



Portable Meter **SHP02 pH/RX/T**

TECHNICAL MANUAL



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Certified Company, according to the UNI EN ISO 9001 standards

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 prescribed instructions.



Before performing any maintenance or repair action, ensure that the system is electrically and hydraulically insulated.



Dispose of waste material and consumables accordingly with local regulations.

How to ship the instrument

To send back the device for repairing or calibration purposes, proceed as follows:

- Fill the module “REPAIR REQUEST AND DECONTAMINATION DECLARATION” supplied with this manual, and include it in the transport documentation.
- Clean the device properly, to eliminate any hazardous residuals.

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

Warranty

All our 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.

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TECHNICAL SPECIFICATIONS

pH/RX Input	available on BNC connector, input impedance > $10^{12} \Omega$ pH range: -2.00 to +16.00 pH RX range: -1000 to +1000 mV Accuracy > 0.3% F.S. / Repeatability > 0.2% F.S.
Temperature Input	for Pt1000 probe, available on 5-pin DIN connector Range: -50.0 to +200.0 °C Accuracy > 0.3% F.S. / Repeatability > 0.2% F.S.
Display	Alphanumeric LCD, 2 rows x 16 characters, with backlight
Power Supply	9 V alkaline battery (6LR61) (standard) or rechargeable Ni-Cd battery and battery charger (optional)
Battery Life	approx. 70 hours for alkaline battery (and backlight off) approx. 20 hours for rechargeable Ni-Cd battery (and backlight off)
Environment	Storage temperature -20 to +60 °C Working temperature -10 to +50 °C RH max. 90% not condensing
Casing	ABS (UL 94 HB) with polycarbonate control panel
Protection Rate	IP65
Dimensions	228 x 72/117 x 47 mm
Weight	approx. 350 g (without battery)

Main Technical Notes

- 1) High protection rate, thanks to the absence of trimmers on the control panel
- 2) Automatic temperature compensation of pH readings through Pt1000 sensor
- 3) Quick switch from pH to redox meter by just pressing a button
- 4) Alarms and errors (diagnostic) shown on the display
- 5) Configuration / calibration data saved in non-volatile memory
- 6) Easy calibration procedures with automatic buffer recognition
- 7) Constant monitoring of 5 variables by the microprocessor: pH measurement (*read1*), redox measurement (*read2*), temperature measurement (*read3*), battery voltage level (*read4*), internal temperature (*read5*)

Connections

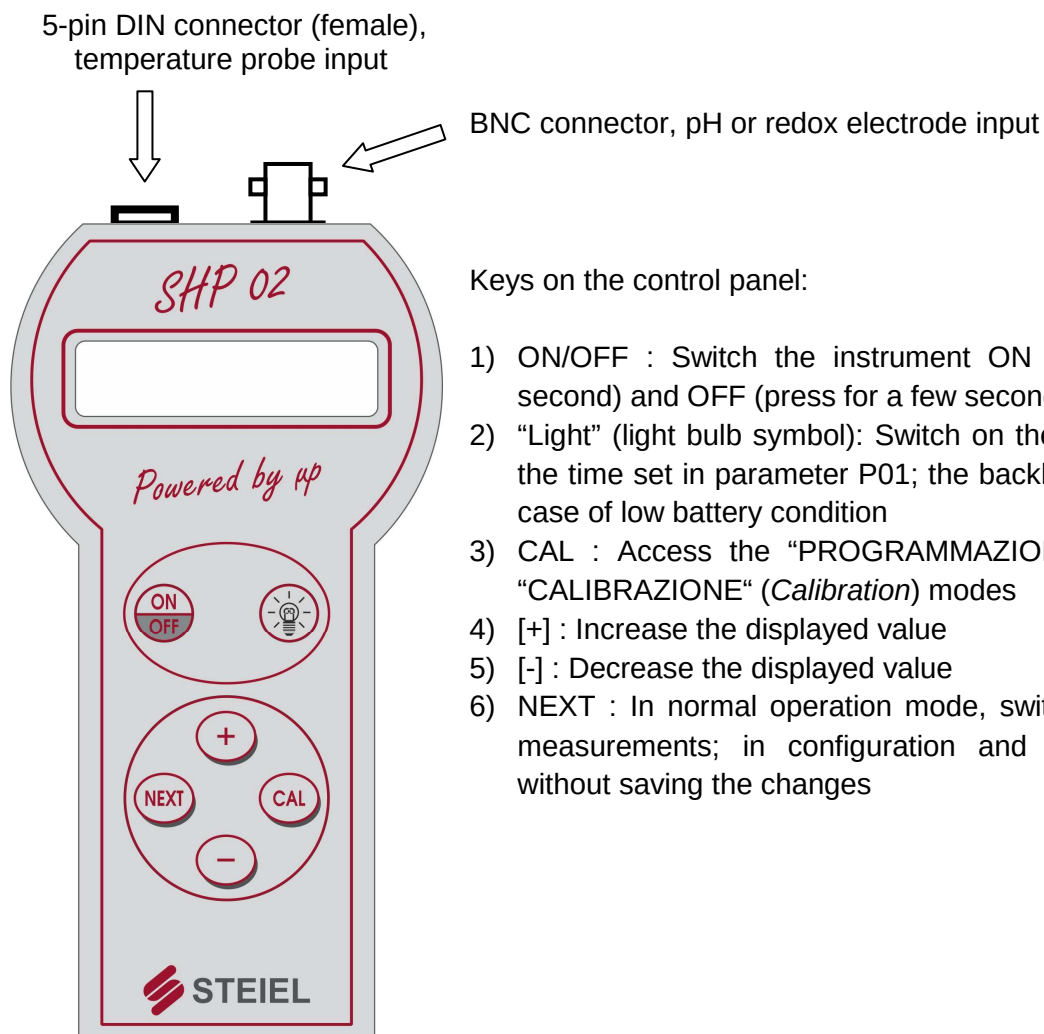
Install the supplied 9V battery in the battery compartment, located on the instrument back, while paying attention to the correct polarity.

Warning! If the instrument is not used for long time (e.g. one month or more), remove the battery from its compartment in order to avoid leaks and consequent oxidation.

The BNC plug is used for connecting a pH or redox electrode, while the 5-pin DIN connector is used for the Pt1000 temperature probe (optional).

If no temperature probe is connected, the working temperature is the value set in parameter P03 (see "Configuration" section for details).

DESCRIPTION OF THE CONTROL PANEL



START-UP

At start-up the instrument performs a memory check and displays an error message if any data is not correct (also see "Errors" section). If the display flashes and shows no reading, battery needs to be replaced.

If no problem is detected, the instrument enters normal operation mode and displays standard information (see below section).

STANDARD DISPLAY

The following information is displayed:

- a) the main reading (e.g. pH) complete with measurement unit
- b) the temperature value in °C; if no temperature probe is connected, the temperature value is pointed by an arrow (→), and corresponds to the value set in parameter P03
- c) the battery life expressed as a percentage (100% = battery is fully charged)

Note: Replace (or recharge) the battery if its life is lower than 20%.

At start-up, the instrument automatically enters the pH mode.

Press NEXT key to switch to REDOX value (in mV); press NEXT key again to switch back to pH value.

ADDITIONAL VISUALIZATIONS

If the [-] and NEXT keys are pressed simultaneously during normal operation mode, several details about the pH and RX readings will be displayed.

Data will be shown without taking into account the electrochemical calibration. OFFSET and GAIN values are also displayed. This information helps to check the electrode's status: the closer these values are to the ideal ones (OFFSET = 0 and GAIN = 1000), the better the electrode performs. On the other hand, if the OFFSET and GAIN values are close to their allowed limits, the electrode is damaged or contaminated.

The OFFSET and GAIN limit values are:

pH-meter	OFFSET	(neutrality error)	min -1.50 ... max 1.50 pH
	GAIN	(multiplication factor)	min 0.667 ... max 1500
Redox-meter	OFFSET	(electrode offset)	min -150 ... max 150 mV
	GAIN	(multiplication factor)	fixed at 1000

Note: The first calibration settings are: OFFSET = 0, GAIN = 1000

Pressing the NEXT key switches between pH and RX. Pressing a combination of NEXT and [-] keys will display the following sequence:

- a) battery voltage
- b) instrument's internal temperature; note that the internal temperature is approx. 2-3 °C higher than the outside temperature; if no temperature probe is used, this value should be entered in P03

ERRORS

If an error condition occurs, the display will show the "ERR" or "IMPOSSIBLE!" (Impossible!) message. The "ERROR!" message is displayed if the input signal is outside the instrument measurement range.

CONFIGURATION

This section describes how to configure the 16 editable parameters from the keypad.

- 1) Press CAL and NEXT keys simultaneously for more than 2 seconds
- 2) The display shows the "EDITING" message; press CAL to continue (si=yes) or NEXT to quit (no)
- 3) If CAL is pressed, the display shows the first editable parameter and its current value
- 4) Press NEXT to exit the configuration mode, or use the [+] / [-] key to display the next/previous parameter. Press CAL to edit the parameter value
- 5) Use the [+] / [-] keys to increase/decrease the displayed value; press and hold the [+] or [-] key for more than two seconds to enter the "Repeat" function
- 6) Once the desired value is displayed, press CAL to confirm, or NEXT to exit without saving
- 7) Proceed in the same way for all editable parameters

Notes:

- After entering the configuration mode, if no key is pressed for 20 seconds, the instrument automatically returns to normal operation
- No parameter can be set if battery level is lower than 50%
- Parameters from P04 to P19 are factory set and must not be changed by the user, otherwise the instrument may not function correctly. If one of these values is changed, the *RESET* function is available at parameter P20; proceed as follows:
 - o Enter the configuration mode
 - o Display parameter P20 (default value = 0)
 - o Press CAL, enter the value "12", and press CAL to confirm
 - o The message "RIPRISTINO EFFETTUATO" (*Reset Done*) will be displayed for a few seconds and the default values will be restored

LIST OF CONFIGURATION PARAMETERS

Parameter	Description	Min. Value	Max. value	Default Value
P01	Backlit time	0	60	10
P02	Shut down time	0	600	180
P03	Working temperature	0	100	25
P04	Start reading 1 scale	-1000	10000	-700
P05	Reading 1 full scale	-1000	10000	701
P06	Reading 1 point position	0	4	2
P07	Reading 1 units	0	10	1
P08	Start reading 2 scale	-1000	10000	-1000
P09	Reading 2 full scale	-1000	10000	1001
P10	Reading 2 point position	0	4	0
P11	Reading 2 units	0	10	2
P12	Start reading 3 scale	-1000	10000	-500
P13	Reading 3 full scale	-1000	10000	2001
P14	Reading 3 point position	0	4	1
P15	Reading 3 units	0	10	3
P16	Start reading 4 scale	-1000	10000	0
P17	Reading 4 full scale	-1000	10000	1001
P18	Reading 4 point position	0	4	2
P19	Reading 4 units	0	10	5
P20	Reset	0	100	0

Meaning of Parameters

P01 Backlit time

This parameter allows to set the time (in seconds) of the display backlighting, when the “Light” key is pressed.

P02 Shutdown time

The instrument features an automatic shutoff function for saving battery life if no key is pressed for a certain time. This parameter allows to set this time.
Setting this parameter to 0 (zero) will disable the shutdown function.

P03 Working temperature

If no temperature sensor is used, the instrument will use as reference temperature the value set in this parameter (even for thermo-compensating pH readings).

The remaining parameters are factory set and should never be modified by the user. If any of these parameters is modified accidentally, follow the *RESET* procedure explained in the previous page.

ELECTROCHEMICAL CALIBRATION

pH Calibration Procedure

Before starting the calibration, ensure that to have fresh buffer solutions (not expired), and battery level is higher than 30%.

If temperature compensation is used, immerse the temperature probe into the buffer solution together with the measure electrode

- 1) Display the pH reading mode (if necessary, press NEXT while in normal operation mode)
- 2) Rinse the electrode with distilled water
- 3) Immerse the electrode in pH 7.01 buffer solution
- 4) Press and hold CAL for at least 2 seconds to enter the calibration mode; the display will show the message "TARATURA pH, OFFSET - , GAIN + " (*pH Calibration, OFFSET - , GAIN +*)
- 5) Press the [-] key to start OFFSET calibration, and the instrument will automatically recognize and display the buffer value (7.01)
- 6) If necessary, adjust the value by pressing the [+]/[-] keys
- 7) Press CAL key to confirm the new calibration, or press NEXT to exit without saving
- 8) Rinse the electrode with distilled water
- 9) Immerse the electrode in pH 4.01 (or 9.01) buffer solution
- 10) Press and hold CAL for at least 2 seconds to enter the calibration mode; the display will show the message "TARATURA pH, OFFSET - , GAIN + " (*pH Calibration, OFFSET - , GAIN +*)
- 11) Press the [+] key to start GAIN calibration, and the instrument will automatically recognize and display the buffer value (4.01 or 9.01)
- 12) If necessary, adjust the value by pressing the [+]/[-] keys
- 13) Press CAL key to confirm the new calibration, or press NEXT to exit without saving

If calibration solutions are not automatically recognized, please verify the following:

- a) buffer solution status and expiration date
- b) electrode status
- c) electrode connection cable

If you try to calibrate the offset at values too far from pH 7.00 or if the gain calibration is performed at values too far from the correct ones, the instrument automatically ignores the calibration and generates an error signal.

Redox Calibration Procedure

Before starting the calibration, ensure that to have fresh calibration solution (not expired), and battery level is higher than 30%.

- 1) Display the RX reading mode (if necessary, press NEXT while in normal operation mode)
- 2) Rinse the electrode with distilled water
- 3) Immerse the electrode in the standard solution at known redox value (e.g. 230 mV)
- 4) Press and hold CAL for at least 2 seconds to enter the calibration mode; the display will show the message "TARATURA RX, PREMERE + O – " (*RX Calibration, Press [+] or [-]*)
- 5) Press either the [+] or [-] key to display the current redox reading
- 6) If necessary, adjust the value by pressing the [+] / [-] keys.
- 7) Press CAL key to confirm the new calibration, or press NEXT to exit without saving

The redox calibration is a single point procedure (offset).

If a redox calibration is performed with an offset value that exceeds the min/max limits (± 150 mV), the instrument automatically ignores the calibration and generates an error signal.

Please check the following:

- a) calibration solution status and expiration date
- b) electrode status
- c) electrode connection cable