VioLab

50 Series

pH - Cond - PC

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

MADE IN ITALY

Index

1. Introduction 4
2. Safety information 5
   - Definitions of warning words and symbols 5
   - Reporting terms 5
   - Additional documents for safety 6
   - Use according to destination 6
   - Basic requirements for a safe use 6
   - Unauthorized use 6
   - Device maintenance 6
   - Responsibility of the owner of the instrument 7
3. Instrumental features 7
   - Parameters 7
   - Datasheet 8
4. Instrument description 9
   - Display 9
   - Keyboard 9
   - LED 9
5. Installation 10
   - Supplied components 10
   - Start-up 10
   - Connection of the power supply 10
   - Turning On and Off 10
   - Instrument transportation 11
   - Key functions 11
   - Inputs / Outputs Connections 12
   - Symbols and icons on the display 12
6. Operation of the device 13
7. Setup Menu 14
   - Setup Menu Structure 14
8. Temperature measurement ATC – MTC 15
9. pH Parameter 15
   - pH parameter Setup 15
   - Automatic pH calibration 17
   - Calibration with manual values 18
   - Performing pH measurement 18
   - Sensors with DHS technology 19
   - Errors during calibration 19
10. mV Parameter 20

11. ORP Parameter (Redox Potential) 20
- ORP Parameter Setup 20
- ORP automatic calibration 21

12. Conductivity Parameter 21
- …how to get Conductivity? 21
- Setup for Conductivity Parameter 21
- Automatic COND calibration 24
- Manual COND calibration 25
- Errors during calibration 25
- Performing Conductivity measurement 26

13. TDS Parameter 26
14. Instrument Setup Menu 27
15. Warranty 28
- Warranty period and limitations 28

16. Disposal of electrical devices 28

1. Introduction

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

The perfect balance between the high performance of the instrument, a modern and attractive design and the user-friendliness make this series of instruments the ideal solution for electrochemical measurements in laboratory.

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 (also custom), the condition of stability.

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 easy to consult. In addition, a LED indicates the status of the system to the user.

Up to 3 pH calibration points can be carried out between 8 automatically recognized values and 5 points for Conductivity; in addition, buffers chosen by the operator can be used.

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

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

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

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

2. Safety information

- ***Definitions 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 the 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.

Warning

This symbol draws the 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 in laboratory.
Pay attention to the technical specifications shown in the INSTRUMENT CHARACTERISTICS / 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***

pH 50 VioLab: pH, mV, ORP, Temp

COND 50 VioLab: Cond, TDS, Temp

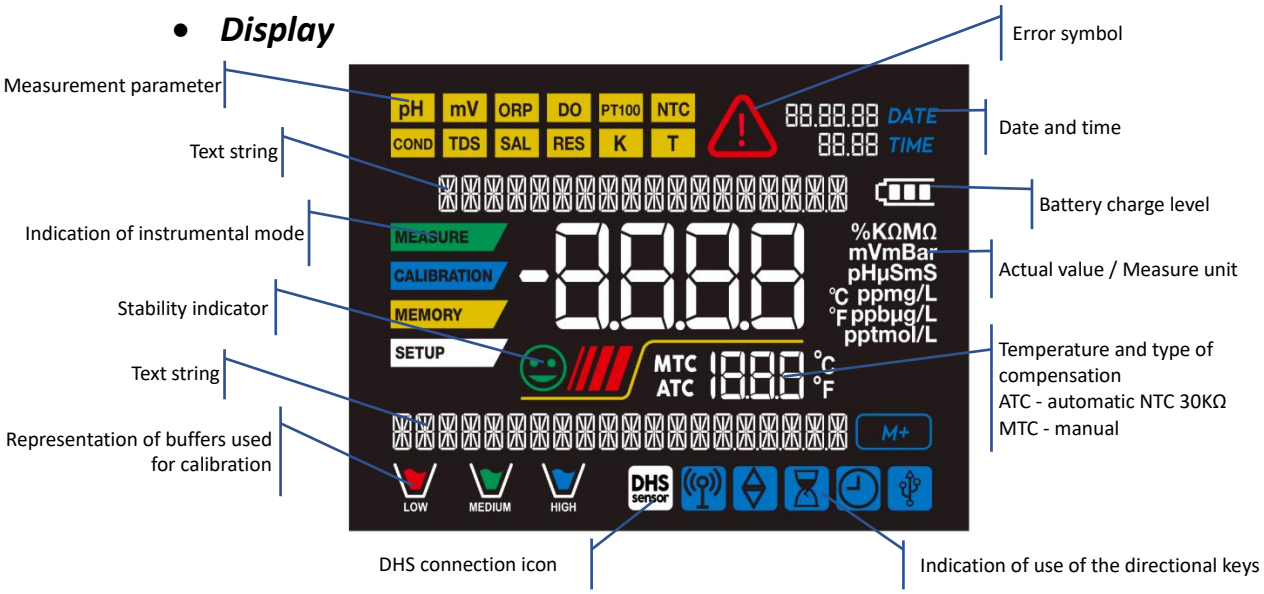
PC 50 VioLab: pH, mV, ORP, Cond, TDS, Temp

- ***Datasheet***

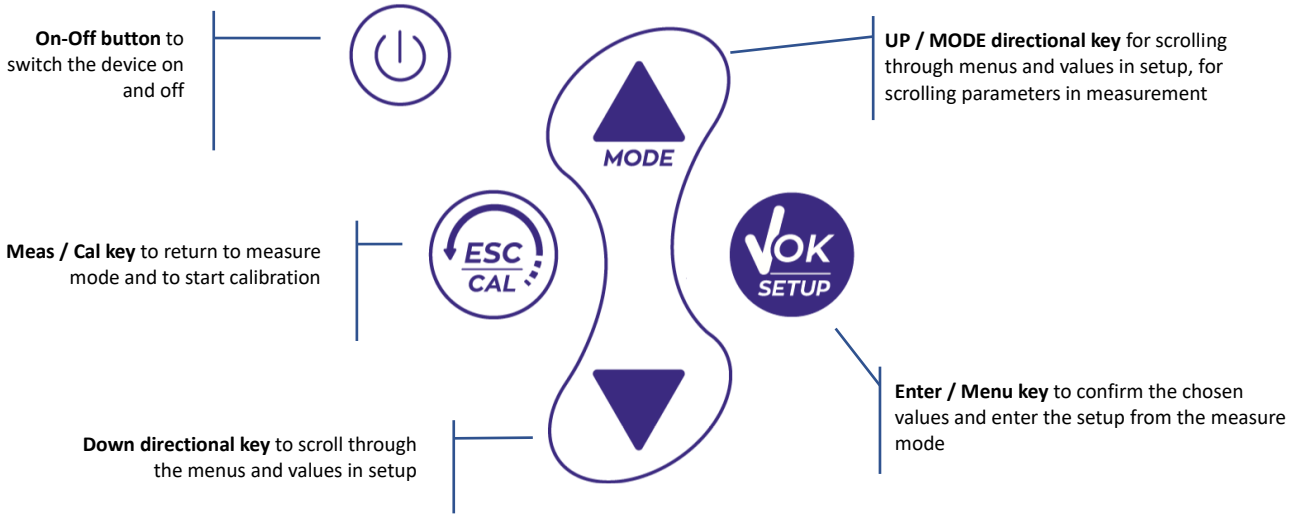
	Series 50 VioLab
pH	**pH 50 VioLab - PC 50 VioLab**
Measuring range	0 … 14
Resolution / Accuracy	0.1, 0.01 / ±0.02
Recognized calibration points and buffers	**AUTO:** 1…3 / USA, NIST **CUS:** 2 user values
Buffers indication	Yes
Calibration Report	Yes
DHS sensor recognition	Yes
Stability criteria	Low – Med - High
mV	**pH 50 VioLab - PC 50 VioLab**
Range / Resolution	Range: -1000 … +1000 / Resolution: 1
ORP	**pH 50 VioLab - PC 50 VioLab**
Calibration points	1 point / 475 mV
Conductivity	**COND 50 VioLab - PC 50 VioLab**
Range / Resolution	0,00 – 20,00 – 200,0 – 2000 µS / 2,00 – 20,00 – 200,0 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
TDS	**COND 50 VioLab - PC 50 VioLab**
Measuring range / TDS Factor	0,1 mg/l / 200,0 g/l 0.40…1.00
Temperature	**pH 50 VioLab - COND 50 VioLab - PC 50 VioLab**
Measuring range	0…100 °C
Resolution / Accuracy	0,1 / ± 0,5°C
Temperature compensation ATC (NTC30KΩ) and MTC	pH: 0…100 °C Cond: 0…100 °C
System	
Display	High definition colour LCD
Brightness management	Manual
IP protection	IP 54
Power supply	5 V Power supply
Power supply tolerance	± 10%
Sound level during standard operation	< 80 dB
Electric voltage	100 … 240 V
Work frequency	50 … 60 Hz
Maximum absorption	200 mA
Environmental operating conditions	0 … +45 °C
Maximum permissible humidity	< 95 % non-condensing
Maximum altitude of use	2000 m
System dimensions	160 x 140 x 45 mm
System weight	380 g

4. Instrument description

- ***Display***



- ***Keyboard***



- ***LED***

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

Function	LED (colours)	Description
Power on	(green)	*Fixed*
Power off	(red)	*Fixed*
Standby	(green)	*Flashing every 20 s*
Stable measure	(green)	*Flashing every 3 s*
Errors during calibration	(red)	*Flashing every 1 s*
Errors during measurement	(red)	*Flashing every 3 s*
Selection confirmation	(green)	*Switched on for 1 s*
Timed screens	(green)	*Fixed*
DHS deactivation	(red)	*Fixed*

5. Installation

- ***Supplied components***

The instrument is always supplied with all the accessories necessary for being put into service; the version without sensor is always supplied with:
instrument complete with multi-socket adapter, 1m S7/BNC connection cable, NT55 temperature probe, buffer solutions in single-dose bottle and / or sachet, electrode holder stand, multilingual user manual and test report.
There are versions with the sensor(s) already included. Contact your local distributor to be updated on the correct composition of the sales kit.

- ***Start-up***

- Place the instrument on a flat, stable laboratory table with appropriate front and side accessibility. It is recommended to place the instrument at not less than 20 cm from overlying and surrounding parts.
- Positioning the device in this way, there is no more residual risk of possible minor damage caused by manual handling of loads.
- Make sure that the instrument and the surrounding environment are correctly illuminated.

- ***Connection of the power supply***

- **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 plug to the connector on the rear panel of the instrument indicated with the icon

.
- Connect the power supply to an electric socket easy to reach.
- The instrument is equipped with a power supply unit which is not protected against any liquid entry; therefore, for its use, it is necessary to keep all electrical cables and connections away from any liquids, humidity and not to use the device in a humid room, such as a bathroom or a laundry room.

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.**

- In the event of accidental loss of power during the operation of the instrument, there is no dangerous condition for the user.
- The instrument is NOT automatically reactivated. Press the button to turn the device back on.

- ***Turning On and Off***

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

- model and firmware of the instrument;
- settings relating to the most important parameters and possible information about the DHS sensor;

- the instrument switches on at the last parameter used.

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

- ***Instrument transportation***

To move the instrument to a new location, ship it carefully to avoid damage; the instrument can be damaged, if it is not transported correctly.
Disconnect the instrument from the power supply and remove all the connection cables. Remove the electrode arm from its holder.

- To avoid damage to the instrument during long distance transport, use the original packaging.
- If the original packaging is no longer available, choose a package that guarantees a safe shipment.

- ***Key functions***

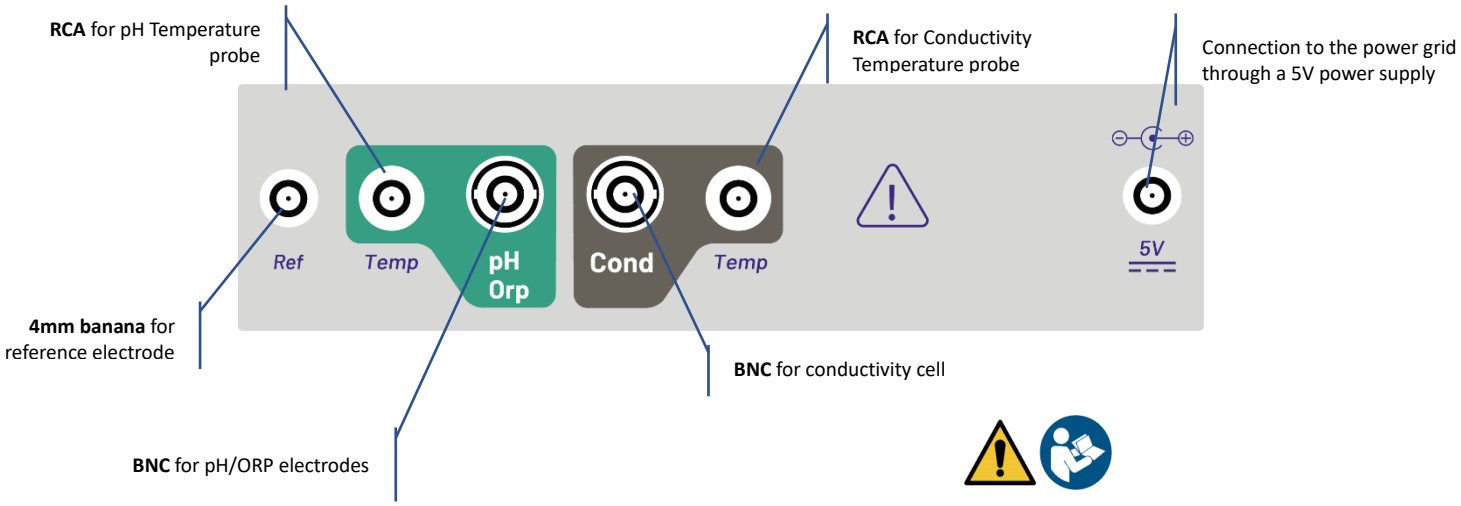
Button	Pression	Function
	Short	Press to turn the device on or off.
	Short	• In calibration mode and press to return to measure mode. • In measure mode, press to start the calibration.
	Short	In measure mode, press to enter the setup. In the setup menus, press to select the desired program and / or value. During calibration, press to confirm the value.
	Short	In the setup and sub-setup menus press to scroll. In the setup submenus, press to change the value. In MTC and custom calibration mode, press to change the value.
	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
	Short	In measure mode, press to scroll through the different parameters: • **pH 50 VioLab**: pH → mV → ORP • **COND 50 VioLab**: Cond → TDS • **PC 50 VioLab**: pH → mV → ORP → Cond → TDS

The correct use of the function keys and the attention in pressing them, given the small size, eliminates the residual risk of minor damage, not probable, caused by simultaneous pressing of the keys; before using the instrument, check that pressing the keys has the corresponding effect on the 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.

PC 50 VioLab upper panel



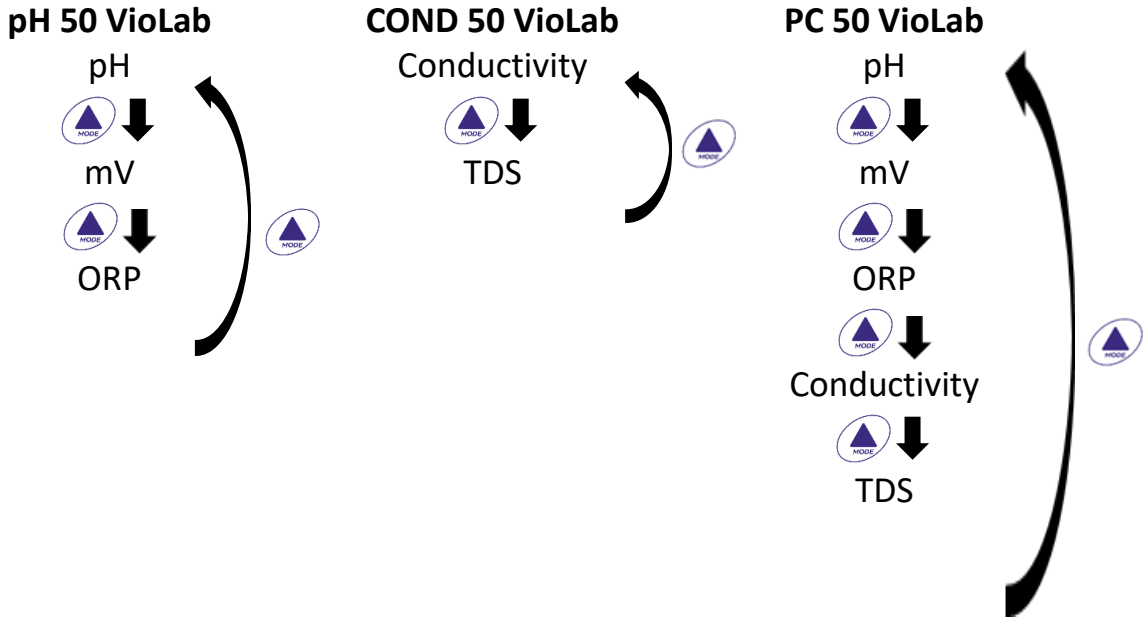
- ***Symbols and icons on the display***

Symbol	Description	Symbol	Description
	Press the directional keys to change the parameter or value on the display		Error in measurement or calibration
	DHS digital sensor active		The bars scroll if the measurement is not stable
	Measurement stability indicator		

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** ; the current measurement parameter is shown in the display on the top left (e.g.: pH).

Sequence of parameters in measure mode:



Note: *Pressing the button after the last parameter, the instrument automatically restarts from the first one.*

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

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

Note: *in order to confirm to the user the switching from one mode to another, the string flashes.*

String	Meaning
MEASURE	The instrument is in measure mode.
CALIBRATION	The instrument is in calibration mode (automatic or manual in relation to the user's choice).
SETUP	The user is in the setup mode. The configuration menus can concern the characteristics of the parameters or the general setting of the instrument.

7. Setup Menu

SETUP

- In measure mode, press the key to enter SETUP mode, select the parameter you want to edit by using the directional keys and confirming with .

pH 50 VioLab

PH SETTINGS

ORP SETTINGS

SETTINGS

COND 50 VioLab

COND SETTINGS

TDS SETTINGS

SETTINGS

PC 50 VioLab

PH SETTINGS

ORP SETTINGS

COND SETTINGS

TDS SETTINGS

SETTINGS

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

SETUP

- ***Setup Menu Structure***

P1.0	PH SETTINGS	P1.1	Buffer Selection
		P1.2	Resolution
		P1.3	Set Stability
		P1.6	View pH Cal
		P1.8	Reset pH Setting
		P1.9	Temp Cal pH
P2.0	ORP SETTINGS	P2.6	View ORP Cal
		P2.8	Reset ORP Setting
		P2.9	Temp Cal ORP
P3.0	COND SETTINGS	P3.1	Cell Constant
		P3.2	Buffer Selection
		P3.3	Reference Temp
		P3.4	Temp. Compensation Factor
		P3.6	View Cond Cal
		P3.8	Reset Cond Setting
		P3.9	Temp Cond pH

P4.0	TDS SETTING		P4.1	TDS Factor
P9.0	SETTINGS		P9.1 P9.4 P9.6 P9.8	Temperature U.M. Brightness Parameters Setup Reset

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:

  keep pressed or until the value starts to flash; then adjust it by continuing to use the directional keys; then press to confirm.

9. pH Parameter

PH 50 Vio; PC 50 Vio

On this series of devices, it is possible to use pH sensors with integrated temperature probe or to connect two different sensors. Connect the pH electrode to the BNC type connector marked in green. Connect the temperature probe to the RCA / CINCH Temp connector always marked with a green background.
The instrument is also able to recognize the DHS sensor, an innovative electrode that stores calibration data and that can be used immediately after on any enabled instrument.

• *pH parameter Setup*

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

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

Program	Description	Options	Factory Default Settings
P1.1	CAL BUFFER SELECT	USA – NIST – Custom	USA
P1.2	SELECT RESOLUTION	0.1 – 0.01	0.01
P1.3	STABILITY FILTER	LOW – MEDIUM - HIGH	MED
P1.6	CALIBRATION DATA	-	-
P1.8	RESET SETTINGS	YES – NO	NO
P1.9	TEMPERATURE CAL	YES – NO	-

P1.1 Selection of pH buffers

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

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

The instrument automatically recognizes 2 families of buffers (**USA and NIST**); in addition, the user has the option of performing a **manual** calibration up to 2 points with customizable values.
USA Buffers: 1,68 - 4,01 - **7,00**** - 10,01 (Factory setting)
NIST Buffers: 1,68 - 4,00 - **6,86**** - 9,18
***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.

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

P1.2 Resolution
Access this menu to choose the resolution needed when reading the pH parameter:
- **0.1**
- **0.01** -default-

P1.3 Stability criterion in pH measurement
To consider the reading of a value truthful, we recommend waiting for the measurement stability, indicated by the icon . When the measurement is not stable, four red flashing bands appear on the display.
Access this menu to change the measurement stability criterion:

"LOW": choose this option to bring up the stability icon even in conditions of poor stability. Readings included within 1.2 mV.
"MEDIUM" (default value): readings included within 0.6 mV.
"HIGH": choose this option to display the stability icon only in conditions of high measurement stability, readings within 0.3 mV.

P1.6 pH Calibration data
Access this menu to get information about the last calibration performed. The following screens will automatically scroll on the display:
- first screen: beakers indicating the buffers used;
- second screen: OFFSET value of the electrode expressed in mV;
- third and possibly fourth screen: Slope% in the measuring range (one Slope% only if two calibration points are performed, two Slope% if three points are performed).

***Note**: The instrument accepts calibrations with pH electrodes with Slope% between 80 - 120% only. Outside this range of acceptability, the instrument does not allow to end the calibration and displays the error message.* SLOPE OUT OF RANGE.

P1.8 Reset of pH parameter
If the instrument does not work perfectly or incorrect calibrations have been carried out, confirm YES with button to take all the parameters of the pH menu back to the default settings.

P1.9 Temperature calibration
All the instruments of this series are pre-calibrated for a correct temperature reading. However, if there is a difference between the measured and the real temperature (usually due to a probe malfunction), it is possible to perform an offset adjustment of ± 5°C.

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

CALIBRATION

- ***Automatic pH calibration***

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

- In **pH** measure mode pH press the key ESC CAL to enter calibration mode.
  The string "1ST POINT PH 7.00" appears on the display; the device requires the neutral value as the first calibration point.
- Rinse the electrode with distilled water and gently dab with paper towel. Dip the electrode in the pH 7.00 buffer solution.
- When the signal is stable, the red bands are replaced by the stability icon .

- Press the key OK SETUP as indicated by the string "PRESS OK".
  The measured value flashes on the display and then the icon of the pH 7.00 beaker appears at the bottom left MEDIUM indicating that the instrument is calibrated on the neutral point.
- Remove the electrode, rinse with distilled water and dab gently with paper towel. Dip the sensor in the pH 4.01 buffer solution ("CHANGE BUFFER").
- The instrument is now ready to recognize the second calibration point.
  Next to the string "2ND POINT PH", the different buffers, that the device can recognize automatically, scroll.
- When the 4.01 value is recognized and the icon appears, press the key OK SETUP as indicated by the string "PRESS OK".
  The actual measured value and the Slope% flash on the display; subsequently, the icon of the beaker pH 4.01 LOW appears next to the green beaker, indicating that the instrument is calibrated in the acid field.
- Remove the electrode, rinse with distilled water and dab gently with paper towel. Dip the sensor in the pH 10.01 buffer solution ("CHANGE BUFFER").
- The instrument is now ready to recognize the third calibration point.
  Next to the string "3RD POINT PH", the different buffers, that the device can recognize automatically, scroll.
- When the value 10.01 is recognized and the icon appears, press the key OK SETUP, as indicated by the string "PRESS OK".
  Switching from an acidic to a basic pH may take a few more seconds to achieve stability.
  The actual measured value and the second Slope% flash on the display; subsequently, the icon of the beaker pH 10.01 HIGH appears next to the green and red beakers, indicating that the instrument is calibrated in the alkaline field.
- At the end of the third calibration point, the instrument returns automatically to measure mode.
- To perform a one- or two-point calibration, press the key ESC CAL once finished the first or second point.

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

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

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

- ***Calibration with manual values***

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

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

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

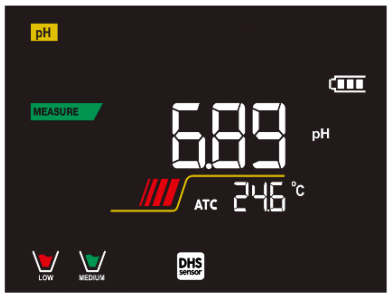
- When the icon appears again, press the key OK SETUP to confirm the first point; the actual measured value flashes on the display and the beaker icon appears with the buffer identification colour MEDIUM .
- Remove the electrode, rinse with distilled water, dab gently with paper towel and dip it in the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

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

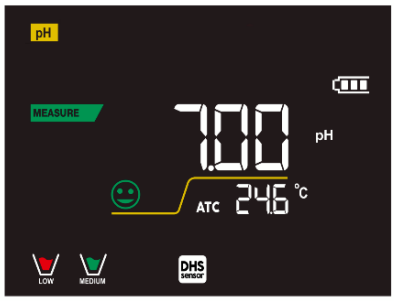
- ***Performing pH measurement***

MEASURE

- In measure mode, press the key MODE and move to the pH parameter indicated by the icon pH.
- Connect the electrode to the pH / ORP BNC of the instrument (green).
- If the user does not use an electrode with a built-in temperature probe or an external probe NTC 30KΩ, it is 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.
- The scrolling on the display of four red bands means that the measurement is not stable yet.
- Consider the measurement truthful only when the stability icon appears .



Example of an unstable measurement



Example of stable measurement

- **After the measurement, wash the electrode with distilled water and preserve it in the appropriate storage solution.**
- **Never store the sensors in ANY TYPE of water OR DRY!**
- It is a useful tool for obtaining accurate measurements always having on the display the indication of the buffers used for calibration and the possibility of consulting the calibration data, at any time, or entering the expiry date.

- ***Sensors with DHS technology*** DHS sensor MEASURE

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

- Connect the DHS electrode to the BNC and RCA connectors of the instrument.
- The device automatically recognizes the chip; the following screens scroll on the display:
  - first screen: sensor identification name and production batch;
  - second screen: CALIBRATION DATE and TIME (if a GLP instrument is used) and beakers indicating the buffers used;
  - third screen: OFFSET value of the electrode expressed in mV;
  - fourth and possibly fifth screen: Slope% in the measuring range (one Slope% only if two calibration points are performed, two Slope% if three points are performed).
- When the DHS electrode is recognized, the active calibration on the instrument becomes the one of the sensor.
- The icon on the display DHS sensor indicates that the connection was successful.
- If the calibration is satisfactory (see the calibration data in menu P.1.6), the electrode is ready to start the measurements. Otherwise, recalibrate the electrode; the data will be updated automatically.
- The DHS electrode calibrated with a pH 7 Vio or PC 7 Vio device is ready to be used on any pH meter enabled for DHS recognition and vice versa.
- When the electrode is disconnected, a message on the display informs the user of the deactivation of the sensor; the instrument regains its previous calibration and no data is lost!
- The DHS electrode does not require batteries and if it is used on pH meters that are not enabled to recognize the chip, it works as a normal “analog” electrode.

- ***Errors during calibration*** CALIBRATION

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

10. mV Parameter

pH 50 VioLab; PC 50 VioLab

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

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

11. ORP Parameter (Redox Potential)

pH 50 VioLab; PC 50 VioLab

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; instead, 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 purchase.
The instrument can correct the sensor offset by ± 75 mV.

SETUP

- ***ORP Parameter Setup***

- In measure mode press the key OK SETUP to access the SETUP menu.
- Use the directional keys to move to **ORP SETTINGS P2.0** and access the menu by pressing the key OK SETUP.
- Move with keys MODE 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	Options	Factory Default Settings
P2.6	CALIBRATION DATA	-	-
P2.8	RESET SETTINGS	YES – NO	NO
P2.9	TEMPERATURE CAL	YES – NO	-

P2.6 Calibration data
Access this menu to get information on the last calibration performed. The screens with the sensor offset value and the temperature at which the calibration was performed will scroll on the display.

P2.8 Reset of the ORP Parameter
If the instrument does not work properly or incorrect settings have been made, confirm YES with the key OK SETUP to return all the parameters of the ORP menu to the default settings.

P2.9 Temperature calibration
All the instruments in this series are pre-calibrated for a correct temperature reading. However, if a difference between the measured and the real one is evident (usually due to a probe malfunction), it is possible to perform an offset adjustment of ±5 °C.

Use the keys MODE and ▼ to correct the temperature offset value and confirm with OK SETUP.

- ***ORP automatic calibration***

CALIBRATION

Automatic calibration with 475 mV

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

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

- *Redox Standard solutions.*
- *STORAGE solution for ORP electrodes.*
- *Filling solution for ORP electrodes.*

12. Conductivity Parameter

COND

COND 50 VioLab, PC 50 VioLab

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 the 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 cm^2. 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) and µS/cm (1 S/cm -> 10^6 µS/cm).

- ***Setup for Conductivity Parameter***

SETUP

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

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

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

P3.1 Cell constant Selection

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

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

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

CELL COSTANT	0.1	1		10
Standard (25°)	84 - 147 µS	1413 µS	12.88 mS	111.8 mS
Measuring range	0 – 300 µS	300 – 3000µS	3 – 30 mS	30 – f.s. mS
Icon on display	LOW	MEDIUM	MEDIUM HIGH	HIGH

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

- **0.1**
- **1** -default-
- **10**

For each of the 3 selectable cell constants, the instrument stores the calibrated points. By selecting the cell constant, the previously performed calibration points are automatically recalled.

P3.2 Calibration mode

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

- **AUTOMATIC:** -default- The device automatically recognizes up to 3 of the following standards **84** µS/cm, **147** µS/cm, **1413** µS/cm, **12.88** mS/cm e **111.8** mS/cm;
- **CUSTOM**: the device can be calibrated on a point with a manually entered value.

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

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

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

P3.3 Reference Temperature

Conductivity measurement strongly depends on temperature.

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

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

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

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

P3.4 Temperature compensation Factor

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

- Access this menu to change the temperature compensation factor.
  By default, 1.91% / °C is set which is suitable for most of the analyses.
- Press the key , the value flashes and as indicated by the icon , use the directional keys to enter the new coefficient. Confirm with key .

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

Solution	(%/°C)	Solution	(%/°C)
NaCl Saline solution	2.12	1.5% Hydrofluoric acid	7.20
5% NaOH Solution	1.72	Acids	0.9 - 1.60
Diluted ammonia solution	1.88	Bases	1.7 – 2.2
10% Hydrochloric acid solution	1.32	Salts	2.2 - 3.0
5% Sulfuric acid solution	0.96	Drinking water	2.0

Compensation coefficients for calibration standards at different temperatures for T_{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

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

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

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

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

Select 0.00% / °C as the temperature coefficient to deactivate the compensation. The displayed Conductivity value refers to the temperature value measured by the probe and not related to a reference temperature.

P3.6 COND calibration Data

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

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

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

P3.8 COND parameter Reset

If the instrument does not work properly or incorrect settings have been made, confirm **YES** with the key to return all the parameters of the pH menu to the default settings.

P3.9 Temperature calibration

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

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

- ***Automatic COND calibration***

Example: One-point calibration (1413 µS/cm) using a K=1 cell constant

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

Automatically, the device returns to measure mode.

- *One-point calibration is enough if measurements are performed within the measurement range. For example, the standard solution 1413 µS / cm is suitable for measurements between 200 - 2000 µS / cm.*
- **To calibrate the instrument on several points, once returned to the measure mode, repeat all the calibrations steps.**

The beaker relating to the new calibrated point will join the previous one. It is recommended to start the calibration from the less concentrated standard solution and then continue in order of increasing concentration.

- **When a new calibration of a previously calibrated point is performed, it is overwritten on the previous one and the cell constant is updated.**
- For each cell constant (P3.1), the instrument stores the calibration, to allow the user who uses multiple sensors with different constants not to be forced to recalibrate each time.
- The instrument recalls the last calibration with respect to the parameters P3.1 (cell constant) and P3.2 (type of calibration solutions) selected.

Important: *Standard conductivity solutions are more vulnerable to contamination, dilution and direct influence of CO2 than pH buffers, which instead, thanks to their buffer capacity, tend to be more resistant. In addition, a slight change in temperature, if not adequately compensated, can have significant effects on accuracy. Therefore, pay attention in the calibration process of the Conductivity cell in order to obtain accurate measurements.*

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

Replace standard solutions frequently, especially low Conductivity ones.

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

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

- *Calibration Buffer solutions.*

CALIBRATION

• *Manual COND calibration*

Example: Calibration at 5.00 µS/cm using a K=0.1 cell constant

- Access the Setup menu for COND SETTINGS and select in the **P3.1** → **0.1** and into the program **P3.2** → **Custom,** then go back to the measurement and go into **COND** mode COND.
- Press the key ESC CAL to enter the calibration mode.
- Rinse the cell with distilled water and dab gently with paper towel.
- Apply few ml of standard solution and immerse the sensor in the conductivity standard 5.00 µS/cm.
- The string "WAIT FOR STABILITY" and the flowing red bands indicate that the measurement is not stable yet.
- Wait for the Conductivity value on the display to stabilize; when the icon appears, use the keys MODE and to adjust the value by entering that of the standard solution (e.g.: 5.00 µS/cm), as indicated by the string "ADJUST THE VALUE" and by the icon .
- When the icon appears again, confirm the calibration point by pressing the key OK SETUP .
- The actual measured value flashes on the display and then it is shown the updated cell constant.
- The icon LOW appears, which indicates that the instrument is calibrated in the low conductivity range. Automatically, the device returns to measure mode.
- For each cell constant (P3.1), the instrument stores the calibration in order to allow the user, who uses multiple sensors with different constants not to be forced to recalibrate each time.

The instrument recalls the last calibration with respect to parameter P3.1 (cell constant) and P3.2 (type of calibration solutions) selected.

Note: *if you are not aware of the exact compensation coefficient, to obtain a calibration and an accurate measurement set in P3.4 → 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.

CALIBRATION

• *Errors during calibration*

- **NOT STABLE:** 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***

MEASURE

- Access the Setup menu for Conductivity to check the calibration, and if necessary, update the reading parameters; press key ESC CAL to return to measure mode.
- Press MODE to scroll through the different screens of parameters until activating the Conductivity parameter indicated by the icon COND.
- Connect the Conductivity cell to the BNC for Cond of the instrument (grey).
- If the user does not use a cell with a built-in temperature probe or an external probe NTC 30KΩ, it is recommended to manually update the temperature value (MTC).
- Remove the cell from its test tube, rinse with distilled water, dab gently **taking care not to scratch the electrodes**.
- Dip the sensor in the sample: the measuring cell and any relief holes must be completely immersed.
- Keep slightly stirred and eliminate any air bubbles that would distort the measurement by gently shaking the sensor.
- Scroll on the display with four red bands //// means that the measurement is not stable yet.
- Consider the measurement truthful only when the stability icon appears .
- **For a highly accurate measurement the instrument uses five different measurement scales and two units of measurement (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 carrying out this operation, clean it by immersing it in ethanol or acetone.

Never clean it mechanically, this would damage the electrodes compromising the functionality.
For short periods, store the cell in distilled water, while for long periods, keep it dry.

13. TDS Parameter

TDS

COND 50 VioLab, PC 50 VioLab

- The Conductivity measurement can be converted into the TDS Parameter.
- This parameter uses the Conductivity calibration; therefore, refer to the previous paragraph to calibrate the sensor.

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

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

SETUP

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

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

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

Conductivity of the Solution	TDS Factor
1-100 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.

14. Instrument Setup Menu

SETUP

- In measure mode press key OK SETUP to access the SETUP menu.
- Use the directional keys to move to **SETTINGS P9.0** and access the menu by pressing the key OK SETUP .
- Move with the keys MODE and ▼ to select the program you 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
P9.1	TEMPERATURE U.M.	°C / °F	°C
P9.4	BRIGHTNESS	LOW –MEDIUM - HIGH	MEDIUM
P9.6*	SELECT PARAMETER	YES – NO *for each parameter*	YES
P9.8	RESET	YES - NO	NO

** Function available only for PC 50 VioLab.*

P9.1 Temperature Unit

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

- **°C** -default-
- **°F**

P9.4 Brightness

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

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

P9.6 Select Parameters

Function available only for PC 50 VioLab

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

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

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

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

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

In the P9.6 menu:

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

Press key ESC CAL twice to return to measure mode. Scrolling with the key MODE only the parameters pH, COND and TDS are displayed.

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

P9.8 Reset Settings

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

15. 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.

16. Disposal of electrical devices

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