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Introduction

Thanks for purchasing 70+ 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.

Measurement parameters

Measurement parameters	pH70+DHS	COND70+	PC70+DHS
pH/mV	√		√
Conductivity/TDS/Salinity		√	√
Temperature	√	√	√

Basic features

- 3 Colors display for intuitive operations
- 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.
- Selection of parameters to be display (only for PC70+DHS)
- Meet GLP, clock display, manual storage and automatic timing storage, USB port for PC linking and power supply

pH measurement features (suited for model pH70+DHS and PC70+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 solution set-up.
- The meter recognize DHS Sensor

Conductivity measurement features (suited for model COND70+ and PC70+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 and salinity measurement

Data sheet

	Specifications		Models
pH	Range	(-2.00 ~ 16.00) pH	pH 70+ PC 70+
	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 - 4,01 - 7,00 - 10,01pH NIST: 1,68 - 4,01 - 6,86 - 9,18pH 2 value CUSTOMER	
mV	Range	+1900mV – 1000mV	
	Resolution	0.1mV (+200mV) / 1mV (other values)	
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 70+ PC 70+
	Resolution	0.01/0.1/1μS/cm 0.01/0.1 mS/cm	
	Accuracy	±2.0% FS	
	Temperature compensation	(0 ~ 100) °C (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 1 customer value	
TDS	Range	0~100 g/L	
	Resolution	1% f.s.	
Salinity	Range	0~50 g/L	
Temperature	Range	-10~110°C	
	Resolution	0.1°C	
	Accuracy	±0.5°C±1digit	
Power	AA batteries × 3 (1.5V× 3) / AC/DC adapter with USB		pH 70+ COND 70+ PC 70+
IP rating	IP57		
Dimension & Weight	Meter: (86×196×33) mm / 295g		
Data Storage	500 slots		

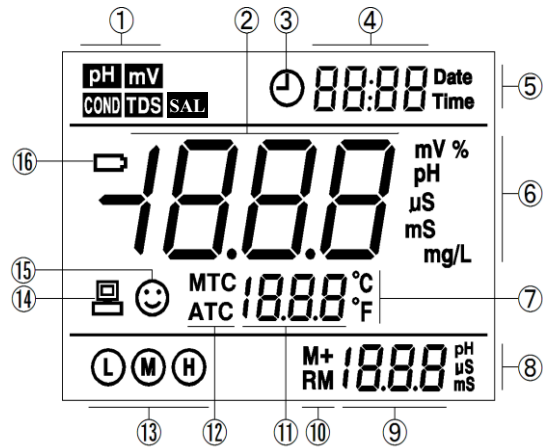
Instrument Description

LCD Display

The instrument is provided with three-color backlit display to help the user get a quick and intuitive understanding of how to use them

- **Green:** Measurement and setup mode
- **Blue:** Calibration mode
- **Red:** Alarm/Error


- (1) — Parameter icons
- (2) — Measurement reading
- (3) — Automatic data storage mode
- (4) — Time (appears with (5), and prompts of special display mode)
- (5) — Date (appears with (4))
- (6) — Units of measurement
- (7) — Temperature units (°C and °F)
- (8) — Units of pH and conductivity calibration value (appears with(9))
- (9) — pH and conductivity calibration value or store position (RM)
- (10) — Storage and recall icons
M+ — Measurement to be stored icon RM — Reading to be recalled icon
- (11) — Temperature value, and prompts of special display mode
- (12) — Temperature compensation icons
ATC — automatic temperature compensation, MTC — manual temperature compensation
- (13) — Calibration range icon
- (14) — USB icon, when this icon appears, the meter connects the computer
- (15) — Stability icon
- (16) — Battery life




Keypad Functions

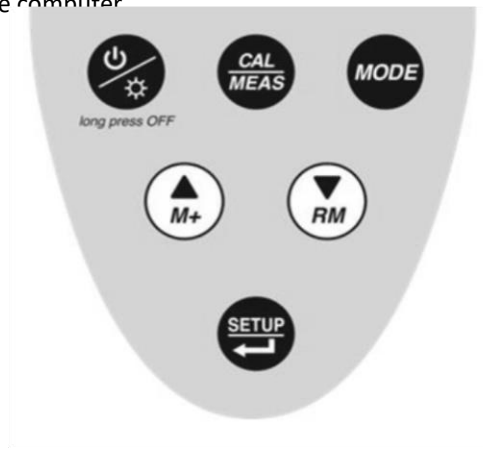
- Momentary press** ----- <1.5 seconds
- Long press** ----- >1.5 seconds



Turn on the meter










Press  to turn on the meter: LCD full display → display colors RGB test with 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"> In the power-off mode, press this key to turn on the meter In the measurement mode, press this key to turn on or turn off the backlight display
	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"> pH70+DHS: press this key to select measurement mode: pH → mV, COND70+: press this key to select measurement mode: COND → TDS → SAL PC70+DHS: press this key to select measurement mode: pH → mV → COND → TDS → SAL
	Momentary press	<ul style="list-style-type: none"> In the measurement mode, press this key to enter in the calibration mode In the calibration mode or the setup mode, press this key to return in measurement mode In the recall mode (RM), press this key to return to the measurement mode
	Momentary press	<ul style="list-style-type: none"> In the measurement mode, press this key to enter in the parameter set-up main menu In the calibration mode, press this key to confirm calibration In the parameter set-up mode, press this key to select programs
 	Long press	<ul style="list-style-type: none"> In the mode of manual temperature compensation (MTC), when press and hold these keys, the temperature value flashes, then press this keys to change the temperature value, and press  to confirm
	Momentary press	<ul style="list-style-type: none"> In the recall mode (RM), press momentarily this key to change the storage serial number, press and hold this key to change the number quickly In the setup mode, press this key to scroll menu and submenu In the submenu mode, press this key to change parameters and values In the measurement mode, press  key to store manually the value In the measurement mode, press  key to recall the stored measuring value

Meter Connections

Models	Photos	Description
pH70+DHS		<ul style="list-style-type: none"> BNC socket— pH electrode or ORP electrode RCA socket —temperature probe
COND70+		<ul style="list-style-type: none"> BNC socket— conductivity electrode, RCA socket — temperature probe

<p>PC70+DHS</p>		<ul style="list-style-type: none"> •BNC socket —pH electrode or ORP electrode, •BNC socket— conductivity electrode, •RCA socket— temperature probe
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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:

NOF -Normal (default) **HI** -High (longer time) **Lo** - Low (shorter time.)

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

Parameter selection

Only for PC70+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.

Automatic Power Off

If the meter stops operation for 20 minutes, It will turn off automatically. In the setup menu P6.8 the user has the possibility to disable this option. In the automatic storage mode, the automatic power off is not possible.

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.

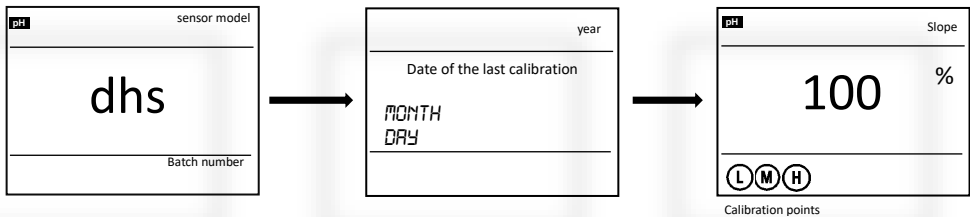
If not, the instrument will work as a standard pH meter.

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.

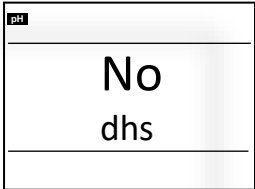
And It hasn't the battery, so It is possible to stock the electrode as normal one.

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:



Note: 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 4.01 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, display get blue color and show 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 ≤ ±0.1pH
Two-point calibration	7.00 pH and 4.01 pH or 1,68 pH	6.86 pH and 4.01 pH or 1,68 pH	 	Range<7.00pH
	7.00 pH and 10.01 pH	6.86 pH and 9.18 pH	 	Range>7.00pH
Three-point calibration	7.00 pH, 4.01 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 (≤ ±0.02pH), the meter should be calibrated immediately before taking a measurement.

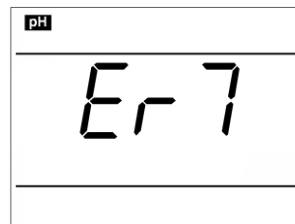
For general accuracy ($\geq \pm 0.1 \text{pH}$), the meter can be calibrated and used for approximately one week before the next calibration.

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

Due calibration

Pre-set calibration interval (begin from the date of last calibration) to remind due calibration in a preset period per parameter P1.2 (DC). During due calibration, **Er 7** in red color appears on LCD. The meter can't continue operation and Er 7 icon disappears until the calibration is done, or when select No per parameter P1.2.



Note: If DHS electrode is link, due data calibration is refer to DHS last calibration (is possible to check when DHS is activated or in P1.3 parameter setting -next paragraph-)

Check calibration date


Check the date and time of last calibration to decide whether new calibration is needed. Please refer to parameter setting P1.3. If DHS electrode is link last calibration date is refer to DHS last calibration.

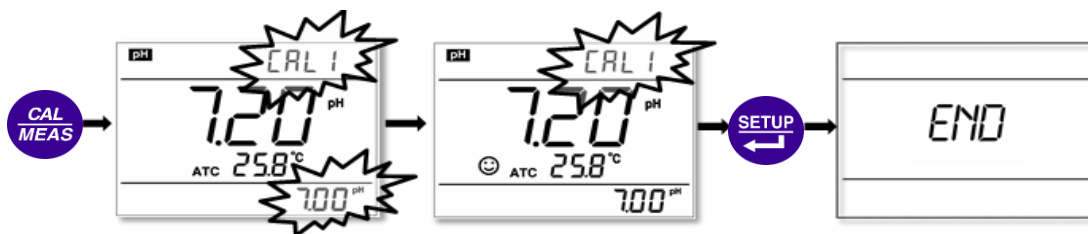
pH Meter Calibration

Press **CAL MEAS** key to enter into the calibration mode (the display get blue color), "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.


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.

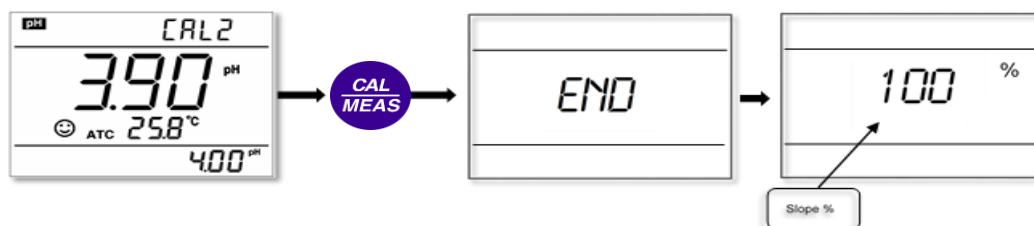
Er 2 displays if press **SETUP** key before the value is stable.

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. After the 1st point calibration, the meter's display will show at the top right a blinking CAL2, and show at the bottom right blinking 4.01 pH and 10.01 pH alternately, indicating using pH4.01 or pH10.01 buffer solution to make the 2nd 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 4.01 pH, stability  icon displays on LCD. Press **SETUP** 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 10.01 pH, indicating using pH10.01 buffer solution to make the 3rd 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 show a blinking CAL 1 icon at the top right of LCD, indicating the meter enters into the 1st 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 CAL 2 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  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.

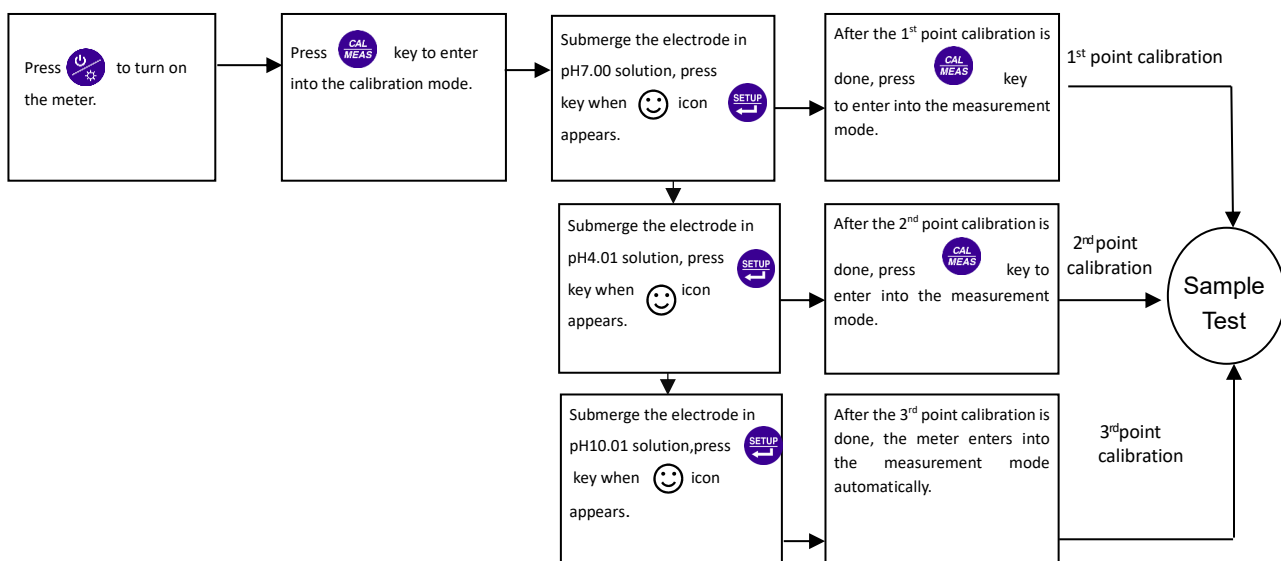
The meter can perform 1-2 point customer-defined calibration. When the 1st point calibration is done, press  key, the meter exits from calibration mode. This is one-point customer-defined calibration.

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.



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.

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 ≥ 3 min.	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 (< -60 mV or > 60 mV)	1. Check whether there are bubbles in glass bulb.
<i>Er 5</i>	Electrode slope out of range ($< 85\%$ or $> 110\%$)	2. Check whether pH buffer solution is correct. 3. Replace with new pH electrode.
<i>Er 6</i>	pH measuring range out of range (< -2.00 pH or > 16.00 pH)	1. Check whether the electrode is suspended. 2. Check whether the meter connects the electrode well. 3. Check whether the electrode is damaged
<i>Er 7</i>	Enter in pre-set due calibration to remind due calibration	Press  key to perform calibration or cancel due calibration setup per parameter P1.2

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.

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 cm^{-1}	K=1.0 cm^{-1}			K=10 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 mS/cm	2-20 mS/cm
	111.9 mS/cm	20-200 mS/cm

Calibration intervals

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

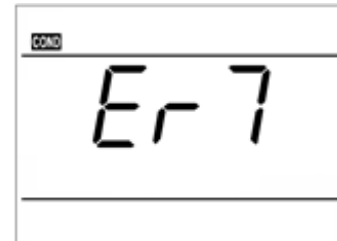
Solution	Temperature compensation coefficient
NaCl solution	2.12%/°C
5% NaOH solution	1.72%/°C
Dilute ammonia solution	1.88%/°C
10% hydrochloric acid solution	1.32%/°C
5% sulfuric acid solution	0.96%/°C

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.

Due calibration

Pre-set calibration interval (begin from the date of last calibration) to remind due calibration in a preset period per parameter P2.3 (DC). During due calibration, ER 1 in red color appears on LCD. The meter cannot continue operation and ER 1 icon disappears until the calibration is done, or when select No per parameter P2.3.



Check the calibration date

Check the last calibration date to see whether a new calibration is needed per parameter P2.4.

Conductivity Calibration

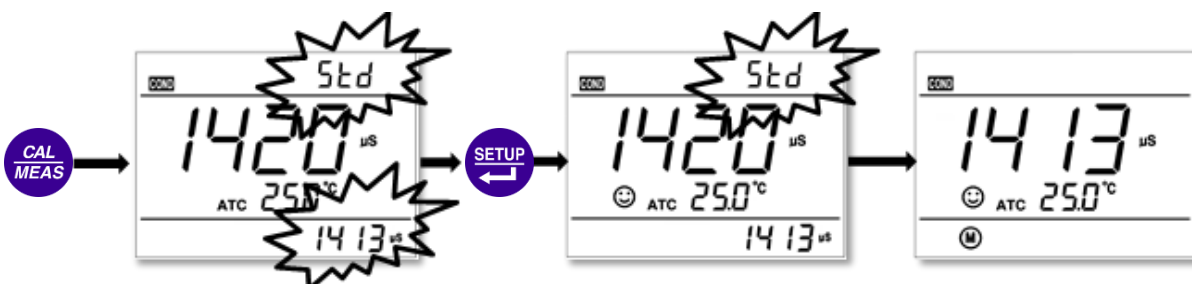
example of calibration at 1413µS/cm


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.

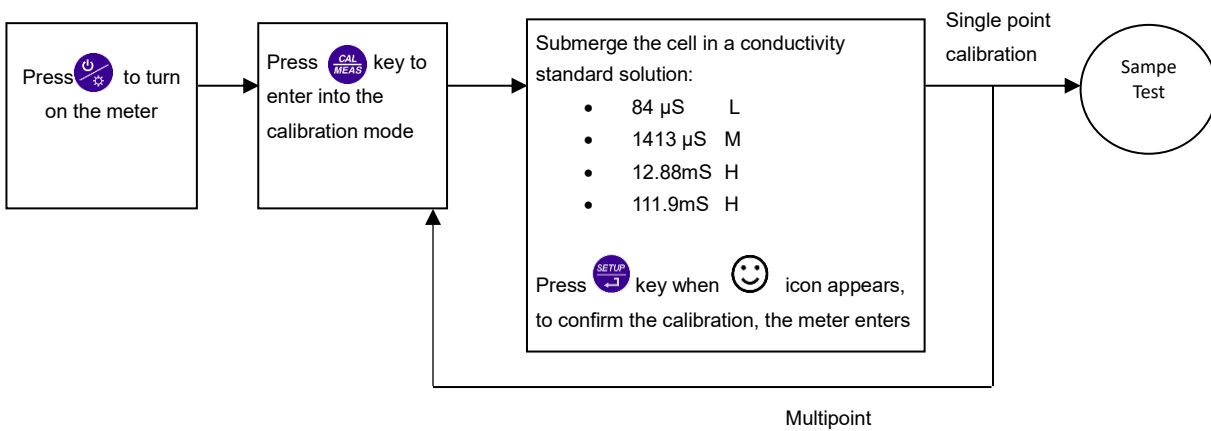
Press **CAL MEAS** key to enter into the calibration mode. The meter's display gets blue color and will show blinking "STD" at the top right, and scanning and locking process of calibration solution at the bottom right.

ER 2 appears if press **SETUP** key before the value is stable.

When the meter locks 1413 µS, stability 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.




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 147µS/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 and the display gets blue color.




Rinse the electrode in pure water, allow it to dry, and submerge it in 147 $\mu\text{S}/\text{cm}$ 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 $\mu\text{S}/\text{cm}$, 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 $\mu\text{S}/\text{cm}$
	1300 - 1500 $\mu\text{S}/\text{cm}$
	> 1500 $\mu\text{S}/\text{cm}$

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
Er 1	Wrong conductivity calibration solution or the meter recognition of calibration solution out of range	<ol style="list-style-type: none"> 1.Check whether conductivity calibration solution is correct. 2.Check whether the meter connects the electrode well. 3.Check whether the electrode is damaged.
Er 2	Press  key when measuring value is not stable during calibration.	Press  key when  icon appears
Er 3	During calibration, the measuring value is not stable for ≥3min.	<ol style="list-style-type: none"> 1.Shake the electrode to eliminate bubbles in electrode head. 2.Replace with new pH electrode.
Er 7	Enter in pre-set due calibration to remind due calibration	Press  key to perform calibration or cancel due calibration setup per parameter P2.3.

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, Salinity 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 or salinity.


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

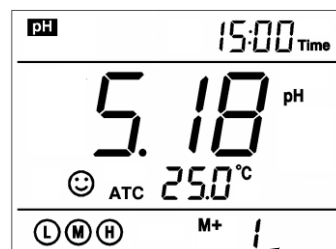
Common used TDS conversion factors

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 mS/cm	0.81
10-100 mS/cm	0.94






Datalogger functions (pH70+DHS, COND70+, PC70+DHS)

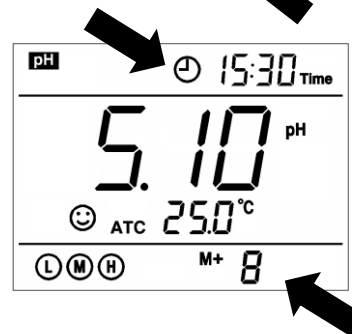
Manual storage

When ☺ icon appears, press momentarily  key, M+ icon and storage serial number appear on LCD, storing measuring information.







Automatic timing storage

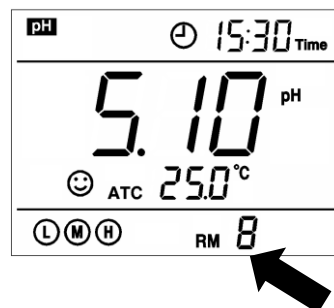
Set the storage timing into the setup menu P6.3,  icon appears on LCD and the meter enters into the timing storage mode. Press momentarily  key to start the data automatic storage,  flashes on the display. To stop the recording, press momentarily  key,  icon stops flashing and the meter stops automatic storage. In automatic storage mode, manual storage does not work.



Set time 00:00 per parameter P6.3 to exit from the automatic storage mode.

Recall stored value

In the measurement mode, press  key to recall the last stored measuring value. RM icon and storage serial number appear on the display. Press  and  keys to slide all the stored values. Press  to return in measurement mode.






Clear stored value

Select YES into the setup menu P6.7 to clear all stored value.

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

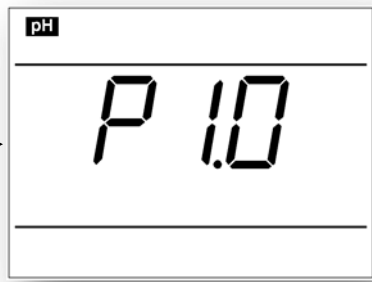
In **P1.0** mode, press  key to enter in submenu P1.1 of pH parameter setting, then press  and  keys to switch among submenu: **P1.1→P1.2→P1.3→P1.4→P1.5→P1.6→P1.7.**

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→P2.3→P2.4→P2.5→P2.6→P2.8→P2.9.**

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

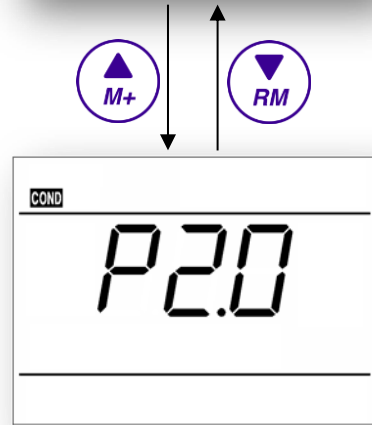
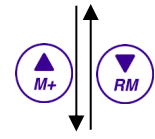
In **P6.0** mode, press  key to enter in submenu P6.1 of basic parameter setting, then press  and  keys to switch among submenu: **P6.1→P6.2→P6.3→P6.4→P6.5→P6.6→P6.7→P6.8.**

Main menu of parameter setting



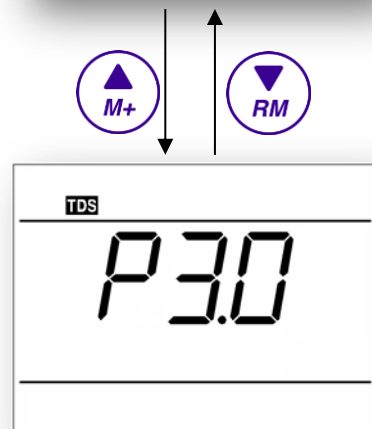
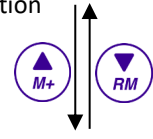
Submenu of pH parameter setting

- P1.1 Select pH standard solution
- P1.2 Set due calibration
- P1.3 Check calibration date
- P1.4 Select resolution
- P1.5 Restore to factory setting
- P1.6 Set stability criteria
- P1.7 Temperature calibration



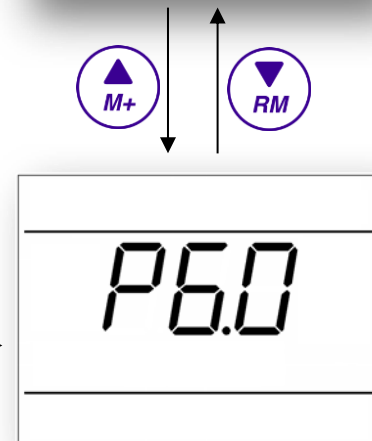
Submenu of conductivity parameter setting

- P2.1 Select electrode constant
- P2.2 Select conductivity standard solution
- P2.3 Set due calibration
- P2.4 Check calibration date
- P2.5 Select reference temp.
- P2.6 Adjust temperature compensation coefficient
- P2.8 Restore to factory setup
- P2.9 Temperature calibration



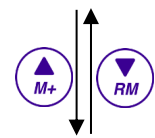
Submenu of TDS parameter setting

- P3.1 Adjust TDS factor



Submenu of basic parameter setting

- P6.1 Select temperature unit
- P6.2 Select backlight time
- P6.3 Adjust timing storage time
- P6.4 Adjust date
- P6.5 Adjust time
- P6.6 Parameters selection
- P6.7 Clear stored value
- P6.8 Automatic power-off setup




Connection to PC and DataLink+ software (pH70+DHS, COND70+, PC70+DHS)

USB connection

With this series of instruments the user has the possibility to link the device with a PC through USB, in order to:

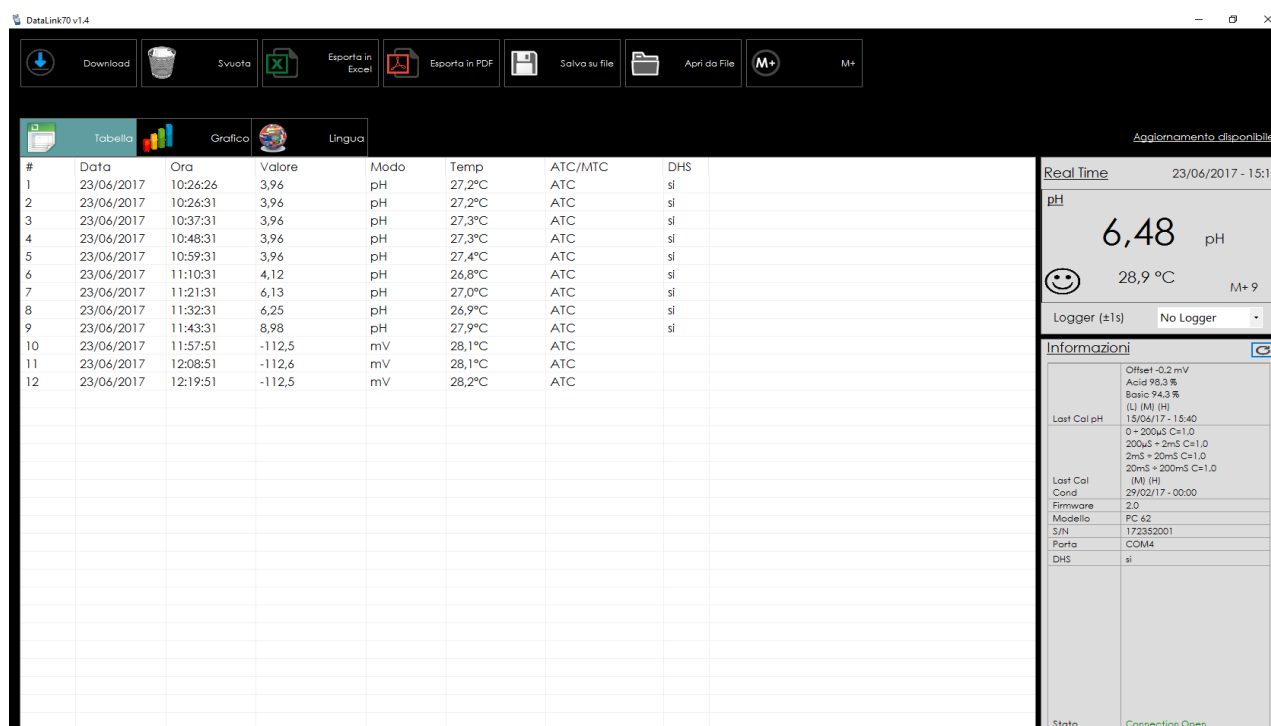
- Improve the management of the values stored with datalogger memory mode
- Take real time measurement directly displaying the results to the PC

The software is free-download on Giorgio Bormac website and is compatible from Windows7 upward. When the device is correctly link with the PC,  icon appears on the instrument display.

For an easier use the software is available in 6 languages.

Software interface

- **Download:** press this key, all the data stored in the meter is downloaded to the computer. pH, mV, Conductivity, TDS and Salinity are sorted in the program.
- **Clear:** press this key to empty the table with the stored values.
- **Export to excel/PDF:** press these keys to export the stored value to Microsoft Excel file or in PDF report file (with GLP, instruments and calibration information).
- **Save/Open from file:** press these keys to manage the stored values.
- **M+:** During operation, press this key to store manually or begin an automatic datalogger. The measuring information is downloaded to the computer through USB and will not be stored in the meter. The stored data during operation is the same as the data shown on the meter.
- **Table/Chart:** display mode of stored values. GLP information, Temperature, DHS (for pH parameters) are simultaneously viewable.
- **Real Time:** In this display the user can take real time measurement directly displaying the results to the PC (Date and time, actual value, stability icon, actual temperature and set timing storage are reported).
- **Information:** In this display are show the data of the actual calibrations (pH, -DHS if link- and conductivity) and other information about the device (Model, firmware and serial number of the instrument, DHS link or not)



#	Data	Ora	Valore	Modo	Temp	ATC/MTC	DHS
1	23/06/2017	10:26:26	3,96	pH	27,2°C	ATC	si
2	23/06/2017	10:26:31	3,96	pH	27,2°C	ATC	si
3	23/06/2017	10:37:31	3,96	pH	27,3°C	ATC	si
4	23/06/2017	10:48:31	3,96	pH	27,3°C	ATC	si
5	23/06/2017	10:59:31	3,96	pH	27,4°C	ATC	si
6	23/06/2017	11:10:31	4,12	pH	26,8°C	ATC	si
7	23/06/2017	11:21:31	6,13	pH	27,0°C	ATC	si
8	23/06/2017	11:32:31	6,25	pH	26,9°C	ATC	si
9	23/06/2017	11:43:31	8,98	pH	27,9°C	ATC	si
10	23/06/2017	11:57:51	-112,5	mV	28,1°C	ATC	
11	23/06/2017	12:08:51	-112,6	mV	28,1°C	ATC	
12	23/06/2017	12:19:51	-112,5	mV	28,2°C	ATC	

Real Time 23/06/2017 - 15:13

pH

6,48

pH

😊 28,9 °C M+ 9

Logger (±1s) No Logger

Informazioni

Offset -0,2 mV
Acid 99,3 %
Basic 94,3 %
(L) (M) (H)

Last Cal pH 15/06/17 - 15:40
0 = 200µS C=1.0
200µS = 2mS C=1.0
2mS = 20mS C=1.0
20mS = 200mS C=1.0
(M) (H)

Last Cal Cond 29/02/17 - 00:00


Firmware 2.0
Modello PC 62
S/N 172352001
Porta COM4
DHS si

Stato Connection Open

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
	P1.2	Set due calibration	dC	No - H00 - D00	No
	P1.3	Check the date of the last calibration	/	-	-
	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 $\pm 5^{\circ}\text{C}$	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	STD—CUS	STD
	P2.3	Set due calibration	dC	No - H00 - D00	No
	P2.4	Check the date of the last calibration	/	-	-
	P2.5	Select reference temperature	tREF	15~30 $^{\circ}\text{C}$	25 $^{\circ}\text{C}$
	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 $\pm 5^{\circ}\text{C}$	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	/	$^{\circ}\text{C}$ — $^{\circ}\text{F}$	$^{\circ}\text{C}$
	P6.2	Select backlight timing	BL	1 - 2 - 3 - On	1minute
	P6.3	Adjust timing storage time	/	-	00:00
	P6.4	Adjust date	/	-	-- -- --
	P6.5	Adjust time	/	-	--- --
	P6.6	Parameters selection	PARAM	No/Yes for each parameters	Yes
	P6.7	Clear stored data	CLr	No - Yes	No
	P6.8	Automatic power off setup	ROFF	On - Off	On

Appendix II: Self-diagnosis information

Icons	Self-diagnosis information	pH	Conductivity
<i>Er 1</i>	Wrong pH buffer solution or the meter recognition of calibration solution out of range	√	√
<i>Er 2</i>	Press  key when measuring value is not stable during calibration	√	√
<i>Er 3</i>	During calibration, the measuring value is not stable for ≥3min.	√	√
<i>Er 4</i>	Electrode zero electric potential out of range (<-60mV or >60mV)	√	
<i>Er 5</i>	Electrode slope out of range (<85% or >110%)	√	
<i>Er 6</i>	pH measuring range out of range (<-2.00 pH or >16.00pH)	√	
<i>Er 7</i>	Enter in pre-set due calibration to remind due calibration	√	√