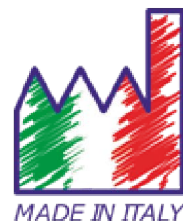# ReVio

T   pH   Cond   Orp   Ise   DO

INSTRUCTIONS MANUAL
MANUALE DI ISTRUZIONI
MANUAL DE INSTRUCCIONES
MANUEL D'UTILISATION
BETRIEBSANLEITUNG

MADE IN ITALY

Index

1.Introduction

XS Instruments, globally recognized as a leading brand in the field of electrochemical measurements, has developed this new instrument, which, thanks to the 3 front BNC connectors, is able to measure up to a total of 12 parameters, simultaneously displaying up to 6 parameters, chosen by the user!

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.

The innovative high definition colour LCD display shows all the necessary information, such as the measurement, the temperature, the buffers used for the last calibration, the condition of stability and GLP data, in order to offer the user an exciting measuring experience.

Everyone can use these tools thanks to the instructions that appear directly on the display. The calibration is guided step by step and the instrument configuration menu is multilingual, intuitive, and easy to consult. In poor visibility conditions, it is possible to activate the full screen view of measurement.

pH calibrations up to 5 points can be performed using the USA, NIST and DIN buffer families. Furthermore, it is possible to use values chosen by the user. The resolution of the measurement is to the thousandth and three different levels of signal stability can be selected.

Using the ORP parameter, it is possible to adjust the offset of a redox sensor using a known standard value.

The instrument automatically recognizes 5 standard conductivity solutions and one can be entered manually. A calibration is saved for each cell constant. For low conductivity analysis, it is possible to use the nonlinear compensation factor for ultrapure water.

Selective ion reading is also available with 3 selectable measurement units, possibility of building 5-point calibration curves and timed stability for volatile compounds.

Reading of dissolved oxygen via polarographic sensor. Barometric sensor included in the instrument and possibility to automatically compensate the salinity.

Unique in its kind is the innovative multiparametric screen. The user can choose to view up to 6 parameters with relative temperature. The choice of parameters to be displayed is at user discretion.

It is possible to consult the calibration data anytime and the representation 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 (10000 data) or on the PC.

The waterproof suitcase IP 67, which can be ordered separately, allows the user to work even in difficult environmental conditions. For those who want to travel without the bulk of the suitcase, a practical shoulder soft case in eco-sustainable material can also be ordered.

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

2.Safety information

- ## *Definition of warning words and symbols*

This manual contains extremely important safety information, in order to avoid personal injury, damage to the instrument, malfunctions or incorrect results due to failure to comply with them. Read entirely and carefully this manual and be sure to familiarize with the tool before starting to work with it.

This manual must be kept near to the instrument, so that the operator can consult it easily, 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 can cause material damage, data loss or minor or medium-sized accidents, if not avoided.

WARNING   for important information about the product.

NOTE   for useful information about the product.

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 for safety*

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

- operating manual for electrochemical sensors;
- safety data sheets for buffer solutions and other maintenance solutions (e.g. 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 is to be considered unauthorized. This instrument has left the factory in perfect technical and safety conditions (see test report in each package). The regular functionality of the device and the operator 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 a safe use*

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

- the instrument can be used in accordance with the specifications mentioned above only;
- use the supplied power supply only. 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; no part of the instrument can be opened by the user.

Do this only if explicitly authorized by the manufacturer.

- ### *Unauthorized use*

The instrument must not run, if:

- it 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 by 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 procedures. 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, disconnected from the power supply and by authorized personnel only. 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 original spare parts only. 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 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*

The portable electrochemical instrument REVio is able to measure the following parameters:

MEASURING CHANNEL GREEN:
pH, mV, Redox, selective Ions, Temperature

MEASURING CHANNEL VIOLET:
Saturation DO, Concentration DO, barometric pressure, Temperature

MEASURING CHANNEL GREY:
Conductivity, TDS, Salinity, Resistivity, Temperature
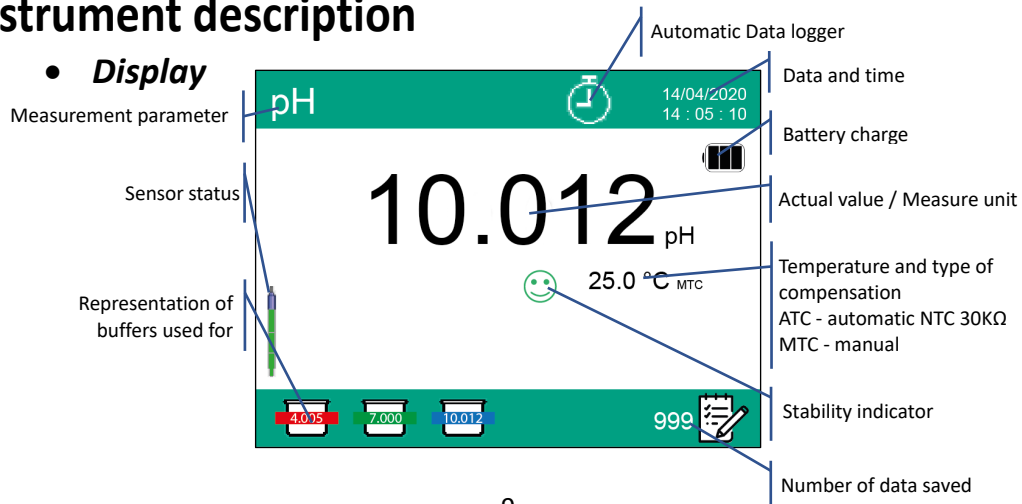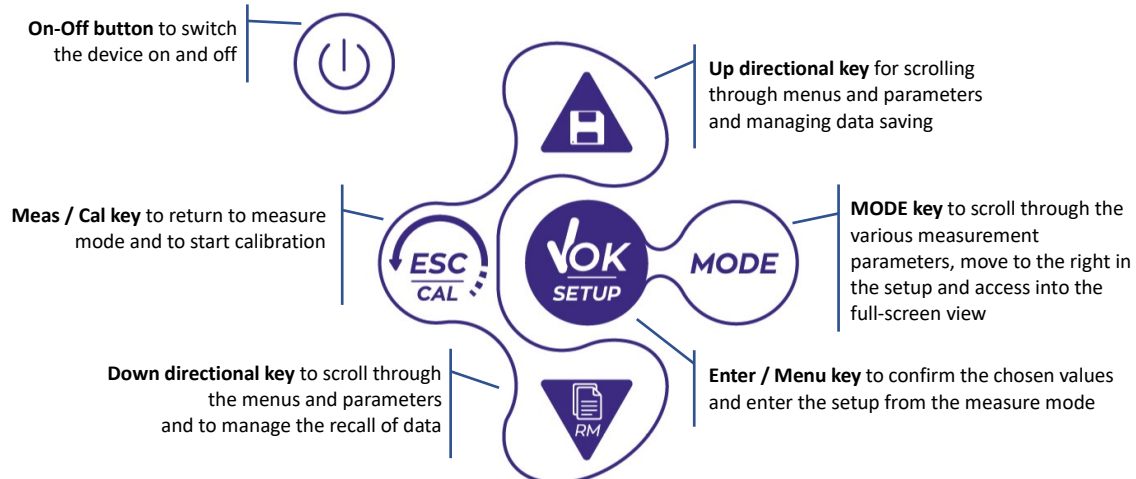In the **multiparametric screen,** the user has the opportunity to simultaneously view up to 6 parameters.

- *Datasheet*

pH	
Measuring range	-2…20
Resolution / Accuracy	0.1, 0.01, 0.001 / $\pm$0.002
Recognized calibration points and buffers	**AUTO:** 1…5 / USA, NIST, DIN **CUS:** 5 user values
Buffers indication	Yes
Calibration report	Yes
Automatic DHS recognition	Yes
Stability filter	Med – High - Tit
Values alarm MIN MAX	Yes
mV	
Range / Resolution	Range: $\pm$2000 / Resolution: 0.1 / 1
ISE	
Resolution	0.001 – 0.099 / 0.1 – 19.9 / 20 – 199 / 200 – 19999
Calibration points	2…5
Measure units	mg/L – g/L – mol/L
ORP	
Calibration points	1 point / 475 mV
Conducibilità	
Range / Resolution	00,00 – 20,00 – 200,0 – 2000 µS / 2,00 – 20,00 – 200,0 – 1000 mS Automatic scale
Recognized calibration points and buffers	1…4 / 84, 147, 1413 µS, 12.88, 111.8 mS, 1 user value
Reference temperature	15…30 °C
Temperature coefficient	0,00…10,00 %/°C and ultrapure water
TDS	
Measuring range / TDS Factor	0,1mg/L…500 g/L / 0.40…1.00
Salinity	
Measuring range	0,01…100ppt
Resistivity	
Measuring range	1….10 Ω / MΩ*cm

Dissolved O₂ saturation	
Measuring range	0,00…50,00 mg/l
Resolution	0,01 mg/l
Accuracy	± 1,5% F.S. (full scale)
Dissolved O₂ saturation	
Measuring range	0,0…400.0 %
Resolution	0,1 %
Accuracy (with sensor)	± 10%
Oxygen calibration points	1 o 2 automatic
Calibration points indication	Yes
Calibration report	Yes
Barometric pressure	
Measuring range	300.0…1100.0 mbar
Resolution / Accuracy	0.1 mbar / ± 0,5%
Automatic pressure compensation	Yes
Temperature	
Measuring range	-30…130,0 °C
Resolution / Accuracy	0,1 / ± 0,2°C
Temperature compensation ATC and MTC	0…100 °C
System and Data logger	
GLP with calibration timer	Yes
Password	Yes, numerical
Internal memory	10000 Data
Display	Colour LCD
Brightness and contrast management	Manual and automatic with integrated sensor
Simultaneous view screen	Yes, up to 6 parameters
HOLD Function	Yes, in all parameters
Multilingual	Yes, 7 languages
Auto switch-off	Si
Sleep Mode	Off / 1…20 min
Power supply	4 batteries AA 1,5 V / Adaptor 5 V 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	450 g
IP protection	IP 57

4.Instrument description

- *Display*

Automatic Data logger

Data and time

Measurement parameter

Battery charge

Sensor status

Actual value / Measure unit

Temperature and type of compensation
ATC - automatic NTC 30KΩ
MTC - manual

Representation of buffers used for

Stability indicator

Number of data saved

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UM ReVio EN rev.0 04.06.2020

- *Keyboard*

On-Off button to switch the device on and off

Up directional key for scrolling through menus and parameters and managing data saving

Meas / Cal key to return to measure mode and to start calibration

MODE key to scroll through the various measurement parameters, move to the right in the setup and access into the full-screen view

Down directional key to scroll through the menus and parameters and to manage the recall of data

Enter / Menu key to confirm the chosen values and enter the setup from the measure mode

- *LED*

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

Function	LED	Description
Power on	Green	*Fixed*
Power off	Red	*Fixed*
Standby	Green	*Flashing every 20 s*
Stable measure/ HOLD	Green	*Flashing every 3 s*
Errors during calibration	Red	*Flashing every 1 s*
Errors during measurement	Red	*Flashing every 3 s*
Time of saving the data	Green	*On / Off in rapid succession*
Recall Memory mode	Green Red	*Alternate green and red, pause 5 s*
Selection confirmation	Green	*Switched on for 1 s*
DHS activation	Green	*Fixed*
DHS deactivation	Red	*Fixed*

5.Installation

- *Supplied components*

The manufacturer makes available to the local distributor the opportunity to purchase the instrument in different kits, depending on the sensors the user wants to combine:

The kit REVIO ONLY INSTRUMENT is always supplied with: suitcase with shaped interiors, device with batteries, 5V adapter with USB cable, S7/BNC connection cable 3 m, NT55 temperature probe 3 m, buffer solutions in single-dose bottle and/or in sachet, paper tissues, screwdriver, beaker, electrode holder, multilingual user manual and test report. Different versions are available with sensors already included, or the possibility of ordering different transport accessories, such as the IP67 waterproof case or the sot case in eco-friendly material. Contact your local distributor to be updated on the correct composition of the sales kit.

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

- *Connection of the power supply*
- In addition to batteries, the instrument can be powered through electricity grid;

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- check that the electrical standards of the line on which the instrumentation is to be installed comply with the voltage and operating frequency of the instrument;
- use the original power supply only;
- 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 an electric socket easy to reach.

> **ATTENTION - Danger of death or serious injury from electric shock.** ⚠️
>
> **Contact with live components can lead to injury or death.**
> - **Use the adapter supplied only.**
> - **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.**

The electricity supply can be originated from the power grid and from the USB port of a PC too.

If the instrument is powered by PC, the icon ⚡ will appear on the display.

Opening the DataLink+ software, on the display it is shown this icon 🔌.

• *Power on, date and time, power off*

Turn on the system by pressing the button ⏻ . The display will show:
- REVio home screen with software version.
- Settings relating to the most important parameters and possible information about the DHS sensor.
- Once the upload is complete, the device enters the measure mode.

On first use, and after each battery replacement, the instrument during the start-up phase will request the updating of the date and time (See paragraph *Instrument configuration menu*):

- In measure mode press the key 🔘 . Move the cursor over the icon ⚙️ and access by pressing 🔘 again.

- Use the keys 🔼 and 🔽 to scroll the menu until "**Date setting**" and access with the button 🔘 . Change the date using the directional keys. (See paragraph *Instrument configuration menu*).

- Repeat the same operation with the "**Time Setting**" menu.

- Press the button (ESC CAL) to return to measure mode.

- To switch off the instrument, press the key ⏻ in measure mode.

• *Replacement of batteries* ⚠️ ℹ️

The instrument works with 4 AA 1.5V batteries. To proceed with the replacement:
- 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 to avoid any scratching on display.
- Using the screwdriver supplied, completely unscrew the screw close to the battery symbol.
- Remove the battery stopper cap with the help of the lanyard.
- Remove the 4 exhausted batteries 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.
- Reinsert the battery stopper cap; always hold it with two fingers, insert the screw and tighten.

- ## *Instrument transportation*

The instrument is always supplied with the appropriate carrying case or soft case in eco-friendly material. Use the original accessorises only, to transport the instrument. If you need to buy it again, contact your local distributor. The interior of the classic case or the IP 67 one is shaped to be able to house the instrument and the sensors still connected.

- ## *Key functions*

Button	Pression	Function
(power icon)	Short	Press to turn the device on or off.
MODE	Short	In measure mode, press to scroll through the different parameters: **pH → mV → ISE → ORP → Cond → TDS → Sal → Res → DO% → DOmg/L → mbar → multi view** In Setup move the cursor to the right column.
	Long-press (3s)	In measure mode keep pressed to access the full screen view.
ESC CAL	Short	In calibration, setup and memory recall mode, press to return to measure mode.
	Long-press (3s)	In measure mode, press to start the calibration.
OK SETUP	Short	In measure 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.
(up/down arrows)	Short	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 custom calibration mode, press to change the value. (up arrow icon) : In measure mode, press to save the data (manual Data Logger) or start and end the recording (Automatic Data Logger). (down arrow icon) : In measure mode, press to recall the saved data.
	Long-press (3s)	In measure 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 and confirming with (OK SETUP icon) .

Further key functions:

- When the **Sleep mode** is active (selectable from 1 to 20 minutes)) press any key to reactivate the brightness of the display.
  Only at this point do the keys regain their function.

- When in measure mode you are in **full screen mode** (activated by long pressing the button (ESC CAL icon)), press any key to exit and return to the standard display.

- ## *Inputs / Outputs connections*

Use original accessories guaranteed by the manufacturer only.
If necessary, contact your local distributor. The BNC connectors are protected by a plastic cap. Remove the cap before connecting the probes.

ReVio top panel

RCA for pH temperature probe

Micro USB for connection to PC and power supply

BNC for pH/ORP electrodes

RCA temperature probe of DO sensor

RCA for Conductivity temperature probe

Banana 4mm for reference electrode

BNC for conductivity cell

BNC for polarographic sensor DO

READ THE MANUAL BEFORE PROCEEDING TO CONNECT THE PROBES OR PERIPHERALS
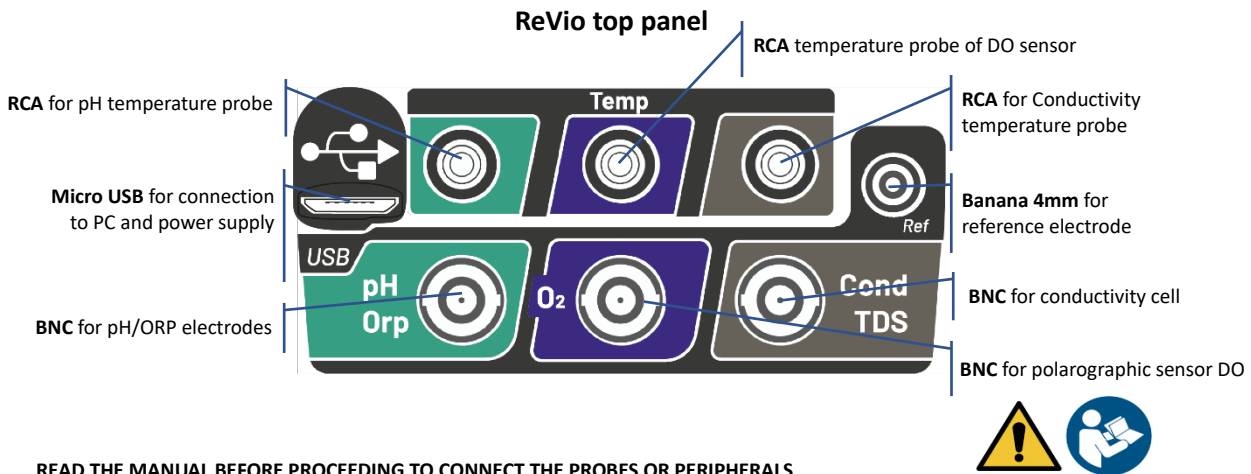
• *Symbols and icons on the display*

Symbol	Description	Symbol	Description
	Number of data stored in Data Logger mode on instrumental memory.		Error / Alarm *Follow the indications of the string next to the icon.*
	Device connected to software DataLink+.		FIXED: Automatic Data Logger set INTERMITTENT: Automatic Data Logger in operation
Due Cal	Calibration deadline set for the displayed parameter.	HOLD	HOLD mode, reading locked when stable.
⚡	Device connected to the mains.		Battery charge indication.
☺	Measurement stability indicator.		Password entered.
	Alarm MIN / MAX set for the pH-Parameter.	DHS sensor	DHS digital sensor active.

6.Operation of the device

- After the switching on, the instrument enters measure mode in the last parameter used.

- **To scroll through the different parameter screens, press the key** (MODE) ; the current measurement parameter is shown in the display on the top left.
  Parameters that use the same sensor are combined by two bands of the same colour on the display (e.g. the parameters Conductivity, TDS, Salinity and Resistivity have brown bands).

Sequence of parameters in measure mode:
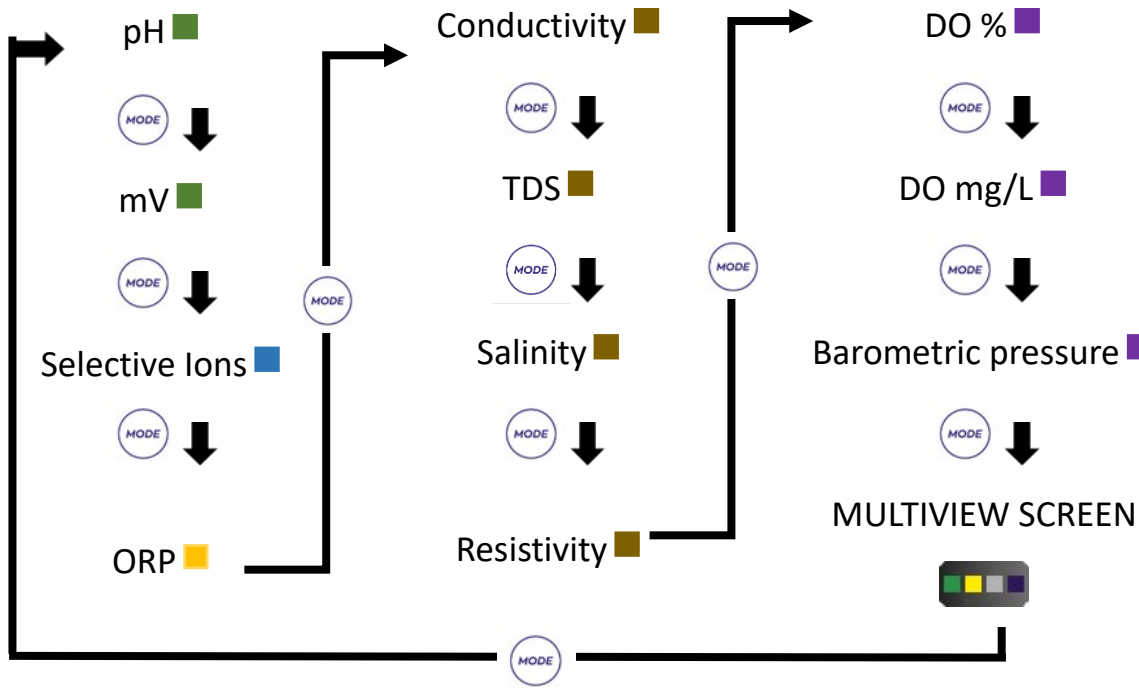
In the measurement screens for parameters, which accept calibration, press the key to start the calibration of the active parameter.

- *Full-screen*

In order to obtain a clearer view of the measured value, in measure mode (Multiview screen excluded),

long-press for 3 seconds the button to activate the full-screen view.
Press any key to return to the classic view.
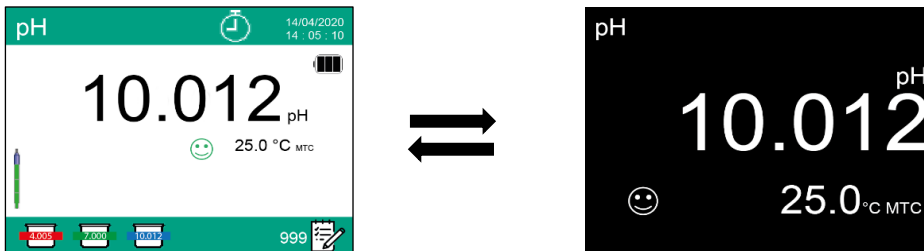
- *Sleep Mode*

When the Sleep mode is active (*see paragraph Instrument Setup Menu*), the display brightness is reduced to a minimum, thus saving significantly on battery consumption.
To exit the Sleep mode and return to normal brightness, press ANY key. Once the display brightness is reactivated, the buttons reacquire their function (paragraph "*Key functions*").

7.Setup Menu

- In measure mode, press the key to enter SETUP mode.
- In the SETUP screen, the cursor will be positioned on the parameter that was active in measure mode.

- Access the SETUP Menu of the parameter with the button , or move with the directional keys

or with the button on the other parameters and enter using always the key .

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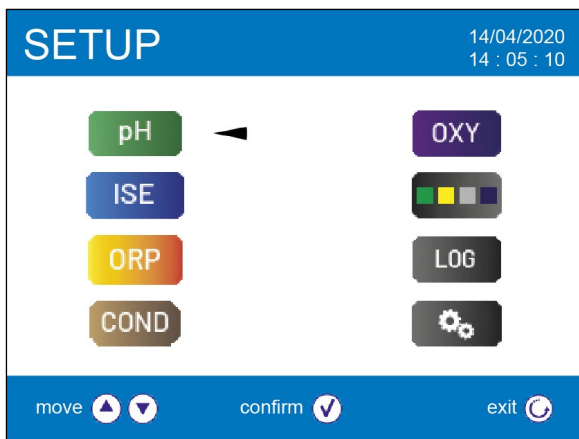
- Within the selected menu, move between the different programs using the directional buttons and press the button [VOK SETUP] to access the submenu you want to edit.

- **Using the keys** [▲] **and** [▼] **choose the desired option or change the numerical value and confirm with** [VOK SETUP] .

- Press the key [ESC CAL] to return to the measure mode.
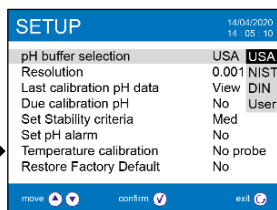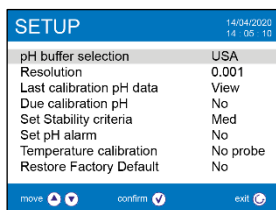
To confirm the setup

- *Setup menu* [i]

 pH

pH Buffer Selection
Resolution
Last Calibration data
Due calibration
Set Stability criteria
Set pH alarm
Temperature calibration
Restore Factory Default

 ISE

Measuring unit
Select low standard
Set stability criteria
Last calibration data
Due calibration
Restore Factory Default

 ORP

Last Calibration Data
Due calibration
Temperature calibration
Restore Factory Default

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COND → Cell Constant
Calibration Solution
Last calibration data
Due calibration
Reference temperature
Temperature Compensation factor
Temperature calibration
TDS factor
Restore Factory Default

OXY → Calibration point Zero
Last calibration data
Due calibration
Salinity Compensation
Temperature calibration
Restore Factory Default
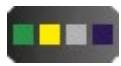
→ *Select which parameters to view in the MULTIVIEW screen.*

LOG → Data Logging type
Delete data in memory

→ Select parameters
Password
Backlight Mode
Brightness
Sleep Mode
Reading with HOLD
Date format
Date setting
Time setting
Temperature unit option
Select Language
Auto Off
Buzzer Mode / Restore Factory Default

8. Temperature measurement ATC – MTC

- **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: in measure mode, keep pressed ▽ or △ until the value starts to flash; then adjust it by continuing to use the directional keys; press OK/SETUP to confirm.
- The set or measured temperature in a given measuring channel will be used for all parameters connected to it.

Example: the temperature probe connected in the "green" measuring channel will detect the temperature for pH, mV, ORP and ISE parameters.

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9.pH Parameter

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*

- In measure mode press [SETUP] to access the SETUP menu.
- Scroll using the directional keys to select the menu **"pH"** [pH] and access by pressing the button [SETUP] .

- Move with the keys [down] and [up] to select the program to modify.

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:

	Description	Options	Factory Default Settings
pH	pH buffer selection	USA – NIST – DIN – User	USA
	Resolution	0.1 – 0.01 – 0.001	0.01
	Last calibration data	View	View
	Due calibration	No – Hours – Days	No
	Set Stability criteria	Med – High – Tit	Med
	Set pH alarm	No – MIN - MAX	No
	Temperature calibration	-	-
	Restore Factory Default	Yes - No	No

pH buffer selection
- Access this setup to select the buffer family for performing the pH-electrode calibration.
- This Device allows the execution of calibration lines for pH from **1 to 5 points**.

During the calibration, press [ESC CAL] **to exit and save the points calibrated up to that moment.**
- 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 5 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
DIN buffers: 1,68 - 4,01 - **6,86**** - 9,18 - 12,45
** Neutral point always requested as first
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.
Inside the beaker, the number represents the exact value of the buffer; furthermore, for a quick and intuitive understanding a chromatic scale has been inserted.

Beaker colour	pH value of the buffer
Brown	< 2.5
Red	2.5 ~ 6.5
Green	6.5 ~ 7.5
Blue	7.5 ~ 11.5
Black	> 11.5
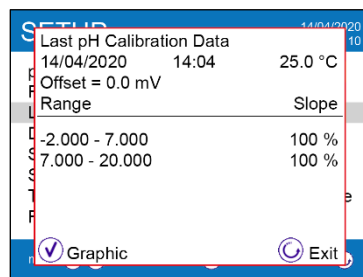
Resolution
Access this menu to choose the resolution needed, when reading the pH parameter:
- **0.1**
- **0.01** - default -
- **0.001**

Last calibration data

Access this menu to get information on the last calibration performed. Selecting "View", a report appears on the display with the following information regarding the calibration currently in use:

CALIBRATION DATE / CALIBRATION TIME / TEMPERATURE / DHS MODEL IF PRESENT / OFFSET / SLOPE % for each range.

Select [ESC CAL] to exit; by pressing the button [OK SETUP], you will access the innovative **graphic representation** regarding the calibration conditions, which allows you to intuitively understand the status of the sensor.
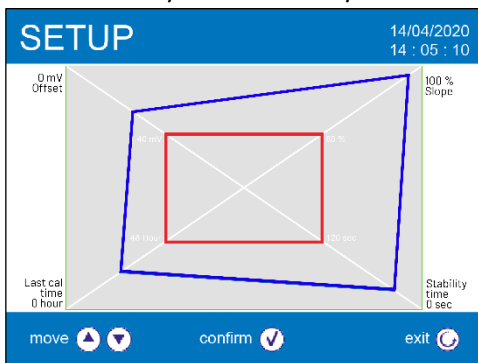
The calibration report has been designed to provide the user with an immediate view of the calibration conditions, in fact, the closer the blue rectangle (actual calibration data) is to the outside of the graph, the closer to ideality is the calibration and electrode conditions; vice versa, the condition worsens if the red rectangle is closer, which represents the limit of acceptability recommended by the supplier.

The graph shows the data relating to the offset, the average slope, the sensor settling time and how many hours have passed since the last calibration.

Due calibration

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 [▲] and [▼] to select hours or days which must pass between the two calibrations e confirm with button [OK SETUP].

- When a calibration deadline for a parameter is set, the icon [Due Cal] is present on the display in measure mode.

- **When the calibration deadline is activated, the instrument prevents further measurements**, until the calibration is renewed, or the deadline deactivated.

- The error icon [⚠] will appear on the display and a message invites the user to perform a new calibration of the pH sensor to be able to work again.

Set stability criteria

To consider the reading of a value truthful, we recommend waiting for the measurement stability, indicated by the icon [☺].

Access this menu to change the measurement stability criterion:
- **"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.
- "**Tit**" (titolation) no stability criterion is activated; the reading will therefore be "continuous".

With this active option, the icon [TR] will appear on the display and the measurement will hardly stabilize, however the response time of the device is reduced to the minimum, as it is a simultaneous measurement.

Set pH alarm

Access to set threshold alarm for measuring the minimum and/or maximum pH value.

This option is indicated by the appearance of the icon on the display [⊢⊣].

When the set threshold is exceeded, the instrument will report the alarm to the user in the following ways:
- The measured pH-value turns into red.

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- Flashing of the red led every 3 seconds.
- Acoustic signal *(see paragraph Instrument Setup Menu /Buzzer Mode).*

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°C.

After connecting the temperature probe in the correct measurement channel, use the keys and

to correct the temperature offset value and confirm with .

Restore Factory Default

If the instrument does not work properly 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 delete the stored data.

• *Automatic pH calibration*
Example: three-point calibration with USA type buffers

- In **pH** measure mode keep the button pressed for 3 seconds to enter calibration mode.

- Rinse the electrode with distilled water and gently dab with paper towel.

- Press the button and dip the electrode in the pH 7.00 buffer solution (as indicated by the beaker on display). *The first calibration point is always the neutral pH (7.00 for USA curve, 6.86 for NIST and DIN curve), while the rest are at user's discretion.*

- When the icon ☺ appears, confirm the first point by pressing the button .

  The measured value flashes on the display and then the icon of the pH 7.00 beaker `7.00` 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.

- Press the button in order to proceed with the calibration and dip the sensor in the pH 4.01 buffer solution. In the beaker the different pH-buffers, that the device can recognize automatically, scroll.

- When the 4.01 value is recognized and the icon ☺ appears, confirm by pressing the button .
  The actual measured value flashes on the display and subsequently, next to the beaker pH 7.00, the icon of the beaker pH 4.01 `4.01` appears, indicating that the instrument is calibrated in the acid field.

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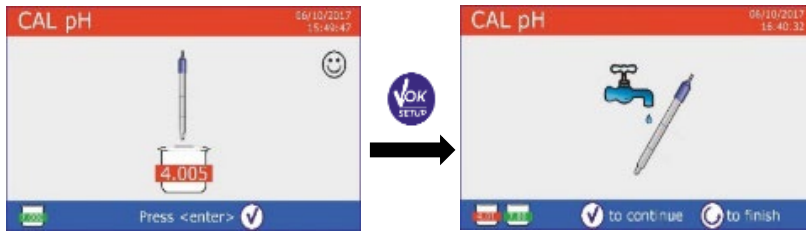
For a two-point calibration curve, press ⎛ESC CAL⎞ *to end the calibration process and return to measure mode.*

- Remove the electrode, rinse with distilled water and dab gently with paper towel.

- Press the button (OK SETUP) in order to proceed with the calibration and dip the sensor in the pH 10.01 buffer solution.
  In the beaker the different pH-buffers, that the device can recognize automatically, scroll.

- When the value 10.01 is recognized and the icon ☺ appears,

  confirm by pressing the button (OK SETUP).
  Switching from an acidic to a basic pH may take a few more seconds to achieve stability.
  The actual measured value flashes on the display and subsequently, next to the beakers of pH 7.00 and

  pH 4.01, the icon of the beaker pH 10.01 [10.01] appears, indicating that the instrument is calibrated in the alkaline field.

- Although the device can accept two more calibration points, **stop and confirm this three-point curve by pressing** ⎛ESC CAL⎞ .
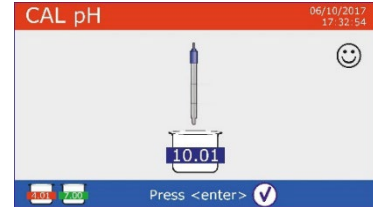
The calibration report and the graphic representation appear on the display; press the button (OK SETUP) or ⎛ESC CAL⎞ to exit and return to measure mode.

The buffers used for the last calibration are displayed in the lower left side.

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. After a long time or after reading of particular samples, it is necessary to renew the calibration; the graphic report can help the user in making this decision.*

IMPORTANT: *in order to obtain highly accurate results, the manufacturer recommends the use of **XS Solution** buffer solutions and **XS Sensor** pH electrodes. Contact your local distributor for supply.*

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.*
The careful reading of the safety data sheets of the solutions used favors the elimination of residual risks related to skin, contact, ingestion, inhalation or eye contact that can generate possible but not probable minor damages.

- ***Calibration with manual values***

Example: two-point calibration pH 6.79 and pH 4.65 (DIN19267)

- Access the Setup menu for **pH** [pH] and select **User** in entry **pH buffer selection,** press the key ⎛ESC CAL⎞ to return to the measurement and position in pH mode.

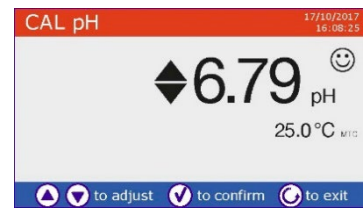- Keep press for three second the button ⎛ESC CAL⎞ to enter the calibration mode.

- Rinse the electrode with distilled water ⌴ and gently dab it with paper towel.

- Press the button ⓥ and 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, use the keys ▼ and ▲ to adjust the value by entering the correct one (e.g. pH 6.79).

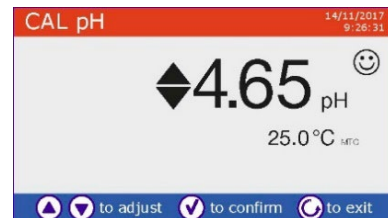*Note: Check the buffer value according to the temperature.*

- 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 at the bottom left with the buffer identification colour and value U 6.79 (the letter U indicates the "user value").

- Rinse the electrode with distilled water ⌴ and gently dab it with paper towel.

- Press the button ⓥ to proceed with the calibration and dip the electrode in the next buffer (e.g. pH 4.65).

- Wait for the pH value on the display to stabilize; when the icon ☺ appears, use the keys ▼ and ▲ to adjust the value by entering the correct one (e.g. pH 4.65).

- When the icon ☺ appears, press the key ⓥ to confirm the second point; the actual measured value flashes on the display and the icons U 4.65 appear at the bottom left.

- Although the device can accept three more calibration points, **stop and confirm this calibration by pressing** (ESC/CAL).

- The calibration report and the graphic representation appear on the display; press the button ⓥ or (ESC/CAL) to exit and return to measure mode. The beakers relating to the calibration are displayed at the bottom left side, the value is preceded by the letter "U", indicating that the value has been entered manually.

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

• *Performing pH measurement* ⓘ

- In measure mode, press the button (MODE) and move to **pH** (*see paragraph "Operation of the device"*).
- Connect the electrode to the BNC of the instrument in green colour.
- Connect the temperature probe to the RCA in the green input.
- If the user does not use an electrode with a built-in temperature probe or an external probe NTC 30KΩ, it is recommended 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 slightly stirred.
- Consider the measurement truthful only when the stability icon ☺ appears.

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To eliminate any error due to user interpretation, it is possible to use the "HOLD" function (*See paragraph Instrument Setup Menu*), which allows you to block the measurement as soon as it reaches stability.

- **After the measurement, wash the electrode with distilled water and preserve it in the appropriate storage solution. Never touch the sensors in the distilled water.**
  Note: *the graphical representation of the electrode at the bottom left of the display indicates the slope of the current calibration.*
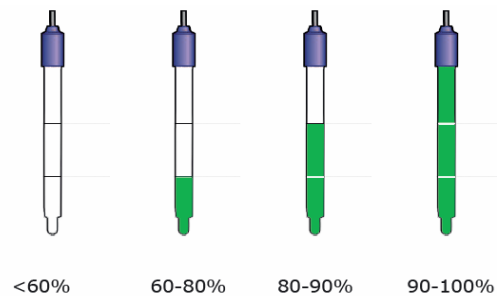
| <60% | 60-80% | 80-90% | 90-100% |

The possibility to have immediate access and manage all the information regarding the calibration and the status of the sensor allows the user to work while maintaining high quality standards.

IMPORTANT: the use of the wide range of XS Sensor electrodes is preferred and it the solution recommended by the manufacturer to obtain highly accurate measurements. Read carefully the instructions and recommendations for use and maintenance, which are always present inside the packages of XS Sensor electrodes.

• *Sensors with DHS technology*

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 in the green inputs.
- The device automatically recognizes the chip; information on the model, sensor lot and last calibration data (if the electrode was already calibrated) appear on the display.
- When the DHS electrode is recognized, the active calibration on the instrument becomes the one of the sensor.
- **The sensor is ready to be used.**
- 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.
- Consult your local distributor for more information on the pH-meters (bench and portable) produced by the suppliers compatible with DHS sensors.
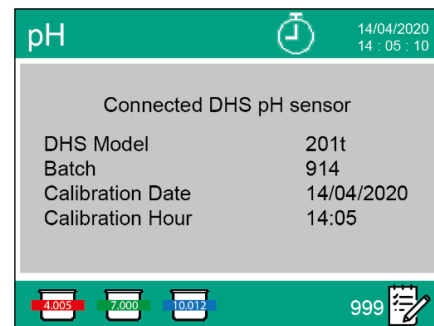
• *Errors during calibration*

- **NOT STABLE MEASURE**: 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.
- **CALIBRATION TOO LONG:** The calibration exceeded the time limit: only the points calibrated up to that moment will be kept.

10.mV Parameter

- In measure mode press the key and move to the **mV** parameter.
- The display shows the measurement in mV of the pH sensor.
- Consider the measurement truthful only when the stability icon appears.

Note: This measurement is recommended to evaluate the sensor efficiency.

11. Measurement with ion-selective electrodes (ISE/ION)

This series of devices can measure the concentration of ions such as ammonium, fluorides, chlorides, nitrates etc., using an ion selective electrode specific for the ion of interest. Connect the electrode to the BNC connector in green measuring channel. Connect any reference electrode to the **Ref** connector next to the grey channel for Conductivity.

- ### *Setup for ISE Parameter*

- In measure mode, press the button to access the SETUP menu.

- Using the directional keys, move to the **"ISE"** menu ISE and access by pressing the button .

- Move with directional keys and to select the program to modify.

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

Program	Description	Options	Factory Default Settings
ISE	Measuring unit	mg/l – g/l – mol/l	mg/l
	Select low standard	0.001 … 19999 ppm	0.001
	Set stability criteria	Stability / Seconds	Stability
	Last calibration data	View	View
	Due calibration	No – Hours – Days	No
	Restore Factory Default	Yes - No	No

Measuring unit

Access this menu to select the measure unit with which to calibrate the instrument and read the sample:
- **mg/l** -default-
- **g/l**
- **mol/l**

Note: use the same unit of measure for the calibration and measurement.

IMPORTANT: If the unit of measure is modified, the calibration is automatically cancelled.

Select low standard

Access this menu to select the concentration of the first point of the calibration curve (*more diluted standard*). The other point will automatically be identified by the software, by multiplying the concentration by a factor of **10**.

Example: Low standard 0.050 mg/l, the other calibration points expected by the instrument will be 0.5 / 5 / 50 / 500 mg/l.

The device can accept from a **minimum of 2 to a maximum of 5** calibration points, once the second

calibration is finished, the user can stop the calibration by pressing and saving the points performed up to that moment.

Set Stability criteria

Access this menu to choose which stability criterion to use for calibration and measurement.
- **Stability**: Equivalent to the "Medium" stability criterion for pH.

- **Seconds (0…180)**: Using the keys and , select the seconds after which the device fixes the measurement (useful function for volatile compounds).

When this option is used, the countdown is activated on the display at the end of which the measurement

is fixed. To restart the time, press the button .

Last calibration data

Access this menu to get information on the last calibration performed.

Due calibration

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 ⌄ and ⌃ to select days or hours that must elapse between two settings and access with key 🔘 .

- When a calibration deadline for a parameter is set, the icon ⏳ is shown on the display in measure mode.

- **When the calibration reaches the set deadline, it will no longer be possible to perform measurements for that parameter** until the calibration is renewed or the deadline is deactivated.

- The error icon ⚠ and a message appear on the display, which invites the user to perform a new calibration of the sensor to be able to work again.

Restore Factory Default

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.

- ## *Calibration with ion-selective electrodes*

Example: two-point calibration 0.01 e 0.1 mg/l

- Access the Setup **ISE** menu [ISE] and select in **Measuring unit** parameter the unit of measure **mg/L** and in **Select low standard** parameter the more diluted solution: **0.010** (mg/l).

The device automatically multiplies the lower standard entered by the user by a factor of 10, to identify the other points of the calibration line.

- Connect the appropriate ISE electrode for the ion you want to determine to the connector for pH/mV/ORP (green measuring channel).

Important: if the ISE electrode is not combined, it necessary to connect the specific reference 𝒊 *electrode. For any filling electrolytes of the reference electrode and for any iconic strength adjusters (ISA) refer to the user manual of the ISE electrode.*

- Press the button (ESC/CAL) to return to measure mode and by pressing (MODE) move to page **ISE.**

- Keep the button (ESC/CAL) pressed for 3 seconds and access the calibration mode.

- Rinse the electrode with distilled water ⊔ and gently dab with paper towel.

- Press the key 🔘 and dip the electrode in the more diluted standard (low standard), as indicated by the icon [0.010]

- When the stability icon ☺ appears (or at the end of time if "**Seconds**" was chosen as stability criterion), confirm the first point by pressing 🔘 .

- Remove the electrode, rinse with distilled water ⊔ and dab gently with absorbent paper.

- Press 🔘 Dip the sensor in the next standard (**Low standard X 10**), as indicated by the icon [0.100].

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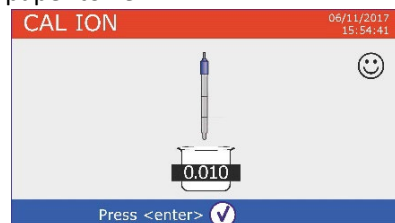
- When the stability icon ☺ appears, confirm the second point by pressing the button 🅥OK/SETUP .
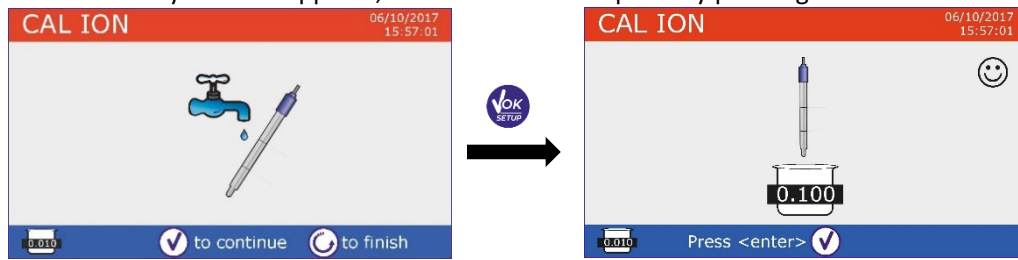
- At the end of the second point, the user has the option to exit from the calibration by pressing the button 🅔SC/CAL , or can continue with other points by pressing the button 🅥OK/SETUP .
- After the calibration, the calibration report appears on the display with DATE AND TIME, TEMPERATURE, UNIT OF MEASURE, SENSOR ID AND SLOPE % for each RANGE.
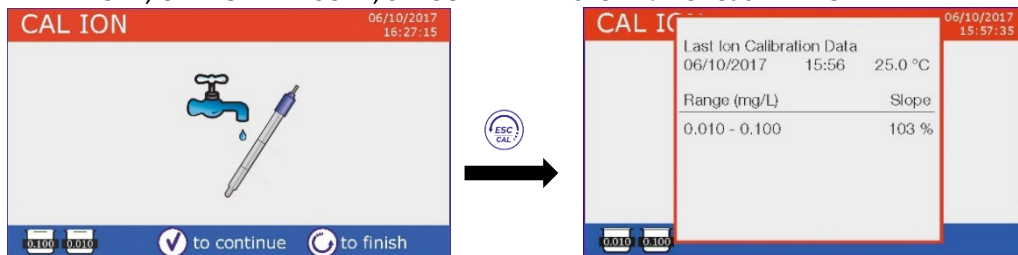
Important: carry out at least two calibration points; if you press 🅔SC/CAL abandoning the calibration after the first point, the display will show the error *"Calibration Error – Not enough calibrated points"* and the calibration is invalidated.

ATTENTION: Before proceeding with the calibration operations, carefully consult the safety data sheets of the substances involved:
- *Standard calibration buffer solution.*
- *Storage solution for ISE electrodes.*
- *Filling solution for ISE electrodes.*

• *Measurements with ion-selective electrodes*

- Access the **ISE** setup menu to check if the calibration and instrument parameters are correct, return to measure mode by pressing the button 🅔SC/CAL and move to screen **ISE**.
- Connect correctly the ISE sensor to the green measuring channel connector, rinse with distilled water, dab it gently and dip it in the sample.
- The display shows the **measurement in mV** until stability is reached.
- When the measurement stabilizes, the measurement in m Vis replaced by the **concentration** of the analyte with the unit of measure chosen by the user.
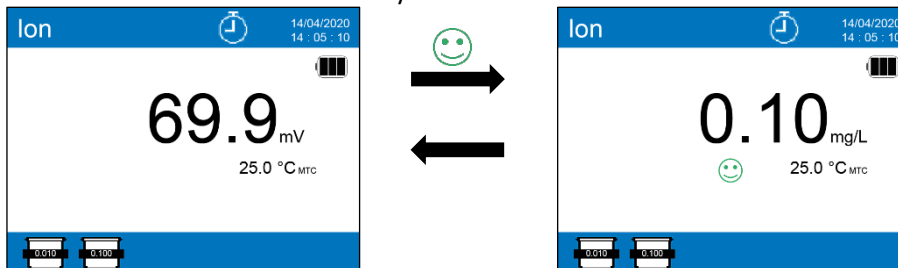
Important: If the device is not calibrated in reading mode, only the mV are displayed.

Note: If the countdown of seconds is used as stability criterion, to restart the time press the button 🅔SC/CAL .

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12.ORP Parameter (Oxide-Reduction potential)

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 $\pm$ 75 mV.**

- *ORP Parameter Setup*

- In measure mode press the key to access the SETUP menu.

- Use the directional keys to move to **"ORP" Menu** and access by pressing the button

- Move with the keys and to select the program 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:

Program	Description	Option	Factory Default Settings
ORP	Last calibration data	View	View
	Due calibration	No – Hours – Days	No
	Temperature calibration	Yes – No	No
	Restore Factory Default	Yes – No	No

Last calibration data
Access this menu to get information on the last calibration performed.

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

- By default, no calibration deadline is set; use the keys and to select days or hours that

  must elapse between two settings and confirm with key .

- When a calibration deadline for a parameter is set, the icon is shown on the display in measure mode.

- **When the calibration reaches the set deadline, it will no longer be possible to perform measurements for that parameter** until the calibration is renewed or the deadline is deactivated.

- The error icon and a message appear on the display, which invites the user to perform a new calibration of the pH sensor to be able to work again.

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°C.

After connecting the temperature probe to the correct measurement channel, use the keys and to correct the temperature offset value and confirm with .

Restore Factory Default

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.

- ## • *ORP automatic calibration*

Automatic calibration with 475 mV solution

- In **ORP** measurement mode, keep the button pressed for three seconds to enter the calibration mode.

- Rinse the electrode with distilled water and gently dab it with paper towel.

- Press the button and dip the electrode in the 475 mV Redox buffer solution.

- When the icon appears, confirm by pressing .
- The actual measured value flashes on the display and subsequently the calibration report appears.

- Press the key to return to measure mode. The icon 475 will appear at the bottom left of the display and indicates that the sensor was calibrated using the 475 mV Redox buffer solution.

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.*

The possibility to have immediate access and manage all the information regarding the calibration and the status of the sensor allows the user to work while maintaining high quality standards.

IMPORTANT: the use of the ORP XS Sensor electrodes is preferred and it the solution recommended by the manufacturer to obtain highly accurate measurements. The manufacturer has the possibility of supplying a wide range of sensors in order to cover different fields of application.
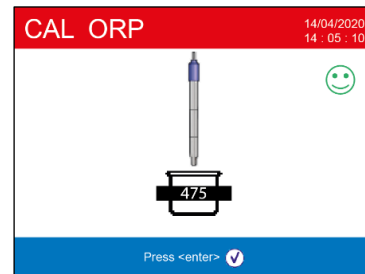
13.Conductivity Parameter

Connect the Conductivity probe to the BNC type connector marked in grey, while the temperature probe must be connected 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 x 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 cm2. The conductance is transformed into specific conductivity (k), which is independent of the cell configuration, multiplying it by the cell constant.
k = G x C is expressed in S / cm even if the units of measurement mS / cm are in common use
(1 S/cm -> 10^3 mS/cm) e µS/cm (1 S/cm -> 10^6 µS/cm).

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- ### *Setup for Conductivity parameter*

- In measure mode press button to access the SETUP menu.

- Use the directional keys to move to **"COND"** setup menu ![COND] 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 COND parameter; for each program, there are the options that the user can choose and the default value:

Program	Description	Options	Factory Default Settings
COND	Cell constant	0.1 - 1 - 10	1
	Calibration solution	Standard / User	Standard
	Last calibration data	View	View
	Due calibration	No – Hours – Days	No
	Reference temperature	15 … 30 °C	25 °C
	Temp compensation fact	0.0…10.0 %/°C – Ultrapure water	1.91 %/C°
	Temperature calibration	-	-
	TDS factor	0.40 … 1.00	0.71
	Restore Factory Default	Yes - No	No

Cell constant

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. **Contact your local dealer for information on the different conductivity cells provided by the manufacturer.**

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

Cell Constant	**0.1**	**1**		**10**
Standard (25°)	84 µS – 147 µS	1413 µS	12.88 mS	111.8 mS
Ideal range of measure	0 – 500 µS	500 – 5000µS	5 – 50 mS	50 – f.s. mS
Display Icon	![84.0] - ![147]	![1413]	![12.88]	![111.8]

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

- **0.1**
- **1** – default option-
- **10**

The cell constant in use appears on the bottom left side of the display. For each of the 3 selectable cell constants the device stores the calibrated points. By selecting the cell constant, the calibration points previously performed are automatically recalled.

Calibration solution

Enter this setup menu to set Automatic or Manual buffer conductivity standard calibration:

- **STANDARD**: -default- the device automatically recognizes up to 3 of the following standards:

    84.0 µS/cm, **147** µS/cm, **1413** µS/cm, **12.88** mS/cm e **111.8** mS/cm.

- **USER:** the device can be calibrated on one point defined by user.

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

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

ATTENTION: when using Standards 84 µS and 147 µS, pay particular attention that the instrument recognizes the correct one. Replace the solution and perform maintenance on the sensor if this does not happen.

Last calibration data

Access this menu to get information on the last calibration performed.
The effective cell constant applied after calibration is reported for each measurement range.

Due calibration

Enter this menu to set a calibration deadline; this option is essential in GLP protocols.

- No calibration deadline is set by default; use the keys ⬇ and ⬆ to choose days or hours that must elapse between two calibrations and confirm with button (OK/SETUP) .

- When a calibration deadline is set for a parameter, it is indicated in measure mode with the icon (Due Cal ⌛) .

- **When the calibration reaches the set deadline, it will no longer be possible to make measurements for that parameter** until the calibration is performed again or the deadline deactivated.

- The error symbol ⚠ and a message will appear on the display, which invites the user to recalibrate the sensor to continue the measurements.

Temperature compensation in conductivity measurement should not be confused with the temperature compensation for pH measurement.

In a conductivity measurement, the value showed on the display is the conductivity calculated at the reference temperature. Therefore, the effect of temperature on the sample is corrected.

On the contrary, in a pH measurement, the value showed is the pH at the displayed temperature. The temperature compensation involves the adaptation of the slope and the electrode offset at the measured temperature.

Reference temperature

The conductivity measurement is strongly temperature dependent.

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

For each conductivity measurement the temperature to which it is related must be specified, otherwise it is a worthless result. Generally, the temperature refers to 25 °C or more rarely to 20 °C.

This device measures the conductivity at the actual temperature (ATC or MTC) and then convert it to the reference temperature using the correction algorithm chosen in program. 𝑖

"Temp compensation factor"

- Access this setup menu to set the temperature at which you want to refer the Conductivity measurement.

- The device is able to report Conductivity from **15 to 30** ° C. By default, it is **25 ° C,** which is suitable for most of the analyses.

Temperature compensation factor

It is important to know the dependence on temperature (percentage variation of conductivity every °C) of the sample being measured. To simplify the complex relationship between conductivity, temperature and ionic concentration, different compensation methods can be used:

- **Linear Coefficent 0.00…10.0 %/°C** -default value 1.91 %/°C - For the compensation of medium and high conductivity solutions, linear compensation can be used.
  The default factory value is fine for most of the routine measures in aqueous solutions.

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

Solution	(%/°C)	Sample	(%/°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_{ref} 25 °C are shown in the following table:

°C	0.001 mol/L KCl (147µS)	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

The following formula is used to determine the calibration coefficient of a particular solution:

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

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

Each result with the compensated temperature is affected 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 to not use the correction factor, acting directly on the sample temperature.

Select 0.00% as temperature coefficient, to deactivate the compensation.

The displayed conductivity value refers to the real temperature value measured by the probe and not related to a reference temperature.

- **Ultrapure water**: Select this option when working with conductivity **LOWER than 10 µS/cm.**
  An icon in the upper left corner of the display informs the user that this compensation mode is being used. When this threshold is exceeded, this option is automatically disabled, and linear compensation is activated.

The temperature coefficient in ultrapure water varies strongly. The main reason for is that the self-ionization of water molecules is more temperature-dependent than the conductivity caused by the other ions.

Note: Low conductivity measurements (<10 µS/cm) are strongly influenced by atmospheric carbon dioxide. To obtain reliable results, it is important to prevent contact between the sample and the air, this can be achieved by using a flow cell or chemically inert gases, such as nitrogen or helium that isolate the sample surface.

Temperature calibration

All the instruments in this series are pre-calibrated for a correct measure of the temperature. However, if there is a difference between the measured and the real one (usually due to a malfunction of the probe), it is possible to adjust the offset of $\pm$ 5°C.

After connecting the temperature probe in the right measurement channel, use the directional keys

and to correct the temperature offset value and confirm with the button .

TDS factor

Access this setup menu to modify the factor **0.4…1.00** -default 0.71- to carry out the conversion from conductivity to TDS.

- See section -*Other measurements performed with conductivity cell.*

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Restore Factory Default

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.*

• *Automatic COND calibration*

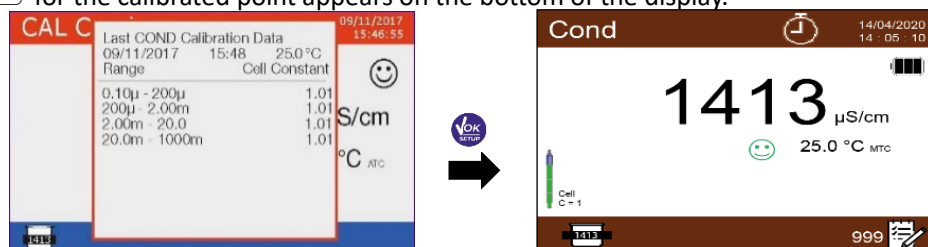*Example: one-point calibration (1413 µS / cm) using a cell constant sensor 1*

- In **Cond** measure mode, keep the button pressed for 3 seconds to enter the calibration mode.

- Rinse the cell with distilled water and dab gently with paper towel.
- Mix with a few ml of standard solution.

- Press key and dip the sensor in the standard 1413 µS/cm, keeping it slightly stirred and making sure that there are no air bubbles in the cell.
  In the beaker, all the Conductivity values, that the instrument is able to recognize, scroll.

- When the value stops on **1413** and the icon ☺ appears, confirm by pressing the button .
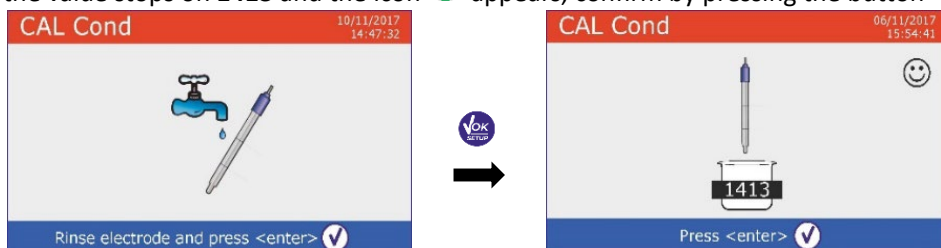
- The actual measured value flashes on the display, then, the calibration report appears, showing the cell constant for each scale and finally, the device automatically returns to measure mode. The beaker icon for the calibrated point appears on the bottom of the display.

- One-point calibration is enough, if measurements are performed within the measurement range.

EXAMPLE: the standard solution 1413 µS/cm is suitable for measurements between 500 – 5000 µS/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, the instrument stores the calibration, to allow the user who uses multiple sensors with different constants not to be forced to recalibrate each time.

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.

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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.
Important: to obtain highly accurate results, the manufacturer of the instrument recommends the use of XS Solution conductivity solutions and XS Sensor cells.
Contact your local distributor for the supply of buffer solutions at different values with which to calibrate the instrument and the different conductivity cells with constant 0.1 / 1 / 10.
ATTENTION: Before proceeding with the calibration operations, carefully consult the safety data sheets of the substances involved.

- *Calibration buffer solutions.*

- ## *Manual COND calibration*

Example: calibration at 5.00 µS / cm with sensor with Cell Constant 0.1

- Access the Setup menu for **Conductivity** COND , select **0.1** in the entry **Cell constant** and **User** in the entry **Calibration solution,** press the button (ESC/CAL) to return to measure mode and go to **Cond** mode.

- Keep the button (ESC/CAL) pressed for 3 seconds and enter the calibration mode.

- Rinse the cell with distilled water and dab gently with paper towel.

- Apply few ml of standard solution, press the button (OK/SETUP) and dip the sensor in the conductivity standard 5.00 µS/cm.

- Wait until the Conductivity value is stable; when the icon ☺ appears, use the directional keys and to adjust the value by entering that of the standard solution (e.g. 5.00 µS/cm).

- When the icon ☺ appears again, confirm the calibration point by pressing the key (OK/SETUP) .
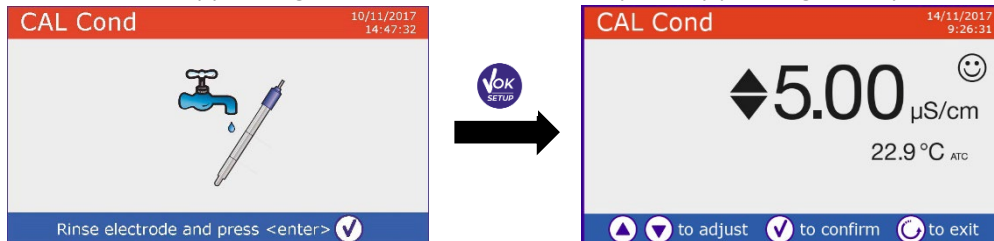
- Automatically on the display, the calibration report appears. Press the button (OK/SETUP) to return to measure mode.

- The beaker icon relating to the calibration U5.00 is displayed at the bottom left; the value is preceded by the letter "U", indicating that the value **has been entered manually.**
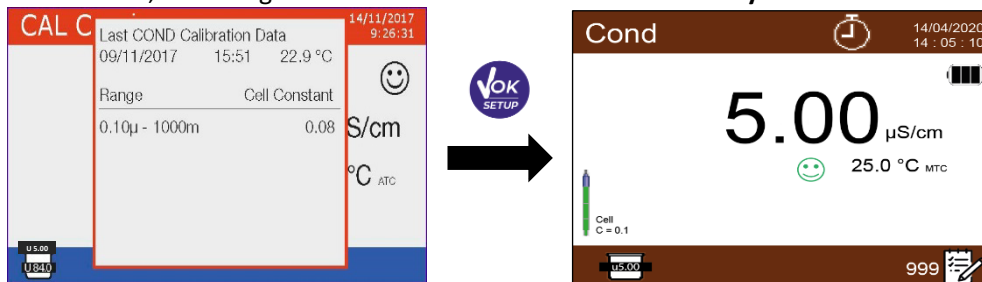
- For each cell constant (P3.1) the instrument stores the calibration in order to allow the user, who uses multiple sensors with different constants not to be forced to recalibrate each time.

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Note: If you are not aware of the exact compensation coefficient, to obtain an accurate calibration and measurement set in "Temperature compensation factor" → 0.00 %/°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* ⚠️

- **NOT STABLE MEASURE:** The button 🔵OK/SETUP 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.

• *Performing Conductivity measurement*

- In measure mode press the button (MODE) to scroll through the different screens of parameters until activating the **Cond** (see paragraph "*Operation of the device*").
- Connect the Conductivity cell to the BNC in the grey measure channel.
- If the user does not use a cell with a built-in temperature probe or an external one NTC 30KΩ 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.
- Consider the measurement truthful only when the stability icon appears 😊.
  To eliminate any errors due to user interpretation, it is possible to use the "HOLD" function (see paragraph *Instrument Setup Menu*), which allows you to block the measurement as soon as it reached stability.
- For a highly accurate measurement the instrument uses six different measurement scales and two units of measurement (μS / 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.

The ability to have immediate access and manage all information regarding the calibration and the cell status allows the user to work while maintaining high quality standard.

IMPORTANT: the use of XS Sensor cells is preferred and is the solution recommended by the manufacturer to obtain highly accurate analyzes. The manufacturer has the possibility to supply sensors with constant 0.1 / 1 / 10, so that they can be used in various fields of application (pharmaceutical, environmental, industrial, galvanic, etc.).

14. Other measurements carried out with the Conductivity cell

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

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

• *TDS Parameter*

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. Within the Conductivity setup menu COND access the "**TDS factor**" option to change the conductivity/TDS conversion factor.

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

Conductivity of the solution	TDS Factor
1-100 µS/cm	0.60
100 – 1000 µS/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*

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

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

• *Resistivity*

Resistivity is preferable for low conductivity measurements, such as ultrapure water or organic solvents. Resistivity represents the reciprocal of the conductivity $\rho = 1/\kappa$ (MΩ*cm).

15. Dissolved oxygen measurement (mg/l and Saturation %)

Connect the polarographic sensor to the RCA / CINCH Temp connectors in the top panel of the device violet part. It is not necessary connect an external temperature probe, because it is already integrated.

• *O₂ Parameter Setup*

- In measure mode press (OK SETUP) to access the SETUP menu.
- Scroll parameters using directional keys until the **"OXY"** OXY menu and enter pressing (OK SETUP) key.
- Move with the keys (▼) and (▲) to select the program to access.

The table below shows the setup menu structure for the O₂ parameter, and for each program the options that the user can choose and the default value:

Program	Description	Options	Factory Default Settings
OXY	Calibration point Zero	-	-
	Last calibration data	View	View
	Due calibration	No – Hours – Days	No
	Salinity Compensation	Auto – 0.0 … 50.0 ppt	Auto
	Temperature calibration	-	-
	Restore Factory Default	Yes - No	No

Calibration point Zero
- Access this setup menu to start the calibration with Standard Zero Oxygen of the polarographic sensor (see paragraph "*Zero Oxygen Calibration*").
- Once the operation is completed, the device returns automatically to measure mode; the beaker

  $\boxed{0.0}$ indicates the point % O_2 = 0 on which the calibration was performed.
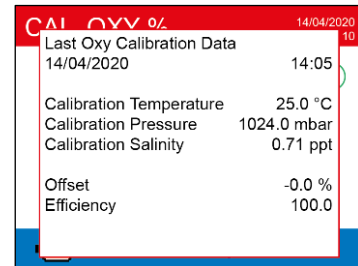
Last calibration data
Access this menu to view the report on the last calibration performed. The information provided on the last calibration are: Date and time / Temperature / Barometric pressure / Salinity / Offset / Efficiency.

Due calibration
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 and to select days or hours that must elapse between two calibrations and confirm by pressing the button .
- If a calibration deadline is set, it is displayed in measure mode by icon .
- **When the calibration deadline is activated, the instrument prevents further measurements for that parameter,** until the calibration is renewed, or the deadline deactivated.

- The error icon and a message will appear on the display, which invites the user to calibrate the sensor again and perform new measurements.

Salinity Compensation
The salinity of the sample to be measured influences the partial pressure of the dissolved oxygen. For a correct measurement, it is necessary to set the salinity value of the sample. If oxygen measurements are carried out on salt or sea water samples, it is important to modify the measurement by setting the indicative salinity value of the sample. The average salinity of the sea water is 35ppt.
- **Auto**: The salinity measurement is acquired automatically through the conductivity cell.
Important: Make sure you have connected the conductivity cell correctly and that the measuring chain is properly calibrated.
- **Manual 0.0 … 50.0 ppt***: Using the directional keys, insert the value of salinity.

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°C.
After the connection of the temperature probe in the right measuring channel, use the directional keys

and to correct the temperature offset value and confirm with .

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Restore Factory Default

If the instrument does not work properly or incorrect calibrations have been carried out, confirm **Yes** with

button ![ok setup button] , in order to take all the parameters of the DO back to the default settings.

IMPORTANT: *The factory reset of the parameters does not erase the stored data.*

• *Polarographic sensor DO 7*

The probe DO7 is polarographic with integrated temperature sensor. The oxygen sensor uses a BNC connector, while the temperature sensor uses an RCA connector.

Integrated temperature sensor
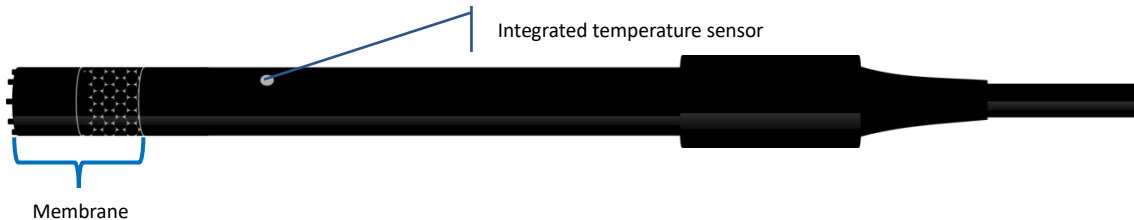
Membrane

• *Sensing element*

The permeable membrane allows the passage of only gas present in the sample to be analysed, blocking the passage of liquids. The oxygen reacts with the electrolytic solution, after passing through the membrane, and changes its chemical and physical properties depending on oxygen concentration. The sensing elements detect this change and generate a signal depending on the amount of dissolved oxygen. The oximeter reads this signal and returns the value on the display.

• *Membrane*

The membrane, which must allow only passage of oxygen, must be in perfect conditions.
If it presents any ripples, irregularities or is punctured, it must be replaced with a new one.

• *Electrolyte*

The electrolyte is an alkaline solution that reacts to the presence of oxygen, it saturates with wear and over time, therefore, it must be replaced regularly.

• *Polarization time*

The polarographic sensor needs to be polarized before performing the measurements.

• Connect the probe to the instrument and switch on with button ![power button] .
• The device automatically starts the sensor polarization.
• The display will show the countdown in seconds. The string "**Probe polarization in progress**" indicates that the operation is in progress.
• At the end of the polarization, the meter is ready to perform measurements and calibrations.

The polarization time lasts 10 minutes. However, if the instrument is turned off for less than an hour, the polarization time will reduce proportionally.

• *New sensor with new instrument*

The sensor is supplied with the membrane filled with electrolyte; it is necessary to hydrate the membrane dipping it in distilled water for half an hour. Switch the device on and wait for the polarization time.

• *Probe storage*

When the probe is not in use, store it in the storage cap containing distilled water. In this way, the membrane is protected and hydrated, ready for use.

• *Not using the sensor for long period of time: over one month*

If the instrument and the sensor are not used for a long period of time (over one month), it is recommended to empty the membrane from the electrolyte and wash the probe accurately. Dry the sensor and screw the membrane without electrolyte, protecting the sensor with its rubber cap.

• *Oxygen sensor calibration*

The polarographic sensor is an active sensor which changes its response with wear and aging; therefore, it is necessary to perform the calibration regularly in air.

• *Calibration in air at 100%*

The ordinary calibration is performed at 100% in air.

Turn the instrument on, dip the probe in water and wait for the polarization time of 10 minutes.

Later, dry the probe thoroughly with paper towel and proceed as follows:

• Place the probe in air with the membrane facing downwards and wait for 2 minutes.

• In measure mode **OXY %**, keep the key ⊘ pressed for 3 seconds to enter in calibration mode.

On the display the icon 100.0 appears; the device will automatically look for the value %O_2 = 100 %. *Keep the sensor in air in a vertical position with the membrane facing downwards.*

• When the signal is stable, the stability icon ☺ appears; confirm

the calibration in air at 100% by pressing the button ⊘ .

On the display, the measured value flashes, then the calibration report appears and subsequently the device returns automatically to measure mode. Below on the left the beaker 100.0 appears, which indicates that the instrument is calibrated on value 100% O_2.
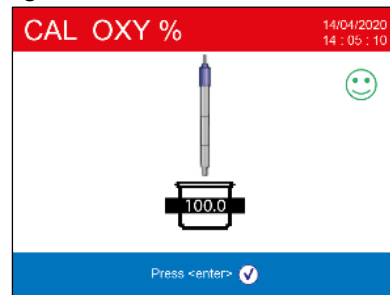
• *Calibration with Standard Zero Oxygen*

Normally, it is enough to calibrate the instrument in air at 100%, as explained previously. However, sometimes it is also necessary to calibrate at 0%, for example when:

• A probe is replaced by a new one.
• The probe is not used for a long period of time (over one month).
• A complete maintenance of the sensor is performed.
• The instrument does not calibrate at 100%, in this case calibrate it before at 0%.
• The instrument does not measure correctly.

For calibration at 0%, proceed as follows:

• **Before proceeding, perform a maintenance of the probe DO 7** (see paragraph *"Probe DO7 maintenance"*).

• Turn the instrument on, dip the probe in the water and wait for the polarization time of 10 minutes. Then, dry the probe thoroughly with paper towel and proceed as follows:

  • Put the probe in the Zero Standard Oxygen and wait for 5 minutes.
    Contatct your local distributo in order to buy the Zero Oxygen Standard. Follow the instructions on the package carefully to reconstitute the solution.

  • Access the setup menu **OXY** OXY and by pressing the button ⊘ select the setting "**Calibration point Zero**"
    The calibration wizard for 0% oxygen is automatically started.

  • Gently stir the probe in the Zero Oxygen Standard Solution, and eliminate any air bubbles under the membrane, moving the sensor. Press the button ⊘ to go on.

- On the display, the beaker : appears it indicates that the instrument is searching for the Zero Oxygen Standard; when the measure is table, the icon 😊 appears; confirm the calibration by pressing the button 🔘 .

CAL OXY % 14/04/2020 14 : 05 : 10

0.0

Press <enter> ✓

- The actual measured value flashes on the display, then the calibration report is shown and finally the instrument automatically returns to measure mode.

The beaker icon appears at the bottom left, indicating that the instrument is calibrated on value 0 % dissolved oxygen.

After the calibration of the point Zero using the Zero Oxygen Standard Solution, perform the calibration in air at 100% too. This procedure remains saved, even after the turning off of the device

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

- *Zero oxygen Standard calibration solution.*

Note: The Zero Oxygen Standard Solution is SINGLE DOSE! After its use, contact your local distributor for the purchase.
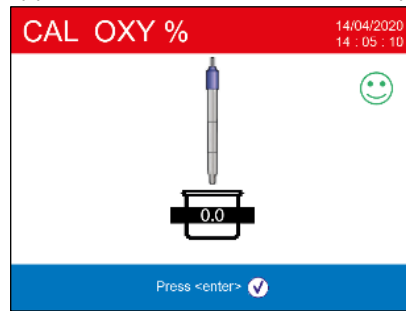
- ### *Calibration range*

The time range between two calibrations (100% in air) depends on the type of the sample, the efficiency of the electrode and the researched accuracy; usually, it is necessary to calibrate the instrument at least once a week, but for a better accuracy, it is recommended to calibrate it more often.

The instrument must be recalibrated, if occurs one of the following conditions:

- New probe, or probe not used for a long time
- After the sensor maintenance.

- ### *Errors during calibration* ⚠️

- **NOT STABLE MEASURE:** The button 🔘 was pressed with still unstable signal. Wait for the icon 😊 to appear to confirm the point.
- **CALIBRATION TOO LONG:** The calibration exceeded the time limit: only the points calibrated up to that moment will be kept.

16. Dissolved oxygen measurement

- ### *Before starting*

In order to reduce measurement errors and get the greatest possible accuracy, observe the following rules before starting:

- The sensor must be calibrated;
- The sensor must be placed in a vertical position with the membrane downwards;
- Remove the protective cap;
- The sensor must be at the same temperature of the sample to analyse; if necessary, leave the probe immersed in the sample until the reaching of thermal equilibrium.

- ### *Measure mode*

The instrument can work in two different measure modes:

- **Dissolved O$_2$ saturation** expressed in %

Dissolved O$_2$ saturation	
Measure range	0,0...400,0 %
Risolution	0,1 %

- **Dissolved O₂ concentration** expressed in mg/l, corresponding to ppm

Dissolved O₂	
Measure range	0,00...50,00 mg/l - ppm
Risolution	0,01 mg/l

- During the measurement press the button (MODE), in order to change the unit of measurement.

• *Performing the measurement*

Remove the protective cap of electrode, rinse it with distilled water; dab it with paper towel and dip in the

solution to analyse. Gently stir and wait until the value stability, when the icon appears on the display, take the reading.

Note: the polarographic sensor tends to consume the oxygen, and thus reducing gradually the detected value. Make sure that there is a minimum flow in the sample to analyse; if you are working in a laboratory, keep the sample stirred.

17. Probe DO 7 maintenance

If the instrument does not calibrate or the reading does not stabilize, it is necessary to perform a maintenance of the probe. In order to perform the maintenance, follow these steps in order:
- Replacement of electrolyte.
- Cleaning of anode and cathode.
- Replacement of membrane.

If you want to buy some spare parts, contact your local distributor.

• *Electrolyte replacement*

- Unscrew the membrane cap from the sensor, check that it is not punctured or damaged; if it is intact, it can be used again, otherwise it must be replaced.
- Carefully wash the membrane and the sensitive part of the sensor with distilled water; remove any salt residue and dry with paper towel.
  Be very careful when handling the sensor and the membrane. Falls, shocks or crushing can damage the sensor and/or membrane.
- Fill the membrane cap with distilled water at half level and screw it on the sensor (pay attention in the fixing phase, since the membrane does not have to be screwed strongly up to end run, because it can be damaged). Stir gently, unscrew the membrane again and empty it completely; in this way, any traces of water or dust will be eliminated.
- Refill the membrane with new electrolyte; this time, fill it completely and screw the sensor making sure that no air bubbles appear inside. A light leakage of electrolyte during the screwing of membrane, ensures that no air bubble will be created.
- Wash the probe and leave it in distilled water for at least half an hour, in order to rehydrate the membrane.

Perform the **Calibration of the sensor.** If it does not work, proceed with the **Maintenance of the anode and the cathode.**

• *Maintenance of the anode and the cathode*

The sensitive part of the probe is composed by an anode and a cathode; the two elements are composed by precious metals. Over time, these metals can be passivated by decreasing the efficiency of the probe, up to the point that the probe does not calibrate. In this case, remove the membrane and the passivation with very fine abrasive paper, gently scratching the metal parts; wash everything with distilled water and proceed with the **Replacement of Electrolyte.** Perform the **Calibration of the sensor.** If it does not work, proceed with the **Replacement of the membrane**.

- ***Replacement of the membrane***

If the membrane has ripples or irregularities, it must be replaced with a new one.
Remove the membrane cap and replace it with a new and intact one.
With the new membrane, follow the procedure of the **Replacement of Electrolyte.**
If, even after these procedures, the probe does not calibrate, replace the probe.

18. Barometric pressure

Since the measurement of the partial pressure of the dissolved oxygen is related to the barometric pressure, this instrument is able to compensate each variation, thanks to the integrated barometric sensor.

In order to view the barometric pressure measured by the instrument, press the key (MODE) until the screen **Press**. The measurement is express in mbar.

19. Multiparametric view

**Up to 6 parameters can be displayed simultaneously on the user's discretion.**

- Access the SETUP and and move the cursor over the icon .

- Press again the button (OK SETUP) to access.

- The list of all the parameters managed by the device is shown on the display. Scroll them with the directional keys and with the button (OK SETUP) activate the flag next to those you want to display on the MULTIVIEW screen. *Up to 6 can be chosen.*

- Press (ESC CAL) to confirm and return to measure mode. With the button (MODE) move to the MULTIVIEW screen. For each parameter, its relative temperature is also displayed. For graphic reasons, there is no "smile" icon, therefore, to indicate that the measurement has reached stability, the colour of the value on the display changes from black to grey.

MultiView		14/04/2020 14 : 05 : 10
pH	4.005 pH	25.0 °C
mV	177.3 mV	25.0 °C
Cond	1381 µS/cm	25.0 °C
TDS	981 mg/l	25.0 °C
SAL	0.71 ppt	25.0 °C
OXY %	0.0 %	25.0 °C
		999

20. 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 10000 data in total. Once the memory is finished, the values are NOT overwritten. In measure mode, next to the icon , the number of data stored for that parameter appears

- 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. *Recommended option if you plan measurements with durations of more than 15 hours.*
  Recordings can be acquired **manually** (MANUAL) or **automatically at pre-set frequencies** (SECONDS – MINUTES-HOURS).

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.*

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- *Setup for Data Logger parameter*

- In measure mode press button [✓OK/SETUP] to access the SETUP menu.
- Use the directional keys to move to **"LOG"** menu [LOG] and access the menu by pressing the key [✓OK/SETUP].

- 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:

Program	Description	Options	Factory Default Settings
LOG	Data logging type	Manual – Seconds – Minutes - Hours	Manual
	Delete data in memory	Yes - No	No

Data logging type
Access this menu to select the data acquisition mode:

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

Use the directional keys to move from MANUAL to HOURS or MINUTES. Access with [✓OK/SETUP] and with the directional keys [▼] and change the value of the acquisition time. Confirm the setting with the key [✓OK/SETUP] .

- *Use of automatic Data Logger*

Press the button [▲] in measure mode, to start and end the 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.
Note: scrolling the parameters, the recording stops.
IMPORTANT: *for recordings lasting longer than 15 hours, it is recommended to connect the device to an external power source (PC or electrical outlet) through the appropriate cable.*

- *Achievement of limit memory (10000 total values)*

The following reports inform the user of the acheivement of the maximum instrumental data saving capacity:

- When the 9500 total data stored is reached, the icon 📝 starts flashing.
- When the emory limit is reached, the data logger stops automatically and the string "**End of Log Memory / Delete Memory**" appears next to the error signal ⚠ .

Delete data in memory
Access this menu and select **YES** to delete the saved data and empty the memory.

- *Example of automatic Data Logger mode*

Example: automatic pH recording on internal memory every 2 minutes

- Access the "**LOG**" setup menu [LOG] **.**
- Press the button [ENTER], enter the **Data logging type** menu and move with directional keys to **MINUTES.**

- Press the button ✓ again and modify with directional keys ▼ and ▲ the minutes.

- Enter **"2"** and confirm with ✓. Return to measure model and move to **pH** screen.

  In the upper string of the display, the icon ⏱ is on, which indicates that an automatic frequency Data Logger has been set.

- Press the button ▲ to start recording; the icon ⏱ starts flashing, indicating that memorization is in progress.

  The number next to the 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 or by scrolling with* MODE .

• *Example of manual Data Logger mode*

Example: recording a Conductivity value in manual mode

- Access the "**LOG**" setup menu LOG .

- Press the button ✓ , enter the **Data logging type** menu and move with directional keys to **MANUAL.**

- Confirm with ✓ and return to measure mode, go to the **COND** screen.

- Press the button ▲ to save the value. The number next to the icon 📝 indicate show much data has been saved for that parameter.

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

• *Recall memory*

- In measure mode in the parameter of interest, press key ▼ to enter the **Recall Memory** function and view the saved data on the display for that specific parameter.

- Use the directional keys ▼ and ▲ to scroll through the different stored values.

- Press the button ESC/CAL to return to reading mode.

RM		14/04/2020 14 : 05 : 10
7	14/04/2020:26	4.005 pH 25.0 °C
8	14/04/2020:26	4.005 pH 25.0 °C
9	14/04/2020:26	4.005 pH 25.0 °C
10	14/04/2020:26	4.005 pH 25.0 °C
11	14/04/2020:26	4.005 pH 25.0 °C
12	14/04/2020:26	4.005 pH 25.0 °C
13	14/04/2020:27	4.005 pH 25.0 °C
▼ Previous	▲ Next	⟳ Exit

Note: the first value of a series always has a progressive number "1" and is identified by an orange icon.

IMPORTANT: *If the data is saved with the instrument in error* ⚠ *, the measurement will not appear even in recall mode.*

Not: *when recalling the date stored in Multiview mode, one screen is reserved for each acquisition. However, the values shown will only be those of the parameters active at that time.*

RM		14/04/2020 14 : 05 : 10
41	14/04/2020:28	4.005 pH 25.0 °C
		177.3 mV 25.0 °C
		1380 µS/cm 25.0 °C
		980 mg/l 25.0 °C
		0.71 ppt 25.0 °C
		0.0 % 25.0 °C
▲ Previous	▼ Next	⟳ Exit

• *Clear the saved data*

- To clear the data stored in the instrumental memory, access the "**Delete data in memory**" setup menu and select **YES.**

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

21.Instrument Setup Menu

- In measure mode, press key to access the SETUP menu.

- Use the directional keys to move to **"SETUP"** menu and access by pressing the key .

- Move with 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.

Program	Description	Options	Factory Default Settings
	Select Parameters	Yes / No for each parameter	Yes
	Password	Insert Password	No
	Backlight Mode	Auto – Indoor - Outdoor	Auto
	Brightness	Low – Normal - High	Normal
	Sleep Mode	Off – On (1 … 20 min)	On / 1 min
	Reading with HOLD	No - Yes	No
	Date format	yyyy/mm/dd – mm/dd/yyyy – dd/mm/yyyy	dd/mm/yyyy
	Date setting	-	-
	Time setting	-	-
	Temperature unit option	°C - °F	°C
	Select Language	Eng – Ita -Deu – Esp – Fra – Cze - Por	Eng
	Auto Off	No - Yes	No
	Buzzer Mode	Off – Only Alarm - On	On
	Restore Factory Default	No – Yes	No

Select parameters

Access this menu to select which parameters to display or hide in measure mode. By default, no parameters are hidden.

- Use the key to set the flag to the parameters you want to keep active and display in measure mode.
- **By removing the flag, the parameter will NOT be displayed in measure mode.**

- Move through the different parameters with keys , and .

EXAMPLE: the user is only interested in the display of pH, mV, Cond and MULTIVIEW screen.

*Access the" **Select parameters**" menu and by pressing the button , remove the flag from the remaining parameters.*

Return to measure mode by pressing . In measure mode, scrolling the parameters with the button , only the parameter screens will be displayed: pH → mV → COND → MULTIVIEW.

Password

Access this menu to enter, change or disable the password.

- The **active** password is indicated on the display by the icon .
- If the password is active, it will be requested from the user to perform the following activities:
  - **Calibrate the device;**
  - **Delete the data saved in Data Logger mode;**
  - **Change the date and time of the device;**
  - **Modify or deactivate the calibration deadline.**
- The password entered by the user consists of 4 numeric characters.

- Change the number with the keys and , press the button to move to the next number.

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- In order to deactivate the password, enter as new password "**0 0 0 0**".

Note: if the password is lost, contact the Technical Assistance service to unlock the instrument via Master Password, which will be provided at the time.

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.

Brightness

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

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

Note: Keeping the display bright always adversely affects battery life.

Sleep Mode

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

- **OFF**: Sleep mode off.
- **ON (1 … 20 min)**: use the directional keys to select after how many minutes the keyboard has not been used, activate Sleep Mode. By default, it activates after one minute.

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

IMPORTANT: Sleep mode only affects the brightness of the display. All other instrumental functions continue to operate normally (e.g. 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 functions"*).

Reading with HOLD

Access this setup menu to activate or deactivate the HOLD stability criterion.

- **NO** – default option- the measurement is not fixed.
- **YES:** with this option active, the measurement is blocked as soon as it reaches stability.

The locked value is indicated with the icon HOLD.

To unlock and restart the measurement until the next stability, press the button .

Date format

Access this setup menu to update the date format

- **dd/mm/yyyy** -default option-
- **mm/dd/yyyy**
- **yyyy/mm/dd**

Date setting

Access this setup menu to update the device date.

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

Time setting

Access this setup menu to update the device time.

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

Temperature unit option

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

- **°C** – default option-
- **°F**

Select Language

Access this setup menu to select the language in use on the device:

- **English** –default language-
- **Italiano**
- **Deutsch**
- **Portugues**
- **Espanol**
- **Francais**
- **Czech**

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 options Backlight Mode, Brightness, Sleep Mode ed Auto Off allows to significantly lengthen battery life.

Restore Factory Default

Access this setup menu to restore the instrument to factory conditions.
*IMPORTANT: Restoring the factory parameters does not delete the stored data.*

22. Software DataLink+ (for Windows 7/8/10)

It is possible to connect the instruments of the ReVio series to the PC and then use the DataLink + 1.9 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.
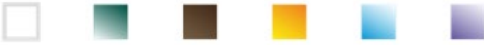
Functions

Visualization of acquired data in table or diagram

Reproduction of the instrument display for real-time measurements

Connection data and instrument information

Calibration data for each parameter

Automatic Data-logger

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23.Warranty

- ### *Warranty period and limitations*

- The manufacturer of this device and its accessories offers the final consumer of the new device the three-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 is valid only and exclusively on the electronic parts of the device and 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.

24.Disposal of electrical devices

This equipment is subject to the regulations for electronic devices.
Dispose of in accordance with local regulations.

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