

70 Vio



pH - Cond - PC

INSTRUCTIONS MANUAL

vio

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1. Introduction

XS Instruments, globally recognized as a leading brand in the field of electrochemical measurements, has developed this new line of portable instruments completely produced in Italy, finding the perfect balance between performance, attractive design and ease of use.

The robustness and integrity of the case, the integrated brightness sensor and the practical carrying case make this instrument ideal for measurements directly in the field.

Thanks to the triple power supply and the ability to manually change the contrast and brightness of the display, this instrument is also suitable for use in the laboratory.

The innovative high definition color LCD display shows all the necessary information such as the measurement, the temperature, the buffers used for the last calibration (also customer), the condition of stability.

Everyone can use these tools thanks to the instructions that appear directly on the display. The calibration is in fact guided step by step and the instrument configuration menu is easy to consult. In addition, a LED indicates the status of the system to the user.

Up to 3 pH calibration points can be carried out between 10 automatically recognized values and 5 points for Conductivity; buffers chosen by the operator can also be used.

It is also possible to perform mV calibration for Redox sensors.

For an accurate measurement of the conductivity value it is possible to work with 3 different cell constants and to modify the compensation coefficient and the reference temperature.

It is always possible to consult the calibration data and the representation, through the icons of the buffers used, makes the calibration process more efficient.

Automatic or manual Data Logger function with values that can be stored in different GLP formats on the internal memory (1000 data) or on the PC.

The ideal solution for an accurate and precise measurement is to use an XS electrochemical sensor with an XS Instruments device and perform the calibrations by supplying XS Solution certified calibration solutions.

2. Safety informations

- ***Details of the words and symbols of warning***

The safety information in this manual is very important to avoid personal injury, damage to the instrument, malfunctions or incorrect results due to failure to comply with them. Read this manual carefully in its entirety and make sure you familiarize yourself with the tool before putting it into operation and starting to work with it.

This manual must be kept in the vicinity of the instrument, so that the operator can consult it if necessary.

Safety provisions are indicated with warning terms or symbols.

- ***Reporting terms:***

ATTENTION for a medium risk hazardous situation, which could lead to serious injury or death if not avoided.

ATTENTION for a dangerous situation with reduced risk which, if not avoided, can cause material damage, data loss or minor or medium-sized accidents.

ADVICE for important product informations.

NOTE for useful important informations.

Warning symbols:



Attention

This symbol indicates a potential risk and warns you to proceed with caution.



Attention

This symbol draws attention to a possible danger **from electric current**.



Attention

The instrument must be used following the indications of the reference manual. Read the instructions carefully.



Advice

This symbol draws attention to possible damage to the instrument or instrumental parts.



Note

This symbol highlights further information and tips.



• ***Additional documents that provide safety information***

The following documents can provide the operator with additional information to work safely with the measuring system:

- operating manual for electrochemical sensors;
- safety data sheets for buffer solutions and other maintenance solutions (ex storage);
- specific notes on product safety.



• ***Use according to destination***

This instrument is designed exclusively for electrochemical measurements both in the laboratory and directly in the field.

Pay attention to the technical specifications shown in the INSTRUMENT FEATURES / TECHNICAL DATA table; any other use outside them is to be considered unauthorized.

This instrument has been manufactured and tested in compliance with EN 61010-1 safety standards for electronic instruments and has left the factory in perfect technical conditions (see test report in each package) and safety.

The regular functionality of the device and the operator's safety are guaranteed only if all the normal laboratory safety standards are respected and if all the specific safety measures described in this manual are observed.

• ***Basic requirements for safe use***



The regular functionality of the device and the operator's safety are guaranteed only if all the following indications are respected:

- the instrument can only be used in accordance with the specifications mentioned above;
- if using the instrument with the power supply, use only the model supplied. If you need to replace the power supply, contact your local distributor;
- the instrument must operate exclusively in the environmental conditions indicated in this manual;
- the only part of the instrument that can be opened by the user is the battery compartment.
Carry out other operations only if explicitly authorized by the manufacturer.

• ***Unauthorized use***



The instrument must not be put into operation if:

- is visibly damaged (for example due to transportation);
- it has been stored for a long period of time in adverse conditions (exposure to direct light, heat sources or places saturated with gas or vapours) or in environments with conditions different from those mentioned in this manual.

• ***Device maintenance***



If used correctly and in a suitable environment, the instrument does not require maintenance procedure.

It is recommended to occasionally clean the instrument case with a damp cloth and a mild detergent. This operation must be performed with the instrument off and disconnected from the power supply and only by expert and authorized personnel.

The housing is in ABS / PC (acrylonitrile butadiene styrene / polycarbonate). This material is sensitive to some organic solvents, for example toluene, xylene and methyl ethyl ketone (MEK).

If liquids get into the housing, they could damage the instrument.

In case of prolonged non-use of the device, cover the BNC connectors with the special cap.

Do not open the instrument housing: it does not contain parts that can be maintained, repaired or replaced by the user. In case of problems with the instrument, contact your local distributor.

It is recommended to use only original spare parts. Contact your local distributor for information. The use of non-original spare parts can lead to malfunction or permanent damage to the instrument. Moreover, the use of spare parts not guaranteed by the supplier can be dangerous for the user himself.

For the maintenance of the electrochemical sensors, refer to the documentation present in their packaging or contact the supplier.

- ***Responsibility of the owner of the instrument***

The person who owns and uses the tool or authorizes its use by other people is the owner of the tool and as such is responsible for the safety of all users of the tool and third parties.

The owner of the instrument must inform users of the use of the same safely in their workplace and on the management of potential risks, also providing the required protective devices.

When using chemicals or solvents, follow the manufacturer's safety data sheets.

3. Instrumental features

- ***Parameters***



pH 70 Vio: pH, mV, ORP, Temp



COND 70 Vio: Cond, TDS, Sal, Temp



PC 70 Vio: pH, mV, ORP, Cond, TDS, Sal, Temp

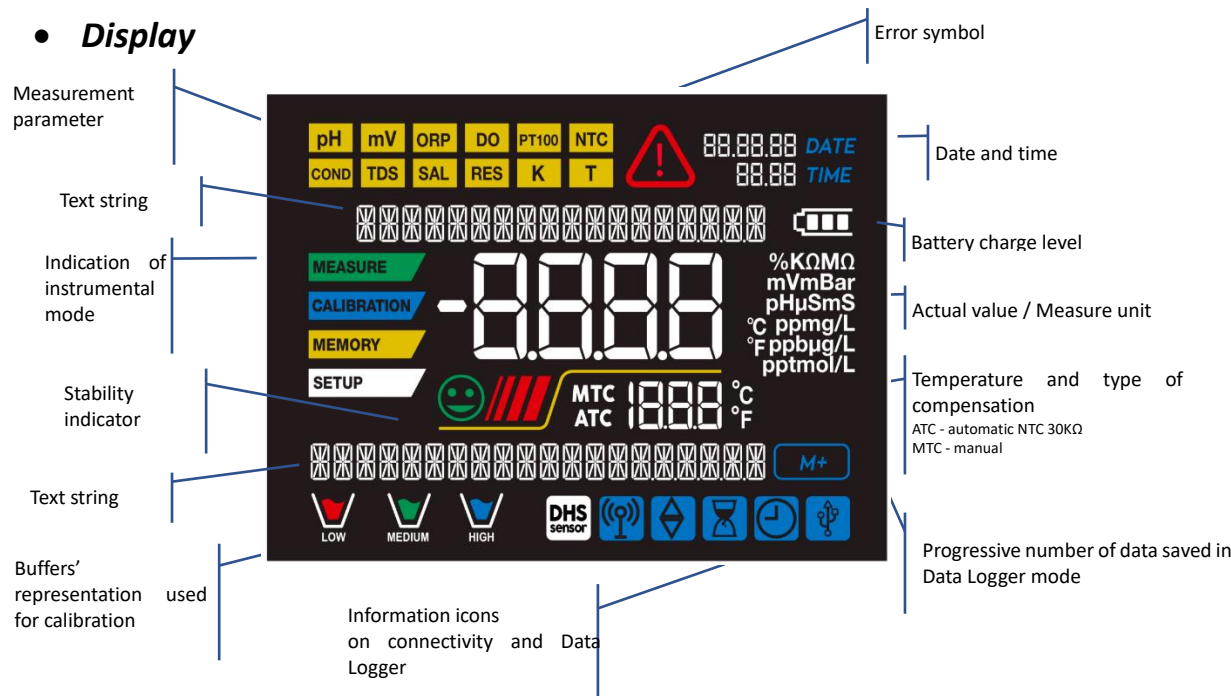
- Datasheet**



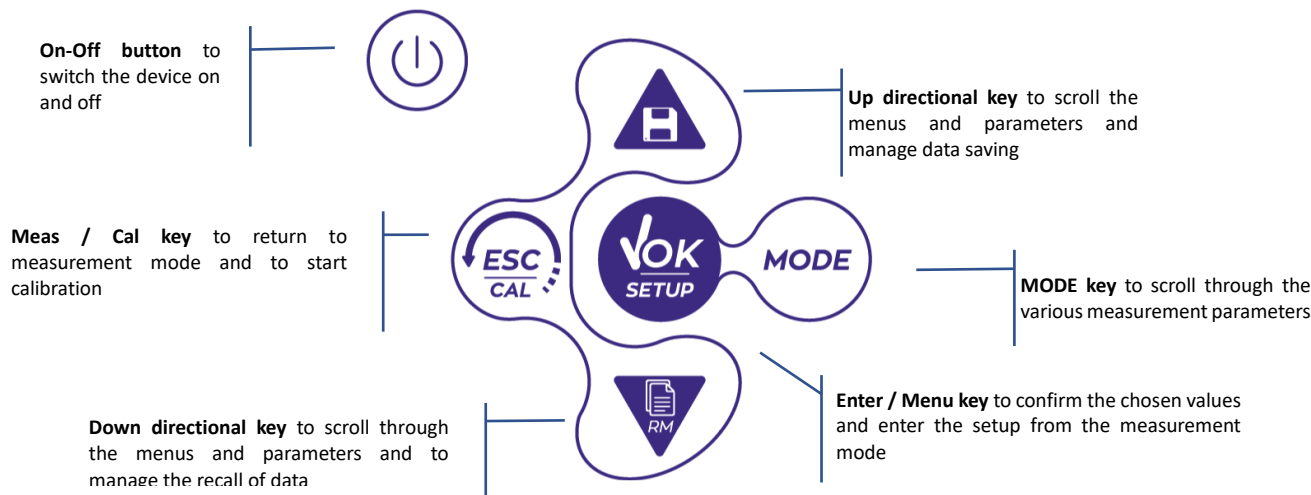
	Series 70 Vio
pH	pH 70 Vio - PC 70 Vio
Measuring range	-2...16
Resolution / Accuracy	0.1, 0.01 / ± 0.02
Recognized calibration points and buffers	AUTO: 1...3 / USA, NIST CUS: 2 user values
Buffers indication	Yes
Calibration report	Yes
Automatic DHS recognition	Yes
Stability filter	Low – Nor - High
mV	pH 70 Vio - PC 70 Vio
Range / Resolution	Range: -1000 ... +1900 / Resolution: 0.1 / 1
ORP	pH 70 Vio - PC 70 Vio
Calibrations points	1 point / 475 mV
Conductivity	COND 70 Vio - PC 70 Vio
Range / Resolution	0,00 – 20,00 – 200,0 – 2000 μ S / 2,00 – 20,00 – 200,0 mS Automatic scale
Recognized calibration points and buffers	1...5 / 84, 147, 1413 μ S, 12.88, 111.8 mS, 1 user value
Reference temperature	15...30 °C
Temperature coefficient	0,00...10,00 %/°C
TDS	COND 70 Vio - PC 70 Vio
Measuring range / TDS Factor	0,1mg/l...200 gr/l / 0.40...1.00
Salinity	COND 70 Vio - PC 70 Vio
Measuring range	0,1ppm ...100ppt
Temperature	pH 70 Vio - COND 70 Vio - PC 70 Vio
Measuring range	-10...110 °C
Resolution / Accuracy	0,1 / $\pm 0,5$ °C
Temperature compensation ATC (NTC30K Ω) and MTC	0...100 °C
System	
GLP with calibration Timer	Yes
Internal memory	1000 Dates
Display	High definition colours LCD
Brightness and contrast management	Manual and automatic with integrated sensor
IP protection	IP 57
Power supply	AA 1,5 V – 3 batteries / 5 V power supply with USB cable
Sound level during standard operation	< 80 dB
Environmental operating conditions	0 ... +60 °C
Maximum permissible humidity	< 95 % non-condensing
Maximum altitude of use	2000 m
System dimensions	185 x 85 x 45 mm
System weight	400 g
Reference regulations	EMC 2014/30/UE RoHS 2011/65/EU EN 61326-1 EN 61010-1

4. Description of the instrument

• Display



• Keyboard



- **LED**

All the instruments are equipped with a two-colours LED (red and green) which provide the user with important information on the status of the system:

Function	LED	Description
Power on	■	<i>Fixed</i>
Power off	■	<i>Fixed</i>
Standby	■	<i>Flashing every 20 s</i>
Measure stable	■	<i>Flashing every 3 s</i>
Errors during calibration	■	<i>Flashing every 1 s</i>
Errors during measurements	■	<i>Flashing every 3 s</i>
Time of saving the data	■	<i>On / Off in rapid succession</i>
Recall Memory mode	■ ■	<i>Alternate green and red, pause 5 s</i>
Selection confirm	■	<i>Switched on for 1 s</i>
Timed screens	■	<i>Fixed</i>
DHS deactivation	■	<i>Fixed</i>



5. Installation

- **Components supplied**

The instrument is always supplied inside the specific transport case; in the version without sensor it is always present:

Instrument with batteries, 5V adapter with USB cable, 1m S7/BNC connection cable, NT55 temperature probe, buffer solutions in single-dose bottle and / or sachet, paper tissues, screwdriver, beaker, electrode holder support -only for multi-parameter- multilingual user manual and test report.

Versions with the sensors(s) already included are also available. Contact your local distributor to be updated on the correct composition of the sales kit.

- **Implementation**

- The device leaves the factory ready to be used by the user.
- Batteries are included.

- **Connecting the power supply**

- in addition to batteries, the instrument can be powered via the mains;
- check that the electrical standards of the line on which the instrumentation will be installed respect the power supply voltage and frequency;
- use only the original power supply;
- connect the power supply to the USB cable and the other end of the cable (Micro USB) to the Micro USB port located on the front of the instrument;
- connect the power supply to a mains socket which is not difficult to reach.


ATTENTION


Danger of death or serious injury from electric shock.




Contact with live components can lead to injury or death.

- Use only the power supply provided.
- Do not put the power supply in contact with liquids nor in a condensing environment. Avoid thermal shock.
- All electrical cables and connections must be kept away from moisture or liquids.
- Check that the cables and plugs are not damaged, otherwise replace them.
- During use, do not cover the power supply and/or do not place it inside containers.

In addition to the power supply, the power supply can also come directly from the USB port of a PC by directly connecting the end of the USB cable to it. The ignition on the icon  indicates that the operation was successful.


If the instrument is powered by PC, the icon indicating the battery status disappears from the display .


- ***Power on, date and time update, power off***

Turn on the system by pressing the button . The display initially activates all segments, then appears:

- Device model and software.
- Settings relating to the most important parameters and any info on the DHS sensor.

On first use, and after each battery replacement, the instrument during the start-up phase will request the updating of the date and time.

- Using the directional keys, update the year and confirm with the key . Carry out the same operation with the month and day, and subsequently with hours and minutes.
- The instrument will enter measurement mode in the last parameter used.

To switch off the instrument, press the key  in measurement mode.

- ***Replacement of batteries***



The instrument works with 3 AA 1.5V batteries.

To proceed with the replacement:

1. Turn off the device.
Turn the instrument over with the display facing down and place it on a stable surface.
It is advisable to put a cloth so as not to scratch the display.
2. Using the screwdriver supplied, completely unscrew the screw close to the battery symbol.
3. Remove the battery stopper cap with the help of the lanyard.
4. Remove the 3 exhausted batteries (one in the left compartment and two in the right compartment) and insert the new ones. Pay attention to the correct polarity. Follow the diagram above the battery symbol in the rear compartment of the instrument.
5. Reinsert the battery holder and tighten the screw.




• **Transporting the instrument**



The instrument is always supplied with the appropriate transport case. Use only the original case to transport the instrument. If you need to buy it back, contact your local distributor.

The interior of the case is shaped to be able to house the instrument and the sensors still connected.

• **Key functions**

Button	Pression	Function
	Short	Press to turn the device on or off.
	Short	In measurement mode, press to scroll through the different parameters: <ul style="list-style-type: none"> • pH 70 Vio: pH → mV → ORP • COND 70 Vio: Cond → TDS → Sal • PC 70 Vio: pH → mV → ORP → Cond → TDS → Sal
	Short	<ul style="list-style-type: none"> • In calibration, setup and memory recall mode, press to return to measurement mode. • In measurement mode, press to start the calibration.
	Short	In measurement mode, press to enter the setup. In the setup menus, press to select the desired program and / or value. During calibration, press to confirm the value.
 	Short	<p>In the setup and subset menus press to scroll In the setup submenus, press to change the value In memory recall mode, press to scroll through the saved values. In MTC and customer calibration mode, press to change the value.</p> <p> : In measurement mode, press to save the data (manual Data Logger) or start and end the recording (Automatic Data Logger).</p> <p> : In measurement mode, press to recall the saved data.</p>
	Prolonged (3s)	In measurement mode, keep one of the two keys pressed to change the temperature in MTC mode (manual compensation, without probe). When the value starts to flash, the user can change the temperature value by entering the correct one. Then confirming with  .

IMPORTANT:

- When the Sleep mode is active (by default after two minutes of inactivity of the instrument) press any key to reactivate the brightness of the display.
- Only at this point do the keys regain their function.





• Inputs / Outputs connections

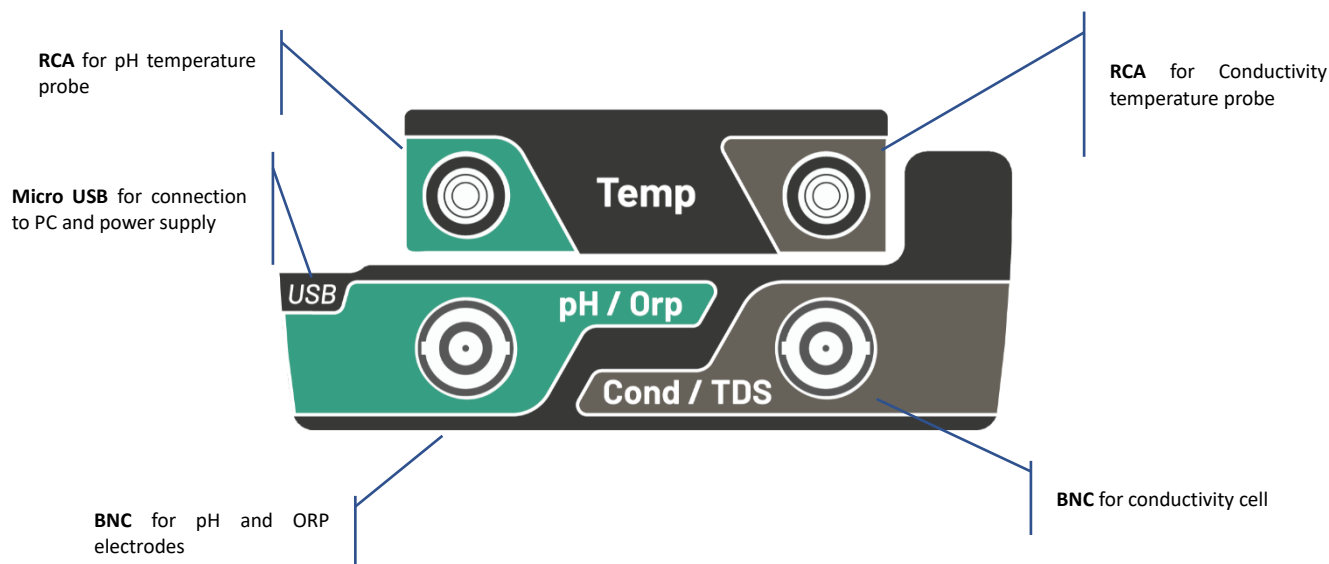
Use only original accessories guaranteed by the manufacturer.

If necessary, contact your local distributor.

The BNC connectors at the time of sale are protected by a plastic cap.

Remove the cap before using connecting the probes.

PC 70 Vio top panel





READ THE MANUAL BEFORE PROCEEDING TO CONNECT THE PROBES OR PERIPHERALS



• Symbols and icons on the display

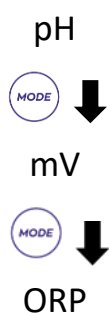
Symbol	Description	Symbol	Description
M+	Number of data stored in Data Logger mode on instrumental memory		Error in measurement or calibration
	Instrument connected to the DataLink+ software		FIXED: Automatic Data Logger set INTERMITTENT: Automatic Data Logger in operation
	FIXED: Calibration deadline set for that parameter INTERMITTENT: Calibration deadline active for that parameter		Press the directional keys to change the parameter or value on the display
	DHS digital sensor active		Battery charge indication
	Measurement stability indicator		The bars scroll if the measurement is not stable

6. Device operation

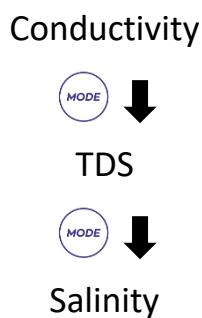
- After switching on, the instrument enters measurement mode in the last parameter used.
- To scroll through the different parameter screens, press the key ; the current measurement parameter is shown in the display on the top left (ex: ).

Sequence of parameters in measurement mode:

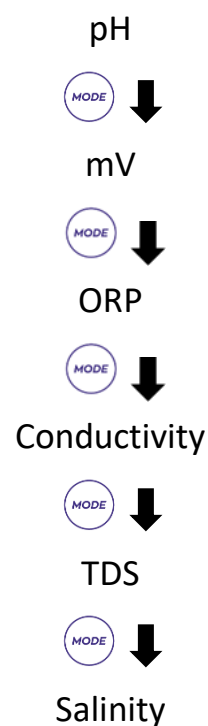
pH 70 Vio





COND 70 Vio



PC 70 Vio



Note: Pressing  after the last parameter the instrument automatically restarts from the first

In the measurement screens for the pH, ORP and Conductivity parameters, press the key  to start the calibration of the active parameter. (Subsequent paragraphs).



On the left side of the display, through a string of different colours, it is always indicated how the instrument is located.

Note: To confirm the user switching from one mode to another, the string flashes

String	Meaning
MEASURE	The instrument is in measurement mode.
CALIBRATION	The instrument is in calibration (automatic or manual in relation to the user's choice).
SETUP	The user is in the configuration menu. The configuration menus can concern the characteristics of the parameters or the general setting of the instrument.
MEMORY	The instrument is in the Recall Memory mode. The data that have been stored are being displayed by running the manual or automatic Data Logger.




7. Setup menu

SETUP




- In measurement mode, press the key  to enter SETUP mode, select the parameter you want to modify by moving with the directional keys and confirming with .

pH 70 Vio




PH SETTINGS

ORP SETTINGS




LOG SETTINGS




SETTINGS

COND 70 Vio




COND SETTINGS

TDS SETTINGS




LOG SETTINGS




SETTINGS

PC 70 Vio




PH SETTINGS




ORP SETTINGS




COND SETTINGS







TDS SETTINGS

LOG SETTINGS











  

SETTINGS

- Within the selected menu, move between the different programs using the directional buttons and press the button  to access the submenu you want to edit.
- Using the keys  and  choose the desired option or change the numerical value and confirm with .
- The value or parameter that is being edited is recognizable as it **flashes** on the display.
- The icon  indicates that the value or parameter to choose is editable using the directional keys.
- Press the key  to return to the previous menu.

• **Setup Menu's Structure**

SETUP

P1.0	PH SETTINGS	 → ← 	P1.1 Buffer Selection P1.2 Resolution P1.3 Set Stability P1.6 View pH Cal P1.7 Due pH Cal P1.8 Reset pH Setting P1.9 Temp Cal pH
P2.0	ORP SETTINGS	 → ← 	P2.6 View ORP Cal P2.7 Due ORP Cal P2.8 Reset ORP Setting P2.9 Temp Cal ORP
P3.0	COND SETTINGS	 → ← 	P3.1 Cell Constant P3.2 Buffer Selection P3.3 Reference Temp P3.4 Temp. Compensation Factor P3.6 View Cond Cal P3.7 Due Cond Cal P3.8 Reset Cond Setting P3.9 Temp Cond pH
P4.0	TDS SETTING	 → ← 	P4.1 TDS Factor
P8.0	LOG SETTINGS	 → ← 	P8.1 Data Logger Type P8.2 Clear Data

P9.0 SETTINGS



- P9.1 Temperature U.M.
- P9.2 Time and data Set
- P9.3 Backlight mode
- P9.4 Brightness
- P9.5 Sleep Mode
- P9.6 Parameters Setup
- P9.8 Reset
- P9.9 Auto Power-Off

8. ATC – MTC Temperature measurement

MEASURE

- ATC:** The direct measurement of the sample temperature for all parameters is carried out through the NTC 30KΩ probe, which can be either integrated into the sensor (electrode and / or cell) or external.
- MTC:** If no temperature probe is connected, the value must be changed manually: keep pressed or until the value starts to flash; then adjust it by continuing to use the directional keys; press to confirm.

9. pH Parameter



pH 70 Vio; PC 70 Vio

On this series of devices, it is possible to use pH sensors with integrated temperature probe or to connect two different sensors. Connect the pH electrode to the BNC type connector marked in green. Connect the temperature probe to the RCA / CINCH Temp connector always marked with a green background.

The instrument is also able to recognize the DHS sensor, an innovative electrode that stores calibration data and that can be used immediately after on any enabled instrument.

- pH parameter Setup**

SETUP

- In measure mode press to access the SETUP menu.
- Press the key to access the **pH SETTINGS P1.0** menu.
- Move with the keys and to select the program you want to access.

The table below shows the setup menu structure for the pH parameter, and for each program the options that the user can choose, and the default value:


- Composition of the Setup menu for pH parameter**

Program	Description	Options	Factory Default Settings
P1.1	CAL BUFFER SELECT	USA – NIST – Custom	USA
P1.2	SELECT RESOLUTION	0.1 – 0.01	0.01

P1.3	STABILITY FILTER	LOW – MEDIUM - HIGH	MED (nor)
P1.6	CALIBRATION DATA	-	-
P1.7	SET DUE CAL	NO – HOURS - DAYS	NO
P1.8	RESET SETTINGS	YES – NO	NO
P1.9	TEMPERATURE CAL	YES – NO	-

P1.1 Selection of pH buffers

- Access this setup to select the buffer family for performing the electrode calibration. Calibration lines from **1 to 3 points** can be made.

During calibration, press  to exit and save the points calibrated up to that moment (see calibration paragraph).




The instrument automatically recognizes 2 families of buffers (**USA and NIST**); in addition, the user has the option of performing a **manual** calibration of up to 2 points with customizable values:

USA Buffers: 1,68 - 4,01 - **7,00**** - 10,01 - 12,45 (Factory setting)

NIST Buffers: 1,68 - 4,00 - **6,86**** - 9,18 - 12,46

**** The neutral point is always required as the first point**

In measure mode at the bottom left of the display, a series of beakers indicates the buffers with which the last automatic and manual calibration was carried out.



Beaker	pH value of the buffer
 LOW	Acid < 6.5
 MEDIUM	Neutral 6.5 ~ 7.5
 HIGH	Basic > 6.5


P1.2 Resolution

Access this menu to choose the resolution needed when reading the pH parameter:

- 0.1**
- 0.01** -default-

P1.3 Stability criterion in pH measurement

To consider the reading of a value truthful, we recommend waiting for the measurement stability, indicated by the icon . When the measurement is not stable, four red flashing bands  appear on the display. Access this menu to modify the measurement stability criterion:

“LOW”: choose this option to bring up the stability icon  even in conditions of poor stability. Readings included within 1.2 mV.

“MEDIUM” (default value): readings included within 0.6 mV.

“HIGH”: choose this option to display the stability icon only in conditions of high measurement stability, readings included within 0.3 mV.

P1.6 pH calibration data

Access this menu to get information about the last calibration performed. The following screens will automatically scroll on the display:

- First screen: CALIBRATION DATE and TIME and beakers indicating the buffers used.
- Second screen: OFFSET value of the electrode expressed in mV.

- Third and possibly fourth screen: Slope% in the measuring range (one Slope% only if two calibration points are performed, two Slope% if three points are performed).



Note: The instrument accepts calibrations with pH electrodes with Slope% between 80 - 120% only.

Outside this range of acceptability, the instrument does not allow to end the calibration and displays the error message SLOPE OUT OF RANGE

P1.7 pH calibration deadline

Access this menu to set a calibration deadline; this option is very important in GLP protocols.

- By default, no calibration deadline is set. Use the directional keys to select HOURS or DAYS and access with button . Use the directional keys to change the number that appears in the center of the display, entering the hours or days that must elapse between two settings, and confirm with .
- If a calibration deadline is set, the icon is present on the display in measure mode.
- When the calibration deadline is activated, the instrument prevents further measurements.

The error icon and the icon representing the calibration deadline flash on the display. The string “MAKE A NEW CAL” invites the user to perform a new calibration of the pH sensor to be able to work again.

Press the key to start the calibration.

P1.8 Reset of the pH parameter

If the instrument does not work perfectly or incorrect calibrations have been carried out, confirm YES with the button to take all the parameters of the pH menu back to the default settings.



IMPORTANT: The factory reset of the parameters **DOES NOT** erase the stored data.

P1.9 Temperature calibration

All the instruments of this series are pre-calibrated for a correct temperature reading. However, if there is a difference between the measured and the real temperature (usually due to a probe malfunction), it is possible to perform an offset adjustment of $\pm 5^{\circ}\text{C}$.

Use the keys and to correct the temperature offset value and confirm with .

• Automatic pH calibration

CALIBRATION

Example: three-point calibration with USA type buffers (7.00 / 4.01 / 10.01).

- In pH measure mode press the key to enter calibration mode. The string “1ST POINT PH 7.00” appears on the display; the device requires the neutral value as the first calibration point. Rinse the electrode with distilled water and gently dab with paper towel. Dip the electrode in the pH 7.00 buffer solution.

- When the signal is stable, the red bands are replaced by the stability icon



Press the key  as indicated by the string "PRESS OK".



The measured value flashes on the display and then the icon of the pH



7.00 beaker MEDIUM appears at the bottom left, indicating that the instrument is calibrated on the neutral point.





- Remove the electrode, rinse with distilled water and dab gently with absorbent paper. Dip the sensor in the pH 4.01 buffer solution ("CHANGE BUFFER").
- The instrument is now ready to recognize the second calibration point. Next to the string "2ND POINT PH" the different buffers, that the device is able to recognize automatically, scroll.

- When the 4.01 value is recognized and the icon  appears, press the key  as indicated by the string "PRESS OK".

The actual measured value and the Slope% flash on the display; subsequently, the icon of the beaker



pH 4.01 LOW appears next to the green beaker, indicating that the instrument is calibrated in the acid field.


- Remove the electrode, rinse with distilled water and dab gently with paper towel. Dip the sensor in the pH 10.01 buffer solution ("CHANGE BUFFER").
- The instrument is now ready to recognize the third calibration point. Next to the string "3RD POINT PH", the different buffers, that the device is able to recognize automatically, scroll.
- When the value 10.01 is recognized and the icon  appears, press the key , as indicated by the string "PRESS OK".

Switching from an acidic to a basic pH may take a few more seconds to achieve stability.

The actual measured value and the second Slope% flash on the display; subsequently, the icon of the



beaker pH 10.01 HIGH appears next to the green and red beakers, indicating that the instrument is calibrated in the alkaline field.

- At the end of the third calibration point, the instrument returns automatically to measure mode.
- To perform a one- or two-point calibration, press the key  once finished the first or second point.

Note: electrode calibration is an essential operation for the quality and truthfulness of a measurement. Therefore, make sure that the buffers used are new, unpolluted and at the same temperature






ATTENTION: Before proceeding with the calibration operations, carefully consult the safety data sheets of the substances involved:

- Calibration buffer solutions.
- STORAGE solution for pH electrodes.
- Filling solution for pH electrodes.












• Calibration with manual values

Example: two-point calibration pH 6.79 and pH 4.65 (DIN 19267)

- Access the Setup menu for **pH** and select in the **P1.1** → **Customer**, press twice the key  to return to the measure and position in pH mode .
- Press  to enter the calibration mode.
- Rinse the electrode with distilled water and gently dab it with paper towel. Dip the electrode in the first buffer solution (e.g. pH 6.79).
- Wait for the pH value on the display to stabilize; when the icon  appears and the value flashes, modify it using the directional keys by entering the correct one (ex: pH 6.79), as suggested by the string “ADJUST THE VALUE” and by the icon .



Note: Check the buffer value according to the temperature



- When the icon  appears again, press the key  to confirm the first point; the actual measured value flashes on the display and the beaker icon appears with the buffer identification color .
- Remove the electrode, rinse with distilled water, dab it gently with absorbent paper and dip it in the next buffer (e.g. pH 4.65).
- Wait for the pH value on the display to stabilize; when the icon  appears and the actual value flashes, modify it using the directional keys by entering the correct one (e.g. pH 4.65), as suggested by the string “ADJUST THE VALUE” and by the icon .
- When the icon  appears again, press the key  to confirm the second point; the actual measured value flashes on the display, the Slope% and, next to the first beaker, the icon with the identifying colour of the second buffer  appears.
- At the end of the second calibration point, the instrument automatically returns to measuring mode.
- To perform a one-point calibration just press the key  after finishing the first point.

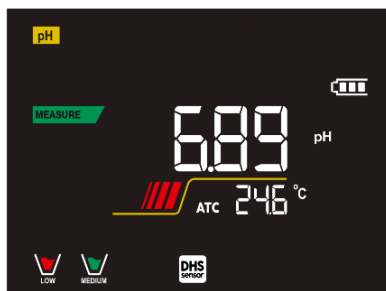
Note: If you are working with manual temperature compensation (MTC), update the value before calibrating the instrument

• Making a pH measurement

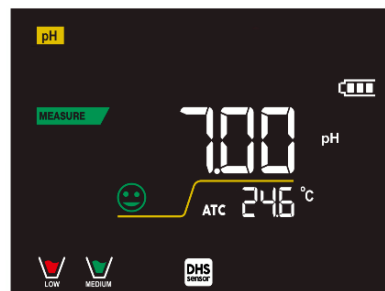
MEASURE

- In measure mode, press the button  and move to the pH parameter indicated by the icon .
- Connect the electrode to the BNC for pH / ORP of the instrument (green).
- If the user does not use an electrode with a built-in temperature probe or an external probe NTC 30KΩ, it is advisable to manually update the temperature value (MTC).
- Remove the electrode from its tube, rinse with distilled water and dab gently with paper towel.
- Check the presence and eliminate any air bubbles in the membrane bulb by stirring vertically (as for the clinical thermometer). If present, open the side cap.
- Dip the electrode in the sample while keeping it under slightly stirred.

- The scrolling on the display of four red bands  means that the measurement is not stable yet.
- Consider the measurement truthful only when the stability icon appears .



Example of an unstable measurement



Example of stable measurement

- After the measurement, wash the electrode with distilled water and preserve it in the appropriate storage solution (STORAGE).
- Never store the sensors in ANY type of water OR dry!
- Always having on the display the indication of the buffers used for calibration and the possibility of consulting the calibration data, at any time, or entering the expiry date, are useful tools for obtaining accurate measurements.




• **Sensors with DHS technology**



MEASURE



The electrodes equipped with DHS technology can save a calibration curve within their memory. The calibrated sensor is automatically recognized by any instrument enabled for DHS recognition and acquires its calibration.

- Connect the DHS electrode to the BNC and RCA connectors of the instrument.
- The device automatically recognizes the chip; the following screens scroll on the display:
 - First screen: sensor identification name and production batch.
 - Second screen: CALIBRATION DATE and TIME and beakers indicating the buffers used.
 - Third screen: OFFSET value of the electrode expressed in mV.
 - Fourth and possibly fifth screen: Slope% in the measuring range (one Slope% only if two calibration points are performed, two Slope% if three points are performed).
- When the DHS electrode is recognized, the active calibration on the instrument becomes the one of the sensor.
- The icon  on the display indicates that the connection was successful.
- If the calibration is satisfactory (see the calibration data in menu P.1.6), the electrode is ready to start the measurements. Otherwise, recalibrate the electrode; the data will be updated automatically.
- The DHS electrode calibrated with a pH 70 Vio or PC 70 Vio device is ready to be used on any pH meter enabled for DHS recognition and vice versa.
- When the electrode is disconnected, a message on the display informs the user of the deactivation of the sensor; the instrument regains its previous calibration and no data is lost!
- The DHS electrode does not require batteries and if it is used on pH meters that are not enabled to recognize the chip, it works as a normal “analog” electrode.

• Errors during calibration







CALIBRATION

- **NOT STABLE:** The button  was pressed with still unstable signal. Wait for the icon  to appear to confirm the point.
- **WRONG BUFFER:** The buffer is polluted or not part of the recognized families.
- **SLOPE OUT OF RANGE:** The slope of the sensor calibration line is out of the acceptable range 80 - 120%.
- **CALIBRATION TOO LONG:** The calibration exceeded the time limit: only the points calibrated up to that moment will be kept.

10. mV Parameter



pH 70 Vio; PC 70 Vio

- In measure mode press the key  and move to the mV parameter indicated by the icon .
- The display shows the measurement in mV of the pH sensor.
- The scrolling on the display of four red bands  means that the measurement is not stable yet.
- Consider the measurement truthful only when the stability icon appears .

Note: This measurement is recommended to evaluate the sensor efficiency

11. ORP Parameter (Oxide-Reduction potential)



pH 70 Vio; PC 70 Vio

ORP sensors can be used on this series of devices to measure the Oxide-Reduction potential.





Connect the Redox electrode to the BNC type connector marked in green; if necessary, connect the temperature probe to the RCA / CINCH Temp connector always marked with a green background.

It is possible to calibrate the sensor offset by performing automatic calibration on a predefined point. The instrument automatically recognizes the **Redox solution 475 mV / 25 °C**; contact the local distributor to proceed with the relevant purchase.

The instrument can correct the sensor offset by ± 75 mV.

• ORP parameter Setup

SETUP

- In measure mode press the key  to access the SETUP menu.
- Use the directional keys to move to **ORP SETTINGS P2.0** and access the menu by pressing the key .
- Move with the keys  and  to select the program you want to access.

The table below shows the setup menu structure for the ORP parameter; for each program there are the options that the user can choose and the default value:

• Composition of the setup menu for the ORP parameter

Program	Description	Options	Factory Default Settings
P2.6	CALIBRATION DATA	-	-
P2.7	SET DUE CAL	NO – HOURS - DAYS	NO
P2.8	RESET SETTINGS	YES – NO	NO
P2.9	TEMPERATURE CAL	YES – NO	-




P2.6 Calibration Data



Access this menu to get information on the last calibration performed. The following screens will automatically scroll on the display:

- First screen: CALIBRATION DATE and TIME.
- Second screen: OFFSET value of the electrode expressed in mV.
- Third screen: TEMPERATURE at which the calibration was performed.

P2.7 ORP calibration deadline

Access this menu to set a calibration deadline; this option is fundamental in GLP protocols.

- By default, no calibration deadline is set; use the directional keys to select HOURS or DAYS and access with key . Use the directional keys to change the number that appears in the center of the display, entering the hours or days that must elapse between two settings, and confirm with key .
- If a calibration deadline is set, the icon  is shown on the display in measure mode.
- When the calibration deadline is activated, the instrument prevents further measurements.

The error icon  and the icon representing the calibration deadline  flash on the display.

The string “MAKE A NEW CAL” invites the user to perform a new calibration of the pH sensor to be able to work again.

Press the key  to start the calibration.

P2.8 Reset of the ORP parameter

If the instrument does not work properly or incorrect settings have been made, confirm **YES** with the key



to return all the parameters of the ORP menu to the default settings.



IMPORTANT: The factory reset of the parameters does not delete the stored data

P2.9 Temperature Calibration






All the instruments in this series are pre-calibrated for a correct temperature reading. However, if a difference between the measured and the real one is evident (usually due to a probe malfunction), it is possible to perform an offset adjustment of $\pm 5^{\circ}\text{C}$.

Use the keys  and  to correct the temperature offset value and confirm with .

CALIBRATION

- **ORP automatic calibration**

Automatic calibration with 475 mV solution

- In **ORP** measurement mode  press the key  to enter the calibration mode.
- The string "POINT ORP 475" appears on the display; the device requires 475 mV as calibration point.
- Rinse the electrode with distilled water and gently dab it with paper towel. Dip the electrode in the 475 mV Redox buffer solution.
- When the solution is recognized and the signal is stable, the red stripes are replaced by the stability icon .
- Press the key  as indicated by the string "PRESS OK".
- The actual measured value flashes on the display and then the beaker icon  appears at the bottom left, indicating that the instrument is calibrated. The instrument automatically returns to measure mode.

ATTENTION: Before proceeding with the sensor calibration operations, carefully consult the safety data sheets of the substances involved:

- Redox standard solutions.
- STORAGE solution for ORP electrodes.
- Filling solution for Redox electrodes.



12. Conductivity Parameter



COND 70 Vio, PC 70 Vio

Connect the Conductivity probe to the BNC type connector marked in grey and any temperature probe to the RCA / CINCH Temp connector always on a grey background.

Conductivity is defined as the ability of the ions contained in a solution to conduct an electric current. This parameter provides a fast and reliable indication of the quantity of ions present in a solution.

- **...how to get Conductivity?**

The first Ohm's law expresses the direct proportionality in a conductor between the current intensity (I) and the applied potential difference (V), while the resistance (R) represents its proportionality constant. Specifically: $V = R \times I$, the resistance is consequently $R = V / I$

Where R = resistance (Ohm) V = voltage (Volt) I = current (Ampere)

The inverse of the resistance is defined as conductance (G) $G = 1 / R$ and is expressed in Siemens (S)





Measuring resistance or conductance requires a measuring cell, which consists of two opposite charge poles. The reading depends on the geometry of the measuring cell, which is described through the constant cell parameter $C = d / A$ expressed in cm^{-1} where d represents the distance between the two electrodes in cm and A their surface in cm^2 . The conductance is transformed into specific conductivity (k), which is independent of the cell configuration, multiplying it by the cell constant.

$k = G \times C$ is expressed in S / cm even if the units of measurement mS / cm are in common use

(1 S/cm \rightarrow 10^3 mS/cm) e $\mu\text{S/cm}$ (1 S/cm \rightarrow 10^6 $\mu\text{S/cm}$)

• Setup for Conductivity parameter

SETUP

- In measure mode press  to access the SETUP menu.
- Use the directional keys to move to **COND SETTINGS P3.0** and access the menu by pressing the key .
- Move with keys  and  to select the program to access.

The table below shows the setup menu structure for the COND parameter; for each program there are the options that the user can choose and the default value:

Program	Description	Options	Factory Default Settings
P3.1	CELL CONSTANT	0.1 - 1 - 10	1
P3.2	CALIBRATION METHOD	AUTOMATIC / CUSTOM	AUTOMATIC
P3.3	REFERENCE TEMPERATURE	15 ... 30 °C	25 °C
P3.4	TEMP COMPENSATION FACTOR	0.00 ... 10.00 %/°C	1.91 %/°C
P3.6	CALIBRATION DATA	-	-
P3.7	SET DUE CAL	NO – HOURS - DAYS	NO
P3.8	RESET SETTINGS	YES – NO	NO
P3.9	TEMPERATURE CAL	YES – NO	-






P3.1 Cell constant Selection



Choosing the right conductivity cell is a decisive factor for obtaining accurate and reproducible measurements.

One of the most important parameters to consider is to use a sensor with the right cell constant in relation to the solution under analysis.

The following table relates the sensor cell constant with the measurement range and the preferable standard for calibration:

Costante di cella	0.1	1	10	
Standard (25°)	84 - 147 μ S	1413 μ S	12.88 mS	111.8 mS
Range di Misura ideale	0 – 300 μ S	300 – 3000 μ S	3 – 30 mS	30 – f.s. mS
Simbolo taratura a display	 LOW	 MEDIUM	  MEDIUM HIGH	 HIGH

Access this setup menu to select the cell constant related to the sensor used:

- 0.1**
- 1** - default-
- 10**
- For each of the 3 selectable cell constants the instrument stores the calibrated points. By selecting the cell constant, the previously performed calibration points are automatically recalled.

P3.2 Calibration mode

Access this setup menu to select automatic or manual recognition of the standards for performing the calibration:

- **AUTOMATIC:** -default- the device automatically recognizes up to 3 of the following standards.
84 $\mu\text{S}/\text{cm}$, 147 $\mu\text{S}/\text{cm}$, 1413 $\mu\text{S}/\text{cm}$, 12.88 mS/cm e 111.8 mS/cm .
- **CUSTOM:** the device can be calibrated on a point with a manually entered value.

Note: To obtain accurate results, it is advisable to calibrate the device with standards close to the theoretical value of the solution to be analysed



P3.3 e P3.4 Temperature compensation in conductivity measurement is not to be confused with pH compensation.

- In a conductivity measurement, the value shown on the display is the conductivity calculated at the reference temperature. Therefore, the effect of temperature on the sample is corrected.
- On the other hand, when measuring pH, the pH value at the displayed temperature is shown on the display. Here the temperature compensation involves the adaptation of the Slope and the electrode offset to the measured temperature.

P3.3 Reference Temperature

Conductivity measurement strongly depends on temperature.

If the temperature of a sample increases, its viscosity decreases and this leads to an increase in the mobility of the ions and the measured conductivity, although the concentration remains constant.

For each conductivity measurement, the temperature to which it refers must be specified, otherwise it is a result without value. Generally, temperature refers to 25 °C or, more rarely, 20 °C.




This device measures conductivity at real temperature (ATC or MTC) and then converts it to the reference temperature using the correction factor chosen in program P3.4.

- Access this setup menu to set the temperature to which you want to refer the conductivity measurement.
- The device can report conductivity from **15 to 30°C**. By default, it is 25°C which is correct for most of the analyses.

P3.4 Temperature compensation Factor

It is important to know the temperature dependence (% change in conductivity per °C) of the sample being measured.

- Access this menu to change the temperature compensation factor.
- By default, 1.91%/°C is set which is suitable for most of the analyses.

Press the key , the value flashes and as indicated by the icon , use the directional keys to enter the new coefficient. Confirm with key .

Compensation coefficients for special solutions and for groups of substances are shown in the following table:

Solution	(%/°C)	Solution	(%/°C)
NaCl Saline solution	2.12	1.5% Hydrofluoric acid	7.20

5% NaOH Solution	1.72	Acids	0.9 - 1.60
Diluted ammonia solution	1.88	Bases	1.7 – 2.2
10% Hydrochloric acid solution	1.32	Salts	2.2 - 3.0
5% Sulfuric acid solution	0.96	Drinking water	2.0

Compensation coefficients for calibration standards at different temperatures for $T_{\text{ref}} 25^{\circ}\text{C}$ are shown in the following table:

$^{\circ}\text{C}$	0.001 mol/L KCl (147 μS)	0.01 mol/L KCl (1413 μS)	0.1 mol/L KCl (12.88 mS)
0	1.81	1.81	1.78
15	1.92	1.91	1.88
35	2.04	2.02	2.03
45	2.08	2.06	2.02
100	2.27	2.22	2.14

To determine the calibration coefficient of a solution, the following formula is applied:

$$tc = 100x \frac{C_{T2} - C_{T1}}{C_{T1} (T_2 - 25) - C_{T2} (T_1 - 25)}$$

Where tc is the temperature coefficient to be calculated, C_{T1} and C_{T2} are the Conductivity at **temperature 1** (T_1) and at **temperature 2** (T_2).

Each result with “correct” temperature is plagued by an error caused by the temperature coefficient. The better the temperature correction, the lower the error. The only way to eliminate this error is not to use the correction factor, acting directly on the sample temperature.

Select 0.00% / $^{\circ}\text{C}$ as the temperature coefficient to deactivate the compensation. The displayed Conductivity value refers to the temperature value measured by the probe and not related to a reference temperature.

P3.6 COND calibration data

Access this menu to get information on the last calibration performed. The following screens will automatically scroll on the display:

- First screen: CALIBRATION DATE and TIME and beakers indicating the buffers used.
- Second and possibly third, fourth and fifth screens: value of the actual cell constant in the measurement range indicated by the beaker.



Note: The instrument accepts calibrations with a maximum tolerance of 40% on the nominal value of the cell constant only.






P3.7 COND Calibration expiration

Access this menu to set a calibration deadline; this option is fundamental in GLP protocols.

- By default, no calibration deadline is set. Use the directional keys to select HOURS or DAYS and access

with . Use the directional keys to change the number that appears in the center of the display, entering the hours or days that must elapse between two settings, and confirm with key .

- If a calibration deadline is set, the icon is present on the display in measure mode . When the calibration deadline is activated, the instrument prevents further measurements.

The error icon  and the icon representing the calibration deadline  flash on the display.

The string “MAKE A NEW CAL” invites the user to perform a new calibration of the pH sensor to be able to work again.

Press the key  to start the calibration.

P3.8 COND parameter Reset

If the instrument does not work properly or incorrect settings have been made, confirm YES with the key



to return all the parameters of the pH menu to the default settings.



IMPORTANT: The factory reset of the parameters DOES NOT delete the stored data

P3.9 Temperature calibration






All the instruments in this series are pre-calibrated for a correct temperature reading. However, if there is a difference between the measured and the real one (usually due to a probe malfunction), it is possible to perform an offset adjustment of $\pm 5^{\circ}\text{C}$.

Use the keys  and  to correct the temperature offset value and confirm with .

• Automatic Conductivity calibration

CALIBRATION

Example: one-point calibration (1413 $\mu\text{S} / \text{cm}$) using a cell constant sensor 1

- In **COND** measurement mode  press the key  to enter the calibration mode.
- Rinse the cell with distilled water and dab gently with paper towel. Start with a few ml of standard solution. Dip the sensor in the standard 1413 $\mu\text{S} / \text{cm}$, keeping it slightly stirred and making sure that there are no air bubbles in the cell.
- On the display, next to the string “POINT COND”, all the Conductivity values, that the instrument can recognize, alternate.
- The string “WAIT FOR STABILITY” and the flowing red bands indicate that the measurement is not stable yet.
- When the value stops on 1413 and the icon  appears: confirm the calibration with the key , as indicated by the string “PRESS OK”.
- The actual measured value flashes on the display and then it is shown the updated cell constant.
- The icon  appears, which indicates that the instrument is calibrated in the medium conductivity

range.

Automatically, the device returns to measure mode.



- *One-point calibration is enough if measurements are performed within the measurement range. For example, the standard solution 1413 $\mu\text{S}/\text{cm}$ is suitable for measurements between 200 – 2000 $\mu\text{S}/\text{cm}$.*
- **To calibrate the instrument on several points, once returned to the measure mode, repeat all the calibration steps.**
The beaker relating to the new calibrated point will join the previous one.
It is recommended to start the calibration from the less concentrated standard solution and then continue in order of increasing concentration.
- **When a new calibration of a previously calibrated point is performed, it is overwritten on the previous one and the cell constant is updated.**
- For each cell constant (P3.1), the instrument stores the calibration, to allow the user who uses multiple sensors with different constants not to be forced to recalibrate each time.
- The instrument recalls the last calibration with respect to the selected parameters P3.1 (cell constant) and P3.2 (type of calibration solutions).

Important: Standard conductivity solutions are more vulnerable to contamination, dilution and direct influence of CO_2 than pH buffers, which, on the other hand, thanks to their buffer capacity, tend to be more resistant. In addition, a slight change in temperature, if not adequately compensated, can have significant effects on accuracy.

Therefore, pay attention in the calibration process of the Conductivity cell in order to obtain accurate measurements.



Important: Always rinse the cell with distilled water before calibration and when switching from one standard solution to another to avoid contamination.

Replace standard solutions frequently, especially low Conductivity ones.

Contaminated or expired solutions can affect the accuracy and precision of the measurement.

ATTENTION: Before proceeding with the calibration operations, carefully consult the safety data sheets of the substances involved:












- Calibration buffer solutions.

• **Manual COND calibration**

CALIBRATION

Example: calibration at 5.00 $\mu\text{S}/\text{cm}$ with sensor with Cell Constant 0.1

- Access the Setup menu for COND SETTINGS and select in the **P3.1** → **0.1** and in **P3.2** → **Custom**, go back to the measurement and go into **COND** mode .
- Press the key  to enter the calibration mode.
- Rinse the cell with distilled water and dab gently with paper towel.
Apply few ml of standard solution and dip the sensor in the conductivity standard 5.00 $\mu\text{S}/\text{cm}$.
- The string “WAIT FOR STABILITY” and the flowing red bands indicate that the measurement is not stable yet.

- Wait for the Conductivity value on the display to stabilize; when the icon  appears, use the keys  and  to adjust the value by entering that of the standard solution (ex: 5.00 $\mu\text{S}/\text{cm}$), as indicated by the string "ADJUST THE VALUE" and by the icon .
- When the icon  reappears confirm the calibration point by pressing the key .
- The actual measured value flashes on the display and the updated cell constant is then shown.
- The icon  appears, which indicates that the instrument is calibrated in the low conductivity range. Automatically, the device returns to measure mode.
- For each cell constant (P3.1) the instrument stores the calibration in order to allow the user, who uses multiple sensors with different constants not to be forced to recalibrate each time. The instrument recalls the last calibration with the respect to the selected parameters P3.1 (cell constant) and P3.2 (type of calibration solutions).

Note: If you are not aware of the exact compensation coefficient, to obtain an accurate calibration and measurement set in P3.4 \rightarrow 0.00 $\%/^{\circ}\text{C}$ and then work by bringing the solutions exactly to the reference temperature

Another method of working without temperature compensation is to use the appropriate thermal tables shown on the most Conductivity solutions.

Important: Always rinse the cell with distilled water before calibration and when switching from one standard solution to another to avoid contamination.





Replace standard solutions frequently, especially low conductivity ones.

Contaminated or expired solutions can affect the accuracy and precision of the measurement.

• Errors during calibration






CALIBRATION




- **NOT STABLE:** The button  has been pressed with unstable signal. Wait for the icon  to appear to confirm the first point.
- **WRONG BUFFER:** The buffer you are using is polluted or not part of the recognized families.
- **CALIBRATION TOO LONG:** The calibration has exceeded the time limit, only the points calibrated up to that moment will be stored.

• Making a Conductivity measurement

MEASURE

- Access the Setup menu for Conductivity to check the calibration, and if necessary, update the reading parameters; press key  to return to measure mode.
- Press  to scroll through the different screens of parameters until activating the Conductivity parameter indicated by the icon .
- Connect the Conductivity cell to the BNC for Cond of the instrument (grey).
- If the user does not use a cell with a built-in temperature probe or an external one NTC 30K Ω probe, it

is recommended to manually update the temperature value (MTC).


- Remove the cell from its tube, rinse with distilled water, dab gently **taking care not to scratch the electrodes**. 
- Dip the sensor in the sample; the measuring cell and any relief holes must be completely immersed.
- Keep slightly stirred and eliminate any air bubbles that would distort the measurement by gently shaking the sensor.
- Scroll on the display with four red bands  means that the measurement is not stable yet.
- Consider the measurement truthful only when the stability icon appears .
- **For a highly accurate measurement the instrument uses five different measurement scales and two units of measurement ($\mu\text{S} / \text{cm}$ and mS / cm) depending on the value; the scale change is performed automatically by the device.**
- Once the measurement is finished, wash the cell with distilled water.
- The Conductivity sensor does not require much maintenance; the main aspect is to make sure that the cell is clean. The sensor must be rinsed with abundant distilled water after each analysis; if it has been used with water insoluble samples, before performing this operation, clean it by immersing it in ethanol or acetone.

Never clean it mechanically, this will damage the electrodes compromising the functionality.

For short periods, store the cell in distilled water, while for long periods, keep it dry.

13. Other measurements carried out with the Conductivity cell

The conductivity measurement can be converted into the TDS and Salinity parameters.







- In measure mode, press the key  to scroll through the various parameters **TDS -> Salinity**.
- These parameters use the Conductivity calibration; therefore, refer to the previous paragraph to calibrate the sensor.

• TDS Parameter

TDS

COND 70 Vio, PC 70 Vio

Total Dissolved Solids (TDS) correspond to the total weight of the solids (cations, anions and non-dissociated substances) in a liter of water. Traditionally, TDS are determined using the gravimetric method, but a simpler and faster method is to measure Conductivity and convert it to TDS by multiplying it by the TDS conversion Factor.

- In measure mode press  to access the **SETUP** menu. 
- Use the directional keys to move to **TDS SETTINGS P4.0** and access the menu by pressing the key .
- Press again  to access the **TDS FACTOR P4.1** program.
- When the value flashes, use the directional keys as indicated by the icon  to enter the correct value and confirm with .

By default, the TDS factor is set at 0.71; the user can change it between 0.40 ... 1.00.

Here below, the TDS factors in relation to the Conductivity value are shown:

Conductivity of the solution	TDS Factor
1-100 $\mu\text{S}/\text{cm}$	0.60
100 – 1000 $\mu\text{S}/\text{cm}$	0.71
1 – 10 mS/cm	0.81
10 – 200 mS/cm	0.94

The TDS measurement is expressed in mg/l or g/l depending on the value.

• Salinity



COND 70 Vio, PC 70 Vio

Usually the UNESCO 1978 definition is used for this parameter, which involves the use of the unit of measurement psu (Practical Salinity Units), corresponding to the ratio between the conductivity of a sample of sea water and standard KCl solution formed by 32.4356 grams of salt dissolved in 1 kg of solution at 15° C. Ratios are dimensionless and 35 psu is equivalent to 35 grams of salt per kilogram of solution. Therefore, approximately 1 psu is equivalent to 1g / L of salt and considering the density of the water it equals 1 ppt.

The UNESCO 1966b definition can also be used, which provides that the salinity in ppt is expressed with the following formula:

$$S_{\text{ppt}} = -0.08996 + 28.2929729R + 12.80832R^2 - 10.67869R^3 + 5.98624R^4 - 1.32311R^5$$

Where R= Cond sample (at 15°) / 42.914 mS/cm (Conductivity of Copenhagen Seawater Standard)

14. Data Logger Function



This series of devices has the possibility of recording values in GLP format on the instrument's internal memory.

- The instrument can save up to 1000 data in total. Once the memory is finished, the values are NOT overwritten. In measure mode, the number of data stored for that parameter appears next to the **M+** icon.
- It is possible to recall and consult the values on the display or download them to a PC using the appropriate software.
- If you have the possibility to work directly connected to the PC, the data are automatically saved on the software without having memory limitations.
- Recordings can be acquired **manually** (MANUAL) or **automatically at preset frequencies** (HOURS - MINUTES).

PC Connection: connect the USB cable inside each package to the USB port on the top panel of the instrument and the other end to a COM port on the computer.



Use the USB cable supplied with the instrument only.

• Setup for Data Logger parameter

SETUP

- In measure mode press  to access the SETUP menu.
- Use the directional keys to move to **LOG SETTINGS P8.0** and access the menu by pressing the key



- Move with the keys  and  to select the program to access.


The table below shows the setup menu structure for the Data Logger mode; for each program, there are the options that the user can choose and the default value:



- Composition of setup menu for the Data Logger menu**

Program	Description	Options	Factory Default Settings
P8.1	TYPE OF SAVING	MANUAL – HOURS - MINUTES	MANUAL
P8.2	EMPTY INTERNAL MEMORY	YES – NO	-

P8.1 Registration type


Access this menu to select the data acquisition mode:

- MANUAL:** The data is acquired only when the user presses the button .
- HOURS - MINUTES:** Set an automatic data acquisition frequency range.

Use the directional keys to move from MANUAL to HOURS or MINUTES. Access with  and, as indicated by the icon , change the value of the acquisition time. Confirm the setting with the key



- Use of automatic Data Logger**

In measure mode press  to start and end automatic recording.

When the automatic data saving is running, the icon  flashes on the display.

When it is set, but not in operation, the icon on the screen remains fixed. When the 1000 total values are reached, the recording stops automatically.



Note: Scrolling through the parameters, the recording stops.


P8.2 Memory emptying


Access this menu and select **YES** to clear the saved data and empty the memory. Next to the **M+** icon. It shown the total number of data stored.



- Example of automatic Data Logger mode**


Example: automatic pH recording on internal memory every 2 minutes

- Access the **LOG SETTING P8.0** setup menu.
- Enter the **LOG TYPE P8.1** menu, press  and move with directional keys to **MINUTES**.
- Use the directional keys to change the number that flashes on the display. Enter "2" and confirm with .

Go back to measure mode and go to the **pH** screen .

The icon  is lit in the lower string of the display, which indicates that an automatic frequency Data




Logger has been set. Press  to start recording; the icon  starts flashing, indicating that the storage is in progress. The number next to the **M+** icon indicates how much data has been saved for that parameter.

Press again  to end the recording.

Note: automatic recording is suspended when the measurement parameter is changed.

• **Example of manual Data Logger mode**

Example: recording a Conductivity value in manual mode




- Access the **LOG SETTING P8.0** setup menu.
- Enter the **LOG TYPE P8.1** menu, press  and move with the directional keys to **MANUAL**.
- Confirm with  and return to measure mode, go to the **COND** screen .

Press  to save the value. The number next to the **M+** icon indicates how much data has been saved for that parameter.

Note: Manual or automatic saving of a value is confirmed by a sequence of flashes of the green LED

• **Recall Memory**

MEMORY

- In measure mode in the parameter of interest, press key  to enter the RECALL MEMORY mode. The last saved data is shown on the display.
- As indicated by the string , use the directional keys to scroll through the different stored values. The number next to the **M+** icon indicates the save slot.
- Press  to return to measure mode.

• **Clear the saved data**





- To clear the data stored in the instrumental memory, access the **CLEAR DATA P8.2** setup menu and select **YES**.

IMPORTANT: Factory reset of the pH, ORP and Cond parameters does not delete the stored data



15. Instrument configuration menu

SETUP

- In measure mode press key  to access the SETUP menu.
- Use the directional keys to move to **SETTINGS P9.0** and access the menu by pressing the key .
- Move with the keys  and  to select the program to access.

The table below shows the setup menu structure for the general settings of the instrument; for each program, there are the options that the user can choose and the default value:

• Composition of the setup menu for the Configuration menu

Program	Description	Options	Factory Default Settings
P9.1	TEMPERATURE U.M.	°C / °F	°C
P9.2	DATE AND TIME SET	-	-
P9.3	BACKLIGHT MODE	INDOOR – OUTDOOR-AUTOMATIC	AUTOMATIC
P9.4	BRIGHTNESS	LOW – NORMAL - HIGH	NORMAL
P9.5	SLEEP MODE	OFF – 2 MIN – 5 MIN	2 MIN
P9.6*	SELECT PARAMETER	YES – NO <i>for each parameter</i>	YES
P9.8	RESET	YES - NO	NO
P9.9	AUTO POWER-OFF	YES – NO	NO

* Function available for PC 70 Vio only


P9.1 Unit of measurement for temperature

Access this setup menu to select the temperature unit to use:

- °C -default-
- °F

P9.2 Date and time setting

Access this setup menu to update the device date and time.

Use the directional keys to change the year, confirm with  and repeat the same operation for month, day, hours and minutes.

P9.3 Backlight Mode

Access this setup menu to select the contrast mode to use for the display backlight:

- **INDOOR (In)** – Recommended if you use the device indoors.
- **OUTDOOR (Out)** – Recommended if you use the device outdoors.
- **AUTOMATIC (Auto)** – Default option. Thanks to the brightness sensor, the display automatically adapts to the environment conditions. This mode also ensures longer battery life.

P9.4 Brightness

Access this setup menu to choose between three different levels of display brightness:

- **LOW** – low
- **NORMAL** – medium
- **HIGH** – high

Note: Keeping the display bright always adversely affects battery life

P9.5 Sleep mode

Access this setup menu to select whether and after how long activating the device Sleep mode:

- **OFF:** Sleep mode off.
- **2 MIN:** The instrument enters Sleep mode if no key is pressed for 2 minutes.
- **5 MIN:** The instrument enters Sleep mode if no key is pressed for 5 minutes.

When the device is in Sleep mode, the brightness of the display is reduced to a minimum, significantly saving battery consumption.

Note: Sleep mode only affects the brightness of the display. All other instrumental functions continue to operate normally (ex: Data Logger).


To exit from the Sleep mode and return the display to normal brightness, press ANY button.

Once the display brightness is activated, the buttons reacquire their function (paragraph "Key function").




P9.6 Selection of the parameters

Function available for PC 70 Vio only.

Through this setup menu, it is possible to select which parameters do NOT display in measure mode.

Access menu P9.6. The icon  flashes, with the directional keys choose:


- **YES:** in measure mode the pH parameter is kept active.
- **NO:** in measure mode the pH parameter is not displayed.

Confirm the selection with key  ; now the icon  flashes, then repeat the same operation for the mV parameter and then for all the parameters up to Salinity .

Example: The user wishes to work with pH, Conductivity and TDS parameters only.

In the P9.6 setup menu:

pH -> YES / mV -> NO / ORP -> NO / COND -> YES / TDS -> YES / SAL -> NO

Press key  twice to return to measure mode. Scrolling with the key  only the parameters pH, COND and TDS are present.

Note: At least one of all the parameters must be enabled with YES.

P9.8 Reset Settings

Access this setup menu to restore the instrument to factory conditions.


IMPORTANT: Restoring the factory parameters does not delete the stored data.



P9.9 Auto off

Access this setup menu to activate or deactivate the auto-shutdown of the instrument:

- **YES:** The instrument automatically turns off after **20 minutes** of inactivity.
- **NO:** The instrument remains always on, even if you are not using it.

NOTE: Auto-switch-off of the instrument is disabled, if data is being recorded with the automatic Data Logger mode 

IMPORTANT: The correct and systematic use of parameters P9.3 / P9.4 / P9.5 / P9.9 allows to significantly lengthen battery life.



16. DataLink+ Software (per Windows 7/8/XP/10)

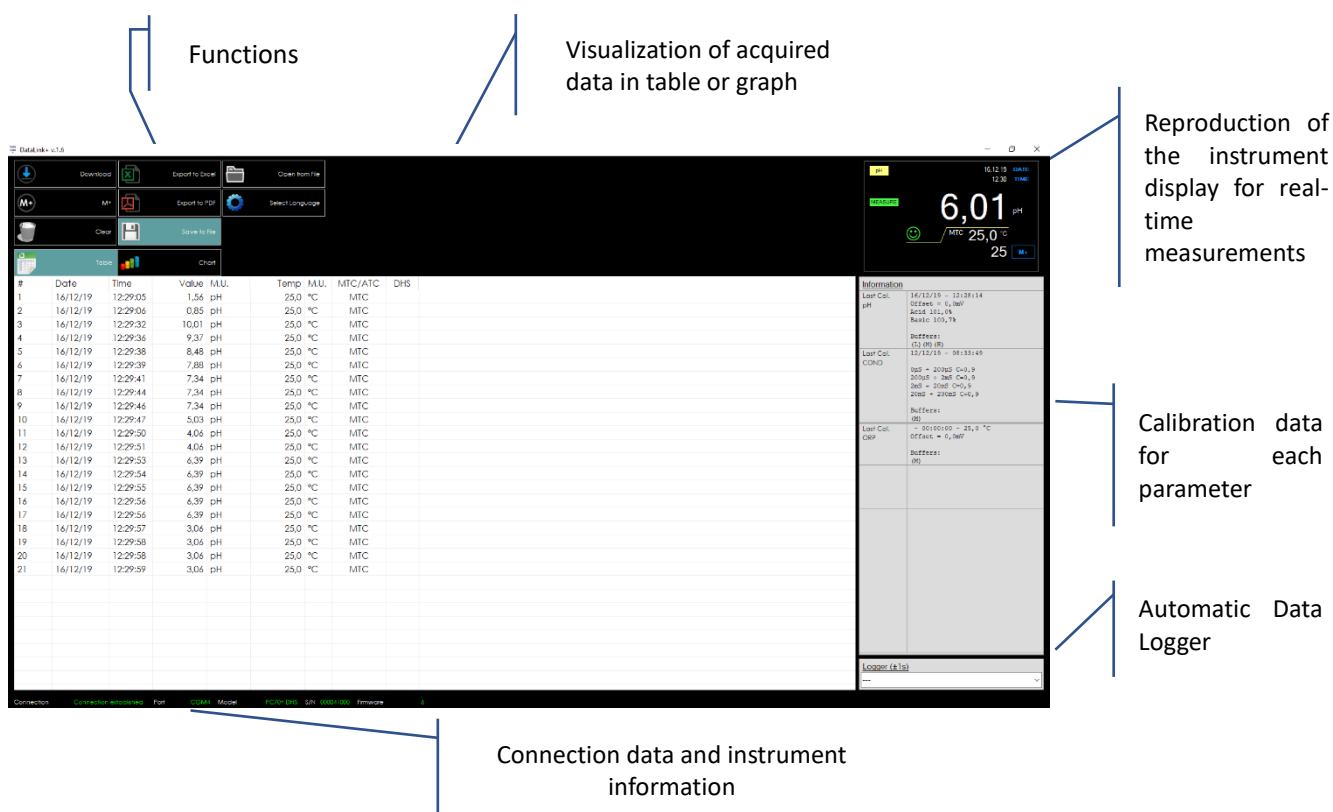
It is possible to connect the instruments of the 70 Vio series to the PC and then use the DataLink + 1.6 software (and later versions) to perform data download, Data Logger directly on PC and exports in .xls (Excel) and .pdf.

The software can be downloaded for free from the web site (pay attention to the correct installation of the drivers).

- https://www.giorgiobormac.com/it/download-software_Download.htm.
- Connect the USB cable inside each package to the USB port on the top panel of the instrument and the other end to a COM port on the computer.
- Use the USB cable supplied with the instrument only.
- Start the program and then switch on the instrument.
- Wait for connection to be established (the connection data are shown at the bottom left of the display).

• Functions

- **Download:** the data saved in the instrumental memory are downloaded to a PC and displayed in the table for processing.
- **M+:** instantaneous acquisition of a value (equivalent to the manual Data Logger option).
- **Logger:** automatic acquisition with set frequency.
- **Empty:** emptying the data in the table. If the password is active, it will be requested.
- **Export to Excel / Export to PDF:** export to PDF and Excel of all the data in the table, of graphs, calibration reports and instrumental information.
- **Save to file / Open from file:** saving the data in the table and possibility to reload them in order to process them or continue recording.
- **Select the language:** set the interface language (Eng – Ita – Deu – Esp – Fra – Cze).
- **Table / Graph:** how to display the acquired data. The graphs are divided by parameter and can be printed separately.



17. Warranty



- ***Warranty period and limitations***

- The manufacturer of this device and its accessories offers the final consumer of the new device the five-year warranty from the date of purchase, in the event of state-of-the-art maintenance and use.
- During the warranty period, the manufacturer will repair or replace defective components.
- This warranty does not apply, if the product has been damaged, used incorrectly, exposed to radiation or corrosive substances, if foreign materials have penetrated inside the product or if changes have been made, which have not been authorized by the manufacturer.

18. Disposal of electrical devices



This equipment is subject to the regulations for electronic devices.

Dispose of in accordance with local regulations.

Series 70 Vio ENG Version 1.0 January 2020