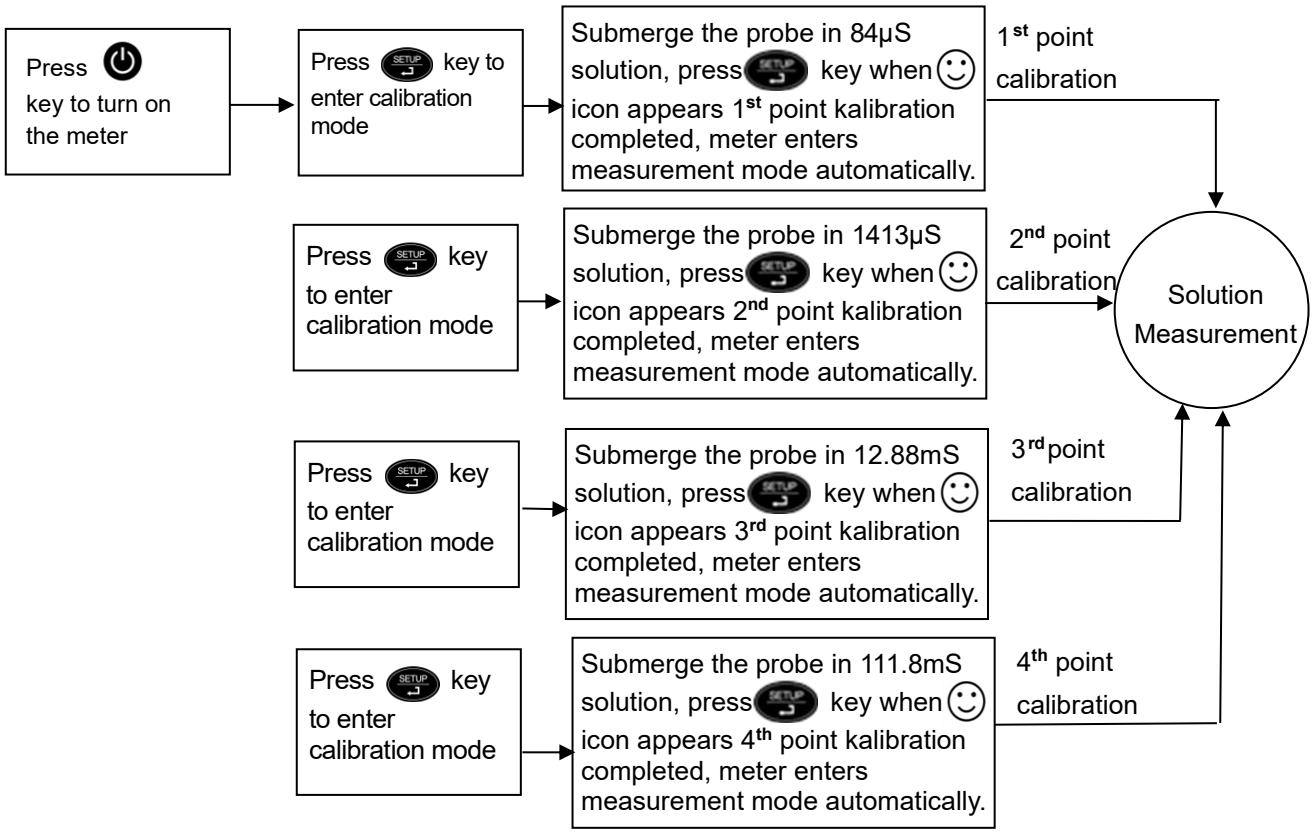


Diagram-13

7.6.2 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 μS/cm	0.60
100~1000 μS/cm	0.71
1~10 mS/cm	0.81
10~100 mS/cm	0.94

7.6.3 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 restoreto 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.

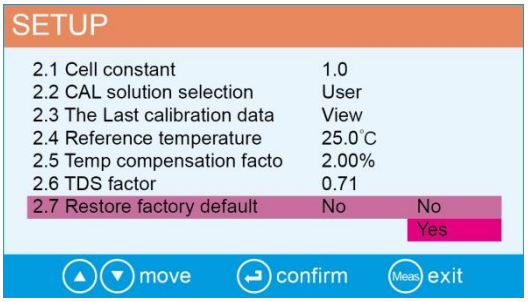


Diagram-14

7.7 Conductivity probe maintenance

7.7.1 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.

7.7.2 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.

8. PARAMETER SETTING

8.1 Main menu and submenu

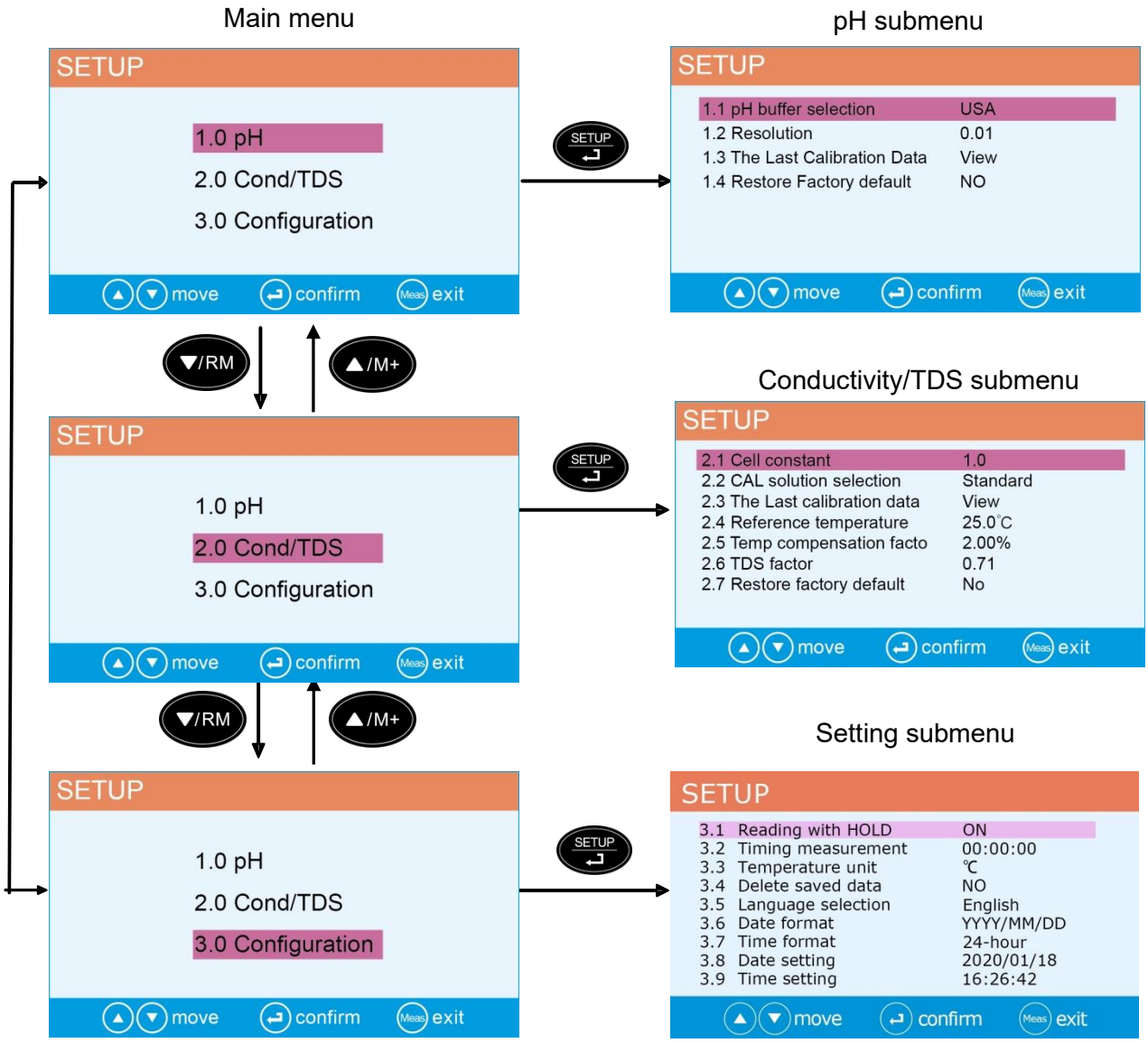


Diagram-15

8.2 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.

8.3 Content of parameter setting

Main menu	Serial number	Parameter setting items	Setting content	Factory default
1.0 pH	1.1	pH buffer selection	CH-USA-NIST-User	USA
	1.2	Resolution	0.01-0.1	0.01
	1.3	The last calibration data	View	/
	1.4	Restore factory default	No-Yes	No
2.0 Cond./TDS	2.1	Cell constant	10-1.0-0.1	1.0
	2.2	CAL solution selection	CH-Standard-User	Standard
	2.3	The last calibration data	View	/
	2.4	Reference temperature	15~30℃	25℃
	2.5	Temp compensation factor	0.00~10.00%	2.0%
	2.6	TDS factor	0.40~1.00	0.71
	2.7	Restore factory default	No-Yes	No
3.0 Configuration	3.1	Reading with HOLD	On-Off	/
	3.2	Auto. timing data log	Manual/Automatically	Manual
	3.3	Temperature unit	°C - °F	/
	3.4	Delete saved data	Yes/No	/
	3.5	Language selection	中文-English-Deutsch Espanl	/
	3.6	Date	Y-M-D	/
	3.7	Time	24hours/12hours	/
	3.8	Date setting	2020-03-13	/
	3.9	Time setting	12:30:30	/

9. STIRRER

9.1 Operation

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

9.1.2 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.

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

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

H — It indicates the stored rotating speed.

9.1.4 For required rotating speed, press RPM key to store. Next time turn on meter and press RPM key to stir with this speed.

9.2 Specification

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

9.3 Notes

9.3.1 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.

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

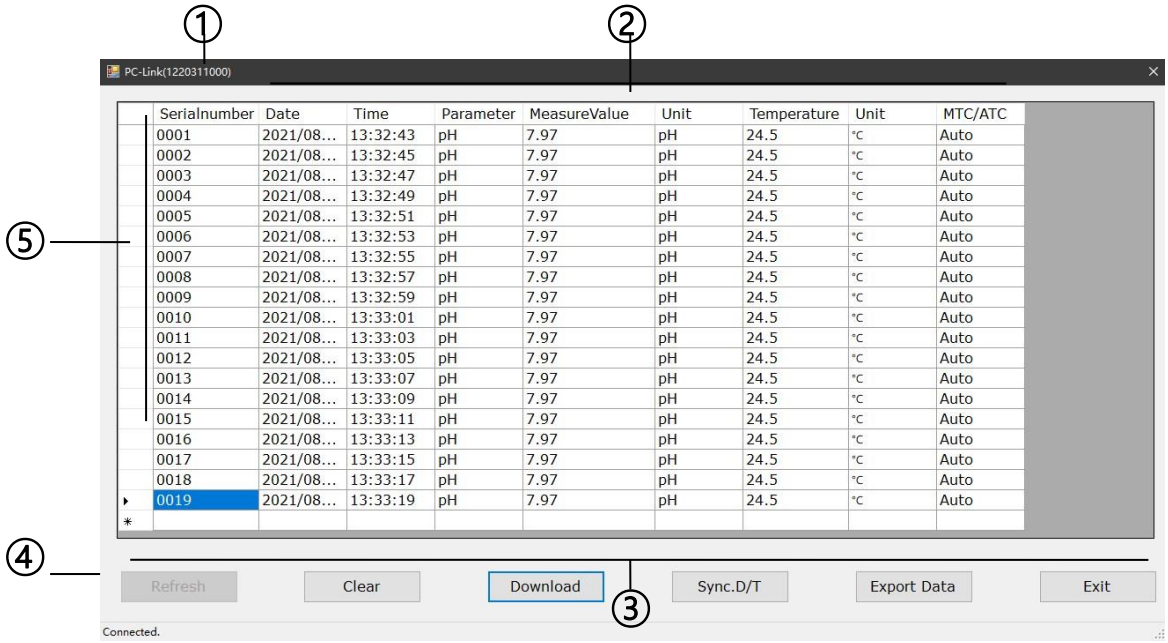
10. USB COMMUNICATION

10.1 Install Software

This instrument uses the PC-Link 950 communication software, and the communication port is USB. Copy the PC-Link 950 program files to the computer from the flash drive, connect the USB communication cable to the PC socket of the meter and the computer's USB port. The software will be automatically open. The instrument and the computer will be automatically connected, and will show up on top of the display. If manual data logger is selected, press ▲/M+, data will be uploaded to the computer, if auto. timing data logger is selected, press ▲/M+, data will be uploaded to the computer by the certain timing you set. All the data uploaded to the computer will not be saved

in the meter. Auto-timing data logger will generate a measurement curve in PC-Link software as shown in Diagram-16.

10.2 Software Interface



Serialnumber	Date	Time	Parameter	MeasureValue	Unit	Temperature	Unit	MTC/ATC
0001	2021/08...	13:32:43	pH	7.97	pH	24.5	°C	Auto
0002	2021/08...	13:32:45	pH	7.97	pH	24.5	°C	Auto
0003	2021/08...	13:32:47	pH	7.97	pH	24.5	°C	Auto
0004	2021/08...	13:32:49	pH	7.97	pH	24.5	°C	Auto
0005	2021/08...	13:32:51	pH	7.97	pH	24.5	°C	Auto
0006	2021/08...	13:32:53	pH	7.97	pH	24.5	°C	Auto
0007	2021/08...	13:32:55	pH	7.97	pH	24.5	°C	Auto
0008	2021/08...	13:32:57	pH	7.97	pH	24.5	°C	Auto
0009	2021/08...	13:32:59	pH	7.97	pH	24.5	°C	Auto
0010	2021/08...	13:33:01	pH	7.97	pH	24.5	°C	Auto
0011	2021/08...	13:33:03	pH	7.97	pH	24.5	°C	Auto
0012	2021/08...	13:33:05	pH	7.97	pH	24.5	°C	Auto
0013	2021/08...	13:33:07	pH	7.97	pH	24.5	°C	Auto
0014	2021/08...	13:33:09	pH	7.97	pH	24.5	°C	Auto
0015	2021/08...	13:33:11	pH	7.97	pH	24.5	°C	Auto
0016	2021/08...	13:33:13	pH	7.97	pH	24.5	°C	Auto
0017	2021/08...	13:33:15	pH	7.97	pH	24.5	°C	Auto
0018	2021/08...	13:33:17	pH	7.97	pH	24.5	°C	Auto
0019	2021/08...	13:33:19	pH	7.97	pH	24.5	°C	Auto

Diagram-16

①	Meter serial number	④	Computer connection icon
②	Data area	⑤	Data stored in meter
③	Operation keys		

10.3 Operation Keys of PC-Link

Refresh — When the meter and the computer are not connected, press the button to connect again.

Clear — Clear the data.

Download — Upload the data in the meter's memory to the computer.

Sync. D/T — Sync the time and date of PC to the meter.

Export Data — Export the stored data to a Microsoft Excel document for further analysis.

Exit — press to exit PC-Link.

11. RECOMMENDED PH ELECTRODES FOR SPECIFIC APPLICATIONS

Application	Ideal Apera pH Electrodes to Use
General water solutions	LabSen 211
Beverage, beer, or wine analysis	LabSen 211
Cosmetics and other viscous liquid	LabSen 851-S, LabSen 851-H
Dairy products (milk, cream, yogurt, mayo, etc.)	LabSen 821
High-Temperature liquid	LabSen 861
Low-temperature liquid	LabSen 881
Meat	LabSen 761
Micro sample testing	LabSen 241-6, LabSen 241-3, LabSen 241-3SP, LabSen 241-180
Purified Water (Low ion concentration samples)	LabSen 801
Soil	LabSen 551
Solid or semi-solid samples (cheese, rice, fruit, etc.)	LabSen 751
Strong acid samples	LabSen 831
Strong alkalis samples	LabSen 841
Surface test (skin, paper, carpet, etc.)	LabSen 371
Titration	LabSen 221, LabSen 801
TRIS buffer solutions	LabSen 211, LabSen 221
Viscous liquid samples	LabSen 851-S
Wastewater or emulsion	LabSen 331, LabSen 231

12. RECOMMENDED CONDUCTIVITY ELECTRODES FOR SPECIFIC APPLICATIONS

Application	Ideal Apera pH Electrodes to Use
Medium range (0-200mS/cm), K=1.0	2301T-F, 2301-C
Medium range (0-200mS/cm) & require higher accuracy, K=1.0	2401T-F, 2401-C
High range (20-2000mS/cm), K=10	2310T-F, 2310-C
Low range (0 to 200μS/cm) e.g. ultra-purified water, K=0.1	DJS-0.1-C, DJS-0.1-F with a flow cell

13. 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.

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