



EVOLUTION EQ

Single Parameter Control Units
with mV/mA or Conductivity Input

Basic Model for Panel-Mounting

TECHNICAL MANUAL FOR INSTALLATION AND USE

Man. 071EQ1 v.03

WARNINGS



This manual is dedicated to the technical personnel responsible of the installation, management, and maintenance of the plants. The manufacturer assumes no responsibility for damages or malfunctions occurring after intervention by non-authorized personnel, or not compliant with the instructions prescribed in this manual.

PRIOR TO PERFORM ANY OPERATION IT IS MANDATORY TO READ THE WHOLE MANUAL!

The manufacturer declares that the information contained in this manual is consistent with technical and safety specifications of the device to which the manual refers.

The manual must be kept by the user and/or personnel responsible for the management and maintenance of the device. In the event of deterioration or loss, a copy may be requested from the manufacturer.



Based on its design and construction, this instrument complies with the essential safety requirements and the following EC directives: 2014/35/UE; 2014/30/UE; CEE 93/68.
The relevant harmonized standards on Safety, Immunity and emission have also been applied.

HEALTH AND SAFETY

The manufacturer cannot be held responsible for accidents or damage resulting from inappropriate use of the device, as well as from even partial failure to comply with the safety regulations and intervention procedures described in this manual.

During the configuration and subsequent use of the device, incorrect operating situations may occur that are not foreseen in this manual. These anomalies can sometimes be caused by environmental factors or by fortuitous failures that cannot be foreseen by the manufacturer.



All maintenance or repair must be performed with the system isolated both electrically and hydraulically.

WASTE DISPOSAL



Disposal of the electronic device and consumables must be carried out in compliance with current local regulations.

The manufacturer can modify the instrument or the technical manual without advanced notice.

Warranty

All STEIEL products are warranted for a period of 12 months from the delivery date.

Warranty is not valid if all instructions of installation, maintenance, and use, are not strictly followed by the user. Local regulations and applicable standards have also to be followed.

The warranty does not extend to any damage caused by incompetence or negligence in the use of the device or by poor or omitted maintenance.

Any repair or modification made to the device by the user or unauthorized technicians will result in the forfeiture of the warranty. Failure to comply with the methods of intervention and use of the device described in this manual will result in the forfeiture of the warranty.

TABLE OF CONTENTS

	INTRODUCTION	Page 4
	PACKING LIST	5
	PRODUCT LABEL	5
	DESCRIPTION OF THE INSTRUMENT	6
	TECHNICAL DATA	7
	INSTALLATION	8
	WIRING INSTRUCTIONS	9
	POWER-ON	10
	DESCRIPTION OF THE DISPLAY / LED INTERFACE	11
	CONFIGURATION	12
	TABLES OF PARAMETERS	20
	CALIBRATION	26
APPENDIX	PASSWORD PROTECTION LEVELS	32



INTRODUCTION



- Input for Pt100 or Pt1000 sensor, with **automatic detection** of sensor type, for temperature measurement and compensation.
- **User-friendly interface** with intuitive menus and four multi-function softkeys.
- Three-level configuration protected by **three different passwords**.
- Large graphic display with **backlight**
- Bicolour LED for immediate indication of the instrument status
- **Pause** (external consent) **digital input** to disable all outputs
- **Two adjustment outputs**
- **Alarm** relay
- One **analog output** (0/4-20 mA), configurable for adjustment or signal repetition
- **Internal RTC** for time schedule setting and data saving with date/time label
- **USB port** for parameters' configuration, data downloading and system updating
- **RS485** serial port **with Modbus RTU communication protocol**
- Panel-mounting casing, IP52-rated with optional front cover
- Power supply: **100-240 V~** (standard), **24 V-/~ / 12 V-** (upon request)

AVAILABLE MODELS

- **EQ mV/mA** with measurement input **configurable via software** for pH electrode / ORP electrode / active or passive mA signal.
- **EQ CO** with measurement input for two-electrode **conductivity probe** (CCK series), with cell constant and measurement range configurable via software.

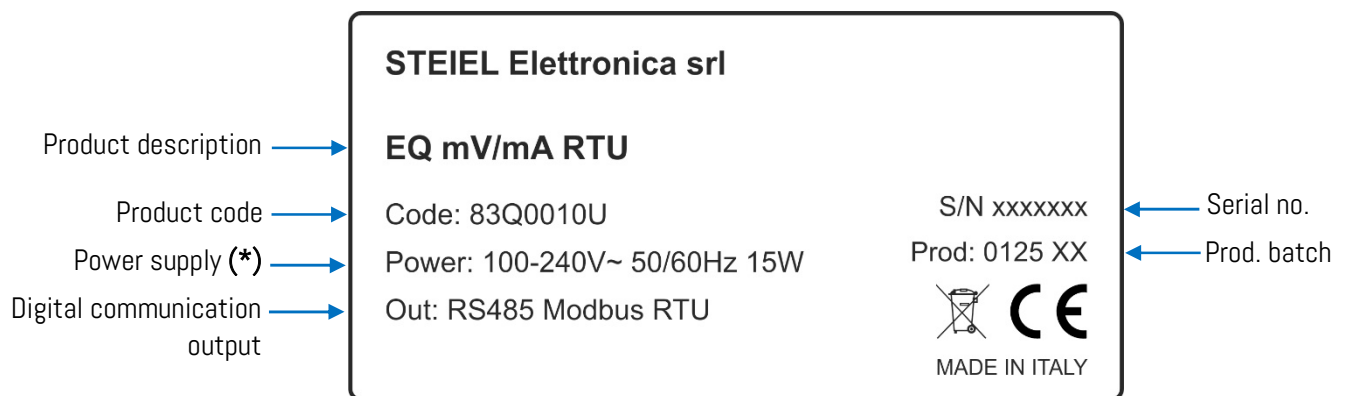


PACKING LIST

The instrument is supplied complete with:

- Brackets for panel mounting
- Instruction manual

PRODUCT LABEL (example)



(*) Power supply options: 100-240V~ or 12/24V.



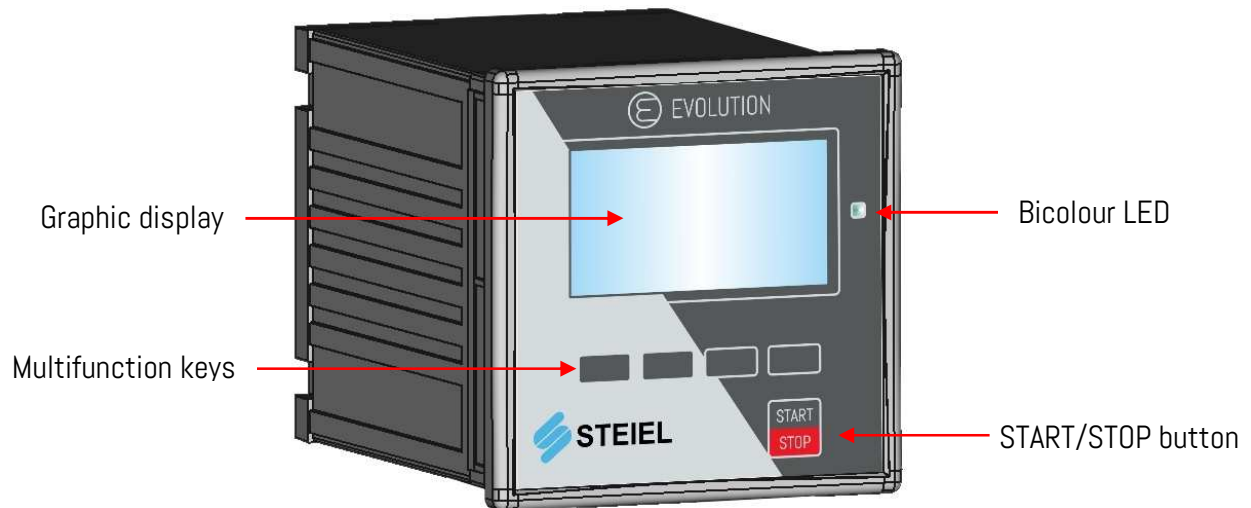
Do not remove the instrument label! It is in fact necessary to communicate the product code and/or serial number for correct identification of the spare parts.

Removing or tampering with the label completely invalidates the warranty!

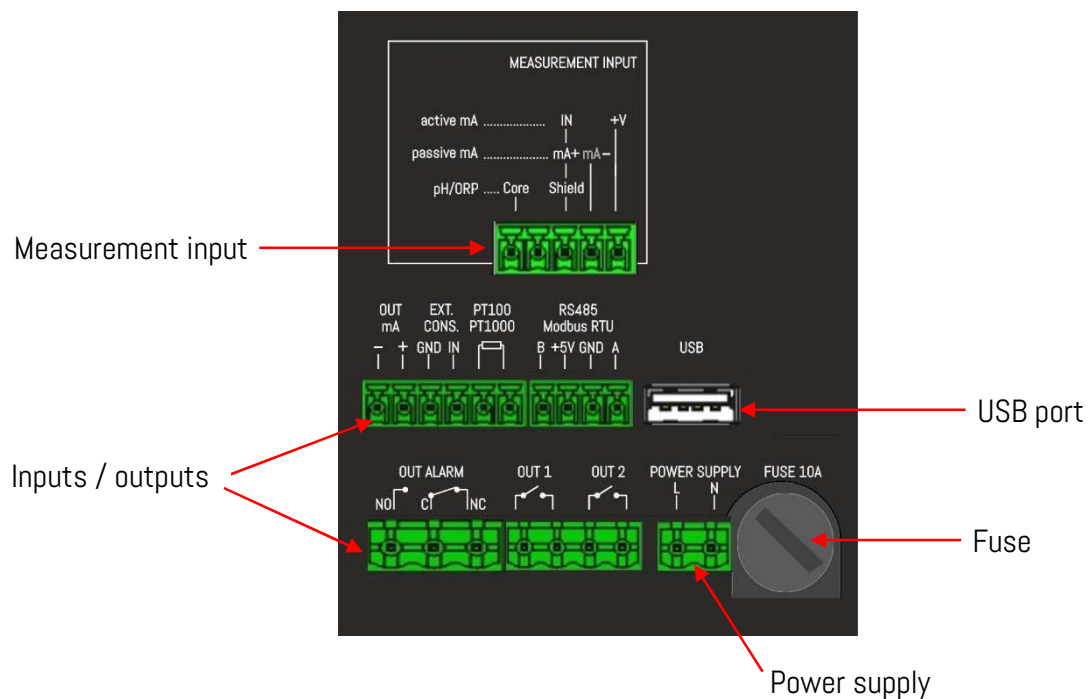


DESCRIPTION OF THE INSTRUMENT

Front View



View of the Rear Panel (Connections)





TECHNICAL DATA

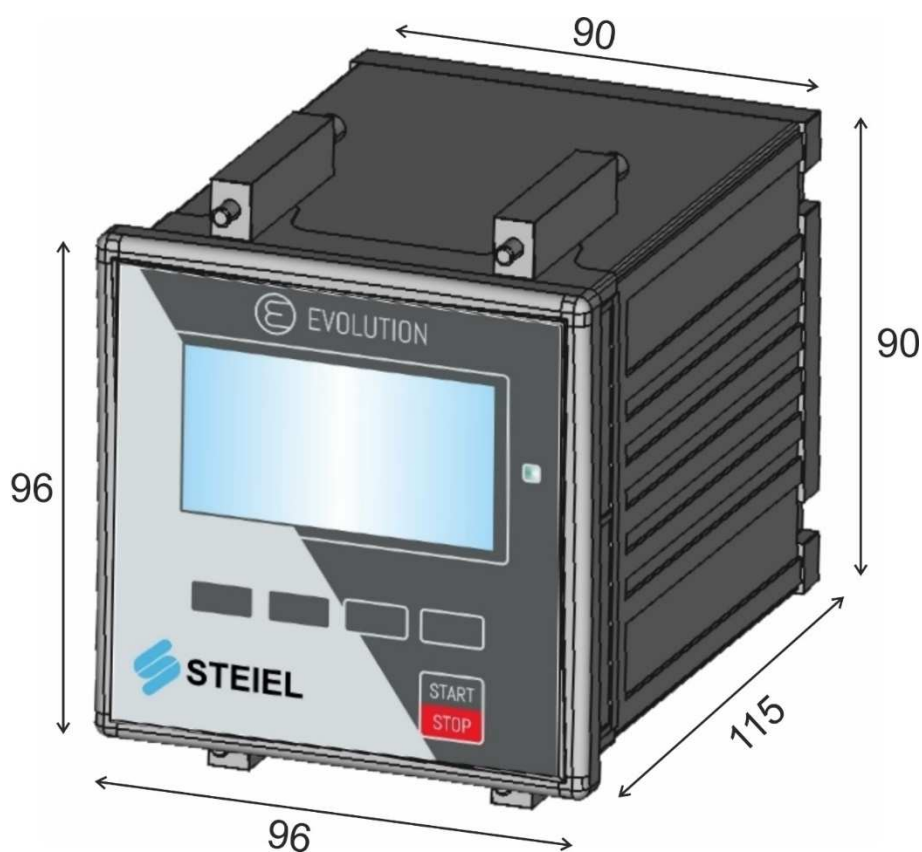
Power supply	standard: 100-240 V~ / 50/60 Hz / 15 W	
	optional, available on request: 12 V- / 24 V~- version	
Protection fuse	F 10A for 100-240 V~ version F 4A for 12 / 24 V version	
Measurement input	mV/mA	Input for pH electrode, ORP electrode or active / passive mA signal, configurable via software; precision 0.3% FS / repeatability 0.2% FS
	CO	Input for two-electrode conductivity probe; measurement range and cell constant user-selectable via software, auto-ranging option; precision 0.3% FS / repeatability 0.2% FS
Temperature input	Input for PT100 / PT1000 sensor, with automatic detection; precision < 0.3% FS / repeatability 0.2% FS	
Adjustment outputs	2x contact, 12V 2A @ 250V~, for On-Off / PWM adjustment	
Alarm relay	1x normally energized / de-energized contact, 12V 10A @ 250V~	
Analog output	1x 0/40 mA, configurable for repetition or adjustment, max 500 Ohm	
EXT.CONTS input	1x NO/NC contact, for external consent / pause	
Timer	Inbuilt RTC, with CR2032 buffer battery	
Communication	1x USB port for configuration uploading / saving, datalogger downloading and FW updating. Note: the USB key must be formatted with FAT filesystem.	
	1x RS485 serial port with Modbus RTU protocol	
Datalogger	Storage capacity: max 8000 data (measurements, events, alarms), complete with date / time label	
Protection rate	IP52 with optional front cover	
Dimensions	Overall dimensions: DIN 96 x 96 x 115 mm Panel drilling template: 90 x 90 mm	
Weight	Approx. 400 g	



INSTALLATION

The instrument has been designed for installation in an electrical panel, in a built-in casing which is locked from the rear side with the supplied fastening tools.

Note: all dimensions are in mm.

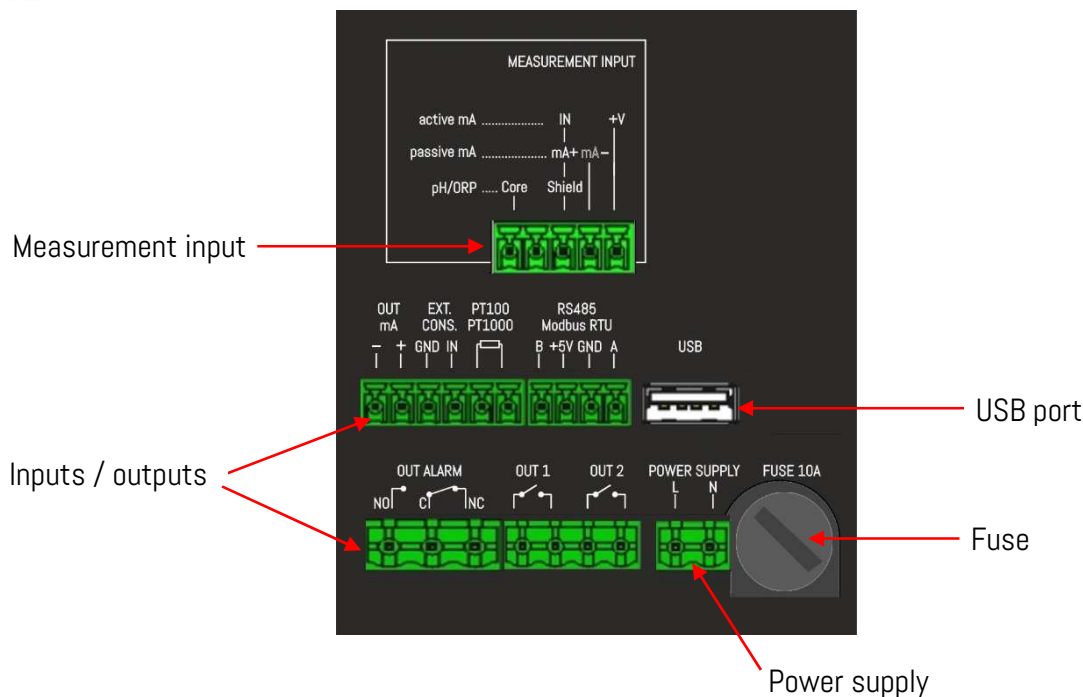




WIRING INSTRUCTIONS



Always unplug the instrument before any intervention on the terminal blocks!



Terminal block	Function
OUT ALARM	Alarm relay, which can be connected in NO or NC configuration
OUT1	Relay output 1, NO/NC contact, configurable for On-Off or PWM mode
OUT2	Relay output 2, NO/NC contact, configurable for On-Off or PWM mode
POWER SUPPLY	Version 100-240 V~ → L / N (fuse 10 A) Version 12 / 24 V → + / - (fuse 4 A)
OUT mA	Analog output, 0/4-20 mA
EXT.CONNS	Pause digital input, configurable NO/NC
PT100 / PT1000	Input for Pt100 / Pt1000 sensor - Note: in case of three-wire sensor, connect the two wires of the same colour to the same pin.
RS485 Modbus RTU	Serial port with Modbus RTU protocol (B / +5V / GND / A)
USB	USB port for flash drive formatted with FAT filesystem

Connection of the measurement sensor

Measurement input	Sensor / signal	5-pin terminal block, from left to right:				
Version mV/mA	pH / ORP Electrode	Cable core	NU	REF (shield)	NU	NU
	Passive mA input	NU	NU	mA+	mA-	NU
	Active mA input	NU	NU	IN (signal)	NU	+V
Version Cond.	CCK Probe	Cell (*)	Cell (*)	Cable shield	NTC / Pt100 (**)	NTC / Pt100 (**)

(*) Electrodes of the CCK cell → **brown** and **blue** (or **green**) wires of the connection cable.

(**) Temperature sensor integrated in the CCK cell → **yellow** and **black** (or **white**) wires of the probe cable.

NU = Not Used



POWER-ON

At **first power-on**, the instrument asks to select the display interface language and to set the internal clock to the current date and time, also selecting the preferred visualization format for the date.

- **Language** → Italiano / English / Español / Français
- **Date / time** → Format → dd-mm-yyyy / mm-dd-yyyy / yyyy-mm-dd

Once completed these operations, you need to **set the measurement input** accordingly with the used sensor.

- **Version mV / mA:**
 - pH: range 0 ... 14.00 pH
 - ORP: range -2000 ... +2000 mV
 - mA (*):
 - 0-20 mA (with measure unit selectable from a list)
 - 4-20 mA (with measure unit selectable from a list)
 - Custom (enter start and full-scale values, with measure unit selectable from a list)

(*) Measure units for 0/4-20 mA input:

pH, mV, °C, ppm, $\mu\text{S}/\text{cm}$, mS/cm , %, mA, mbar, bar, FTU, NTU, l/h, m^3/h , cm, m, l, g, kg

- **Version Cond.:**
 - Measure unit: $\mu\text{S}/\text{cm}$, mS/cm , ppm (TDS), $\Omega\text{ cm}$, $\text{M}\Omega\text{ cm}$
 - Cell constant K: 0.1, 1, 5, 10 cm
 - Resolution: 0, 1, 2 decimals
 - Auto-range: yes / no (function which automatically adjusts the measure range to display the measurement with the maximum available resolution)

Measured parameter	Measure unit	Range
Electrical conductivity	$\mu\text{S}/\text{cm}$	0.00 ... 20,000.00
	mS/cm	0.00 ... 20.00
TDS (Total Dissolved Solids)	ppm	0.00 ... 10,000.00
Resistivity	$\Omega\text{ cm}$	0.00 ... 1,000,000.00
	$\text{M}\Omega\text{ cm}$	0.00 ... 100.00

Upon **next power-ups**, the display first shows the company name (STEIEL) and then a screen indicating the instrument model/version and the hardware (HW) / firmware (FW) revisions of the electronic boards, before switching to the stand-by screen.



EVOLUTION		
EQ mV/mA		
	Main B.	Meas. B.
Rev. HW	0.0.1	0.0.1
Rev. FW	99.9.9	0.0.1

Main board

Input board

Note: For quick restoration of the unit's configuration, it is recommended to save it on a USB flash drive before performing a reset of the instrument.



DESCRIPTION OF THE DISPLAY / LED INTERFACE

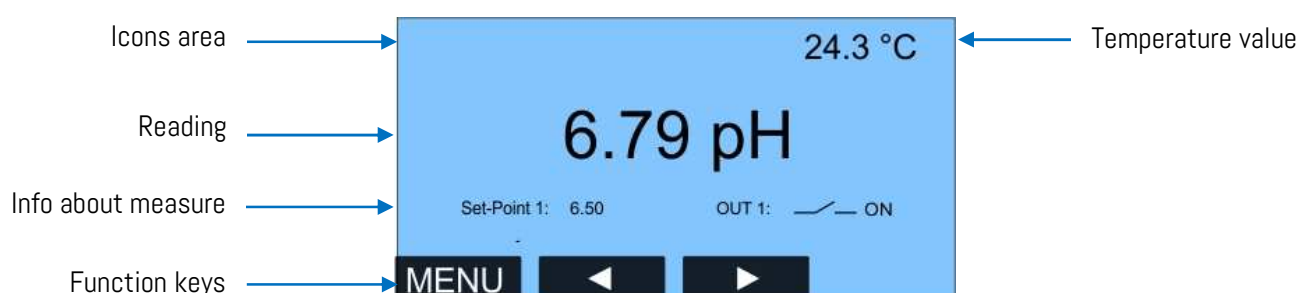
The EVOLUTION EQ unit features a graphic display and a bicolour LED, which changes colour and/or blinks according to the instrument status.

Moreover, up to 4 virtual keys are provided, changing function depending on the menu / mode and defining the action of the corresponding buttons on the front command panel of the instrument.

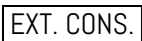
At the top left, graphic icons or short texts are displayed for a quick indication of the instrument status or the active functions.

At the top right, the temperature measurement detected by the connected Pt100 (or Pt1000) sensor is shown or the reference value set via software (with the indication "man"), in case of missing or not functioning sensor.

Stand-by screen (example)



Graphic icons (or texts) at the top left of the display

No text or icon	→ Normal operation
	→ Indicates active Timer function
	→ Indicates instrument in manual STOP due to START/STOP button pressed
	→ Indicates instrument in pause status due to the activation of Ext. Cons. contact
	→ Active alarm (with related message)

LED

The front panel also features a red/green bicolour LED, which provides the following info:

- **Green** light ON (fixed) → Normal operations
- **Green** light slowly blinking → Pause status activated by the Ext.Cons, input, Timer or START/STOP button pressed
- **Green** light 2 flashes and 1 pause → Instrument in configuration, calibration or data downloading mode
- **Red** light blinking → Alarm condition



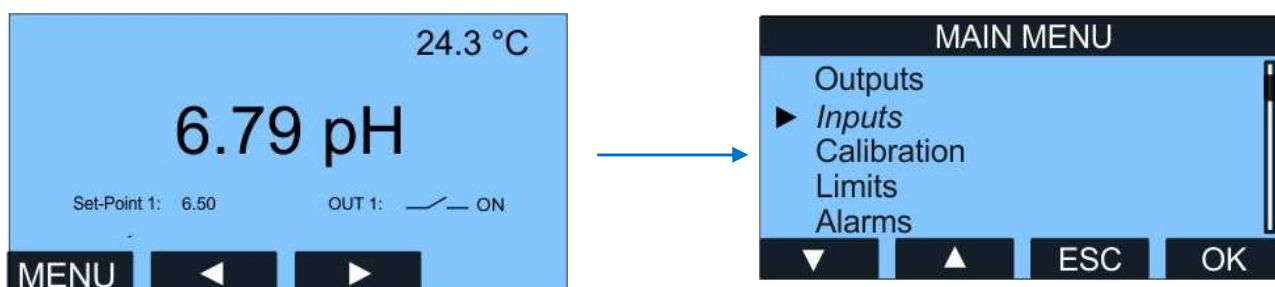
CONFIGURATION

To access the instrument configuration menus, from the stand-by screen, press the keys corresponding to the virtual MENU button.

If a protection password has been set, the instrument will ask for inserting it to access the configuration mode and will enable only the levels unlocked by the entered password (see the Appendix section for more details).

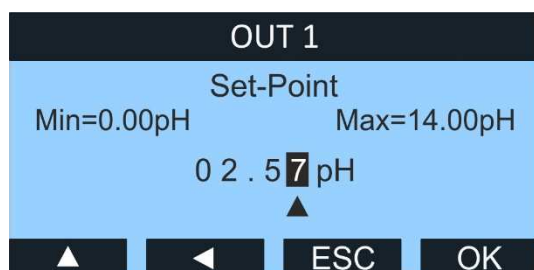
Now, select the desired option scrolling the available ones with the arrow keys ▲▼, confirm with OK and proceed through the various submenus to configure the instrument.

If no key is pressed for 2 minutes, the system automatically returns to the starting screen (stand-by); the instrument will remain in OFF status (outputs disabled and display with orange backlight) and it will have to be reactivated by the operator pressing the START/STOP button.



Command sequence to enter / edit values

Example:



Once selected and confirmed an editable parameter, a screen will activate with the highlighted editable field indicated by a cursor.

Please note that:

- The up-arrow key ▲ increases the value.

- The left-arrow key ◀ moves the cursor to the next position.

- The OK key saves the modifications and quits the editing mode.

- The ESC key quits the editing screen without saving the modifications.



MAIN MENU

- **OUTPUTS**
 - Configuration of the OUT1 and OUT2 adjustment outputs
 - Configuration of the OUT mA analog output
 - Other settings (startup delay, status of the instrument at startup, status of outputs in editing)
- **INPUTS**
 - EXT.CONS. (External consent) input
 - Temperature
 - Thermo-compensation parameters (EQ-CO version only)
- **CALIBRATION**
 - Comparison and / or buffer solutions procedure, depending on measurement
 - Calibration reset and read-only info
- **LIMITS**
 - Setting of min and max alarm thresholds for measurement
- **ALARMS**
 - Control of alarm conditions and alarm relay
- **DISPLAY**
 - Info to be displayed for the measurement channel
- **USB**
 - Datalogger
 - Operations via USB port
- **TIMER**
 - Setting of switching on / off times and outputs / functions to drive
- **CONNECTIVITY**
 - Control of the Modbus communication
- **SERVICE**
 - Alarm list and other functions reserved to technical personnel
- **SYSTEM**
 - Password setting
 - Selection of display language
 - Date/time setting
 - Read-only technical info



OUTPUTS

➤ OUT1 and OUT2 adjustment outputs

When connecting pumps or other dosing devices, the corresponding control output must be enabled and configured with the desired operating mode.

Configuration options for the two relay outputs, with their specific parameters, are listed below:

Output **Disabled**

Output **Enabled**

→ **On-Off:**

Adjustment with constant dosage till the set-point.

Parameters to be set:

- **Set-point** (adjustment end point)
- **Hysteresis** (tolerance range around the set-point, within which the output status does not change)
- **Direction** of the dosage (for example, acidification / alkalization or reduction/oxidation)
- **Max dosage** (max time within which the regulation must reach the set-point; if the output remains active for longer than the set time, the dosage is stopped, and an alarm is generated)
- **Delay ON / Delay OFF** of the relay (time tolerance range to avoid relay commutations due to irrelevant fluctuations)

Output **Enabled**

→ **PWM:**

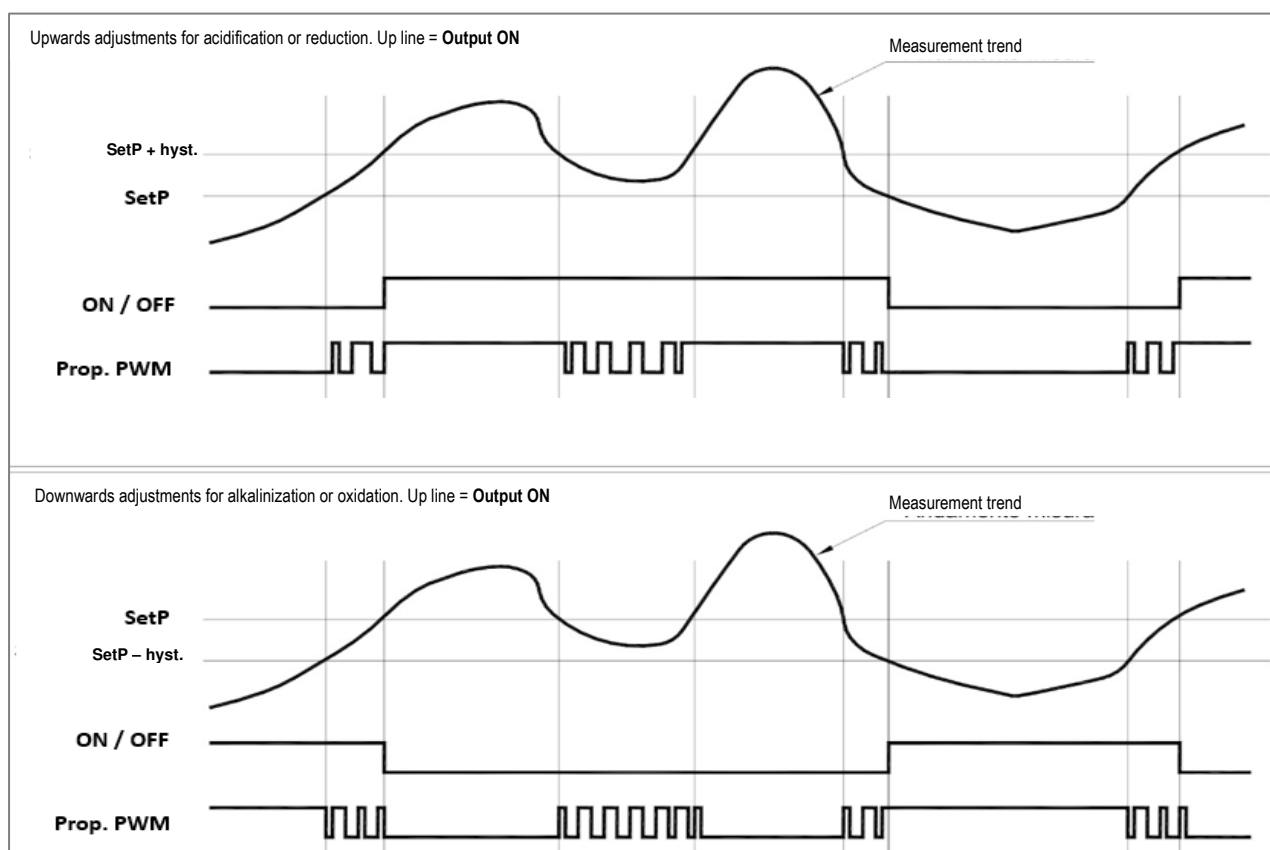
Proportional adjustment on time base.

Parameters to be set:

- **Set-point** (adjustment end point)
- **Proportional band** (measurement range within which the duty cycle adjusts the activation T_{ON} and deactivation T_{OFF} times proportionally to the distance between the real time reading and the set-point to reach)
- **Direction** of the dosage (for example, acidification / alkalization or reduction/oxidation)
- **Max dosage** (max time within which the regulation must reach the set-point; if the output remains active for longer than the set time, the dosage is stopped, and an alarm is generated)
- **Duty cycle** (when measurement is within the adjustment range (proportional band), represents the sum of $T_{ON} + T_{OFF}$ times of a cycle for the calculation of the adjustment proportionality)
- **T min.** (minimum T_{ON} and/or T_{OFF} period to avoid too fast commutations of the output, which could damage the connected dosing device)



Graphical representation of the three adjustment modes: On-Off and PWM



Output **Enabled**

→ **Working range:** Adjustment active only when measurement is inside or outside a set range of values.

Parameters to be set:

- **Threshold 1** (minimum value of the working range)
- **Threshold 2** (maximum value of the working range)
- **Status in the range** (the output contact can be configured as NO or NC when measurement is inside the set range)
- **Delay ON/OFF** of the relay (time tolerance range to avoid relay commutations due to irrelevant fluctuations)

➤ **mA Output**

If used, this output must be enabled and configured according to the connected device.

You can have only the measurement repetition or set it for proportional adjustment if the dosing device features an analog input.

Output **Disabled (default)**

Output **Enabled**

→ **Repetition**

→

Range (0-20 or 4-20 mA)

→

Value at 0 or 4 mA

→

Value at 20 mA

→

Value upon error (mA output signal when in alarm)



Output **Enabled** → Adjustment → **Range** (0-20 or 4-20 mA)
→ **Setpoint** (adjustment end point)
→ **Proportional band** (measurement range within which the output signal is modulated from 0/4 to 20 mA, proportionally to the distance between the real time reading and the set-point to reach)
→ **Value upon error** (mA output signal when in alarm)
→ **Direction** of dosage
→ **Max dosage** (max time within which the regulation must reach the set-point; if the output remains active for longer than the set time, the dosage is stopped, and an alarm is generated)

➤ Other settings

Start-up delay → Enter value (5" ... 30')

This parameter allows to enter a stand-by time at the instrument power-on, during which the dosing heads are disabled to avoid errors due to unreliable readings by not correctly polarized sensors.

Status at start-up → Remember (**default**) / Always ON / Always OFF

This parameter allows to set the instrument status in case of reboot. You can decide to resume the status before the shut-down ("Remember"), or to have the instrument active ("Always ON") or disabled ("Always OFF").

Status of outputs in editing → Disabled (**default**) / Enabled

This parameter allows to set the status of all adjustment outputs during the unit configuration. It is recommended to keep them disabled to avoid anomalous dosages due to transient settings.

INPUTS

➤ EXT.CON.S. External consent

Digital pause / external consent input, to be connected, for example, to the contactor of the filtration / recirculation pump of the swimming pool. If used, it must be enabled and appropriately configured.

Input **Disabled (default)**

Input **Enabled**

→ Type

→ NO / NC (**default**)

→ Delay ON / Delay OFF (time tolerance for the instrument answer on the opening / closing of the input contact)

➤ Temperature

Parameters related to the temperature reading are set.

Mode can be automatic when a PT100 (or PT1000) sensor is connected, while with no sensor the unit requires that a reference value is manually entered.

You can also set the measurement unit for the temperature reading displaying.

Mode → Auto (**default**) / Manual (enter value)

Range (meas. unit) → °C (**default**) / °F



➤ **CO T. comp. → Thermo-compensation parameters, for EQ-CO version only**

This submenu includes two parameters (Alpha T coefficient and Reference temperature), which allow setting the thermo-compensation of conductivity measurements.

Alpha T → Enter value (0.0 ... 4.0)

The Alpha T coefficient is expressed in %/°C and is a characteristic value of the analysed liquid. Setting Alpha T to zero means excluding thermo-compensation.

Alpha T typical values are:

- 1.0 ... 1.6 %/°C for acids
- 1.8 ... 2.2 %/°C for alkalis
- 2.2 ... 3.0 %/°C for salts
- 2.0 %/°C (approx.) for water

In case of unknown Alpha T value, you can calculate it as follows:

1. Set Alpha T = 0.0 (no thermo-compensation)
2. Read the conductivity of the analysed liquid at the reference temperature (e.g. 25 °C)
3. Have the liquid at the working temperature
4. Read the conductivity value at the working temperature
5. Calculate Alpha T using the following formula:

$$\text{Alpha T} = [(\text{Cond}(T) - \text{Cond}(T_{\text{ref}})) / (T - T_{\text{ref}})] \times [100 / \text{Cond}(T_{\text{ref}})]$$

T = working temperature (measured value)

T_{ref} = set reference value

Cond(T) = conductivity reading at the working temperature (T)

Cond(T_{ref}) = conductivity reading at the reference temperature

T. Ref. → Enter value (0.0 ... 100.0 °C)

Reference temperature for thermo-compensation of readings, typically 25 °C.

Once set these two parameters, the instrument automatically calculates the thermo-compensated conductivity value, using the following formula:

$$\text{Cond}(T) = \text{Cond}(T_{\text{ref}}) \times [(1 + \text{Alpha T}/100) \times (T - T_{\text{ref}})]$$

CALIBRATION (See specific section)

This menu allows to calibrate the measurement sensor, delete previous calibration data and get information on the sensor status.

LIMITS

You can set MIN and MAX measurement thresholds. If the measured value falls below the minimum threshold or exceeds the maximum one, an alarm is generated.

- **Threshold MIN** → Disabled (default)
→ Enabled → enter value
- **Threshold MAX** → Disabled (default)
→ Enabled → enter value



ALARMS

➤ **Alarm conditions**

This menu lists all events which can generate an alarm condition of the instrument, resulting in blocking of the adjustment outputs.

See “Tables of parameters” section for the full list of available alarms and related factory settings.

For each event, three settings are available:

OFF = The event does not generate an alarm.

AUT = The event generates an alarm and, once the alarm is reset, the instrument automatically resumes to normal operations

MAN = The event generates an alarm and resuming the normal operation requires the operator to confirm.

➤ **OUT Alarm**

If used, this output must be enabled and configured according to the connected device. Moreover, you can choose which events should cause the alarm relay to switch.

See "Tables of parameters" section for the full list of available alarms".

Output **Disabled** (default)

Output **Enabled** → Type → Relay (normally) energized (**default**)
→ Relay (normally) de-energized
→ **Alarm conditions** (list of alarm events → Yes / No)

DISPLAY

This menu allows to customize some visualizations on the stand-by screen.

In fact, you can select for which enabled outputs to show the relative information, by flagging the corresponding item in the proposed list.

USB

This menu sets the functionality of the USB port and datalogger.

Note: the USB key must be formatted with FAT filesystem.

➤ **Datalogger**

Data and events (complete with date, time and device ID) are saved in the datalogger and can be exported as file.csv.

These are: measurement values, switches of the START/STOP button, sensor calibrations, reset requests, access to password-protected menus, access attempts with wrong password, instrument power-ons / power-offs due to voltage drops, list of occurred alarms.

→ Sampling time (set the time interval between two measurement savings: measure 1, measure 2, temperature)

→ Export data (file csv) (with USB key inserted, asks to confirm before exporting the datalog file)

→ Device ID (enter the ID code of the instrument)

The following actions can be performed only with USB key inserted and after operator confirmation:

- **Save conf.** Save current configuration on the USB key (file.csv)
- **Load conf.** Load current configuration from USB key (file.csv)
- **FW updating**



TIMER

The unit features an internal clock, which allows to schedule timed actions through 25 independent and fully configurable timers.

For each timer you can set the switching on / switching off times and choose in which day(s) of the week to enable it.

- **TIMER 1 / TIMER 2 / TIMER 3 / TIMER 4 / ... / TIMER 25**
 - Timer ON (activation time)
 - Timer OFF (switching off time)
 - Enable Timer (day of the week selection)

CONNECTIVITY

This menu controls the possibly communication of the unit. You can use the RS485 serial line with Modbus RTU protocol (standard), by setting the communication speed and the instrument ID code, or TCP/IP.

- Disabled
- Enabled
 - Modbus
 - RTU
 - Baud rate / ID

SERVICE

This menu is reserved for qualified and authorized technical personnel.

- **Alarm list** Allows to display the list of last alarms, complete with date and time.
- **Inputs test** Allows to force all inputs to check their functioning.
- **Outputs test** Allows to force all outputs (digital and analog), to check the functioning of the connected devices (e.g., dosing pumps); during this operation all controls are disabled.
- **Meas. simulation** Allows to force the measurement channel to check the operation of the adjustment outputs
- **Reset**
 - Alarm history (Delete the saved list of alarms)
 - Datalogger (Delete saved list of measurements)
 - Calibrations (Delete the offset and/or slope data, restoring factory values)
 - Measure autoset (Function reserved for the repair technician, in case of replacement of the input board or measurement sensor type)
 - Factory reset (Full restoring of factory settings; the instrument will need to be reconfigured)



SYSTEM

This menu is reserved for qualified and authorized technical personnel.

- **Password**

Allows to enter three different passwords, for three different access levels to the instrument menus, to prevent interventions by unauthorized personnel.
Note: For further details about the different protection levels of the three passwords, see the "Appendix" section at the end of this manual.

 - Disabled (**default**)
 - Enabled
 - Technician
 - Operator
 - Calibration
- **SOFTKEY 4**

Allows to customize the function of the fourth virtual key to directly access to the calibration of the two measurement channels, to the USB port control menu or to the check of inputs/outputs status.

 - Disabled (**default**)
 - Enabled
 - CAL / USB / I/O
- **Set date/time**

Allows to set current date / time and choose the displaying format for the date, exactly as at first power-on of the unit.
- **Language**

Allows to change the language of display interface.
- **FW updating**

With USB key inserted, you can update the instrument FW.
- **Info**

Read-only displaying of the following technical info: FW and HW version / Instrument model / Measurement type and set range / S/N of power board and input boards / POWER ON and operating time hour-counter / Log nr. of alarms / Internal temperature



TABLES OF PARAMETERS

OUTPUTS

pH Meas.			Valid values
OUT1 and OUT2 Outputs	Disabled		
	Enabled / On-Off	Setpoint	0.00 ... 14.00 pH
		Hysteresis	0.05 ... 6.00 pH
		Direction	Acidification / Alkalinization
		Max dosage	00 :00 ... 08 :00 hh : mm
		Delay ON	00 :00 ... 10 :00 mm : ss
		Delay OFF	00 :00 ... 10 :00 mm : ss
	Enabled / PWM	Setpoint	0.00 ... 14.00 pH
		Proportional band	0.05 ... 14.00 pH
		Direction	Acidification / Alkalinization
		Max dosage	00 :00 ... 08 :00 hh : mm
		Duty cycle	00 :30 ... 10 :00 mm : ss
		T.min	0 ... 5 sec
	Enabled / Working range	Threshold 1 (min.)	0.00 ... 14.00 pH
		Threshold 2 (max.)	Threshold 1 ... FS
		Status in the range	NO / NC
		Delay ON/OFF	00 :00 ... 10 :00 mm : ss
mA Output	Disabled		
	Enabled / Repetition	Range	0-20 or 4-20 mA
		Value at 0/4 mA	0.00 ... 14.00 pH
		Value at 20 mA	0.00 ... 14.00 pH
		Value upon error	0 ... 21 mA
	Enabled / Adjustment	Setpoint	0.00 ... 14.00 pH
		Range	0-20 or 4-20 mA
		Proportional band	0.05 ... 14.00 pH
		Value upon error	0 ... 21 mA
		Direction	Acidification / Alkalinization
		Max dosage	00 :00 ... 08 :00 hh : mm



ORP Meas.			Valid values
OUT1 and OUT2 Outputs	Disabled		
	Enabled / On-Off	Setpoint	-2000 ... +2000 mV
		Hysteresis	5 ... 500 mV
		Direction	Oxidation / Reduction
		Max dosage	00 :00 ... 08 :00 hh : mm
		Delay ON	00 :00 ... 10 :00 mm : ss
		Delay OFF	00 :00 ... 10 :00 mm : ss
	Enabled / PWM	Setpoint	-2000 ... +2000 mV
		Proportional band	5 ... 2000 mV
		Direction	Oxidation / Reduction
		Max dosage	00 :00 ... 08 :00 hh : mm
		Duty cycle	00 :30 ... 10 :00 mm : ss
		T.min	0 ... 5 sec
	Enabled / Working range	Threshold 1 (min.)	-2000 ... +2000 mV
		Threshold 2 (max.)	Threshold 1 ... FS
		Status in the range	NO / NC
		Delay ON/OFF	00 :00 ... 10 :00 mm : ss
mA Output	Disabled		
	Enabled / Repetition	Range	0-20 o 4-20 mA
		Value at 0/4 mA	-2000 ... +2000 mV
		Value at 20 mA	-2000 ... +2000 mV
		Value upon error	0 ... 21 mA
	Enabled / Adjustment	Setpoint	-2000 ... +2000 mV
		Range	0-20 o 4-20 mA
		Proportional band	5 ... 2000 mV
		Value upon error	0 ... 21 mA
		Direction	Oxidation / Reduction
		Max dosage	00 :00 ... 08 :00 hh : mm

mA Signal			Valid values
OUT1 and OUT2 Outputs	Disabled		
	Enabled / On-Off	Setpoint	Measurement range
		Hysteresis	0 ... FS
		Direction	→ Setpoint / Setpoint ←
		Max dosage	00 :00 ... 08 :00 hh : mm
		Delay ON	00 :00 ... 10 :00 mm : ss
		Delay OFF	00 :00 ... 10 :00 mm : ss
	Enabled / PWM	Setpoint	Measurement range
		Proportional band	0 ... FS
		Direction	→ Setpoint / Setpoint ←
		Max dosage	00 :00 ... 08 :00 hh : mm
		Duty cycle	00 :30 ... 10 :00 mm : ss
		T.min	0 ... 5 sec
	Enabled / Working range	Threshold 1 (min.)	Measurement range
		Threshold 2 (max.)	Threshold 1 ... FS
		Status in the range	NO / NC
		Delay ON/OFF	00 :00 ... 10 :00 mm : ss



mA Signal			Valid values
mA Output	Disabled		
	Enabled / Repetition	Range	0-20 or 4-20 mA
		Value at 0/4 mA	Measurement range
		Value at 20 mA	Starting value ... FS
		Value upon error	0 ... 21 mA
	Enabled / Adjustment	Setpoint	Measurement range
		Range	0-20 or 4-20 mA
		Proportional band	0 ... FS
		Value upon error	0 ... 21 mA
		Direction	→ Setpoint / Setpoint ←
		Max dosage	00 :00 ... 08 :00 hh : mm

Cond.			Valid values
OUT1 and OUT2 Outputs	Disabled		
	Enabled / On-Off	Setpoint	Measurement range
		Hysteresis	0 ... 50% FS
		Direction	→ Setpoint / Setpoint ←
		Max dosage	00 :00 ... 08 :00 hh : mm
		Delay ON	00 :00 ... 10 :00 mm : ss
		Delay OFF	00 :00 ... 10 :00 mm : ss
	Enabled / PWM	Setpoint	Measurement range
		Proportional band	0 ... 50% FS
		Direction	→ Setpoint / Setpoint ←
		Max dosage	00 :00 ... 08 :00 hh : mm
		Duty cycle	00 :30 ... 10 :00 mm : ss
		T.min	0 ... 5 sec
	Enabled / Working range	Threshold 1 (min.)	Measurement range
		Threshold 2 (max.)	Threshold 1 ... FS
		Status in the range	NA / NC
		Delay ON/OFF	00 :00 ... 10 :00 mm : ss
mA Output	Disabled		
	Enabled / Repetition	Range	0-20 or 4-20 mA
		Value at 0/4 mA	Measurement range
		Value at 20 mA	Measurement range
		Value upon error	0 ... 21 mA
	Enabled / Adjustment	Setpoint	Measurement range
		Range	0-20 or 4-20 mA
		Proportional band	0 ... 50% FS
		Value upon error	0 ... 21 mA
		Direction	→ Setpoint / Setpoint ←
		Max dosage	00 :00 ... 08 :00 hh : mm

OUTPUTS

		Valid values
Other settings	Start-up delay	5 sec ... 30 min
	Status at start-up	Remember / Always ON / Always OFF
	Outputs status in editing	Disabled / Enabled



INPUTS

			Valid values
EXT. CONS.	Disabled		
	Enabled	Type	NO / NC
		Delay ON	2 ... 10 sec
		Delay OFF	2 ... 10 sec
Temperature	Mode		Auto / Manual
	Range (meas. unit)		°C / °F
CO T. comp. (*)	Alpha T		0.0 ... 4.0 %/°C
	T. Rif.		0.0 ... 100.0 °C

(*) For EQ-CO model only (conductivity measurements).

CALIBRATION

See specific section (page 27).

LIMITS

		Valid values
Threshold MIN	Disabled	
	Enabled	Measurement range
Threshold MAX	Disabled	
	Enabled	Measurement range

ALARMS

			Valid values
Alarm conditions	Events that can generate an alarm (*)		OFF / AUT / MAN
OUT Alarm	Disabled		
	Enabled	Type	Relay normally energized / normally de-energized
		Alarm conditions (*)	Yes (flag) / No (no flag)

(*) List of events that can generate an alarm condition and trigger alarm relay switching:

MIN threshold / MAX threshold exceeded
Under Range / Over Range
Max dosage time

DISPLAY

DISPLAY	List of enabled outputs to be displayed on the stand-by screen
---------	--



USB

			Valid values
USB	Datalogger	Sampling time	1.5, 15, 30, 60 min
		Export data	File .csv
		Device ID	0 ... 250
	Save current config on USB (insert USB key)		File .csv
	Load config file from USB (insert USB key)		File.csv
	Update FW (insert USB key)		

Notes:

- The USB key must be formatted with FAT filesystem
- All data / events are saved complete with date / time / temperature
- The data / events saved in the datalogger are:
 - Measurements read according to the set sampling time
 - Switches of the START/STOP button
 - Sensor calibrations
 - Reset requests
 - Access to menus protected by technician / operator / calibration passwords
 - Access attempts with wrong password
 - Power-ons / offs of the unit
- Alarms are saved with the codes listed here below, complete with date / time indication:

AL01: Threshold min | **AL02:** Threshold max
AL05: Under Range | **AL06:** Over Range
AL07: T. max dosage

TIMER

		Azione
TIMER 1	TIMER ON	Enter activation time
	TIMER OFF	Enter switching off time
	Enable Timer	Choose the day or series of days of the week for Timer 1

Note: The unit features 25 independent TIMERS, each one functioning as described here above for TIMER 1.

CONNECTIVITY

				Valid values
CONNECTIVITY	Disabled			
	Enabled / Modbus	RTU	Baud rate	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115400
			ID	00 ... 31



SERVICE

		Action
SERVICE	Alarm list	List of the occurred alarm events
	Inputs test	Functioning test of all inputs
	Outputs tests	Functioning test of dosing heads
	Meas. simulation	Forcing the measurement channel to check the behaviour of related dosing heads, without the measurement sensor necessarily being connected to the instrument
	Reset	Alarm history / Datalogger / Calibrations / Measurement autoset / Factory reset

SYSTEM

			Valid values
Password	Disabled		
	Enabled	Technician	0000 ... 9999
		Operator	0000 ... 9999
		Calibration	0000 ... 9999
Softkey 4	Disabled		
	Enabled		CAL / USB / I/O
Set date / time	Date / time setting for the internal clock and selection of the date displaying format		
Language	Italiano / English / Français / Español		
FW Updating	With USB key inserted, the unit asks confirmation to update the FW		
Info (read-only)	Instrument model / FW, HW and S/N version of the power board / Operating time / Log nr. of alarms / Internal temperature / FW, HW and S/N version of the input board / Measurement type and range		



CALIBRATION

pH MEASUREMENT

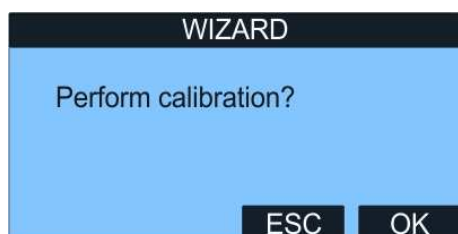
Available options:

- Wizard (2 points)
- Comparison (1 point)
- Buffer solutions (1 or 2 points)
- Reset calibrations
- Info

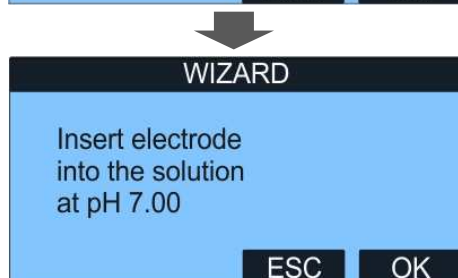
WIZARD PROCEDURE

Messages are displayed which guide the operator with step-by-step instructions to perform a two-point pH calibration, with pH7 and pH4 (or pH9) buffer solutions.

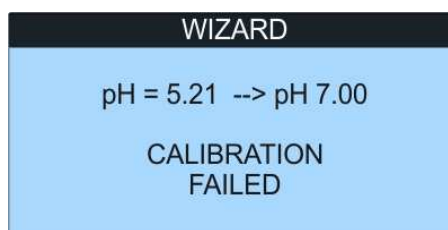
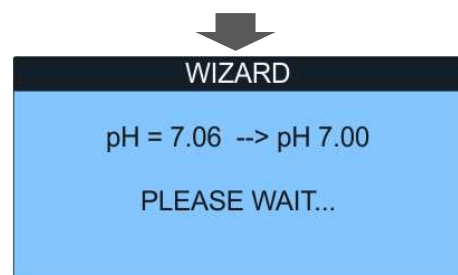
This procedure is recommended when precise measurement is required, also suitable for unskilled personnel.



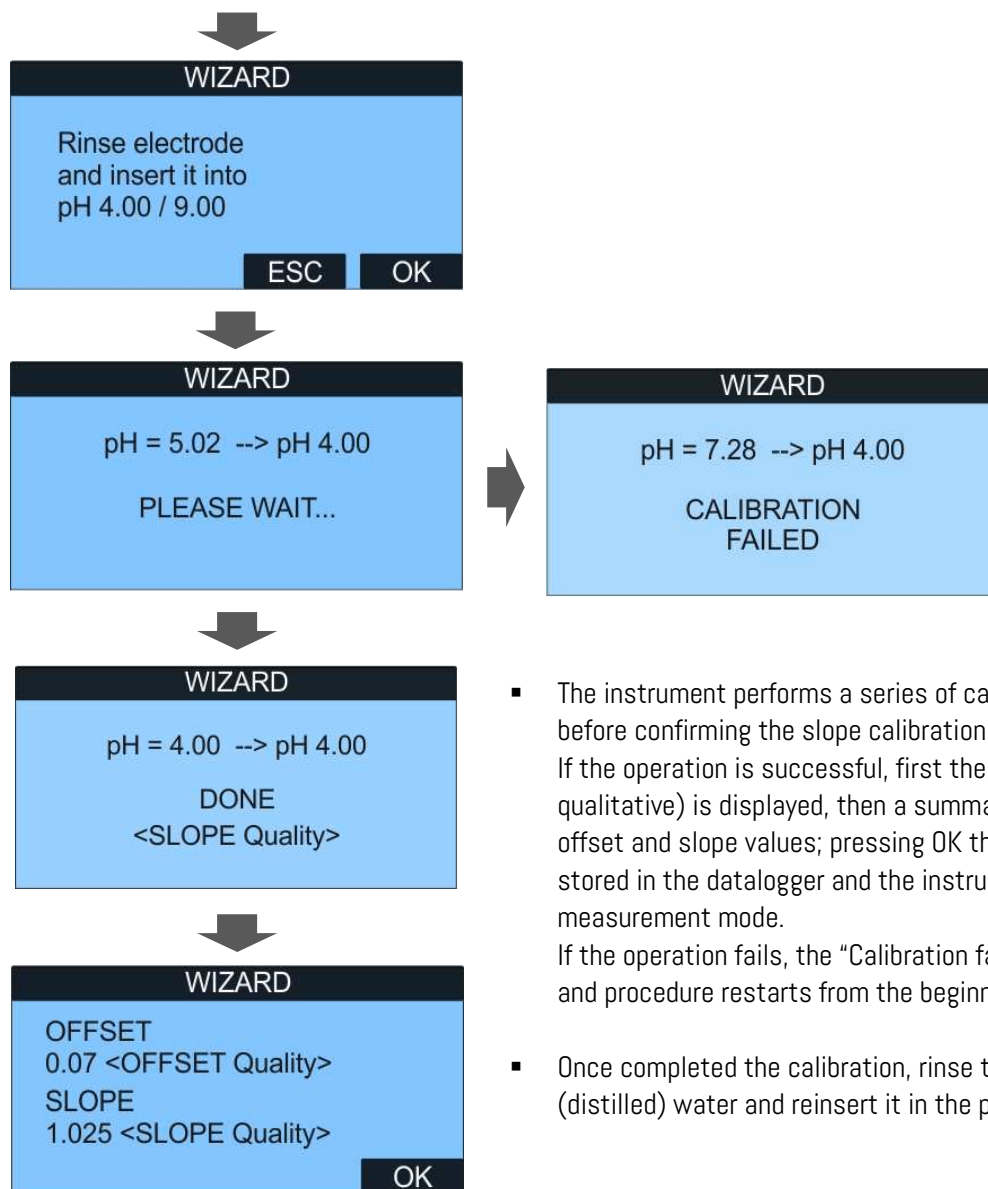
- Remove sensor from probe-holder.
- Rinse it with clean (distilled) water and let it drip dry, without rubbing it with paper or rags.
- Press OK.



- Follow display instructions.



- The instrument performs a series of calculations and checks before confirming the offset calibration. If the operation is successful, the offset value (numeric and qualitative) is displayed, and the unit automatically moves to the second point (slope). If it fails, the "Calibration failed" error is generated and procedure restarts from the beginning.



- The instrument performs a series of calculations and checks before confirming the slope calibration. If the operation is successful, first the slope value (numeric and qualitative) is displayed, then a summary screen of the new offset and slope values; pressing OK the calibration data are stored in the datalogger and the instrument resumes to normal measurement mode. If the operation fails, the "Calibration failed" error is generated and procedure restarts from the beginning.
- Once completed the calibration, rinse the sensor with clean (distilled) water and reinsert it in the probe-holder.

COMPARISON CALIBRATION PROCEDURE

One-point calibration via comparison with a reference instrument.

This procedure is recommended for a quick check / adjustment of the sensor.

- Leave the sensor in the probe-holder.
- Take a water sample from the probe-holder (through the dedicated outlet).
- Measure the pH value with a reliable reference instrument (not photometer).
- Adjust the value with the arrow keys and confirm.
- The calibration data are stored in the datalogger and the instrument resumes to normal measurement mode. If the operation fails, the "Calibration failed" error is generated and procedure restarts from the beginning.

CALIBRATION PROCEDURE WITH BUFFER SOLUTIONS

One or two-point calibration, with pH7 and pH4 (or pH9) buffer solutions.

The two-point procedure is recommended when a precise measurement is required, while the faster one-point calibration is suitable for a quick check / adjustment of the sensor.

- Remove sensor from probe-holder.
- Rinse it with clean (distilled) water and let it drip dry, without rubbing it with paper or rags.





- Select Offset calibration and confirm.
- Immerse the sensor in pH7 solution and wait for stable reading.
- Press OK to confirm.
- If the operation is successful, the offset value (numeric and qualitative) is displayed, and the unit automatically moves to the second point (slope).
If it fails, the "Calibration failed" error is generated and procedure restarts from the beginning.
- Rinse it with clean (distilled) water and let it drip dry, without rubbing it with paper or rags.
- Select Slope calibration and confirm.
- Immerse the sensor in pH4 (or pH9) solution and wait for stable reading.
- Press OK to confirm.
- If the operation is successful, first the slope value (numeric and qualitative) is displayed, then a summary screen of the new offset and slope values; pressing OK the calibration data are stored in the datalogger and the instrument resumes to normal measurement mode.
If the operation fails, the "Calibration failed" error is generated and procedure restarts from the beginning.
- Once completed the calibration, rinse the sensor with clean (distilled) water and reinsert it in the probe-holder.

Notes after sensor calibration

Qualitative indication about the electrode status:

Excellent / Good	Discrete	Calibration failed
Electrode properly working.	Have a new spare electrode available.	See note. *

* A calibration error can be due to the following causes:

- 1) Wrong or polluted buffer solution.
- 2) Dirty electrode; clean it properly.
- 3) During cleaning, the electrode was rubbed with paper or cloths and charged electrostatically; immerse it in pH4 buffer for approx. 20 minutes.
- 4) Air bubble in the sensitive bulb, due to the electrode wrong (horizontal or upside down) position for too long; place it vertically and wait for the air to go upwards.
- 5) The electrode bulb has been left drying; immerse it in pH4 buffer for 1 hour.
- 6) The electrode cable is damaged or oxidized; replace it.
- 7) The cable connector is moist or oxidized; dry and clean it.
- 8) The electrode is exhausted and must be replaced with a new one.

Note: Buy your pH electrode shortly before the replacement time, avoiding long storage; store it in a fresh area, with the bulb always immersed in storage solution.



ORP MEASUREMENT

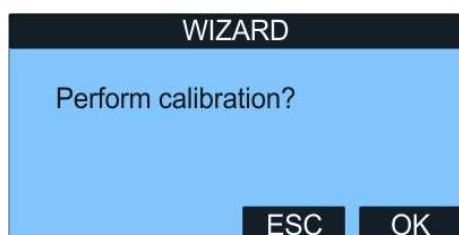
Available options:

- Wizard (1 point)
- Comparison (1 point)
- Reset calibrations
- Info

WIZARD PROCEDURE

Messages are displayed which guide the operator with step-by-step instructions to perform one-point (offset) ORP calibration, with a standard solution, e.g., 220 mV.

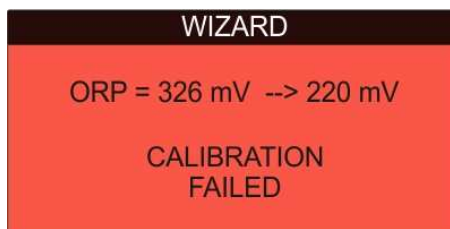
This procedure is recommended when precise measurement is required, also suitable for unskilled personnel.



- Remove sensor from probe-holder.
- Rinse it with clean (distilled) water and let it drip dry, without rubbing it with paper or rags.
- Press OK.



- Follow display instructions.



- The instrument performs a series of calculations and checks before confirming the offset calibration. If the operation is successful, the offset value (numeric and qualitative) is displayed, calibration data are stored in the datalogger, and the unit resumes to normal measurement mode. If the operation fails, the "Calibration failed" error is generated and procedure restarts from the beginning.
- Once completed the calibration, rinse the sensor with distilled water and reinsert it in the probe-holder.



COMPARISON CALIBRATION PROCEDURE

One-point calibration via comparison with known value. Procedure recommended for a quick check / adjustment of the sensor.

This procedure can be performed using a reference instrument or a standard calibration solution.

1. Procedure with reference instrument:
 - Leave the sensor in the probe-holder.
 - Take a water sample from the probe-holder (through the dedicated outlet).
 - Measure the ORP value with a reliable reference instrument.
 - Adjust the value with the arrow keys and press OK to confirm.
 - The calibration data are stored in the datalogger and the instrument resumes to normal measurement mode. If the operation fails, the "Calibration failed" error is generated and procedure restarts from the beginning.
2. Procedure with standard calibration solution:
 - Remove sensor from probe-holder.
 - Rinse it with clean (distilled) water and let it drip dry, without rubbing it with paper or rags.
 - Immerse the sensor in the calibration solution (e.g. 220 mV) and wait for stable reading.
 - If necessary, adjust the value with the arrow keys and press OK to confirm.
 - If the operation is successful, the offset value (numeric and qualitative) is displayed, the calibration data are stored in the datalogger, and the unit automatically resumes to normal measurement mode.
 - If the operation fails, the "Calibration failed" error is generated and procedure restarts from the beginning.
 - Once completed the calibration, rinse the sensor with clean (distilled) water and reinsert it in the probe-holder.

Notes after sensor calibration

Qualitative indication about the electrode status:

Excellent / Good	Discrete	Calibration failed
Electrode properly working.	Have a new spare electrode available.	See note. *

* A calibration error can be due to the following causes:

- 1) Wrong or polluted buffer solution.
- 2) Dirty electrode; clean it properly.
- 3) Air bubble in the sensitive bulb, due to the electrode wrong (horizontal or upside down) position for too long; place it vertically and wait for the air to go upwards.
- 4) The electrode bulb has been left drying; immerse it in pH4 buffer for 1 hour.
- 5) The electrode cable is damaged or oxidized; replace it.
- 6) The cable connector is moist or oxidized; dry and clean it.
- 7) The electrode is exhausted and must be replaced with a new one.

Note: Buy your ORP electrode shortly before the replacement time, avoiding long storage; store it in a fresh area, with the bulb always immersed in storage solution.



0/4-20 mA INPUT

Available options:

- Calibration
- Reset calibrations
- Info

CALIBRATION PROCEDURE

One-point (offset) calibration via comparison with a reference instrument.

CONDUCTIVITY MEASUREMENT

Available options:

- Calibration
- Reset calibrations
- Info

CALIBRATION PROCEDURE

The zero point is electrically calibrated at the factory and does not need to be adjusted by the user.

Only perform the one-point "Standard" procedure to adjust the slope value.

It is a comparison procedure with a reference instrument.

- Measure the conductivity with a reliable reference instrument.
- Adjust the value with the arrow keys, then confirm pressing OK.
- The calibration is stored in the internal datalogger and the instrument resumes to normal measurement mode. If it fails, the "Calibration failed" warning message is generated and the procedure restarts from the beginning.

RESET CALIBRATIONS

Input calibrations are deleted, and factory calibration data are restored.

INFO

The unit displays the date / time of the last calibration, and the offset and/or slope values related to the sensor status.

PASSWORD PROTECTION LEVELS

The instrument configuration menu is structured on three access levels, which can be protected by three different passwords, to prevent incorrect configurations by unauthorized personnel.

- The **TECHNICIAN password** allows complete access to all the menus and submenus of the unit; level reserved for the installer / system engineer.
- The **OPERATOR password** allows to set a series of parameters for customizing the adjustments based on the needs of the specific system; level reserved for the plant manager.
- The **CALIBRATION password** allows limited access to non-critical parameters; level reserved for personnel in charge of ordinary plant maintenance.

Outputs	OUT1 and OUT2 Adjustment outputs	Disabled			
		Enabled	On-Off	Setpoint	
				Hysteresis	
				Direction	
				Max dosage	
				Delay ON	
				Delay OFF	
			PWM	Setpoint	
				Proportional band	
				Direction	
				Max dosage	
				Duty cycle	
				T.min	
			Working range	Threshold 1 / 2	
				Status in the range	
	Delay ON / OFF				
	OUT mA	Disabled			
		Enabled	Repetition		
			Adjustment	Range	
				Setpoint	
Proportional band					
Value upon error					
Direction					
Max dosage					
Other settings					
Inputs					
Calibration	Wizard procedure				
	Comparation				
	Buffer solutions				
	Reset calibrations				
	Info				
Limits					
Alarms	Alarm conditions				
	OUT Alarm				
Display					

USB	Datalogger	Sampling time
		Export data
		Device ID
	Save config.	
	Load config.	
	FW updating	
Timer		
Connectivity		
Service	Alarm list	
	Outputs test	
	Inputs test	
	Measure simulation	
	Reset	Alarm history
		Datalogger
		Calibrations
		Measure autoset
		Factory reset
System	Password	Technician
		Operator
		Calibration
	Softkey 4	
	Set date/time	
	Language	
	FW updating	
	Info	