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Introduction

Thanks for purchasing 60 benchtop 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 for laboratory and industry.
In order to use and maintain the instrument properly, please read the manual thoroughly before use.
To improve instrument performance constantly, we reserve the right to change the manual and accessories without giving notice in advance.

Measurement parameters

Measurement parameters	**pH60 DHS**	**COND 61**	**PC62 DHS**
pH/mV	**√**		**√**
Conductivity/TDS/Salinity		**√**	**√**
Temperature	**√**	**√**	**√**

Basic features

- 3 Colors display for intuitive operations
- The microprocessor-based benchtop meter features automatic calibration, automatic temperature compensation, function set-up and self-diagnostics.
- The meter's digital filter improves measurement speed and accuracy. There is reading stability display.
- The meter is dust-proof and water-proof, meeting the IP54 rating.
- Temperature calibration function.
- Selection of parameters to be display (only for PC62 DHS)
- Meet GLP, clock display, manual storage and automatic timing storage, USB port and RS232 socket

pH measurement features (suited for model pH60 DHS and PC62 DHS)

- 1-3 point automatic calibration, the meter provides calibration guide and automatic checking function.
- The meter is able to recognize up to 8 types of pH standard buffer solutions. There are three options of standard buffer solution: USA series, NIST series and customer-defined solution set-up.
- The meter provides reading stability criteria.
- The meter recognizes DHS Sensor

Conductivity measurement features (suited for model COND61 and PC62 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

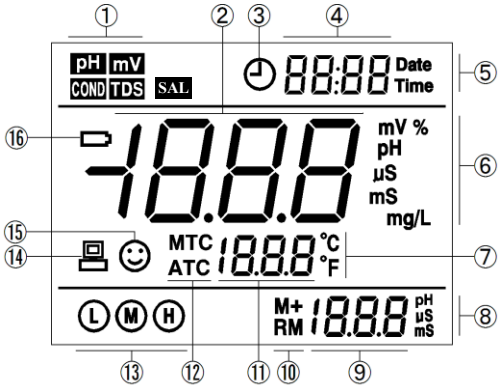
Data sheet

	Specifications		Models
pH	Range	（-2.00 ~ 16.00）pH	pH 60 PC 62
	Resolution	0.1/0.01 pH	
	Accuracy	±0.01 pH ±1digit	
	Temperature compensation	（0 ~ 100）°C（manual or automatic）	
	Multi-point calibration	1-3 point	
	Buffer value	USA: 1,68 - 4,00 - 7,00 - 10,01pH NIST: 1,68 - 4,01 - 6,86 - 9,18pH 2 value CUSTOMER	
mV	Range	+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	C0ND 61 PC 62
	Resolution	0.01/0.1/1µS/cm 0.01/0.1 mS/cm	
	Accuracy	±2.0% FS	
	Temperature compensation	（0 ~ 80）℃（manual or automatic）	
	Electrode constant	0.1 / 1 / 10 cm^{-1}	
	Multi-point	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	pH 60 C0ND 61 PC 62
	Resolution	0.1℃	
	Accuracy	±0.5℃±1digit	
Power		5V DC / 220 V	
IP rating		IP54	
Dimension & Weight		Meter: (160×185×70)mm / 550g	
Data Storage and Connections		500 slots with date and time / USB type B – RS232	

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

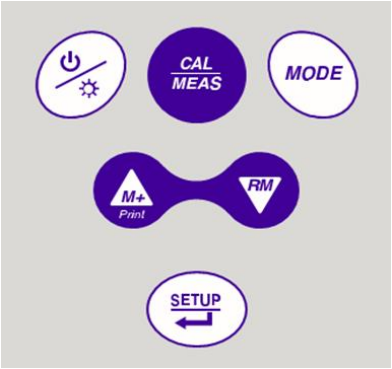


- **Green: Measurement and setup mode**
- **Blue: Calibration mode**
- **Red: Alarm/Error**

(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

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 / Long press	In power-off mode, press this key to turn on the meter In measurement mode, press and hold this key for 2 seconds to turn off the meter
MODE	Momentary press	Press this key to select measurement mode • pH60 DHS: pH → mV, • COND 61: COND → TDS → SAL • PC62 DHS: pH → mV → COND → TDS → SAL
CAL MEAS	Momentary press	In measurement mode, press this key to enter in the calibration mode In 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
SETUP	Momentary press	In measurement mode, press this key to enter in the parameter set-up main menu In calibration mode, press this key to confirm calibration In parameter set-up mode, press this key to select programs
M+ Print / RM	Long press	In 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 SETUP to confirm
	Momentary press	In recall mode (RM), press momentarily this keys to change the storage serial number, press and hold this key to change the number quickly In setup mode, press this key to scroll menu and submenu In submenu mode, press this key to change parameters and values In measurement mode, press M+ to store or print manually the value In measurement mode, press RM to recall the stored measuring value

Meter Connections

Models	Photos	Description
pH60 DHS		•BNC socket— pH electrode or ORP electrode •RCA socket —temperature probe •Banana 4mm —reference electrode •USB type B — Link with PC •RS232—Link with printer • 5V/DC—Power supply
COND61		•BNC socket— conductivity electrode, •RCA socket — temperature probe •USB type B — Link with PC •RS232—Link with printer •5V/DC—Power supply
PC62 DHS		•BNC socket —pH electrode or ORP electrode, •BNC socket— conductivity electrode, •RCA socket— temperature probe •Banana 4mm —reference electrode •USB type B — Link with PC •RS232—Link with printer •5V/DC—Power supply

Stability indication

When the measuring value is stable, smiley icon ☺ appears on LCD.
If the smiley icon does not appear or flash, please do not get the reading value, or make calibration until the measuring value is stable.
In the parameter P1.6, there are 3 criteria for stability standard:
nor -Normal (default) HI -High (longer time) Lo- Low (shorter time.)
User can select suitable stability criteria according to different testing requirement.

Parameter selection

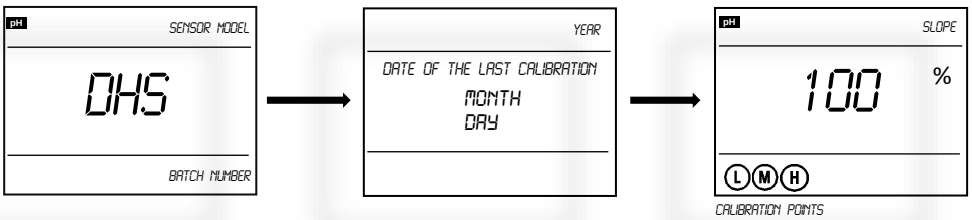
Only for PC62 DHS, enter in the setup menu P6.6, one by one the parameters blinks on the top left of the LCD; press keys for choose Yes (parameter enabled) or No (parameter disable). Then press SETUP key to confirm. Press CAL MEAS key to return in measurement mode.

Warning-Date and time in case of power detachment

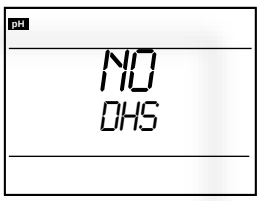
The date and time of the instrument reset when the power supply is interrupted.
When the power is first turned off and whenever the power supply is disconnected, the instrument will automatically require to enter current time and date (Parameters P6.4 / P6.5).
If the user does not do this, (press CAL MEAS key) the date and time will be displayed with a dash; the tool maintains its functionality, only GLP functions that require a time reference will be disabled.
At any time the user accessing setup menus P6.4 / P6.5 can update date and time

DHS Technology

DHS technology, developed by Giorgio Bormac company, allows to save calibration data inside the memory of the pH electrode.
It is possible to calibrate the XS DHS electrode in laboratory, in ideal conditions, using a XS DHS meter.
Calibration data, like date, slope, model and batch number, are memorized inside the electrode.
Moving this electrode on another XS meter DHS compatible, the electrode is ready for high quality measurement, extremely safety and without a new calibration.
Simply useful: XS Meters DHS compatible recognize automatically If a XS sensor DHS is connected.
If not, the instrument will work as a standard pH meter.
And the same is for the electrode: Is possible to connect a XS sensor DHS on a standard XS meter (NO DHS compatible) It will work as a standard pH electrode.
XS DHS sensors use just a BNC plug for the pH, and a RCA/Cinch plug for the temperature, exactly the same connectors of the standard XS electrodes.
And It hasn't the battery, so It is possible to stock the electrode as normal one.
After connecting the XS electrode DHS, meter will recognize It automatically, and display sequentially:



To calibrate the DHS sensor follow the calibration procedure at page 10 (pH meter calibration).
When the DHS electrode is disconnected, display shows:



DHS activation and disabling occur only in measurement mode.

pH Measurement

pH electrode information

On this meter is possible to use electrode with integrated temperature sensor else link two different probes for pH and temperature.
The BNC socket of electrode connects pH socket, RCA socket connects temperature socket. When dip the electrode in the solution, please stir the solution briefly and allow it to stay in the solution until a stable reading is reached.

pH calibration consideration - Standard buffer solution

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

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

Three-point calibration

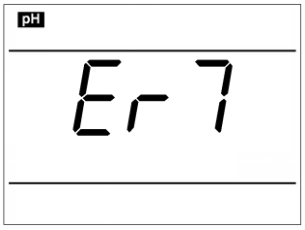
The instrument can perform 1-3 point calibration. The first point of calibration must be 7.00 pH (or 6.86 pH) standard solution, then select other standard solution to perform the second and the third point calibration; the meter is able to recognize the buffer solutions in analysis. During the calibration 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	M	Accuracy ⩽ ±0.1pH
Two-point calibration	7.00 pH and 4.00 pH or 1,68 pH	6.86 pH and 4.01 pH or 1,68 pH	L M	Range<7.00pH
	7.00 pH and 10.01 pH	6.86 pH and 9.18 pH	M H	Range>7.00pH
Three-point calibration	7.00 pH, 4.00 pH or 1,68 pH, 10.01 pH	6.86 pH, 4.01 pH or 1,68 pH, 9.18 pH	L M H	Large Range

Calibration Intervals

Calibration intervals depend on the sample, the electrode performance, and the required accuracy. For high accuracy measurements (≤ ±0.02pH), the meter should be calibrated immediately before taking a measurement. For general accuracy (≥±0.1pH), the meter can be calibrated and used for approximately one week before the next calibration.
The meter must be recalibrated in the following situations:
(a) New probe, or probe that is unused for a long period of time
(b) After measuring acids (pH<2) or alkaline solutions (pH>12)
(c) After measuring a solution that contains fluoride or a concentrated organic solution

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 connect, due data calibration is refer to DHS last calibration (User can check DHS date and time last calibration when connect DHS electrode or entering 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. (LC) If DHS electrode is link, last calibration date is refer to DHS last calibration.
In these series of instruments the user has two possibility for check the last calibration date:

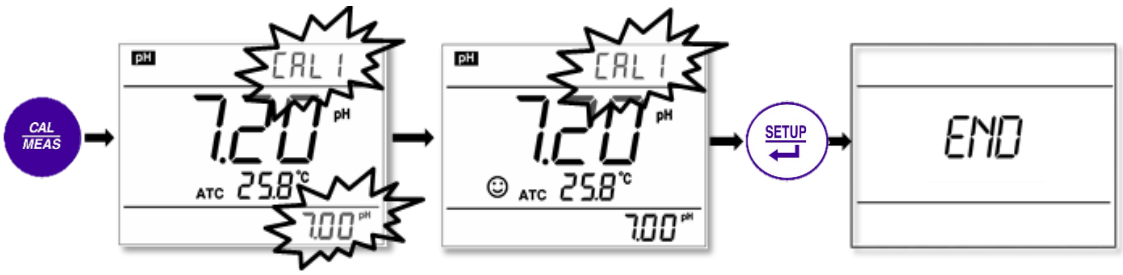
- **Display showing** → Default options, in P1.3 setup menu press SETUP key (**DSP**). The date and time of last calibration will blink on the LCD display
- **Print** → Connect the printer with RS232 socket, in P1.3 menu press M+ / RM keys, choose **PRT** and press SETUP key. The date and time of last calibration are printing; if DHS is link, also sensor model and batch number are printing.

Note: Before using GLP functions, please make sure that the date and time of the device are correct. Use P6.4/P6.5 to update.

pH Meter Calibration

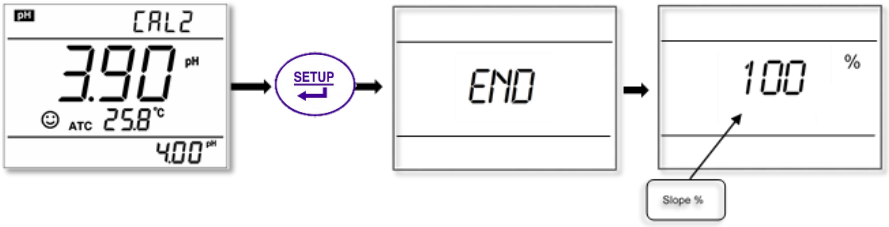
Press CAL MEAS key to enter into the calibration mode (the display gets blue color), "**CAL 1**" blinks at the top right of LCD and "7.00 pH "blinks at the bottom right of LCD, indicating using pH 7.00 buffer solution to make the 1st point calibration.
Rinse pH electrode in pure water, allow it to dry, 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 4.00pH and 10.01pH alternately, indicating using pH4.00 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 4.00 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 10.01pH, 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 SETUP key to calibrate the meter. Display shows "**End**" icon and slope. Than the meter goes automatically to the measurement mode, displays stable measuring value and calibration guide icons.

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

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 CAL/MEAS key, the display gets blue color and show a blinking **CAL1** 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 SETUP key, the main value blinks.

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

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

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

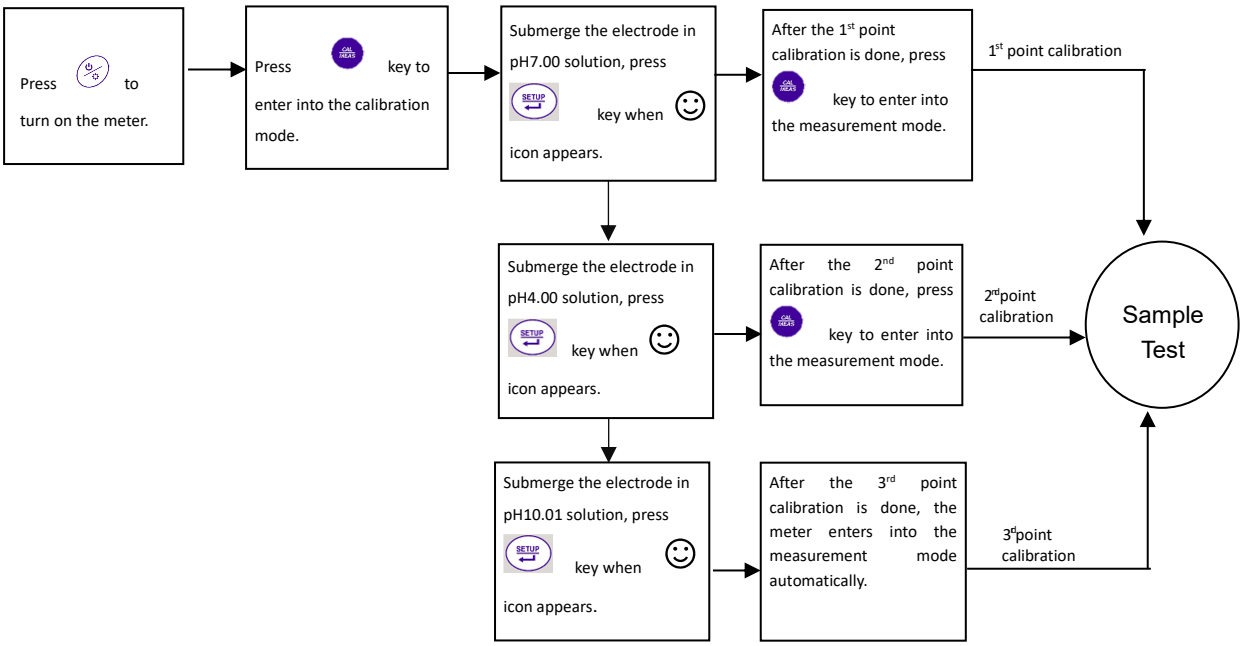
Note: For manual temperature compensation (MTC), when LCD displays the stable measuring value and ☺ icon, press SETUP key, then the temperature value blinks, press keysy to adjust the temperature value, and press SETUP key to confirm it. Then the main value blinks. Follow the above procedures to adjust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

The meter can perform 1-2 point customer-defined calibration. When the 1st point calibration is done, press CAL MEAS key, the meter exits from calibration mode. This is one-point customer-defined calibration.
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	M
< 6.5	L
> 7.5	H

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
Er 1	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.
Er2	Press SETUP key when measuring value is not stable during calibration.	Press SETUP key when ☺ icon appears
Er3	During calibration, the measuring value is not stable for ≥3min.	1.Check whether there are bubbles in glass bulb. 2.Replace with new pH electrode.
Er4	Electrode zero electric potential out of range (<-60mV or >60mV)	1.Check whether there are bubbles in glass bulb. 2.Check whether pH buffer solution is correct. 3.Replace with new pH electrode.
Er5	Electrode slope out of range （<85%or >110%）	
Er6	pH measuring range out of range （<0.00 pH or >14.00pH）	1.Check whether the electrode is suspended. 2.Check whether the meter connects the electrode well. 3.Check whether the electrode is damaged
Er 7	Enter in pre-set due calibration to remind due calibration	Press CAL MEAS 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 bleacher, 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 MODE 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 μS/cm**	**0.5 μS/cm~100 mS/cm**			**>100mS/cm**
Conductivity electrode constant	K=0.1 cm^{-1}	K=1.0 cm^{-1}			K=10 cm^{-1}
Standard solution	84μS/cm	84 μS/cm	1413 μS/cm	12.88 mS/cm	111.9 mS/cm

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**
L	84 μS/cm	0-200 μS/cm
M	1413 μS/cm	200-2,000 μS/cm
H	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.
Normally perform calibration per month.
For high accuracy measurements or large temperature deviation from the reference temperature (25°C), perform calibration per week.
Use conductivity standard solution to check whether there is error. Perform calibration for large error.
For new electrode or factory default setting, perform 3-point or 4-point calibration. Choose closer standard solution to the sample solution to perform 1- point or 2-point calibration. For example: 1413 μS/cm standard solution is suited for range 0-2,000 μS/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.

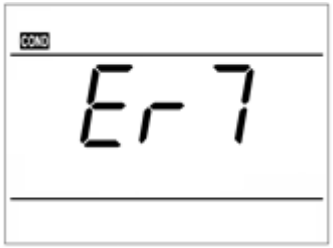
Note: When the coefficient for the temperature compensation is set to 0.00 (no compensation), the measurment value will be based on the current temperature.

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 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 P2.3.

Check calibration date

Check the date and time of last calibration to decide whether new calibration is needed. Please refer to parameter setting P2.4 (LC).
In this series of instruments the user has two possibility for check the last calibration date:

- **Display showing** → Default options, in P2.4 setup menu press SETUP key (**DSP**). The date and time of last calibration will blink on the LCD display
- **Print** → Connect the printer with RS232 socket, in P2.4 menu press keys, choose **PRT** and press SETUP key. The date and time of last calibration are printing.

Note: Before using GLP functions, please make sure that the date and time of the device are correct. Use P6.4/P6.5 to update.

Conductivity Calibration

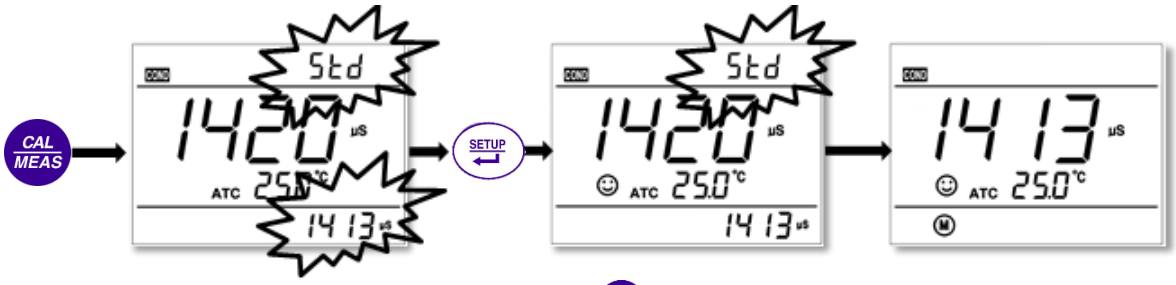
example of calibration at 1413µS/cm

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.

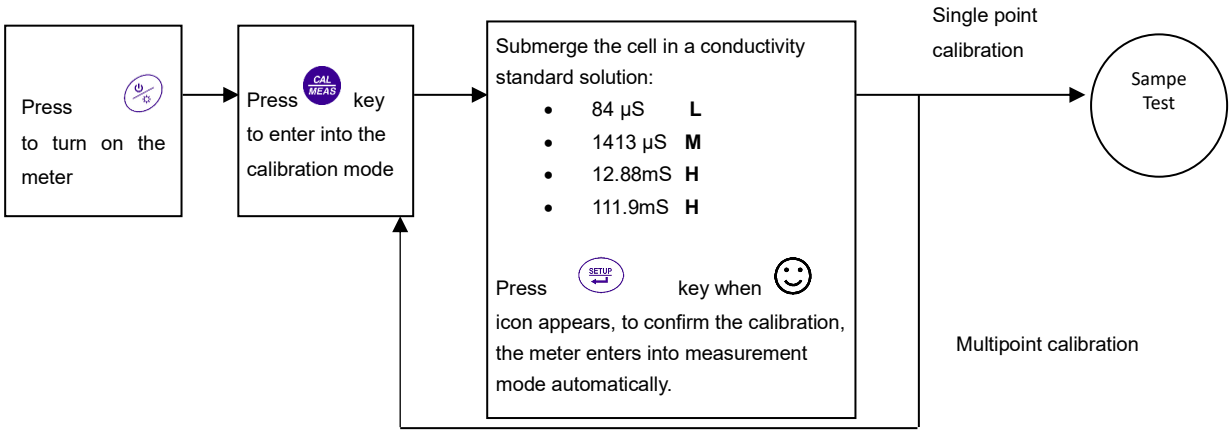
Press CAL/MEAS key to enter into the calibration mode. The meter's display get blue color and will show blinking "**std**" at the top right, and scanning and locking process of calibration solution at the bottom right.

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 (green color display) and LCD shows M icon at the bottom left.



If return from calibration mode without calibration, press CAL/MEAS 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 CAL/MEAS LCD display gets blue color and shows blinking **CUS** at the top right, indicating that the meter enters into customer-defined calibration.

- Rinse the electrode in pure water, allow it to dry, and submerge it in 147 µS/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 SETUP key, the measuring value blinks. "**CUS**" icon appears at the right top of the screen. Press key to adjust the measuring value to 147 µS/cm, and press SETUP key to calibrate the meter. After the calibration is done, the screen shows "End" icon and returns to the measurement mode.

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

Display icon	Suited range
L	< 1300 µS/cm
M	1300 - 1500 µS/cm
H	> 1500 µS/cm

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.

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	1.Check whether conductivity calibration solution is correct. 2.Check whether the meter connects the electrode well. 3.Check whether the electrode is damaged.
Er2	Press SETUP key when measuring value is not stable during calibration.	Press SETUP key when ☺ on appears
Er3	During calibration, the measuring value is not stable for ≥3min.	1.Shake the electrode to eliminate bubbles in electrode head. 2.Replace with new conductivity electrode.
Er7	Enter in pre-set due calibration to remind due calibration	Press CAL MEAS 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 µS/cm	0.60
100-1,000 µS/cm	0.71
1-10 mS/cm	0.81
10-100 mS/cm	0.94

Datalogger functions (pH60 DHS – COND61 – PC62 DHS)

Data saving destination

With this series of meters the user has the possibility to choose where save the data during the datalogger mode:

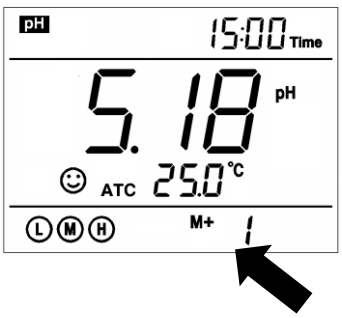
- **Memory/PC** (default option) → Into the setup menu P6.9 select **MEM** and press SETUP key.
  The data are saved on the internal memory of the device or on the DataLink70 software if the instrument is link with the PC.
- **Print** → Connect the printer with RS232 socket, in P6.9 menu press M+ Print / FIM keys, choose **PRT** and press SETUP key. The data store in datalogger mode are printed .

Both the options are available for automatic and manual storage mode (next section).

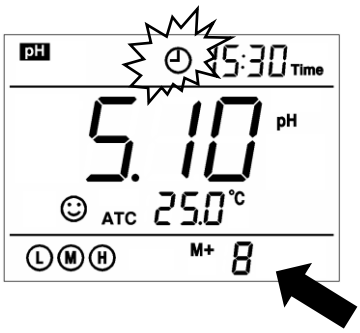
Note: Before using GLP functions, please make sure that the date and time of the device are correct. Use P6.4/P6.5 to update.

Manual storage (or printing)

When ☺ icon appears, press momentarily M+ Print key, **M+** icon and storage serial number appear on LCD, storing measuring information. If print mode is selected in setup menu P6.9, the value is printed.



Automatic timing storage (or printing)

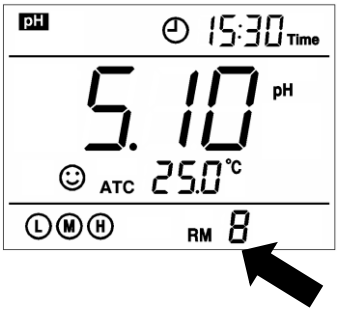


Set the storage timing into the setup menu P6.3, icon appears on LCD and the meter enters into the timing storage mode. Press momentarily key to start the data automatic storage (or printing), flashes on the display. To stop the recording, press momentarily key, icon stops flashing and the meter stops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

Set time 0 per parameter P6.3 to exit from the automatic storage mode.

Note: Before using a manual or automatic storage, please make sure you have chosen the correctly data save destination using setup menu P6.9 (previously section)

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 keys to slide all the stored values. Press to return in measurement mode.

Clear stored value

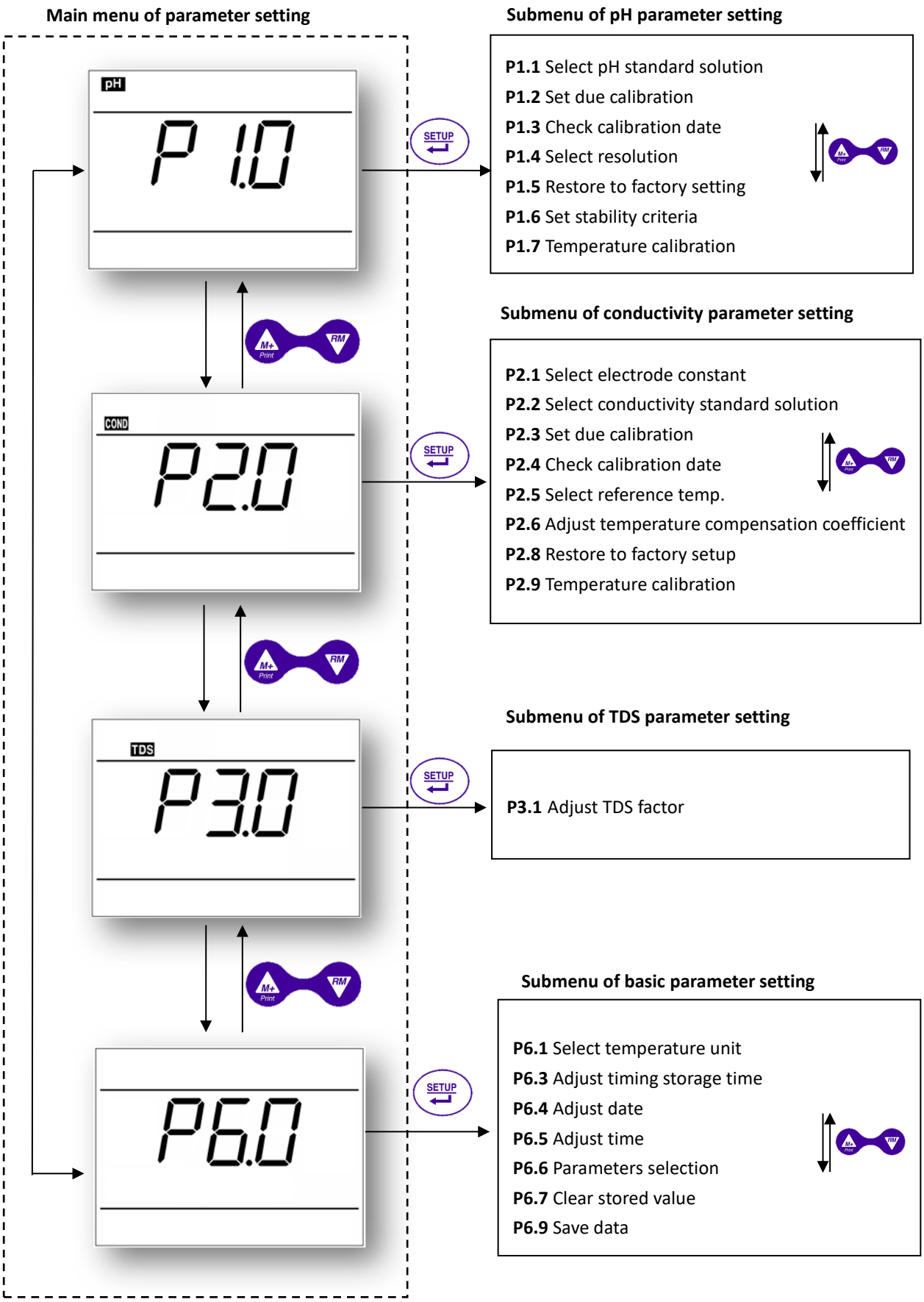
Select **YES** into the setup menu P6.7 to clear all stored value into the device's internal memory.

Setup Menu

Main menu and Submenu

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

- **P1.0**: pH parameter setting menu, press key to enter in submenu P1.1 of, then press keys to switch among submenu: **P1.1→P1.2→P1.3→P1.4→P1.5→P1.6→P1.7.**
- **P2.0**: Conductivity parameter setting menu, press key to enter in submenu P2.1, then press keys to switch among submenu: **P2.1→P2.2→P2.3→P2.4→P2.5→P2.6→P2.8→P2.9.**
- **P3.0**: TDS parameter setting press key to enter in submenu P3.1 to adjust TDS factor.
- **P6.0**: Basic parameter setting menu. press key to enter in submenu P6.1 , then press keys to switch among submenu: **P6.1→P6.3→P6.4→P6.5→P6.6→P6.7→P6.9.**


Main menu of parameter setting
pH
P 1.0
SETUP
M+ Print
RM
COND
P2.0
TDS
P3.0
P6.0
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
P6.3 Adjust timing storage time
P6.4 Adjust date
P6.5 Adjust time
P6.6 Parameters selection
P6.7 Clear stored value
P6.9 Save data

Connection to PC and DataLink 70 software

(pH60 DHS, COND61, PC62 DHS)

USB connection

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

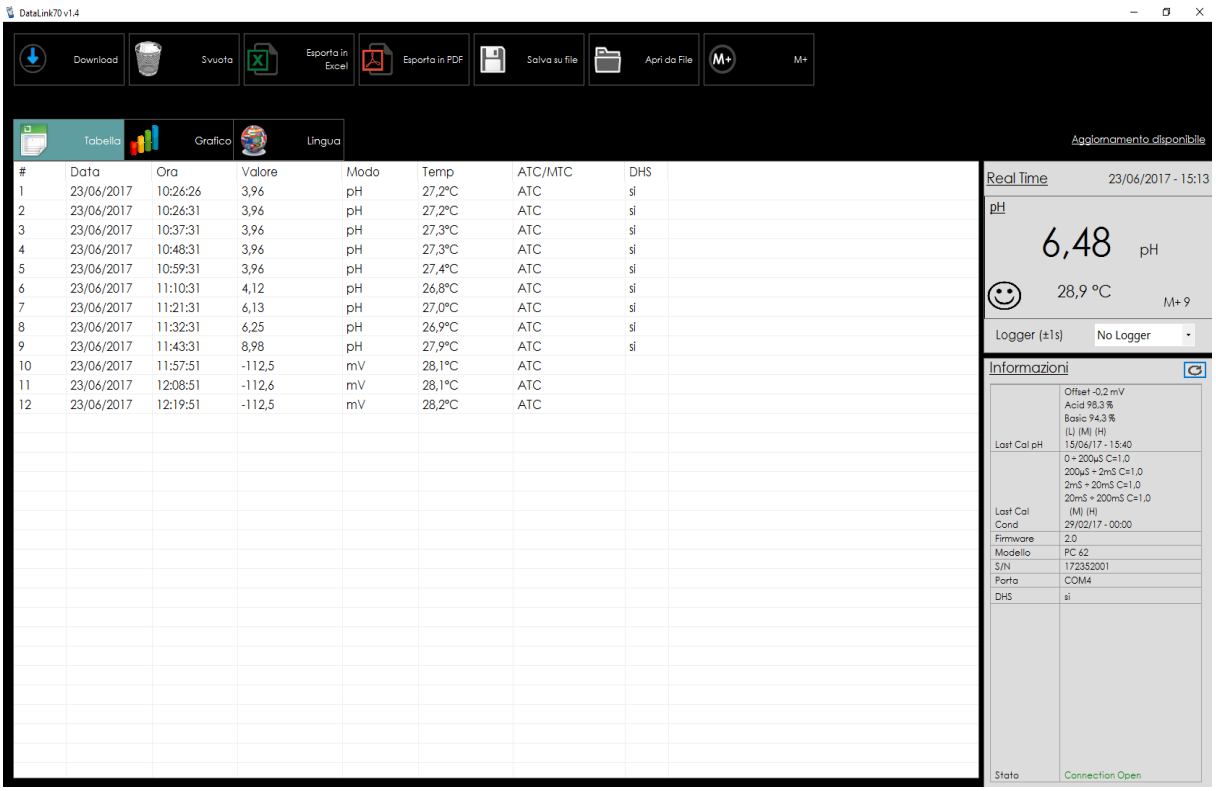
- Improve the management of the values stored with datalogger memory mode
- Take real time measurement directly displaying the results to the PC

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 Salinty are sorted in the program.
- **Clear:** press this key to emty 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)



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	LC	Display-Print	Display
	P1.4	Select resolution	rES	0.01—0.1	0.01
	P1.5	Restore to factory default setting	FS	No—Yes	No
	P1.6	Set reading stability criteria	SC	Normal—High—Low	Normal
	P1.7	Temperature calibration	tCAL	Calibration range± 5℃	Factory default value
P2.0 Cond.	P2.1	Select electrode constant	CELL	1.0—10.0—0.1	1.0
	P2.2	Select conductivity standard solution	SOL	USA—CUS	USA
	P2.3	Set due calibration	dC	No - H00 - D00	No
	P2.4	Check the date of the last calibration	LC	Display-Print	Display
	P2.5	Select reference temperature	trEF	15~30℃	25℃
	P2.6	Adjust temperature compensation coefficient	tCC	0.00~9.99	1.91
	P2.8	Restore to factory default setting	FS	No—Yes	No
	P2.9	Temperature calibration	tCAL	Calibration range± 5℃	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	/	℃—℉	℃
	P6.3	Adjust timing storage time	/	-	00:00
	P6.4	Adjust date	/	-	-- -- --
	P6.5	Adjust time	/	-	-- --
	P6.6	Parameters selection	PARM	No/Yes for each parameters	Yes
	P6.7	Clear stored data	CLr	No - Yes	No
	P6.9	Save Data	SAVE	Memory/PC – Print	Memory/PC

Appendix II: Self-diagnosis information

Icons	Self-diagnosis information	pH	Conductivity
Er 1	Wrong pH buffer solution or the meter recognition of calibration solution out of range	√	√
Er2	Press SETUP key when measuring value is not stable during calibration	√	√
Er3	During calibration, the measuring value is not stable for ≥3min.	√	√
Er4	Electrode zero electric potential out of range （<-60mV or >60mV）	√	
Er5	Electrode slope out of range （<85% or >110%）	√	
Er6	pH measuring range out of range （<-2.00 pH or >16.00pH）	√	
Er7	Enter in pre-set due calibration to remind due calibration	√	√