Instruction manual

CL 6587.103

RESIDUAL CHLORINE - pH - ORP CONTROLLER
3 inputs - wall mounting

Option
S/N
REP N°

Power supply: 85/264 Vac
Installed firmware: R 1.1x

Cod. 28006653 - Rev. B

INDEX

1 GENERAL WARNINGS AND INFORMATION FOR ALL USERS

1.1 WARRANTY

This product is guaranteed for 5 years from the date of purchase for all manufacturing defects.
Please take a look at the terms and conditions described on the warranty certificate at the end of the manual.

1.2 AFTER SALES SERVICE

B&C Electronics offers to all of its customers the following services:

- a free of charge technical assistance over the phone and email for problems regarding installation, calibration and regular maintenance;
- a repairing service in our Carnate (Italy) headquarter for all types of damages, calibration or for a scheduled maintenance.

Please take a look at the technical support data sheet at the end of the manual for more details.

1.3 CE MARKING

This instrument is manufactured according to the following european community directives:

- 2011/65/EU "Restriction of the use of certain hazardous substances in electrical and electronic equipment"
- 2015/863/UE RoHS
- 2014/35/EU "Low Voltage" LV
- 2014/30/EU "Electromagnetic compatibility" EMC
- EN 61010-1/2011 "Low Voltage" LV
- EN 61326-1/2013 "Electromagnetic compatibility" EMC
  - Industrial electromagnetic environment
- EN 55011/2009 "Radio-frequency disturbance characteristics"
  - Class A (devices for usage in all establishment other than domestic)
  - Group 1 (Industrial equipment that do not exceed 9kHz)

The CE marking is placed on the packaging and on the S/N label of the instrument.

1.4 SAFETY WARNINGS

It is important to underline the fact that electronic instruments are subject to accidental failure. For this, it is important to take all necessary precautions to avoid damages caused by malfunctions.

Any operation must be performed by authorized and trained staff.

The use of this controller must comply with the parameters described in chapter "Technical data (page 17)", in order to avoid potential damages and a reduction of its operating life.

1.5 MANUAL REVISIONS

This chapter shortly describes the differences between previously released versions of the same manual, so to help users that are already familiar with the product.

Rev. A: first release.

Rev. B: new Modbus functions

2 PRODUCT OVERVIEW

2.1 FUNCTIONAL PURPOSE OF THE DEVICE

This instrument allows to measure simultaneously:

- free chlorine - combined chlorine - total chlorine - chlorine dioxide - dissolved ozone - and other oxidants
- pH
- ORP
- temperature

or:

- free chlorine - combined chlorine - total chlorine - chlorine dioxide - dissolved ozone - and other oxidants
- pH 1
- pH 2
- temperature

or:

- free chlorine - combined chlorine - total chlorine - chlorine dioxide - dissolved ozone - and other oxidants
- ORP 1
- ORP 2
- temperature

The system for monitoring free chlorine - combined chlorine - total chlorine - chlorine dioxide - dissolved ozone and other oxidizing elements consists of two main parts:

- the meter/regulator object of this instruction manual;
- a measuring sensor.

The instrument contains the electronic circuitry and firmware to perform the following functions:

- display of the parameters measured by the connected sensors;
- display the measurement of temperature, if a temperature sensor Pt100 or Pt1000 is connected;
- perform the automatic or manual pH compensation in free chlorine measurement if enabled;
- perform automatic or manual temperature compensation in the pH and free chlorine measurements;
- automatically adjust the values of the main measurement, if the relay outputs or analog outputs are connected to appropriate dosing pumps or valves;
- provide a min/max alarm and a checkout time alarm on the set point;
- provide two analog output for the main measuring, temperature or PID;
- provide a RS 485 digital output;

- activate the alarm or the hold condition by two external contacts;
- activate automatic or manual cleaning cycles.

Pumps or valves can be activated directly by the instrument or by external control switches if their power load is not compatible with the instrument's relays.

2.2 ACCESSORIES

Sensors and accessories for different applications are available, to be ordered separately.

Our web site www.bc-electronics.it shows accessories, upgrades and detailed specifications of each product.

Our staff is always available to help costumers to select the most appropriate and suitable solution for their specific needs.

3 INSTRUCTION MANUAL CONTENTS

This chapter describes the manual and gives suggestions to all users on how to read it and use it.

The manual is written according to the following norms:

- UNI 10893 "Instructions for use";
- UNI 10653 "Quality of product technical documentation".

The terminologies indicated in the international metrology vocabulary (VIM) are respected as far as possible.

3.1 SYMBOLS

Throughout the manual you may find the following symbols, which are both dictated by a norm or that are simply conventional.

WARNINGS: this symbol is used to warn users that if the instructions are ignored or not correctly followed, damage to the instrument can be caused.

NOTE: this symbol is to invite the user to pay particular attention to a specific section of the manual.

3.2 HOW TO READ THE INSTRUCTION MANUAL

The manual contains all the information needed to acquire full knowledge of the product, to ensure a proper installation, proper use and maintenance in order to achieve the desired result at the time of its choice.

The manual is aimed at staff with appropriate knowledge and experience in the field of measurement and control through the use of sensors and transmitters in the context of industrial plants.

The index of the manual refers the reader to the chapters on aspects that want to learn and develop.

In particular, the first chapters show general topics and allow the user to become familiar with the product and its functional purpose.

The user can then check whether he knows all the elements necessary for the use of the instrument and of the measuring/control.

The instrument has been designed keeping in mind three different levels of use: generic use (end user), control (maintenance staff), installation (plant engineer).

The user normally can read the values on the display.
He will read the parts of the manual regarding the:
- "Users instruction (page 52)".

Maintenance staff could be more interesting in the chapters regarding:
- "Users instruction (page 52)";
- "Maintenance instructions (page 56)";
- "Warranty (page 89)";
- "Repairs (page 89)".

The plant engineer will have to read the chapters and look at the application drawings in order to:
- verify that the technical and functional characteristics are conformed with the plants requirements;
- verify that the environmental and climatic conditions required by the instruments are respected;
- make the correct electrical connections;
- become familiar with the instrument's firmware;
- configure the instrument according to the application;
- run all of the necessary tests before starting the instrument;
- calibrate the instrument once the sensor is connected.

The data shown in the displays in this manual are only illustrative.

3.2.1 USING THE INSTRUMENT ON THE PLANT

For the generic use, the end user can operate with a locked keyboard (suggested mode and to be set by maintenance staff). By this, he can check the set point parameters without the possibility of changing the configured set points values and the zero/sensitivity calibration.

3.2.2 PLANT MAINTENANCE

Maintenance staff can select the operating values, by setting the desired parameters of the setup menu and after inserting the password. He can also enable the user's access to calibration, set point and alarm settings.
The location of this set parameters can be seen in the left column of the technical specifications table and they are identified by a letter "S" followed by a number.
The operations to be done during the start-up and the periodical tests are the following.

In the system setup

- password to access;
- to disable the calibration of the instrument and of the set points to the user;
- °C or °F temperature scale selection;
- manual temperature;

- logic inputs enabling;
- autocleaning enabling;
- repetition, cleaning and holding time of the autocleaning;
- password modification.

In the inputs A / B / C setup

- manual pH compensation value *(only input A)*;
- temperature coefficient *(only input A)*;
- set point 1 hysteresis (ON-OFF);
- set point 1 delay (ON-OFF);
- set point 1 integration time:
- set point 1 derivation time;
- set point 1 proportional band;
- set point 1 pulse frequency FM;
- set point 1 pulse width WM;
- set point 2 hysteresis (ON-OFF);
- set point 2 delay (ON-OFF);
- set point 2 integration time:
- set point 2 derivation time;
- set point 2 proportional band;
- set point 2 pulse frequency FM;
- set point 2 pulse width WM;
- alarm LO;
- alarm HI;
- alarm delay.

3.2.3 INSTRUMENT INSTALLATION

The plant engineer, by inserting the access password and by setting and modifying the configuration parameters, will be able to select the necessary functions required by the plant.

The firmware allows the separate access to the configuration of the system and the configuration of the other main measures.

The location of this set parameters can be seen in the left column of the technical specifications table and they are identified by a letter "C" followed by a number.

The operations that need to be done during the instrument installation are the following.

System configuration

- password to access;
- operating mode (AUTO/MEAS/SIM);
- temperature sensor Pt100 or Pt1000;
- relay 1 function;

- relay 2 function;
- relay 3 function;
- relay 4 function;
- contacts function (if relay 3 is dedicated to the alarm);
- analog output 1 addressed to A,B,C input;
- analog output 2 addressed to A,B,C input;
- logic input 1 function;
- logic input 2 function;
- baud rate;
- ID of the B&C protocol;
- Modbus address;
- password modification.

Input A configuration

- 2 or 3 wires sensor;
- type of oxidant with two electrodes sensors: free chlorine / combined chlorine / chlorine dioxide / custom;
- type of oxidant with three electrodes sensors: free chlorine/ chlorine dioxide / total chlorine / dissolved ozone / custom;
- pH compensation (pH value from the input B) of the free chlorine: automatic / manual / off / editable table;
- custom editable type of oxidant: 5 letters;
- custom sensor current: nA/ppm;
- polarization voltage;
- measuring uit: ppb- ppm µg/l-mg/l;
- input range;
- filter software for large signal variation;
- filter software for small signal variation;
- negative values inhibition: ON/OFF;
- set point 1 regulation type (if assigned to a relay): ON/OFF - PID;
- set point 1 regulation (if assigned to a relay and PID): FM/WM;
- set point 1 function: LO/HI;
- set point 1 max operating time: ON / OFF;
- set point 1 max operating time;
- set point 2 max operating time: ON / OFF;
- set point 2 max operating time;
- set point 2 regulation type (if assigned to a relay): ON/OFF - PID;
- set point 2 regulation (if assigned to a relay and PID): FM/WM;
- set point 2 function: LO/HI;
- input assigned to analog output 1: ppm/mg/l °C/°F;
- analog output 1 range;
- analog output 1 point 1 of the span;

- analog output 1 point 2 of the span;
- input assigned to analog output 2: ppm/mg/l °C/°F;
- analog output 2 range;
- analog output 2 point 1 of the span;
- analog output 2 point 2 of the span.

Input B / C configuration

- type of measure: pH / ORP;
- type of pH sensor: glass / antimony / external 4/20 mA;
- filter software for large signal variation;
- filter software for small signal variation;
- set point 1 regulation type (if assigned to a relay): ON/OFF - PID;
- set point 1 regulation (if assigned to a relay and PID): FM/WM;
- set point 1 function: LO/HI;
- set point 2 regulation type (if assigned to a relay): ON/OFF - PID;
- set point 2 regulation (if assigned to a relay and PID): FM/WM;
- set point 2 function: LO/HI;
- set point 1 max operating time: ON / OFF;
- set point 1 max operating time;
- set point 2 max operating time: ON / OFF;
- set point 2 max operating time;
- input assigned to analog output 1: pH/mV °C/°F;
- analog output 1 range;
- analog output 1 point 1 of the span;
- analog output 1 point 2 of the span;
- input assigned to analog output 2: pH/mV °C/°F;
- analog output 2 range;
- analog output 2 point 1 of the span;
- analog output 2 point 2 of the span.

4 SPECIFICATIONS AND TECHNICAL DATA

4.1 FUNCTIONAL SPECIFICATION

Display

The instrument is equipped with a graphic display that shows the values of the measures and messages to the operator in the various stages of use of the unit.

At the top left it is shown the ID number related to the technical specifications.

In case of inactivity, after 3 minutes the unit turns to the main display.

The A, B and C measures display can stay active by pressing the key DOWN.

The brightness and contrast of the screen can be changed. The mode of presentation "reverse" can be chosen.

Keyboard

The instrument has a keyboard with 8 keys which allow access to all functions available.

The functions of the upper part of the keys, are dedicated to the calibration of the zero and sensitivity and the setting of the set point; these actions can be password protected in the setup menu.

For the functions of other keys, see next paragraphs and chapters.

Inputs

The instrument is able to perform the measurement of three main parameters and temperature.

- The input A is dedicated exclusively to the chlorine and other oxidants measuring with a 2 or 3 wires sensor depending on chemical species.
- The inputs B and C can be assigned to pH or ORP measuring.
- The temperature in °C or °F can be measured by a Pt100 or Pt1000 connected to 2-wire or 3-wire in case of large distances between sensor and instrument.

The input B and C if configured as pH can be connected to glass or antimony electrodes or to a 4/20 mA output from an external pH meter.

The input B if configured as pH can be used for the automatic pH compensation of the free chlorine measuring.

Scales

The input A can be configured to measure free chlorine, combined chlorine, total chlorine, chlorine dioxide, dissolved ozone and other substances with custom sensors (peracetic acid, hydrogen peroxide, sulfides, sulfites, chlorine gas phase, ammonia etc.), with a choice of all possible measurement scales for the various types of sensor used.

The measuring unit of the oxidants are in ppb / ppm / mg/l depending of the selected scale.

The B and C inputs feature 0 - 14 pH or -2000 - 2000 mV scales.

In case of out of range measurements, the instrument sends messages under range or over range.

It is possible to enable the inhibition of the negative values display of the input A.

Temperature compensation

The instrument displays the temperature value and is designed for manual and automatic temperature compensation of the oxidants and pH measuring.

For absence or malfunction of the temperature sensor the instrument automatically switches to manual compensation, displaying the value of the compensation temperature.

pH compensation in the chlorine measuring

The instrument can be configured to perform the manual or automatic pH compensation of the chlorine measuring.

The compensation is done by using the pH values of the input B coming from the connected pH sensor or from a 4/20 mA signal of an external pH meter.

The compensation uses an internal table that can be edited in case of particular condition on the plant.

The display shows both the compensated and the not compensated ($HOCl^-$) values.

Relays

The instrument is provided with 4 relays assignable to two set point of three main measuring of the A, B, C inputs.

- Relays 1 and 2 have SPST normally open contacts.
- Relay 3 has SPDT contacts and it can be assigned to the alarm function.
- Relay 4 has SPDT contacts and it can be assigned to the autocleaning of the sensors.

The firmware informs the user about the assignement already done and if forced to a new assignment, will consider "not used" the previous assignment.

Analog outputs

The instrument has two analog outputs for PID regulation or to transmit the value of the main measurement and/or temperature, programmable 0-20 mA or 4-20 mA.

The outputs are assignable to the 3 inputs A, B, C, the temperature and the two set points.

The outputs are galvanically isolated, and then directly interfaced with a PLC or with data acquisition cards and does not require external power.

The firmware informs the user about the assignement already done and if forced to a new assignment, will consider "not used" the previous assignment.

Serial interface

Through the isolated RS485 interface, the user can connect the probe to a terminal or to a PC using a simple terminal emulation program. A RS485/RS232 or RS485/USB converter can be necessary.

When used with the B&C protocol, measurements can be received.

When used with the Modbus protocol, functions 03, 06 and 16 are implemented for reading the measurements and related parameters, changing the set point, alarm and cleaning management parameters.

The bootloader function allows the firmware's update via serial port.

Configuration

The instrument features a configuration menu protected by a specific password.

In order to simplify the use it has been proposed separately 4 configurations:

- configuration of the system to select the operating mode AUTO / MAN / SIM, the type of temperature sensor, the assignment of the 4 relays to inputs A, B, C and the allocation of 2 analog outputs to the inputs A, B, C, the HOLD / ALARM function of the 2 logic inputs, the transmission speed, the identification of B&C protocol and modbus address;
- configuration of the input A to choose the type of sensor, the type of oxidant to be measured, enabling the pH compensation, the polarization voltage, the measurement unit, the input scale, the software filters, the inhibition of negative values, the types of regulation, alarm and analogue output over inputs in the system configuration;
- configuration of the input B as pH or ORP, the type of pH sensor, the software filters, the types of adjustment, alarm and analog output on the resources allocated in the system configuration;
- configuration of the input C similar to that described for the input B.

Setup

The instrument features a setup menu, which access is protected by a specific password.

In order to simplify the use it has been proposed separately 4 setup menu:

- setup of the system to disable the calibration functions and set points changes; set the measuring unit of the temperature and the eventual manual temperature compensation; to enable the two logic inputs, to enable the function of cleaning the sensors and the related parameters;
- setup of the input A to choose the manual pH value, the temperature coefficient, the regulating parameters associated with the main measurement, the alarm values LO / HI and delay;
- setup of the input B to choose the regulating parameters associated with the main measurement, the alarm values HI / LO and delay;
- setup of the C input similar to that described for the input B.

Set points

The instrument has two independent set points which can be programmed across the whole scale to activate the correspondent relay contacts (SPST) or the PID action.

When using the ON/OFF function, the display shows the status of excitement and delayed actuation.

When using the PID action, the display shows the status of actuation.

Thanks to the specific front panel keys SET1 and SET2, setting the set point value is very simple.

A password can be set in order to avoid that other users may change the settings.

For each relay, it is possible to select:

- the ON/OFF or PID action into the configuration menu;

- the type of PID adjustment: FM (proportional to pulse frequency) or WM (pulse width proportional) or addressed directly on the analog outputs;
- the function min (LO) or max (HI);
- the parameters of the selected function in the setup menu.

Alarm

The relay can 3 be assigned to the alarm function in the system configuration (SPDT type).

The alarm condition can be configured to:

- higher or lower values of the measuring compared to the setting;
- the presence of the contact on the logic input, coming from an external device (if this function is activated);
- overtime of the SET1 and SET2 activation.

The operator can select the activated/deactivated status of relay corresponding to the alarm condition and the delay function.

The alarm status and the delayed actuation is visualized on the display.

Logic inputs

The instrument has two logic inputs to which connect a free voltage contact from an external device.

The function of the logic inputs can be enabled or disabled from the setup menu.

The function of these inputs can be on hold/alarm (HOLD/ALARM), whose actions are described in chapter "Technical data (page 17)", and can be selected in the configuration menu of the system.

The HOLD condition always prevails over the ALARM.

In case of activation of the hold function in the display Messages section "Display (page 51)" will be displayed HOLD status, in case there is a previous alarm condition will be maintained such indication.

Autoclean

The relay 4 can be assigned to the autoclean function in the system configuration (SPDT type).

Into the setup menu, it is possible to:

- enable or disable the automatic/manual cleaning function;
- set the interval of time between two cleaning cycles;
- set the cleaning time;
- set the holding time of measurement after cleaning.

During the cleaning and holding time the instrument retains the last value on the analog output, while the set points and alarm relays are disabled.

Operating mode

The instrument is provided with 3 programmable modes of operation.

Automatic operation (AUTO)]

The automatic mode is the normal operation mode of the unit.

Measuring operation (MEAS)

In this operation mode the display indicates only the measure, the analog outputs are active but the control relays are deactivated.

This would be the mode to use if the relays are not being used for alarm or control functions.

The measuring operation mode is useful during start up or for manual operation of disinfection plants.

Simulated operation (SIM)

The instrument uses the simulated value in the main display to activate the relay set point, the alarm relay and analog outputs.

In this operating mode the users modify the displayed value by means of the keyboard (see chapter "Configuration (page 68)").

The unit maintains the set point, alarm and analog outputs parameters in order to test the plant.

The type of action, the set points and parameters of the analog outputs remain as previously set.

The simulation of values is useful for testing the actuation of the devices connected to the relays and the analog outputs without connecting the sensor.

Filter software

The input signal has a filter with two selectable response time for each main measuring.

The user can separately set the response time relative to signals of small or large variation in order to obtain good reading stability and fast response to the variations of the measurement in the process.

We suggest to use high values for small variations and low values for large variations of the signal similar as the default values.

Universal power supply

The instrument is equipped with a universal power supply that allows the use of the voltage from 85 to 264 Vac, 50-60 Hz.

Option low voltage 9 ÷ 36 Vdc or 12 ÷ 24 Vac

The installation of this option allows you to use either a DC power supply from 9 to 36 V or an AC voltage from 12 to 24 V, 50-60 Hz.

Info menu

The instrument is provided with an information menu to show:

- p/n and firmware release;
- LCD screen parameters;
- total operating hours.

4.2 TECHNICAL DATA

4.2.1 GENERAL SPECIFICATIONS

Accuracy	0.2 %
Ripetibility	0.1 %
Non linearity	0.1 %
Alphanumeric display	LCD 128 x 64 pixel
Keyboard	8 keys
Operating temperature	-10 ÷ 60 °C
Humidity	95 % without condensate
Power supply	85 ÷ 2640 Vac +/- 10 % 50/60 Hz
	9 ÷ 36 Vcc 12 ÷ 24 Vac (091.428 option)
Power	6 VA max.
Isolation	4000 V between primary and secondary
Immunity performance loss	< 1 % full scale
Terminal blocks	extractable
Weight	1300 g
Dimensions	256 x 230 x 89 mm
Protection	IP 65
EMC/RFI conformity	EN61326
Registered design	002564666-002

4.2.2 TECHNICAL SPECIFICATION

In the left column is indicated the number of the display concerning:
- SETUP parameters are indicated by "S xy"
- CONFIGURATION parameters are indicated by "C xy"
  x = paragraph, y = sequential 1..2..3..4..ecc

System technical specifications

D1.0	3 INPUT SYSTEM (SYSTEM)		Default
D1.1	Input A	Oxidants measure	
D1.2	Input B	pH / ORP measure	
D1.3	Input C	pH / ORP measure	
C1.1	Operating Mode	AUTO / MEAS / SIM	AUTO

D2.0	SECONDARY MEASURE (SYSTEM)		Default
C2.1	Input Connection	RTD Pt100 / Pt1000 3 wires	Pt100
S2.1	Measuring unit	°C / °F	°C
	Temperature scale	-10.0 ÷ 110.0 °C 14.0 ÷ 230.0 °F	
	Resolution	0.1 °C / °F	
D2.1	Zero	±5.0 °C ±9.0 °F	0.0 °C 0.0 °F
S2.2	Manual temperature	0.0 ÷ 100.0 °C 32.0 ÷ 212.0 °F	20.0 °C 68.0 °F

	RELAYS FUNCTION (SYSTEM)		Default
C3.1	Relay 1 function	NOT USED SET 1/2 related to input A/B/C	SET 1 IN A
	Contact relay 1	SPST 220 V 5 A resistive	
C3.2	Relay 2 function	NOT USED SET 1/2 related to input A/B/C	SET 1 IN B
	Contact relay 2	SPST 220 V 5 A resistive	
C3.3	Relay 3 function	NOT USED SET 1/2 related to input A/B/C ALARM	ALARM
	Contact relay 3	SPST 220 V 5 A resistive	
C3.4	Relay 4 function	NOT USED SET 1/2 related to input A/B/C CLEAN	CLEAN
	Contact relay 4	SPST 220 V 5 A resistive	

	ALARM RELAY (SYSTEM)		**Default**
C4.5	Function if relay 3 = ALARM	ACTIVE / NON ACTIVE	ACTIVE
	Contact of the relay	SPDT 220 V 5 A resistive	

D5.1	**ANALOG OUTPUTS (SYSTEM)**		**Default**
C5.1	Analog output 1	NOT USED OUT 1 related to input A/B/C SET 1/2 related to input A/B/C	OUT 1 IN A
C5.2	Analog output 2	NOT USED OUT 2 related to input A/B/C SET 1/2 related to input A/B/C	OUT 2 IN B
	Response time	2.5 seconds for 98 %	
	Isolation	250 Vac	
	R max	600 ohm	

6.0	**LOGIC INPUT (2) (SYSTEM)**		**Default**
	HOLD condition	(prevails on ALARM condition)	
	• Analog output	HOLD	
	• Set point	HOLD	
	• Alarm status	Alarm relay OFF	
	• Message on the display	HOLD	
	ALARM condition		
	• Analog output	RUN	
	• Set point	OFF	
	• Alarm status	ON	
	• Message on the display	ALARM	
S6.1	logic input 1	ON / OFF	OFF
C6.1	Function of the logic input 1	HOLD / ALARM	HOLD
S6.2	Logic input 2	ON / OFF	OFF
C6.2	Function of the logic input 2	HOLD / ALARM	ALARM
	Logic input actuation	free voltage contacts	

D7.0	**CLEANING (SYSTEM)**		**Default**
S7.1	Cleaning functions	OFF / AUTO / MANUAL	OFF
	Cleaning parameters		

D7.0	CLEANING (SYSTEM)		Default
S7.2	• Repetition time	0.5 ÷ 100.0 hours	24.0 h
S7.3	• Cleaning time	1.0 ÷ 60.0 seconds	15.0 s
S7.4	• Holding time	0.1 ÷ 20.0 minutes	3.0 min
	Cleaning cycle time		
	• Analog output	HOLD	
	• Set point	OFF	
	• Alarm status	OFF	

D8.0	SERIAL INTERFACE (SYSTEM)		Default
	Interface	RS 485 isolated not terminated	
C8.1	Baud rate	2400 / 4800 / 9600 / 19200 baud	9600 baud
	Distance	1000 / 500 / 250 / 125 m	
	Probes in network	32 probes max	
	Protocols		
	B&C protocol	Command A (only reading)	
	Modbus RTU	Functions 03 - 06 - 16	
C8.2	ID B&C protocol	ID = 01 ÷ 99 * last s/n digit, if 0 ID=10	1 ÷ 10 *
C8.3	Modbus address	ID = 01 ÷ 243 * last s/n digit, if 0 ID=10	1 ÷ 10 *
	Measure and parameters are supplied by interrogating the probe (see Protocol B&C ASCII and Modbus RTU functions 03,06,16)		

D50.0	SETUP (SYSTEM)		Default
D50.1	Password	000 ÷ 999	0
S1.1	Calibration and set point	ON / OFF	ON
S2.1	Temperature measuring unit	°C / °F	°C
S2.2	Manual temperature	0.0 ÷ 100.0 °C 32.0 ÷ 212.0 °F	20.0 °C
S6.1	Logic input 1	ON / OFF	OFF
S6.2	Logic input 2	ON / OFF	OFF
S7.1	Cleaning function	OFF / AUTOCLEAN / MANUAL	OFF
S7.2	Repetition time	0.5 ÷ 100.0 hours	24.0 h
S7.3	Cleaning time	1.0 ÷ 60.0 seconds	15.0 s

D50.0	SETUP (SYSTEM)		Default
S7.4	Holding time	0.1 ÷ 20.0 minutes	3.0 min
S50.1	Password change	XXX	

D60.0	CONFIGURATION (SYSTEM)		Default
D60.1	Password	000 ÷ 999	0
C1.0	Operating mode	AUTO / MEAS / SIM	AUTO
C2.1	Temperature sensor	Pt100 / Pt1000	Pt100
C3.1	Relay 1 function	NOT USED SET 1/2 related to input A/B/C	SET 1 IN A
C3.2	Relay 2 function	NOT USED SET 1/2 related to input A/B/C	SET 1 IN B
C3.3	Relay 3 function	NOT USED SET 1/2 related to input A/B/C ALARM	ALARM
C3.4	Relay 4 function	NOT USED SET 1/2 related to input A/B/C CLEAN	CLEAN
C4.5	Alarm function if relay 3 = ALARM	ACTIVE / NON ACTIVE	ACTIVE
C5.1	Analog output 1	NOT USED OUT 1 related to input A/B/C SET 1/2 related to input A/B/C	OUT 1 IN A
C5.2	Analog output 2	NOT USED OUT 1 related to input A/B/C SET 1/2 related to input A/B/C	OUT 2 IN B
C6.1	Logic input 1 function	HOLD / ALARM	HOLD
C6.2	Logic input 2 function	HOLD / ALARM	ALARM
C8.1	Baud rate	2400 / 4800 / 9600 / 19200 baud	9600 baud
C8.2	ID B&C protocol	ID = 01 ÷ 32 * last s/n digit, if 0 ID=10	1 ÷ 10 *
C8.3	Modbus address	ID = 01 ÷ 243 * last s/n digit, if 0 ID=10	1 ÷ 10 *
C60.1	Password change	XXX	

Input A technical specifications: oxidizers measure

D1.0	MAIN MEASURE (INPUT A)					Default
C1.1	Type of sensor		2 WIRES / 3 WIRES			3 WIRES
C1.2A	Type of measure (2 wires)		Icell	Pol.	TC	
			nA/ppm	mV	%/°C	
	• Cl2 F	Free chlorine	160	-200	2.00	Cl2 F
	• Cl2 C	Combined chlorine	160	-400	2.00	
	• ClO2	Chlorine dioxide	1500	-200	2.00	
	• D O3	Dissolved ozone	160	-200	2.00	
	• ABCDE	Custom measure	variable	variable	variable	
C1.2B	Type of measure (3 wires)		Icell	Pol.	TC	
			nA/ppm	mV	%/°C	
	• Cl2 F	Free chlorine	2000	-200	2.00	Cl2 F
	• ClO2	Chlorine dioxide	2000	-200	2.00	
	• D O3	Dissolved ozone	2000	-200	2.50	
	• Cl2 T	Total chlorine	160	-400	2.00	
	• ABCDE	Custom measure	variable	variable	variable	
C1.3A	pH compensation (Cl2 F)		AUTO / MANUAL / OFF / EDIT TABLE			AUTO
S1.1	pH manual		0.0 ÷ 14.00 pH			7.00 pH
C1.3B	Custom measure		ABCDE			ABCDE
C1.4B	Nominal current custom		-2000 ÷ -10 / 10 ÷ 2000 nA/ppm			160 nA/ppm
C1.5	Polarization		-1000 ÷ 1000 mV			-200 mV
C1.6	Measuring unit		ppb-ppm / µg/l-mg/l			ppb-ppm

D1.0	MAIN MEASURE (INPUT A)				Default
C1.7	Input scale	200.0 ppb / µg/l		(S1)	
		2.000 ppm / mg/l		(S2)	
		20.00 ppm / mg/l		(S3)	20.00 ppm
		200.0 ppm / mg/l		(S4)	
		2000 ppm / mg/l		(S5)	
	Icell dependent available scales				
	10 ÷ 20 nA/ppm	S2 / S3 / S4 / S5			
	21 ÷ 200 nA/ppm	S1 / S2 / S3 / S4			
	201 ÷ 2000 nA/ppm	S1 / S2 / S3			
	Scale	Risolution	Measure limits	Reading limits	
	200.0 ppb / µg/l	0.1	-10.0 / 210.0	-20.0 / 220.0	
	2.000 ppm / mg/l	0.001	-0.100 / 2.100	-0.200 / 2.200	
	20.00 ppm / mg/l	0.01	-1.00 / 21.00	-2.00 / 22.00	
	200.0 ppm / mg/l	0.1	-10.0 / 210.0	-20.0 / 220.0	
	2000 ppm / mg/l	1	-100 / 2100	-200 / 2200	
D1.11	Zero	±20 % of full scale current			0 nA
D1.12	Sensitivity	12.5 ÷ 250 %			100 %
C1.8	RT Large Signal	0.4 ÷ 50.0 seconds			2.0 s
C1.9	RT Small Signal	0.4 ÷ 50.0 seconds			10.0 s
C1.10	Hidden negative values	ON / OFF			OFF
S2.3	Temperature coefficient	0.00 ÷ 4.00 %/°C			See C1.2

3.1	SET POINT 1 (INPUT A)		Default
C3.1	Type of regulation SET1 if related to relay	ON-OFF / PID	ON-OFF
C3.2	Regulation SET1 related to relay and PID	FM / WM	FM

3.1	SET POINT 1 (INPUT A)		Default
	ON-OFF regulation		
D3.11	• Set point	0 ÷ full scale	0.00 ppm
S3.1A	• Hysteresis	0 ÷10 % of full scale	0.20 ppm
S3.2A	• Delay	0.0 ÷ 100.0 seconds	0.2 s
C3.3	• Function	LO / HI (Min / Max)	LO
	PID regulation		
D3.11	• Set point	0 ÷ full scale	0.00 ppm
S3.1B	• Proportional band	0.0 ÷ 400.0 %	1.0 %
S3.2B	• Integral time	0.0 ÷ 999.9 minutes (0 = disabled)	0.0 min
S3.2B	• Derivative time	0.0 ÷ 999.9 minutes	0.0 min
C3.3	• Function	LO / HI (Min / Max)	LO
	FM regulation		
	• PID actuation value	0.0 ÷ 100.0 % PID	
S3.4B	• Pulse frequency	0 ÷ 120 pulses/minute	100 i/min
	• Pulse length	0.1 seconds	
	WM regulation		
	• PID actuation value	0.0 ÷ 100.0 % PID	
S3.4B	• Pulse width	0 ÷ 99.9 seconds	20.0 s
	• Minimum pulse length	0.3 seconds	
	OUT regulation (analog output)		
	• PID actuation value	0.0 ÷ 100.0 % PID	
	• Analog output	4 ÷ 20 mA	

3.2	SET POINT 2 (INPUT A)		Default
C3.4	Type of regulation SET2 if related to relay	ON-OFF / PID	ON-OFF
C3.5	Regulation SET2 related to relay and PID	FM / WM	FM
	ON-OFF regulation		
D3.12	• Set point	0 ÷ full scale	0.00 ppm
S3.5A	• Hysteresis	0 ÷10 % of full scale	0.20 ppm

3.2	SET POINT 2 (INPUT A)		Default
S3.6A	• Delay	0.0 ÷ 100.0 seconds	0.2 s
C3.6	• Function	LO / HI (Min / Max)	HI
	PID regulation		
D3.12	• Set point	0 ÷ full scale	0.00 ppm
S3.5B	• Proportional band	0.0 ÷ 400.0 %	1.0 %
S3.6B	• Integral time	0.0 ÷ 999.9 minutes	0.0 min
S3.7B	• Derivative time	0.0 ÷ 999.9 minutes (0 = disabled)	0.0 min
C3.6	• Function	LO / HI (Min / Max)	HI
	FM regulation		
	• PID actuation value	0.0 ÷ 100.0 % PID	
S3.4B	• Pulse frequency	0 ÷ 120 pulses/minute	100 i/min
	• Pulse length	0.1 seconds	
	WM regulation		
	• PID actuation value	0.0 ÷ 100.0 % PID	
S3.4B	• Pulse width	0 ÷ 99.9 seconds	20.0 s
	• Minimum pulse length	0.3 seconds	
	OUT regulation (analog output)		
	• PID actuation value	0.0 ÷ 100.0 % PID	
	• Analog output	4 ÷ 20 mA	

4.0	ALARM (INPUT A)		Default
	Window alarm		
S4.1	• Low value	-5 % ÷ 105 % full scale	-1.00 ppm
S4.2	• High value	-5 % ÷ 105 % full scale	21.00 ppm
	• Hysteresis	± 0.25 % of full scale	
S4.3	• Delay	0.0 ÷ 100.0 seconds	1.0 s
	Alarm on set point		
C4.1	• Alarm on operation SET1	ON / OFF	OFF
C4.2	• Operation time of SET1	0 ÷ 60 minutes	60 min
C4.3	• Alarm on operation SET2	ON / OFF	OFF
C4.4	• Operation time of SET2	0 ÷ 60 minutes	60 min

D5.1	ANALOG OUTPUT 1 (INPUT A)		Default
	If not related to SET POINT		
C5.1	Input related to OUT1	ppm / mg/l ˚C / ˚F	ppm
C5.2	Range	0-20 / 4-20 mA	0-20 mA
	Under / Over range (0-20)	0.00 / 20.50 mA	
	Under / Over range (4-20)	3.50 / 20.50 mA	
C5.3	Point 1 (0 mA o 4 mA) (ppm)	0 ÷ full scale	0.00 ppm
C5.4	Point 2 (20 mA) (ppm)	0 ÷ full scale	20.00 ppm
C5.3	Point 1 (0 mA o 4 mA) (˚C)	-10.0 ÷ 110.0 ˚C	-10.0 ˚C
C5.4	Point 2 (20 mA) (˚C)	-10.0 ÷ 110.0 ˚C	110.0 ˚C
C5.3	Point 1 (0 mA o 4 mA) (˚F)	14.0 ÷ 230.0 ˚F	14.0 ˚F
C5.4	Point 2 (20 mA) (˚F)	14.0 ÷ 230.0 ˚F	230.0 ˚F

D5.2	ANALOG OUTPUT 2 (INPUT A)		Default
	If not related to SET POINT		
C5.5	Input related to OUT2	ppm / mg/l ˚C / ˚F	ppm
C5.6	Range	0-20 / 4-20 mA	0-20 mA
	Under / Over range (0-20)	0.00 / 20.50 mA	
	Under / Over range (4-20)	3.50 / 20.50 mA	
C5.7	Point 1 (0 mA o 4 mA) (ppm)	0 ÷ full scale	0.00 ppm
C5.8	Point 2 (20 mA) (ppm)	0 ÷ full scale	20.00 ppm
C5.7	Point 1 (0 mA o 4 mA) (˚C)	-10.0 ÷ 110.0 ˚C	-10.0 ˚C
C5.8	Point 2 (20 mA) (˚C)	-10.0 ÷ 110.0 ˚C	110.0 ˚C
C5.7	Point 1 (0 mA o 4 mA) (˚F)	14.0 ÷ 230.0 ˚F	14.0 ˚F
C5.8	Point 2 (20 mA) (˚F)	14.0 ÷ 230.0 ˚F	230.0 ˚F

D50.0	SETUP (INPUT A)		Default
S1.1	Manual pH comp.	0.00 ÷ 14.00 pH	7.00 pH
S2.3	Temperature coefficient	0.00 ÷ 4.00 %/˚C	2.00 %/˚C
S3.1A	Hysteresis SET1 (ON-OFF)	0 ÷10 % of FS	0.20 ppm
S3.2A	Delay SET1 (ON-OFF)	0.0 ÷ 100.0 seconds	0.2 s
S3.1B	Proportional band SET1	0.0 ÷ 400.0 %	1.0 %
S3.2B	Integral time SET1	0.0 ÷ 999.9 minutes	0.0 min
S3.3B	Derivative time SET1	0.0 ÷ 999.9 minutes (0=disabled)	0.0 min
S3.4B	Pulse frequency FM SET1	0 ÷ 120 pulses/minute	100 i/min
S3.4B	Pulse width WM SET1	0 ÷ 99.9 seconds	20.0 s

D50.0	SETUP (INPUT A)		Default
S3.5A	Hysteresis SET2 (ON-OFF)	0 ÷10 % of FS	0.20 ppm
S3.6A	Delay SET2 (ON-OFF)	0.0 ÷ 100.0 seconds	0.2 s
S3.5B	Proportional band SET2	0.0 ÷ 400.0 %	1.0 %
S3.6B	Integral time SET2	0.0 ÷ 999.9 minutes	0.0 min
S3.7B	Derivative time SET2	0.0 ÷ 999.9 minutes (0=disabled)	0.0 min
S3.8B	Pulse frequency FM SET2	0 ÷ 120 pulses/minute	100 i/min
S3.8B	Pulse width WM SET2	0 ÷ 99.9 seconds	20.0 s
S4.1	Alarm LO (low value)	-5 % ÷ 105 % full scale	-1.00 ppm
S4.2	Alarm HI (high)	-5 % ÷ 105 % full scale	21.00 ppm
S4.3	Alarm delay	0.0 ÷ 100.0 seconds	1.0 s

D60.0	CONFIGURATION (INPUT A)		Default
C1.1	Type of sensor	2 WIRES / 3 WIRES	3 WIRES
C1.2A	Type of measure (2 wires)	Cl2 F / Cl2 C / ClO2 / O3 / custom	Cl2 F
C1.2B	Type of measure (3 wires)	Cl2 F / ClO2 / O3 / Cl2 T / custom	Cl2 F
C1.3A	pH compensation (Cl2F)	AUTO / MANUAL / OFF / EDIT TABLE	AUTO
C1.3B	Custom measure	ABCDE	ABCDE
C1.4	Nominal current custom	-2000 ÷ -10 / 10 ÷ 2000 nA/ppm	160 nA/ppm
C1.5	Polarization	-1000 ÷ 1000 mV	-200 mV
C1.6	Measuring unit	ppb-ppm / µg/l-mg/l	ppb-ppm
C1.7	Input scale	Sensor dependent	20.00 ppm
C1.8	RT Large Signal	0.4 ÷ 50.0 seconds	2.0 s
C1.9	RT Small Signal	0.4 ÷ 50.0 seconds	10.0 s
C1.10	Hidden negative values	ON / OFF	OFF
C3.1	SET 1 regulation	ON-OFF / PID	ON-OFF
C3.2	SET 1 actuation (PID only)	FM / WM	FM
C3.3	SET 1 function	LO / HI (Min / Max)	LO
C3.4	SET 2 regulation	ON-OFF / PID	ON-OFF
C3.5	SET 2 actuation (PID only)	FM / WM	FM
C3.6	SET 2 function	LO / HI (Min / Max)	HI
C4.1	Alarm related to SET1 operation time	ON / OFF	OFF
C4.2	SET1 operation time	0 ÷ 60 minutes	60 min
C4.3	Alarm related to SET2 operation time	ON / OFF	OFF
C4.4	SET2 operation time	0 ÷ 60 minutes	60 min

D60.0	CONFIGURATION (INPUT A)		Default
C5.1	Measure on analog output 1	ppm / mg/l ˚C / ˚F	ppm
C5.2	Analog output 1 range	0-20 / 4-20 mA	0-20 mA
C5.3	Point 1 analog output 1	0 ÷ full scale	0.00 ppm
C5.4	Point 2 analog output 1	0 ÷ full scale	20.00 ppm
C5.5	Measure on analog output 2	ppm / mg/l ˚C / ˚F	ppm
C5.6	Analog output 2 range	0-20 / 4-20 mA	0-20 mA
C5.7	Point 1 analog output 2	0 ÷ full scale	0.00 ppm
C5.8	Point 2 analog output 2	0 ÷ full scale	20.00 ppm

Input B technical specifications: pH/ORP measure

D1.2	MAIN MEASURE (INPUT B)		Default
C1.1	Type of measure	pH / ORP	pH
C1.2	Type of pH sensor Type of ORP sensor	GLASS / ANTIMONY / EXT. 4-20 mA ORP	GLASS
	GLASS pH electrode		
	• Slope	59.16 mV / pH at 25 ˚C	
	• Asimmetric potential 7.00 pH	0.0 mV	
D1.21	• Zero	± 2.00 pH	0.00 pH
D1.22	• Sensitivity	80 % ÷ 110 %	100 %
	ANTIMONY pH electrode		
	• Slope	50.00 mV / pH at 25 ˚C	
	• Asimmetric potential 7.00 pH	-325 mV	
D1.21	• Zero	± 2.00 pH	0.00 pH
D1.22	• Sensitivity	70 % ÷ 140 %	100 %
	Input for external transmitter 0 ÷ 14 pH	400 ÷ 2000 mV transmitter 4-20 mA + resistence (shunt) 100 ohm 0.1 % on input	
	• Zero	Set the transmitter	
	• Sensitivity	Set the transmitter	
	ORP electrode		

D1.2	MAIN MEASURE (INPUT B)		Default
D1.21	• Zero	± 100 mV	0 mV
D1.22	• Sensitivity	80 % ÷ 110 %	100 %
	pH scale	0.00 ÷ 14.00 pH	
	Resolution	0.01 pH	
	Under range	-1.00 pH	
	Overrange	15.00 pH	
	ORP scale	-2000 ÷ 2000 mV	
	Resolution	1 mV	
	Under range	-2100 mV	
	Overrange	2100 mV	
	Filter software		
C1.3	Response time at 90 % large signal	0.4 ÷ 50.0 seconds	2.0 s
C1.4	Response time at 90 % small signal	0.4 ÷ 50.0 seconds	10.0 s

3.1	SET POINT 1 (INPUT B)		Default
C3.1	Type of regulation SET1 if related to relay	ON-OFF / PID	ON-OFF
C3.2	Regulation SET1 related to relay and PID	FM / WM	FM
	<u>ON-OFF regulation</u>		
D3.21	• Set point (pH)	0.00 ÷ 14.00 pH	0.00 pH
D3.21	• Set point (ORP)	-2000 ÷ 2000 mV	0 mV
S3.1A	• Hysteresis (pH)	0.00 ÷ 1.40 pH	0.02 pH
S3.1A	• Hysteresis (mV)	0 ÷ 200 mV	1 mV
S3.2A	• Delay	0.0 ÷ 100.0 seconds	0.2 s
C3.3	• Function	LO / HI (Min / Max)	LO
	<u>PID regulation</u>		
D3.21	• Set point (pH)	0.00 ÷ 14.00 pH	0.00 pH
D3.21	• Set point (ORP)	-2000 ÷ 2000 mV	0 mV
S3.1B	• Proportional band	0.0 ÷ 400.0 %	1.0 %
S3.2B	• Integral time	0.0 ÷ 999.9 minutes	0.0 min

3.1	SET POINT 1 (INPUT B)		Default
S3.2B	• Derivative time	0.0 ÷ 999.9 minutes (0=disabl.)	0.0 min
C3.3	• Function	LO / HI (Min / Max)	LO
	FM regulation		
	• PID actuation value	0.0 ÷ 100.0 % PID	
S3.4B	• Pulse frequency	0 ÷ 120 pulses/minute	100 i/min
	• Pulse length	0.1 seconds	
	WM regulation		
	• PID actuation value	0.0 ÷ 100.0 % PID	
S3.4B	• Pulse width	0 ÷ 99.9 seconds	20.0 s
	• Minimum pulse length	0.3 seconds	
	OUT regulation (analog output)		
	• PID actuation value	0.0 ÷ 100.0 % PID	
	• Analog output	4 ÷ 20 mA	

3.1	SET POINT 2 (INPUT B)		Default
C3.1	Type of regulation SET2 if related to relay	ON-OFF / PID	ON-OFF
C3.2	Regulation SET2 related to relay and PID	FM / WM	FM
	ON-OFF regulation		
D3.22	• Set point (pH)	0.00 ÷ 14.00 pH	0.00 pH
D3.22	• Set point (ORP)	-2000 ÷ 2000 mV	0 mV
S3.1A	• Hysteresis (pH)	0.00 ÷ 1.40 pH	0.02 pH
S3.1A	• Hysteresis (mV)	0 ÷ 200 mV	1 mV
S3.2A	• Delay	0.0 ÷ 100.0 seconds	0.2 s
C3.3	• Function	LO / HI (Min / Max)	HI
	PID regulation		
D3.22	• Set point (pH)	0.00 ÷ 14.00 pH	0.00 pH
D3.22	• Set point (ORP)	-2000 ÷ 2000 mV	0 mV
S3.1B	• Proportional band	0.0 ÷ 400.0 %	1.0 %
S3.2B	• Integral time	0.0 ÷ 999.9 minutes	0.0 min
S3.2B	• Derivative time	0.0 ÷ 999.9 minutes (0 = disabled)	0.0 min

3.1	SET POINT 2 (INPUT B)		Default
C3.3	• Function	LO / HI (Min / Max)	HI
	FM regulation		
	• PID actuation value	0.0 ÷ 100.0 % PID	
S3.4B	• Pulse frequency	0 ÷ 120 pulses/minute	100 i/min
	• Pulse length	0.1 seconds	
	WM regulation		
	• PID actuation value	0.0 ÷ 100.0 % PID	
S3.4B	• Pulse width	0 ÷ 99.9 seconds	20.0 s
	• Minimum pulse length	0.3 seconds	
	OUT regulation (analog output)		
	• PID actuation value	0.0 ÷ 100.0 % PID	
	• Analog output	4 ÷ 20 mA	

4.0	ALARM (INPUT B)		Default
	Window alarm		
S4.1	• Low value (pH)	0.00 ÷ 14.00 pH	0.00 pH
S4.2	• High value (pH)	0.00 ÷ 14.00 pH	14.00 pH
	• Hysteresis (pH)	± 0.2 pH	
S4.1	• Low value (ORP)	-2000 ÷ 2000 mV	-2000 mV
S4.2	• High value (ORP)	-2000 ÷ 2000 mV	2000 mV
	• Hysteresis (ORP)	± 1 mV	
S4.3	• Delay	0.0 ÷ 100.0 seconds	1.0 s
	Alarm on set point		
C4.1	• Alarm on operation SET1	ON / OFF	OFF
C4.2	• Operation time of SET1	0 ÷ 60 minutes	60 min
C4.3	• Alarm on operation SET2	ON / OFF	OFF
C4.4	• Operation time of SET2	0 ÷ 60 minutes	60 min

D5.1	ANALOG OUTPUT 1 (INPUT B)		Default
	If not related to SET POINT		
C5.1	Input related to OUT1	pH | mV / °C | °F	pH
C5.2	Range	0-20 / 4-20 mA	0-20 mA
	Under / Over range (0-20)	0.00 / 20.50 mA	

D5.1	ANALOG OUTPUT 1 (INPUT B)		Default
	Under / Over range (4-20)	3.50 / 20.50 mA	
C5.3	Point 1 (0 mA o 4 mA) (pH)	0.00 ÷ 14.00 pH	0.00 pH
C5.4	Point 2 (20 mA) (pH)	0.00 ÷ 14.00 pH	14.00 pH
C5.3	Point 1 (0 mA o 4 mA) (ORP)	-2000 ÷ 2000 mV	-2000 mV
C5.4	Point 2 (20 mA) (ORP)	-2000 ÷ 2000 mV	2000 mV
C5.3	Point 1 (0 mA o 4 mA) (°C)	-10.0 ÷ 110.0 °C	-10.0 °C
C5.4	Point 2 (20 mA) (°C)	-10.0 ÷ 110.0 °C	110.0 °C
C5.3	Point 1 (0 mA o 4 mA) (°F)	14.0 ÷ 230.0 °F	14.0 °F
C5.4	Point 2 (20 mA) (°F)	14.0 ÷ 230.0 °F	230.0 °F

D5.2	ANALOG OUTPUT 2 (INPUT B)		Default
	If not related to SET POINT		
C5.5	Input related to OUT2	pH | mV / °C | °F	pH
C5.6	Range	0-20 / 4-20 mA	0-20 mA
	Under / Over range (0-20)	0.00 / 20.50 mA	
	Under / Over range (4-20)	3.50 / 20.50 mA	
C5.7	Point 1 (0 mA o 4 mA) (pH)	0.00 ÷ 14.00 pH	0.00 pH
C5.8	Point 2 (20 mA) (pH)	0.00 ÷ 14.00 pH	14.00 pH
C5.7	Point 1 (0 mA o 4 mA) (ORP)	-2000 ÷ 2000 mV	-2000 mV
C5.8	Point 2 (20 mA) (ORP)	-2000 ÷ 2000 mV	2000 mV
C5.7	Point 1 (0 mA o 4 mA) (°C)	-10.0 ÷ 110.0 °C	-10.0 °C
C5.8	Point 2 (20 mA) (°C)	-10.0 ÷ 110.0 °C	110.0 °C
C5.7	Point 1 (0 mA o 4 mA) (°F)	14.0 ÷ 230.0 °F	14.0 °F
C5.8	Point 2 (20 mA) (°F)	14.0 ÷ 230.0 °F	230.0 °F

D50.0	SETUP (INPUT B)		Default
S3.1A	Hysteresis SET1 (ON-OFF)	0.00 ÷ 1.40 pH	0.02 pH
S3.2A	Delay SET1 (ON-OFF)	0.0 ÷ 100.0 seconds	0.2 s
S3.1B	Proportional band SET1	0.0 ÷ 400.0 %	1.0 %
S3.2B	Integral time SET1	0.0 ÷ 999.9 minutes	0.0 min
S3.3B	Derivative time SET1	0.0 ÷ 999.9 minutes (0 = disabled)	0.0 min
S3.4B	Pulse frequency FM SET1	0 ÷ 120 pulses/minute	100 i/min
S3.4B	Pulse width WM SET1	0 ÷ 99.9 seconds	20.0 s
S3.5A	Hysteresis SET2 (ON-OFF)	0.00 ÷ 1.40 pH	0.02 pH
S3.6A	Delay SET2 (ON-OFF)	0.0 ÷ 100.0 seconds	0.2 s
S3.5B	Proportional band SET2	0.0 ÷ 400.0 %	1.0 %
S3.6B	Integral time SET2	0.0 ÷ 999.9 minutes	0.0 min

D50.0	SETUP (INPUT B)		Default
S3.7B	Derivative time SET2	0.0 ÷ 999.9 minutes (0 = disabled)	0.0 min
S3.8B	Pulse frequency FM SET2	0 ÷ 120 pulses/minute	100 i/min
S3.8B	Pulse width WM SET2	0 ÷ 99.9 seconds	20.0 s
S4.1	Alarm LO (low value)	0.00 ÷ 14.0 pH	0.00 pH
S4.2	Alarm HI (high value)	0.00 ÷ 14.0 pH	14.00 pH
S4.3	Alarm delay	0.0 ÷ 100.0 seconds	1.0 s

D60.0	CONFIGURATION (INPUT B)		Default
C1.1	Type of measure	pH / ORP	pH
C1.2	Type of pH sensor	GLASS / ANTIMONY / EXT. 4-20 mA	GLASS
C1.3	RT Large Signal	0.4 ÷ 50.0 seconds	2.0 s
C1.4	RT Small Signal	0.4 ÷ 50.0 seconds	10.0 s
C3.1	SET1 regulation	ON-OFF / PID	ON-OFF
C3.2	SET1 regulation related to (PID only)	FM / WM / OUT1 FM/WM on relay 1	FM
C3.3	SET1 function	LO / HI (Min / Max)	LO
C3.4	SET2 regulation	ON-OFF / PID	OFF
C3.5	SET2 regulation related to (PID only)	FM / WM / OUT2 FM/WM on relay 2	FM
C3.6	SET2 function	LO / HI (Min / Max)	HI
C4.1	Alarm related to SET1 operation time	ON / OFF	OFF
C4.2	SET1 operation time	0 ÷ 60 minutes	60 min
C4.3	Alarm related to SET2 operation time	ON / OFF	OFF
C4.4	SET2 operation time	0 ÷ 60 minutes	60 min
C5.1	Input related to the analog output 1	pH / mV °C / °F	pH
C5.2	Analog output 1 range	0-20 / 4-20 mA	0-20 mA
C5.3	Point 1 analog output 1	0.00 ÷ 14.00 pH	0.00 pH
C5.4	Point 2 analog output 1	0.00 ÷ 14.00 pH	14.00 pH
C5.5	Input related to the analog output 2	pH / mV °C / °F	pH
C5.6	Analog output 2 range	0-20 / 4-20 mA	0-20 mA
C5.7	Point 1 analog output 2	0.00 ÷ 14.00 pH	0.00 pH
C5.8	Point 2 analog output 2	0.00 ÷ 14.00 pH	14.00 pH

Input C technical specifications: pH/ORP measure

D1.3	MAIN MEASURE (INPUT C)		Default
C1.1	Type of measure	pH / ORP	ORP
C1.2	Type of pH sensor Type of ORP sensor	GLASS / ANTIMONY / EXT. 4-20 mA ORP	GLASS
	GLASS pH electrode		
	• Slope	59.16 mV / pH at 25 °C	
	• Asimmetric potential 7.00 pH	0.0 mV	
D1.31	• Zero	± 2.00 pH	0.00 pH
D1.32	• Sensitivity	80 % ÷ 110 %	100 %
	ANTIMONY pH electrode		
	• Slope	50.00 mV / pH at 25 °C	
	• Asimmetric potential 7.00 pH	-325 mV	
D1.31	• Zero	± 2.00 pH	0.00 pH
D1.32	• Sensitivity	70 % ÷ 140 %	100 %
	Input for external transmitter 0 ÷ 14 pH	400 ÷ 2000 mV transmitter 4-20 mA + resistence (shunt) 100 ohm 0.1 % on input	
	• Zero	Set the transmitter	
	• Sensitivity	Set the transmitter	
	ORP electrode		
D1.31	• Zero	± 100 mV	0 mV
D1.32	• Sensitivity	80 % ÷ 110 %	100 %
	pH scale	0.00 ÷ 14.00 pH	
	Resolution	0.01 pH	
	Under range	-1.00 pH	
	Over range	15.00 pH	
	ORP scale	-2000 ÷ 2000 mV	
	Resolution	1 mV	
	Under range	-2100 mV	
	Over range	2100 mV	

D1.3	MAIN MEASURE (INPUT C)		Default
	Filter software		
C1.3	Response time at 90 % large signal	0.4 ÷ 50.0 seconds	2.0 s
C1.4	Response time at 90 % small signal	0.4 ÷ 50.0 seconds	10.0 s

3.1	SET POINT 1 (INPUT C)		Default
C3.1	Type of regulation SET1 if related to relay	ON-OFF / PID	ON-OFF
C3.2	Regulation SET1 related to relay and PID	FM / WM	FM
	ON-OFF regulation		
D3.31	• Set point (pH)	0.00 ÷ 14.00 pH	0.00 pH
D3.31	• Set point (ORP)	-2000 ÷ 2000 mV	0 mV
S3.1A	• Hysteresis (pH)	0.00 ÷ 1.40 pH	0.02 pH
S3.1A	• Hysteresis (mV)	0 ÷ 200 mV	1 mV
S3.2A	• Delay	0.0 ÷ 100.0 seconds	0.2 s
C3.3	• Function	LO / HI (Min / Max)	LO
	PID regulation		
D3.31	• Set point (pH)	0.00 ÷ 14.00 pH	0.00 pH
D3.31	• Set point (ORP)	-2000 ÷ 2000 mV	0 mV
S3.1B	• Proportional band	0.0 ÷ 400.0 %	1.0 %
S3.2B	• Integral time	0.0 ÷ 999.9 minutes	0.0 min
S3.2B	• Derivative time	0.0 ÷ 999.9 minutes (0=disabl.)	0.0 min
C3.3	• Function	LO / HI (Min / Max)	LO
	FM regulation		
	• PID actuation value	0.0 ÷ 100.0 % PID	
S3.4B	• Pulse frequency	0 ÷ 120 pulses/minute	100 i/min
	• Pulse length	0.1 seconds	
	WM regulation		
	• PID actuation value	0.0 ÷ 100.0 % PID	
S3.4B	• Pulse width	0 ÷ 99.9 seconds	20.0 s
	• Minimum pulse length	0.3 seconds	

3.1	SET POINT 1 (INPUT C)		Default
	OUT regulation (analog output)		
	• PID actuation value	0.0 ÷ 100.0 % PID	
	• Analog output	4 ÷ 20 mA	

3.1	SET POINT 2 (INPUT C)		Default
C3.1	Type of regulation SET2 if related to relay	ON-OFF / PID	ON-OFF
C3.2	Regulation SET2 related to relay and PID	FM / WM	FM
	ON-OFF regulation		
D3.32	• Set point (pH)	0.00 ÷ 14.00 pH	0.00 pH
D3.32	• Set point (ORP)	-2000 ÷ 2000 mV	0 mV
S3.1A	• Hysteresis (pH)	0.00 ÷ 1.40 pH	0.02 pH
S3.1A	• Hysteresis (mV)	0 ÷ 200 mV	1 mV
S3.2A	• Delay	0.0 ÷ 100.0 seconds	0.2 s
C3.3	• Function	LO / HI (Min / Max)	HI
	Regulation PID		
D3.32	• Set point (pH)	0.00 ÷ 14.00 pH	0.00 pH
D3.32	• Set point (ORP)	-2000 ÷ 2000 mV	0 mV
S3.1B	• Proportional band	0.0 ÷ 400.0 %	1.0 %
S3.2B	• Integral time	0.0 ÷ 999.9 minutes	0.0 min
S3.2B	• Derivative time	0.0 ÷ 999.9 minutes (0 = disabled)	0.0 min
C3.3	• Function	LO / HI (Min / Max)	HI
	FM regulation		
	• PID actuation value	0.0 ÷ 100.0 % PID	
S3.4B	• Pulse frequency	0 ÷ 120 pulses/minute	100 i/min
	• Pulse length	0.1 seconds	
	WM regulation		
	• PID actuation value	0.0 ÷ 100.0 % PID	
S3.4B	• Pulse width	0 ÷ 99.9 seconds	20.0 s
	• Minimum pulse length	0.3 seconds	
	OUT regulation (analog output)		

3.1	SET POINT 2 (INPUT C)		Default
	• PID actuation value	0.0 ÷ 100.0 % PID	
	• Analog output	4 ÷ 20 mA	

4.0	ALARM (INPUT C)		Default
	Window alarm		
S4.1	• Low value (pH)	0.00 ÷ 14.00 pH	0.00 pH
S4.2	• High value (pH)	0.00 ÷ 14.00 pH	14.00 pH
	• Hysteresis (pH)	± 0.2 pH	
S4.1	• Low value (ORP)	-2000 ÷ 2000 mV	-2000 mV
S4.2	• High value (ORP)	-2000 ÷ 2000 mV	2000 mV
	• Hysteresis (ORP)	± 1 mV	
S4.3	• Delay	0.0 ÷ 100.0 seconds	1.0 s
	Alarm on set point		
C4.1	• Alarm on operation SET1	ON / OFF	OFF
C4.2	• Operation time of SET1	0 ÷ 60 minutes	60 min
C4.3	• Alarm on operation SET2	ON / OFF	OFF
C4.4	• Operation time of SET2	0 ÷ 60 minutes	60 min

D5.1	ANALOG OUTPUT 1 (INPUT C)		Default
	If not related to SET POINT		
C5.1	Input related to OUT1	pH | mV / °C | °F	mV
C5.2	Range	0-20 / 4-20 mA	0-20 mA
	Under / Over range (0-20)	0.00 / 20.50 mA	
	Under / Over range (4-20)	3.50 / 20.50 mA	
C5.3	Point 1 (0 mA o 4 mA) (pH)	0.00 ÷ 14.00 pH	0.00 pH
C5.4	Point 2 (20 mA) (pH)	0.00 ÷ 14.00 pH	14.00 pH
C5.3	Point 1 (0 mA o 4 mA) (ORP)	-2000 ÷ 2000 mV	-2000 mV
C5.4	Point 2 (20 mA) (ORP)	-2000 ÷ 2000 mV	2000 mV
C5.3	Point 1 (0 mA o 4 mA) (°C)	-10.0 ÷ 110.0 °C	-10.0 °C
C5.4	Point 2 (20 mA) (°C)	-10.0 ÷ 110.0 °C	110.0 °C
C5.3	Point 1 (0 mA o 4 mA) (°F)	14.0 ÷ 230.0 °F	14.0 °F
C5.4	Point 2 (20 mA) (°F)	14.0 ÷ 230.0 °F	230.0 °F

D5.2	ANALOG OUTPUT 2 (INPUT C)		Default
	If not related to SET POINT		
C5.5	Input related to OUT2	pH | mV / °C | °F	mV

D5.2	ANALOG OUTPUT 2 (INPUT C)		Default
C5.6	Range	0-20 / 4-20 mA	0-20 mA
	Under / Over range (0-20)	0.00 / 20.50 mA	
	Under / Over range (4-20)	3.50 / 20.50 mA	
C5.7	Point 1 (0 mA o 4 mA) (pH)	0.00 ÷ 14.00 pH	0.00 pH
C5.8	Point 2 (20 mA) (pH)	0.00 ÷ 14.00 pH	14.00 pH
C5.7	Point 1 (0 mA o 4 mA) (ORP)	-2000 ÷ 2000 mV	-2000 mV
C5.8	Point 2 (20 mA) (ORP)	-2000 ÷ 2000 mV	2000 mV
C5.7	Point 1 (0 mA o 4 mA) (°C)	-10.0 ÷ 110.0 °C	-10.0 °C
C5.8	Point 2 (20 mA) (°C)	-10.0 ÷ 110.0 °C	110.0 °C
C5.7	Point 1 (0 mA o 4 mA) (°F)	14.0 ÷ 230.0 °F	14.0 °F
C5.8	Point 2 (20 mA) (°F)	14.0 ÷ 230.0 °F	230.0 °F

D50.0	SETUP (INPUT C)		Default
S3.1A	Hysteresis SET1 (ON-OFF)	0 ÷ 200 mV	1 mV
S3.2A	Delay SET1 (ON-OFF)	0.0 ÷ 100.0 seconds	0.2 s
S3.1B	Proportional band SET1	0.0 ÷ 400.0 %	1.0 %
S3.2B	Integral time SET1	0.0 ÷ 999.9 minutes	0.0 min
S3.3B	Derivative time SET1	0.0 ÷ 999.9 minutes (0 = disabled)	0.0 min
S3.4B	Pulse frequency FM SET1	0 ÷ 120 pulses/minute	100 i/min
S3.4B	Pulse width WM SET1	0 ÷ 99.9 seconds	20.0 s
S3.5A	Hysteresis SET2 (ON-OFF)	0 ÷ 200 mV	1 mV
S3.6A	Delay SET2 (ON-OFF)	0.0 ÷ 100.0 seconds	0.2 s
S3.5B	Proportional band SET2	0.0 ÷ 400.0 %	1.0 %
S3.6B	Integral time SET2	0.0 ÷ 999.9 minutes	0.0 min
S3.7B	Derivative time SET2	0.0 ÷ 999.9 minutes (0 = disabled)	0.0 min
S3.8B	Pulse frequency FM SET2	0 ÷ 120 pulses/minute	100 i/min
S3.8B	Pulse width WM SET2	0 ÷ 99.9 seconds	20.0 s
S4.1	Alarm LO (low value)	-2000 ÷ 2000 mV	-2000 mV
S4.2	Alarm HI (high value)	-2000 ÷ 2000 mV	2000 mV
S4.3	Alarm delay	0.0 ÷ 100.0 seconds	1.0 s

D60.0	CONFIGURATION (INPUT C)		Default
C1.1	Type of measure	pH / ORP	ORP
C1.2	Type of pH sensor	GLASS / ANTIMONY / EXT. 4-20 mA	GLASS
C1.3	RT Large Signal	0.4 ÷ 50.0 seconds	2.0 s
C1.4	RT Small Signal	0.4 ÷ 50.0 seconds	10.0 s
C3.1	SET1 regulation	ON-OFF / PID	ON-OFF

D60.0	CONFIGURATION (INPUT C)		Default
C3.2	SET1 regulation related to (PID only)	FM / WM	FM
C3.3	SET1 function	LO / HI (Min / Max)	LO
C3.4	SET2 regulation	ON-OFF / PID	OFF
C3.5	SET2 regulation related to (PID only)	FM / WM	FM
C3.6	SET2 function	LO / HI (Min / Max)	HI
C4.1	Alarm related to SET1 operation time	ON / OFF	OFF
C4.2	SET1 operation time	0 ÷ 60 minutes	60 min
C4.3	Alarm related to SET2 operation time	ON / OFF	OFF
C4.4	SET2 operation time	0 ÷ 60 minutes	60 min
C5.1	Input related to the analog output 1	pH / mV °C / °F	mV
C5.2	Analog output 1 range	0-20 / 4-20 mA	0-20 mA
C5.3	Point 1 analog output 1	-2000 ÷ 2000 mV	-2000 mV
C5.4	Point 2 analog output 1	-2000 ÷ 2000 mV	2000 mV
C5.5	Input related to the analog output 2	pH / mV °C / °F	mV
C5.6	Analog output 2 range	0-20 / 4-20 mA	0-20 mA
C5.7	Point 1 analog output 2	-2000 ÷ 2000 mV	-2000 mV
C5.8	Point 2 analog output 2	-2000 ÷ 2000 mV	2000 mV

70.0	INFO MENU		Default
I1.0	Release code	CL6587.103 R1.1X	
I2.0	LCD brightness	(0 ÷ 30)	20
I3.0	LCD contrast	(0 ÷ 30)	12
I4.0	LCD mode	NORMAL / REVERSE	NORMAL
I5.0	Hours of operation time	xxxxxx hours	

5 INSTALLATION

5.1 PACKING LIST

The package contains:
- N° 1 unit with serial number label;
- N° 1 instruction manual.

5.2 PACKING AND UNPACKING

1 Open the carton box and keep it.
2 Remove the instrument for the carton box.
3 Remove the plastic protection from the instrument.
If repackaging do the reverse.

5.3 STORAGE AND TRANSPORT

For prolonged storage, keep the product in dry places.
In case of transportation, pack the product in a carton box.

5.4 INSTALLATION

The instrument can be installed in proximity of the sensor or in a remote area.
Panel installation must be performed on a rigid surface, in a protected position from shock and corrosive fumes.
Accessories for alternate mounting are available on request (see Fig. 3 and Fig. 4 of chapter "Dimensions and installation (page 87)").

5.4.1 WALL MOUNTING INSTRUCTIONS

The instrument requires 3 screws and fixing accessories suitable for the wall material for mounting (see Fig. 2):
- a screw in the top center of the instrument to hang it;
- two fixing screws at the bottom of the instrument.

Open the front cover to fix these two screws.
The diameter for the top screw head is 8.5 mm.
The diameter for the bottom screws is 4.7 mm.

Mounting without a drilling template

1 Fix the central screw on the wall, ensuring a distance of 6 mm between the screw head and the wall.

2 Remove the front cover of the instrument.
3 Hang the instrument on the central screw (attention to the projection of the screw head, if excessive it can remove the instrument's inner seal).
4 Mark on the wall the position of the bottom holes.
5 Remove the instrument and drill the two holes.
6 Hang the instrument again.
7 Fasten the two bottom screws in the holes.
8 After making all electrical connections required, close the lid.

Mounting with a drilling template

1 Prepare a drilling template according to the measurements shown in Fig. 1 of chapter "Dimensions and installation (page 87)".
2 Make the 3 holes required.
3 Perform steps 1-2-3-7-8 of "Mounting without a drilling template".

5.5 INSTALLATION OF THE SENSORS

Follow the instructions for installation of submersible or in line probes.

The measures of oxidizing agents in water can depend on the sample stream. For this reason, they are placed in special overflow cell to keep the flow constant.

In case of installation in pipe you must maintain a constant flow of the sample to be measured.

The sensors whose measurement does not depend on the flow can also be installed in immersion.

Protect the cable of the sensor from rain or corrosive agents, for example through a sheath.

The interruption of the cable can cause interferences, therefor is not recommended.

In case of extension cable use high isolation IP 65 junction box (for example the accessory SZ 740).

Keep the cable of the sensor away from the power cables.

5.6 ELECTRICAL INSTALLATION

For all the electrical connections refer to the label on the instruments, also shown and described in the chapter "Installation drawings (page 86)".

All connections to the instrument are made using removable terminal blocks located inside the device, accessible via 6 cable glands (2 x PG11, 2 x PG9, 2 x PG7).

The cable glands are provided with a closure that guarantees the IP65 sealing; unscrew the ring and remove it only for the cable glands actually used.

Use the appropriate cable diameter to ensure the IP65 sealing.

The power connections are on two terminal blocks (one for a power supply and one for connection to the relays).

The power connections of the input signals of the transmitters are on a 12-position terminal block.

The connections of the analog and logic input are on a 6-position terminal block.

The RS485 connections are on a 4-position terminal block.

5.6.1 CONNECTING TO THE MAINS

- Connect the ground to the terminal 3
- Connect the mains to the terminals 1-2 marked L-N.

⚠ The device is very sensitive and absorbs very little power.

Use the following precautions to avoid irreversible damage to the electronic circuits.

- Power the device between phase and neutral. Avoid the use of auto-transformers.

- Avoid power taken from nodes with strong inductive loads that may produce noise or damage to the internal circuits.

- In the case of installations with the presence of inverter, check that they are properly installed and not induce noise on the network, on the ground or on the signals.

- Install a switch in the control cabinet for the power of the instrument. This switch can be "specific" or "general" for all electronic equipment installed.

- Install in the control cabinet protection fuses for power supply.

- Install the power cables away from the signal cables.

- Check the voltage supply before turning on the power.

⚠ It should be remembered that the electronic instruments may be subject to accidental failures.

Take the necessary precautions to avoid any damage caused by their dysfunction.

5.6.2 CONNECTING THE SENSORS TO INPUT A

Two electrodes sensors

- Connect the cathode to terminal 20 marked IN.
- Connect the anode terminal 22 marked CE.

Three electrodes sensors

- Connect the cathode to terminal 20 marked IN.
- Connect the third electrode to terminal 21 marked R.
- Connect the anode terminal 22 marked CE.

Connections of the most common sensors:

Connection of the polarographic cells (CL7901 - CL7902 - OZ7901)

The two wires sensor of the above cells includes the Pt100 temperature sensor and is provided with cable whose wires are identified by their color.

- Connect the brown wire (cathode) to the terminal 20 marked IN.
- Connect the white wire (anode) to the terminal 22 marked CE marked or to the terminal 21 marked R.
- Connect the red wire (Pt100) to the terminal 18 marked T1.
- Connect the black wire (Pt100 common) to the terminal 17 marked T2.
- Connect the green wire (Pt100 common) to the terminal 16 marked T0.

Connections of the potentiostatic sensor

The SZ 283 potentiostatic sensor is provided with a shielded cable with three wires: shield and two wires identified by their color.

- Connect the black wire (cathode) to the terminal 20 marked IN.
- Connect the shield (reference) to the terminal 21 marked R.
- Connect the white wire (counter electrode) to the terminal 22 marked CE.

⚠ The connection of the sensors is the most critical part of the whole system.

The application also accidentally of voltages not related to the process can damage the circuitry of the input amplifier:

- use only the cables supplied with the sensor;

avoid interruptions in the cables. If necessary use only special terminal blocks at a very - high insulation and protection from moisture;

- keep the cell cable far from the power cables also inside the switch board.

⚠ The connection of the sensors is the most critical part of the whole system.

The application also accidentally of voltages not related to the process can damage the circuitry of the input amplifier:

use only the cables supplied with the sensor;

avoid interruptions in the cables. If necessary use only special blocks at a very high insulation and protection from moisture;

keep the cell cable far from the power cables also inside the switch board.

5.6.3 CONNECTING THE SENSORS TO INPUT B AND C

The connection of pH or electrodes is the most critical part of the whole system.

The pH or ORP electrodes are connected to the central wire of their coaxial cable.

The reference electrodes are connected to the screen of their coaxial cable.

Input B

- Connect the central of the coaxial cable to the terminal 14 marked high impedance HI.
- Connect the shield of the coaxial cable to the terminal 15 marked low impedance LO.

Input C

- Connect the central of the coaxial cable to the terminal 23 marked high impedance HI.
- Connect the shield of the coaxial cable to the terminal 24 marked low impedance LO.

Use only the original cables supplied by the manufacturer to connect the sensors to the input terminals of the instrument.

⚠ The connecting cable generally has a conductive sheath, very thin, between the central conductor and the shield.
Remove at least 5 mm of this sheath to avoid contact with the pin to the central conductor of the shielded cable.

⚠ In case any sensor (or transmitter) is not connected to one or both inputs (B and C), **it is necessary** to place a jumper between the terminals marked HI and LO.
Because of this jumper the display will show the values 7.00 pH or 0 mV according to the selected scale.

5.6.4 CONNECTING THE PH TRANSMITTERS TO INPUT B AND C

Instead of pH sensor, a transmitter with 4-20 mA analogue output can be connected to the instrument.

Input B

- Connect the analog output's positive pole to the terminal 14 marked HI.
- Connect the analog output's negative pole to the terminal 15 marked LO.
- Connect a resistor (shunt) of 100 ohms and precision 0.1% between terminals 14-15.

Input C

- Connect the analog output's positive pole to the terminal 23 marked HI.
- Connect the analog output's negative pole to the terminal 24 marked LO.
- Connect a resistor (shunt) of 100 ohms and precision 0.1% between terminals 23-24.

5.6.5 CONNECTING THE TEMPERATURE SENSOR

To get the display of the temperature value and the automatic compensation of the effect of temperature on the pH measurement is necessary to connect the temperature sensor Pt100 or Pt1000 as shown in chapter "Connection diagram (page 86)", using the appropriate wire section.

If the temperature sensor is not connected, interrupted or in short circuit, the instrument automatically switches to the manual temperature compensation.

Two-wire Pt100 / Pt1000 connection for short distances

- Connect the Pt100 / Pt1000 to terminals 17-18 (marked T2-T1) and install a jumper between 16-17 (marked T0-T2).

Three wire Pt100 / Pt1000 connection for great distances

- Connect a Pt100 / Pt1000 wire to terminal 18 marked T1.
- Connect the Pt100 / Pt1000 common wire to terminal 16 marked T0 and to terminal 17 marked T2 using two separate wires.

> ⚠ Do not interrupt the connecting cable. Use extension cable fastened on high insulation junction box.
>
> Keep the cable away from the power cables.
>
> In case of interference use shielded cable, connecting the shield to ground terminal 3.

5.6.6 CONNECTING THE ANALOG OUTPUTS

The instrument provides two output current signals to drive an external recorder, PLC or other similar devices.

- Connect the (+) of the recorder N°1 to the terminal 30 marked R1 +.
- Connect the (+) of the recorder N°2 to the terminal 31 marked R2 +.
- Connect the (-) of the recorder to the terminal 29 marked R0 -.

If the output signal drives more devices, they must be connected in "series" between them. The sum of their input resistance must not be greater than 600 Ω.

Alternatively, the outputs can be used for PID control, and then connected to actuators accepting an analog current signal (the connection is same as for the recorders).

> ⚠ Do not give any external power to the analog output terminals. It will damage the circuits of the instrument.

5.6.7 CONNECTING THE SERIAL PORT RS 485

The serial port of the instrument for the digital communication of the measures and parameters is like a slave equipment operating with two protocol type as described in the chapter "Digital operation (page 75)".

- Connect the positive RS 485 interface to the terminal 39 marked A+.
- Connect the negative RS 485 interface to the terminal 38 marked B-.
- Connect the ground RS 485 interface to the terminal 37 marked GND.

5.6.8 CONNECTING PUMPS, SOLENOIDS AND ALARMS

The 4 relays can be used for the regulation of the three main measures if configured in the system configuration menu.

The contacts of the relays are available on the dedicated terminal block.

They consist of two normally open SPST contacts for relay 1 and relay 2.
They consist of two SPDT contacts for relay 3 and 4.
For the alarm function must use the three relays.
For the sensor cleaning function must use the relay 4.

RELAY 1
terminal 5 marked C : common
terminal 4 marked NO : normally open
This relay is normally used for the SET 1 or SET 2.

RELAY 2
terminal 7 marked C : common
terminal 6 marked NO : normally open
This relay is normally used for the SET 1 or SET 2.

RELAY 3
terminal 9 marked C : common contact
terminal 8 marked NO : normally open contact
terminal 10 marked NC : normally closed contact
This relay is normally used for the alarm but can be used for the SET1 and SET2.
The alarm relay can be configured on / off status (ACTIVE / NOT ACTIVE) when in alarm status.
The "deactivated" configuration (NON ACTIVE) allows to signal the switching off or non-operation of the instrument
The alarm condition occurs when:
exceeding the min / max values selected;
exceeding the residence time of set point 1 and 2 if configured;
contact of logic input 1 and 2 if configured.

RELAY 4
terminal 12 marked C : common contact
terminal 11 marked NO : normally open contact
terminal 13 marked NC : normally closed contact
This relay is normally used for the sensor cleaning function but can be used for the SET1 and SET2.

Drive the loads of the relay by a power different from that of the instrument in order to prevent interferences due to the inductive loads.
If necessary use snubbers.
Protect the relay contacts by fuse.
Do not exceed the rated current value of the contacts (5 A resistive).
Each relay can be configured to perform the min/max function (HI/LO).

The set point values can be set if it was not inhibited calibration, the delay is set in the setup menu. (See chapters "Set point (page 63)" and "Setup (page 64)").

To modify the min/max function and the regulation type of the set points see the chapter "Configuration (page 68)".

Set points and alarm feature the delay setting (see "Setup (page 64)").

5.6.9 CONNECTING THE LOGIC INPUTS

The free voltage contacts (in closure) from an external device should be applied to the logic input terminals 27-28 (marked D1-D+) and 26-28 (marked D2-D+).

The activation and the configuration of the logic input are described on the display S6.1 ("Setup (page 64)") and C6.1 ("Configuration (page 68)").

The hold or alarm function are described in the chapter "Technical specification (page 18)".

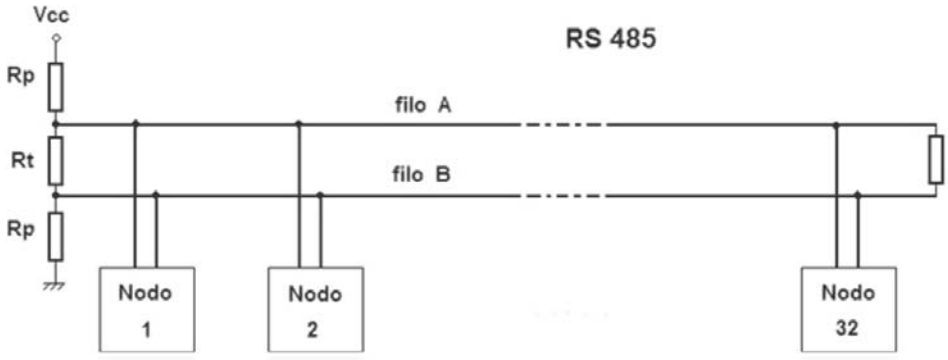
5.6.10 NETWORK CONNECTION (RS485)

This instrument uses a RS485 driver with slow switching fronts.

For this reason it is not necessary to complete the termination of the transmission line even for long distances.

The following indications are to be considered as examples.

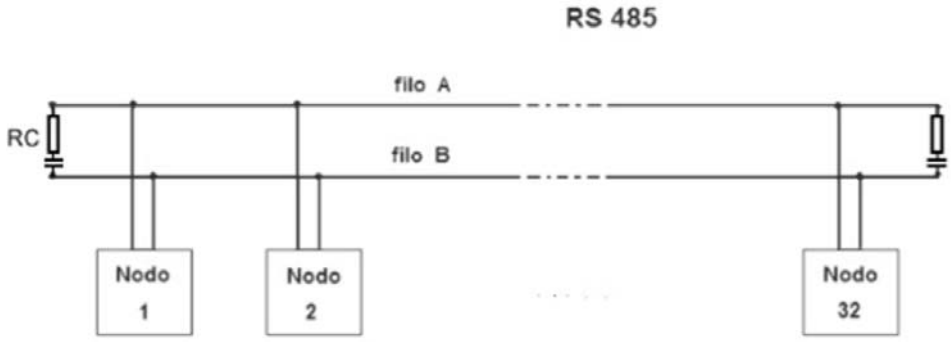
If the driver of the master device has very fast switching fronts, it may be necessary to terminate the beginning and end of the transmission line. In this case it should be inserted in the transmission line a pull-up and pull-down Rp resistors to keep the line polarized and to ensure the starting condition (start bit).



Termination with pull-up and pull-down resistances.

If the power supply to insert the pull-up and pull-down resistances is not available or driver over charge

increasing the consumption of the sensors and devices is avoided, make an AC termination by inserting a capacitor in series with the termination resistor.



AC termination

5.7 DISPOSAL

In case of disposal of the instrument, apply the terms of the law provided for the disposal of electronic devices.

6 OPERATING PROCEDURE

6.1 OPERATING PRINCIPLES

Measure of the oxidizers

This intrument measures the oxidizing substances in water with two types of sensors:

- two or three electrodes immersed in an electrolyte separated from the sample by a membrane selective to the substance to be measured.
- three-electrode amperometric cell, commonly called "potentiostatic sensor".

In the two electrodes cell is applied a suitable polarization voltage to the two electrodes (anode and cathode) through which flows the electric current proportional to the concentration of the oxidizers present in the solution.

In the three electrodes cell is applied a suitable bias voltage to the two electrodes (anode and the counter electrode) in contact with the sample, through which flows the electric current proportional to the concentration of the oxidizers present in the solution.

A reference electrode is used to compensate the internal electrical resistance and the oxidation-reduction potential that occur on the measuring.

The main advantages of the potentiostatic measuring technique are the following:

- a steady and accurate correlation between cell current and concentration of the dissolved oxidizers, especially to very low values;
- the measured value in water without the presence of oxidizers is practically equal to zero;
- the frequency of the instrument calibration in the field is considerably reduced.

In both types of sensor the flow of current makes a chemical reaction in proximity of the electrodes. For this reason the oxidizer must be renewed by means of a constant flow of the sample so to maintain a correct value of the measure.

The constant flow of the sample is obtained by means of a special overflow cell whose use is recommended.

In both cases, you can make corrections (zero and sensitivity) to compensate for changes in sensor response due to the conditions of use.

The temperature influences the activity of the ionic solution and with it the signal provided by the sensor.

For this reason it is necessary to use the temperature compensation in applications where the temperature of the liquid is significantly different from the reference value of 20 °C.

The user needs to evaluate the installation of a temperature probe in order to perform the automatic compensation in case the temperature undergoes large changes.

Measure of pH and ORP

In the pH measurement the instrument receives a mV signal from the sensor and provides the value in pH units, in accordance with the Nernst law relating to the type of sensor used.

In the ORP measuring, the instrument receives a mV signal from the sensor and provides the value in mV.

n both cases, you can make the zero and sensitivity adjustment to compensate the changes of the sensor response due to the conditions of use.

The temperature influences the ion activity of the solution and with it the signal provided by the sensor.

For this reason, in the pH measurement must be used the temperature compensation in applications where the temperature of the sample is significantly different from the reference value of 20 °C.

t is necessary to consider the installation of a thermoresistance and the use of the automatic temperature compensation in case of important changes.

pH compensation for free chlorine measurement

In free chlorine measurement's the sensors used detect the presence of hypochlorous acid (HOCl) present in the solution, the quantity of which derives from the dissociation reaction HOCl <-> OCl^- which is strongly influenced by the pH value of the solution.

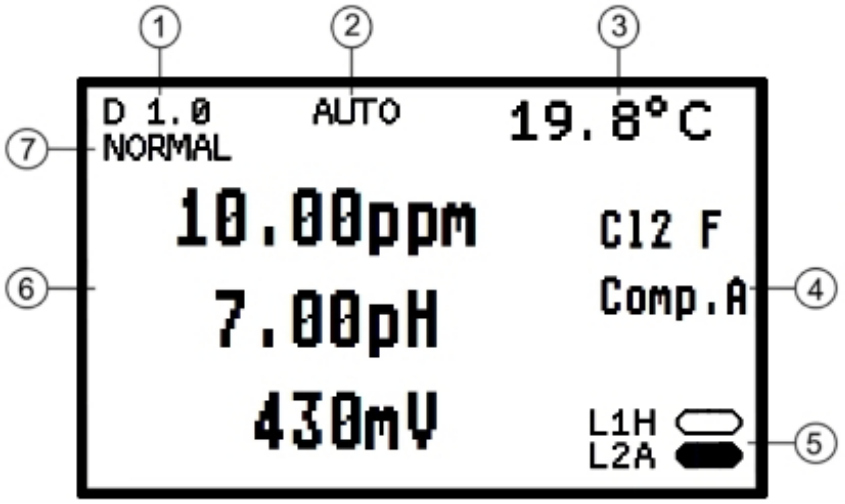
An analysis of the reaction reported above shows that the percentage of HClO reaches its maximum at a pH of about 6.0 to then drop drastically below 50% for pH values above 7.5.

Not being able to dispose of samples to be tested with controlled pH, tend to use two solutions: the correction of the pH of the sample in order to obtain values around 6.5 by weak acids (in liquid or gaseous form) or compensation of the value detected through a correction according to the pH measurement.

The CL 6587.103 instrument allows to perform this compensation using both a manually set value and a value detected by a pH sensor connected directly to the instrument or to another pH meter with 4-20 mA output.

The preset compensation tables allow a good approximation of the actual value of free chlorine (which can also depend on other factors) but can also be easily customized for every need.

6.2 DISPLAY



1. Display ID
2. Operating mode
3. Secondary display
4. Measuring information
5. Information display (set points and analog inputs status; functions and messages)
6. Main display
7. Instrument status: NORMAL, CLEAN, HOLD, ALARM (MEAS/S1/S2/L1/ L2),HN

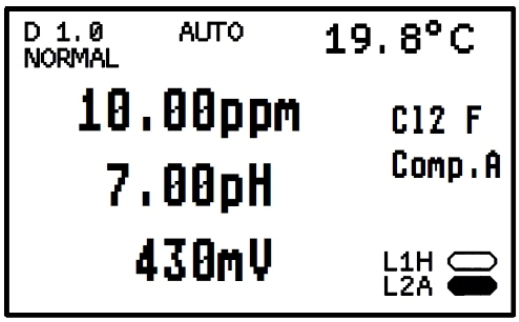
6.3 KEYBOARD

KEYS	FUNCTION
ZERO	- To access the zero calibration
SENS	- To access the sensitivity calibration
SET 1	- To access the set point 1 setting
SET 2	- To access the set point 2 setting
MODE	- To visualize the available displays - To exit from the not confirmed calibrations sequences
^	Key "UP" - To modify (increase) the displayed data - To turn the unit to the main display
v	Key "DOWN" - To modify (decrease) the displayed data - To not return to the main display (valid only for D1.1, D1.2, D1.3)
ENT	- To enter the effected changings and selections

6.4 USERS INSTRUCTION

6.4.1 MAIN DISPLAY

The display shows the measured values of the inputs A, B, C, the temperature and the logic inputs status.



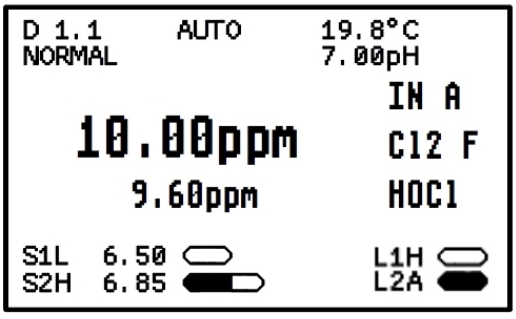
If the user has enabled the cleaning function, during the cleaning cycle will show the value of the measure and the cleaning phase in progress: CLEAN or HOLD.

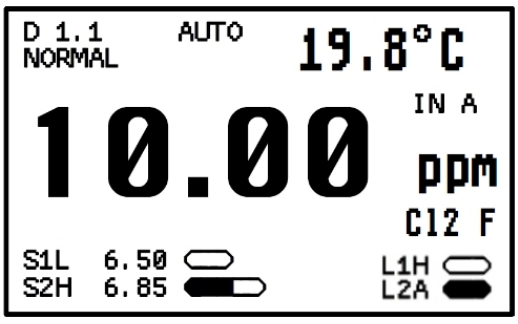
Symbol map	
	Active relay or input
	Non active relay or input
	Relay's activation delayed
	Proportional activation level (PID)

6.4.2 INPUT A MEASURING

Pressing the MODE key from the D1.0 display will be possible to display the measured value on input A (oxidizing) and access the calibration procedures and the set point, if have not been reserved to the maintenance staff.

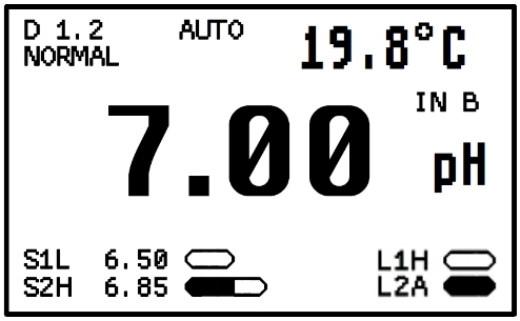
If the pH compensation is activated, the display shows the pH value of input B, the compensated chlorine value and the not compensated value ($HOCL^-$).





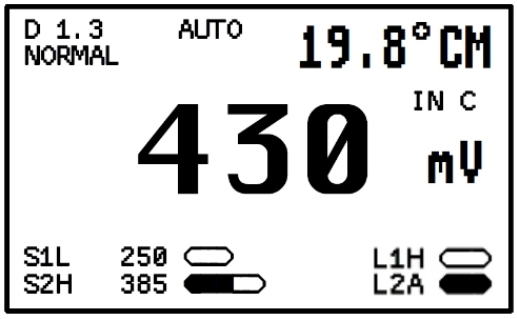
6.4.3 INPUT B MEASURING

By pressing twice the key MODE from D1.0 display it will be possible to display the value of the input B (pH / ORP) and access the calibration procedures, the set point, if these have not been reserved the maintenance staff.



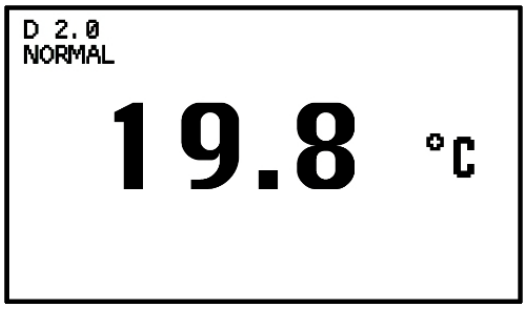
6.4.4 INPUT C MEASURING

Pressing three times the key MODE from D1.0 display will be possible to display the value of the input C (pH / ORP) and access the calibration procedures, the set point, if these have not been reserved the maintenance staff.



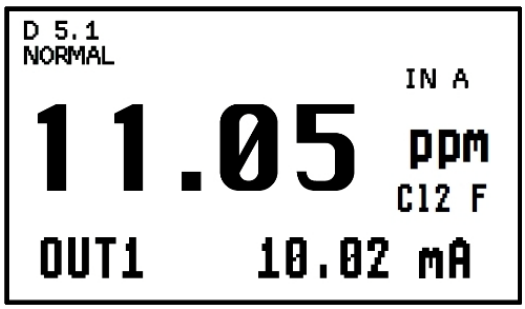
6.4.5 TEMPERATURE MEASURING

Press four times the MODE key from the display D1.0 to visualize the temperature value and to access the sensor calibration (if any).



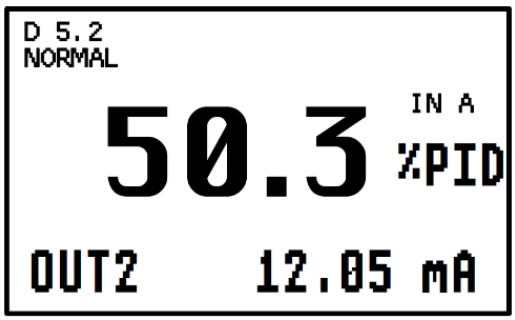
6.4.6 ANALOG OUTPUT 1 VALUES

Press MODE five times from the display D1.0 to visualize the output signal and the corresponding current value.



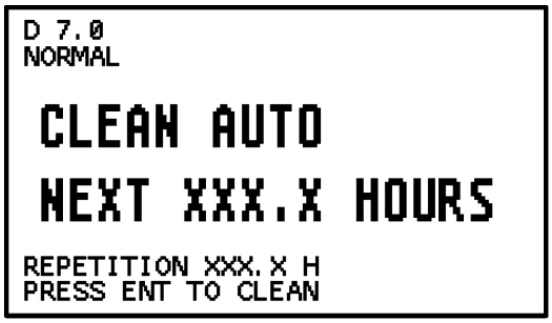
6.4.7 ANALOG OUTPUT 2 VALUES

Press MODE six times from the display D1.0 to visualize the output signal and the corresponding current value.



6.4.8 AUTOCLEAN

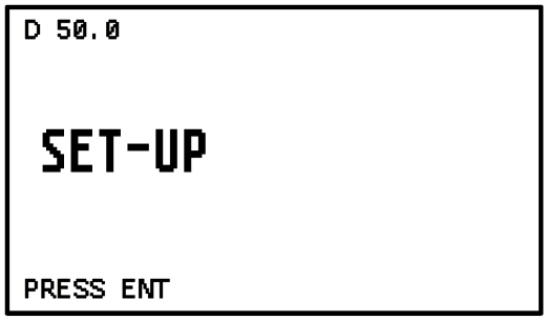
Press MODE seven times from the display D1.0 to visualize the autoclean status, the remaining time to the next cycle and the repetition time as configured in the setup menu.
This function is available if assigned to relay 4.



ENT	to start a cleaning cycle.

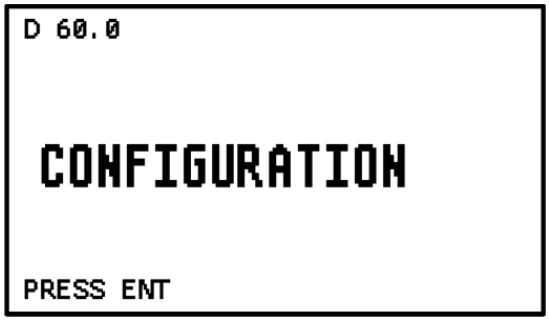
6.4.9 PARAMETERS FOR THE MAINTENANCE

Press MODE eight times (seven if clean function is not active) from the display D1.0 to visualize the SETUP display to access the maintenance menu of the unit.



6.4.10 PARAMETERS FOR THE PLANT ENGINEER

Press MODE nine times (eight if clean function is not active) from the display D1.0 to visualize the CONFIGURATION display to access the installation menu of the unit.



6.4.11 INFORMATION MENU

Press MODE ten times (nine if clean function is not active) from the display D1.0 to visualize the information menu from which you can access the information functions of the instrument.

ENT	press the key to visualize and to confirm in sequence the setup parameters
UP or DOWN	press the key to modify the values
MODE	press the key to turn to the D70.0 display any time

Display	Contents	Meaning	Possible values
I1.0	B&C electronics CL6587 R1.00	P/N e firmware release	
I2.0	LCD BRIGHTNESS 8	Screen brightness	0 ÷ 30
I3.0	LCD CONTRAST 8	Screen contrast	0 ÷ 30
I4.0	LCD MODE NORMAL	Type of visualization of the screen	NORMAL REVERSE
I5.0	TOTAL: XXXXX h	Total operating hours	

6.5 MAINTENANCE INSTRUCTIONS

6.5.1 PRELIMINARY OPERATIONS

All the functioning operations must be done with sensors or simulator connected to the unit.

Verify if the configuration, the set point and the alarm parameter are suitable for the current application.

Follow the procedures described in the chapter "Setup (page 64)" to verify the parameters without modifying the values.

In the setup of the system, you can enable / disable the ability to perform calibration of the sensors and change the values of set point and alarm.

The display allows the operator to perform the preliminary check.

The lit display indicates that the unit is powered and the power circuits work correctly.

6.5.2 MEASURING OPERATIONS

In order to operate the system, verify previously the following:

- the sensors are connected and in operation;
- the power and the ground are connected;

and if necessary

- the analog outputs;
- the loads of relays 1 and 2;
- the alarm relay;
- the logic inputs.

Power the unit and look on the display the measuring value and the set points status.

If the sensors are connected as described in the chapter "Installation (page 40)", the system will work correctly and it will need just the calibration, the set points and alarm values selection.

6.5.3 CALIBRATION

To perform zero and sensitivity calibration go to the D1.x display of the desired channel and use ZERO and SENS keys to start the calibration.

Follow the sequence of operations suggested by the instrument firmware, proper of each selected parameter, using the UP, DOWN and ENT keys.

6.5.4 CALIBRATION OF THE MEASURE

The main measure of the concentration of oxidizing substances can be zero and sensitivity calibrated.

Before performing the calibration wait until the time required for polarization of the electrochemical sensor.

It should also verify if the automatic pH compensation on the basis of pH value of the input B is active. In that case make the pH adjustment before that of chlorine.

> *The newly installed (or after maintenance) chlorine sensors require a few hours of operation before providing a proper measure.*
>
> *During the initial phase of operation the instrument will provide a higher reading than the actual one.*
>
> *It is recommended to keep the sensor polarized in water without chlorine for a few hours before proceeding with the calibration which in any case must be refined after a few days of work.*

If the reservoir of the membrane type sensor is empty, it must be filled with the electrolyte provided with the sensor.

Refer to the sensor instructions.

The calibration of the meter in case of temperature compensation requires special precautions:

- set the manual temperature value in the setup menu;
- set the correct value of temperature coefficient in the set up menu;
- install the temperature sensor in case of automatic compensation;
- wait until the sensor has reached a state of thermal equilibrium with the solution itself. This state of equilibrium can be considered achieved when the display shows stable values.

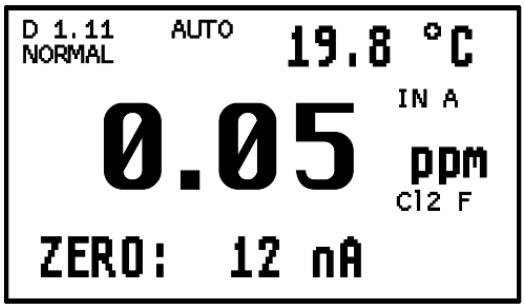
Zero calibration

Zero calibration, if necessary, can be done sending a sample to the measuring cell without chlorine and/or other oxidants.

When it reaches the stabilization of the measurement to values close to zero it is possible to bring to zero the display by the procedure described below.

For potentiostatic sensors the zero calibration can be performed with the sensor in dry air.

On the display D1.1 press the key ZERO to get the following display:



UP and DOWN	to change the displayed value
ENT	to confirm the displayed value

On the information display will appear UPDATE message or error message if the calibration is not successful.

The user can reset to zero factory as follows:
start the calibration of zero, simultaneously press UP, DOWN and ENT.

Sensitivity calibration

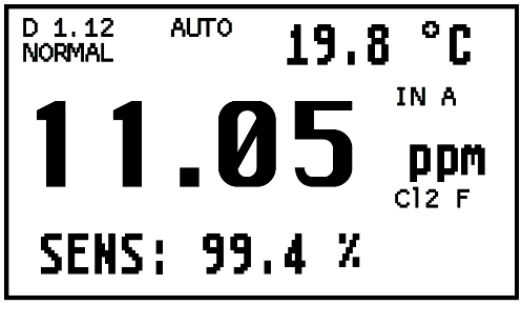
Sensitivity calibration may be carried out only when the actual value of the concentration of the sample is known.

Normally the sample concentration is previously measured with a field photometric instrument (or method) suitable for the measurement of the sample.

You must select the photometer able to perform the measurement of the sample at the desired scale and with an adequate precision.

It's also important to carry out the calibration of sensitivity to higher values possible in order to get a good accuracy of measurement over the entire selected scale.

On the display D1.1 press the key SENS to get the following display:



UP and DOWN	to change the displayed value
ENT	to confirm the displayed value

On the information display will appear UPDATE message or error message if the calibration is not successful.

The user can reset to sensitivity factory as follows:
start the calibration of sensitivity, simultaneously press UP, DOWN and ENT.

One point calibration

In some cases it can be considered sufficient to make only the single-point calibration. In this case you will have to perform the zero calibration if the process provides values close to zero. If the process provides values not below 10% of full scale you will have to carry out the calibration of the sensitivity.

Error messages

The error messages during the calibration inform the user that the sensor is in unacceptable operating condition and therefore risky for the plant.

Deviations of zero value above +/- 20% of full scale and deviations of the sensitivity under 12.5% or above 250% of full scale, are considered errors.

In case of error is advisable to verify the sensor, electrolyte and membrane or to replace the sensor.

6.5.5 PH CALIBRATION (INPUTS B AND C)

The procedures described below are applicable to input B and C in case a pH sensor is connected.

Before calibration (also called electrodes standardization), check that the glass membrane of the sensor was kept moist during storage.

If the protective reservoir is empty and the glass membrane is dry, immerse the electrode in a buffer solution or in tap water (do not use distilled water) for at least three hours before proceeding.

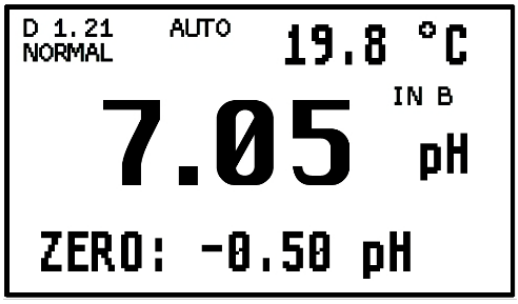
In any case, follow the instructions of the manufacturer of the electrode.

To make the standardization of the pH electrodes you can use the buffer solutions from B&C Electronics.

Zero calibration

Place the electrode in solution at pH = 7 (SZ 954) to calibrate the 1st point (Zero calibration).

Press ZERO to get the following display:



UP and DOWN	to change the displayed value
ENT	to confirm the displayed value

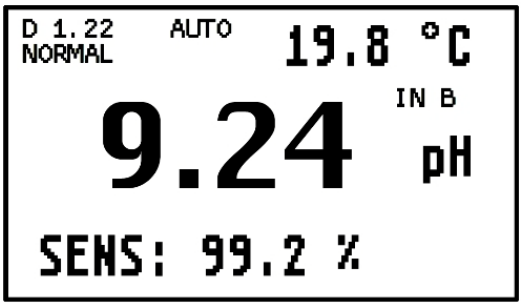
On the information display will appear UPDATE message or error message if the calibration is not successful.

The user can reset to zero factory as follows:
start the calibration of zero, simultaneously press UP, DOWN and ENT.

Sensitivity calibration

Place the electrode in solution at pH = 4 (SZ 952) or pH = 9 (SZ 956) to calibrate the 2nd point (Calibration of sensitivity).

Press SENS to get the following display:



UP and DOWN	to change the displayed value
ENT	to confirm the displayed value

On the information display will appear UPDATE message or error message if the calibration is not successful.

The user can reset to sensitivity factory as follows:
start the calibration of sensitivity, simultaneously press UP, DOWN and ENT.

One point calibration

In some cases it may be considered sufficient to perform a one point calibration with a buffer solution of value close to the average measure.

In this case follow the zero calibration procedure.

Error messages

The error messages during the calibration inform the user that the pH electrode is in unacceptable operating condition and therefore risky for the plant.

In fact a deviation of zero > 2 pH is indicative of excessive pollution of the reference electrode.

A deviation of sensitivity < 80 % or > 110 % indicates an exhausted electrode or losses in connection cable.

In these situations is suggested to replace the electrode.

⚠ If the value of the standard solution is different from expected it may mean that:

- the real value of the buffer used is very different from the nominal one (the solution is polluted or altered):
- the electrode is not operating normally (broken, badly installed).

The calibration of the pH meter in case of temperature compensation requires special precautions:

- consider the value of pH of the buffer at the operating temperature;
- detect the value of the temperature of the solution;
- wait for the stabilization of the temperature measurement.

6.5.6 ORP CALIBRATION (INPUTS B AND C)

he procedures described below are applicable to input B and C in case of a ORP sensor is connected.

In general it is preferable to operate with the factory calibration in order to measure the actual values s upplied by the ORP electrode.

Should calibration be necessary is advisable to perform only zero calibration.

If the sensing part is dry, soak the electrode in tap water (do not use the distilled water) for at least three hours before proceeding.

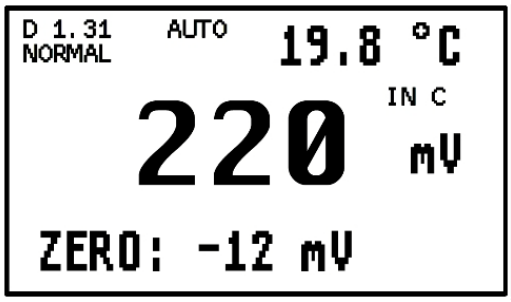
In any case, follow the instructions of the manufacturer of the electrode.

To standardize the ORP electrode you can use the standard solution of the B&C Electronics.

Zero calibration

Place the electrode in the standard solution at mV = 220 (SZ 961) to calibrate the 1st point (Zero calibration).

Press ZERO to get the following display:



UP and DOWN	to change the displayed value
ENT	to confirm the displayed value

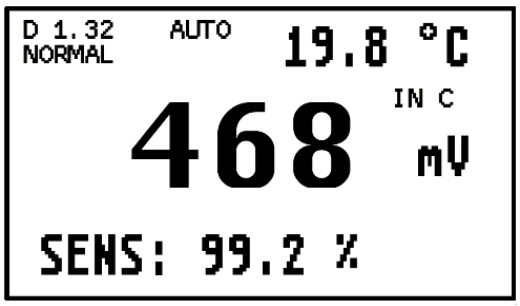
On the information display will appear UPDATE message or error message if the calibration is not successful.

The user can reset to zero factory as follows:
start the calibration of zero, simultaneously press UP, DOWN and ENT.

Sensitivity calibration

If the sensitivity calibration is necessary, place the electrode in the second standard solution.

Press SENS to get the following display:



UP and DOWN	to change the displayed value
ENT	to confirm the displayed value

On the information display will appear UPDATE message or error message if the calibration is not successful.

The user can reset to sensitivity factory as follows:
start the calibration of sensitivity, simultaneously press UP, DOWN and ENT.

Error messages

The error messages during the calibration inform the user that the ORP electrode is in unacceptable operating condition and therefore risky for the plant.

In fact a deviation of zero > 100 mV is indicative of excessive pollution of the reference electrode.

A deviation of sensitivity < 70 % or > 140 % indicates an exhausted electrode or losses in connection cable.

In these situations is suggested to replace the electrode.

If the value of the standard solution is different from expected it may mean that:

- the real value of the buffer used is very different from the nominal one (the solution is polluted or altered):
- the electrode is not operating normally (broken, badly installed).

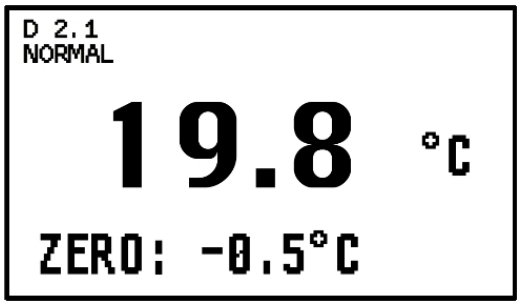
6.5.7 TEMPERATURE CALIBRATION

Temperature sensor connected

It can be done when the temperature sensor is connected to the unit.

Immerse the sensor in a liquid or keep the sensor in the air knowing the value of the temperature.

On the display D2.0 press the key ZERO and it will appear the calibration display:



UP and DOWN	press to change the displayed value
ENT	press to confirm the displayed value

On the information display will appear UPDATE message or error message if the calibration is not successful.

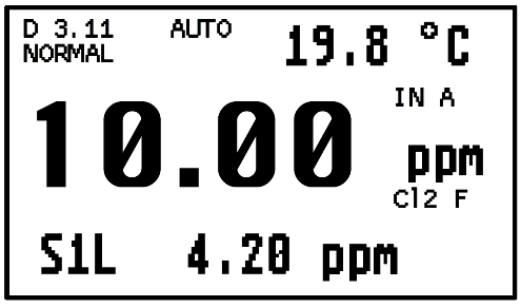
> *The reset to factory value in the main display is done as follows: start the calibration of temperature, simultaneously press the UP, DOWN and ENT.*

Temperature sensor not connected

The temperature for the manual compensation can be changed in the setup menu, refer to the chapter "Setup (page 64)".

6.5.8 SET POINT

Pressing the key SET1 or SET2 on D1.1, D1.2, D1.3 display will see the following display (the example refers to the set point 1 of the input A):

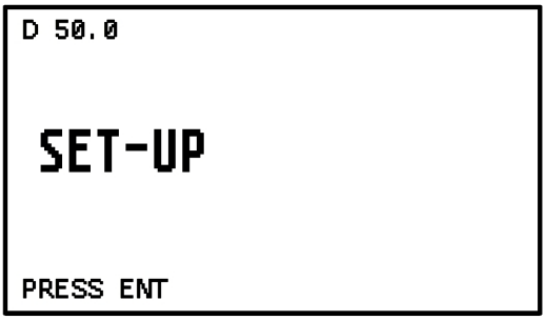


UP and DOWN	to change the displayed value
ENT	to confirm the displayed value

6.5.9 SETUP

Since the instrument has three independent measuring channels you need to select the input on which to operate.

Press MODE eight times form the D1.0 display to go to the D50.0 display (seven times if the clean function is not activated).



Sequence to access setup menu

ENT	press to enter the password
UP and DOWN	press to select system, input A, input B or input C setup
ENT	press to confirm
ENT	press to display and confirm the sequence of the setup parameter of the unit
UP and DOWN	press to change the displayed value
MODE	press to turn to the D50.3 display any time

Depending on the configuration of the instrument the setup parameters may not be visualized.

The display on the top left of each screen identifies the input on which you are working.

Display	Contents	Meaning	Possible values
D50.1	PASSWORD SET-UP ---	Password to access the setup menu	000 ÷ 999
S1.1	CAL FUNCTION ON	Inhibition of the zero and sensitivity calibration and set point changings	ON OFF
S2.1	TEMP. UNIT °C	Temperature measuring unit	°C °F
S2.2	TEMP. MANUAL 20.0 °CM	Manual temperature compensation	Variable
S6.1	LOGIC INPUT1 OFF	Logic input 1 setting	ON OFF
S6.2	LOGIC INPUT2 OFF	Logic input 2 setting	ON OFF

Display	Contents	Meaning	Possible values
S7.1	CLEAN OFF	Cleaning function activation	OFF AUTO MANUAL
S7.2	CLEAN REPETITION 24.0 h	Cleaning cycle	0.5 ÷ 100.0 h
S7.3	CLEAN TIME 15.0 s	Cleaning time	1.0 ÷ 60.0 s
S7.4	HOLD TIME 3.0 min	Holding time	0.1 ÷ 20.0 min
S50.1	PASSWORD MODIFY ---	Password change	0 ÷ 999

Setup of the input A

Display	Contents	Meaning	Possible values
S1.1	pH MANUAL 7.00pHM	pH manual value	0.00 ÷ 14.00 pH
S2.3	TEMP.COEFFICIENT 2.00%/°C	Temperature coefficient	0.0 ÷ 4.00 %/°C
S3.1A	HYSTERESIS SET1 0.20 ppm	Hysteresis of the set point 1	Variable
S3.2A	SET1 DELAY 0.2 s	Delay of the set point 1	0.0 ÷ 99.0 s
S3.1B	PROP. BAND SET1 1.0 %	Proportional band of the set point 1 in PID function	Variable
S3.2B	INTEG. TIME SET1 0.0 min	Integral time (minutes) of the set point 1 in PID function	0.0 ÷ 999.9 min
S3.3B	DERIV. TIME SET1 0.0 min	Derivative time (minutes of the set point 1 in PID function	0.0 ÷ 999.9 min
S3.4B	IMPULSE F. SET1 100 i/min	Pulse frequency of the set point 1 in PID (FM) function	0 ÷ 120 i/min
S3.4B	IMPULSE T. SET1 20.0 s	Pulse width of the set point 1 in PID (WM)	0 ÷ 99.9 s
S3.5A	HYSTERESIS SET2 0.20 ppm	Hysteresis of the set point 2	Variable
S3.6A	SET2 DELAY 0.2 s	Delay of the set point 2	0.0 ÷ 99.0 s
S3.5B	PROP. BAND SET2 1.0 %	Proportional band of the set point 2 in PID function	Variable
S3.6B	INTEG. TIME SET2 0.0 min	Integral time (minutes) of the set point 2 in PID function	0.0 ÷ 999.9 min

Display	Contents	Meaning	Possible values
S3.7B	DERIV. TIME SET2 0.0 min	Derivative time (minutes of the set point 2 in PID function	0.0 ÷ 999.9 min
S3.8B	IMPULSE F. SET2 100 i/min	Pulse frequency of the set point 2 in PID (FM) function	0 ÷ 120 i/min
S3.8B	IMPULSE T. SET2 20.0 s	Pulse width of the set point 2 in PID (WM)	0 ÷ 99.9 s
S4.1	LO ALARM -1.00 ppm	Alarm relay minimum value	Variable
S4.2	HI ALARM 21.00 ppm	Alarm relay maximum value	Variable
S4.3	ALARM DELAY 1.0 s	Delay (seconds) of the alarm relay	0.0 ÷ 100.0 s

Setup of the input B or input C

Display	Contents	Meaning	Possible values
S3.1A	HYSTERESIS SET1 0.02 pH	Hysteresis of the set point 1	Variable
S3.2A	SET1 DELAY 0.2 s	Delay of the set point 1	0.0 ÷ 99.0 s
S3.1B	PROP. BAND SET1 1.0 %	Proportional band of the set point 1 in PID function	0.0 ÷ 400.0 %
S3.2B	INTEG. TIME SET1 0.0 min	Integral time (minutes) of the set point 1 in PID function	0.0 ÷ 999.9 min
S3.3B	DERIV. TIME SET1 0.0 min	Derivative time (minutes of the set point 1 in PID function	0.0 ÷ 999.9 min
S3.4B	IMPULSE F. SET1 100 i/min	Pulse frequency of the set point 1 in PID (FM) function	0 ÷ 120 i/min
S3.4B	IMPULSE T. SET1 20.0 s	Pulse width of the set point 1 in PID (WM)	0 ÷ 99.9 s
S3.5A	HYSTERESIS SET2 0.02 pH	Hysteresis of the set point 2	Variable
S3.6A	SET2 DELAY 0.2 s	Delay of the set point 2	0.0 ÷ 99.0 s
S3.5B	PROP. BAND SET2 1.0 %	Proportional band of the set point 2 in PID function	Variable
S3.6B	INTEG. TIME SET2 0.0 min	Integral time (minutes) of the set point 2 in PID function	0.0 ÷ 999.9 min
S3.7B	DERIV. TIME SET2 0.0 min	Derivative time (minutes of the set point 2 in PID function	0.0 ÷ 999.9 min

Display	Contents	Meaning	Possible values
S3.8B	IMPULSE F. SET2 100 i/min	Pulse frequency of the set point 2 in PID (FM) function	0 ÷ 120 i/min
S3.8B	IMPULSE T. SET2 20.0 s	Pulse width of the set point 2 in PID (WM)	0 ÷ 99.9 s
S4.1	LO ALARM 0.00 pH	Alarm relay minimum value	Variable
S4.2	HI ALARM 14.00 pH	Alarm relay maximum value	Variable
S4.3	ALARM DELAY 1.0 s	Delay (seconds) of the alarm relay	0.0 ÷ 100.0 s

6.5.10 MAINTENANCE

Quality components are used to give the controller a high reliability.

The frequency of controller's maintenance depends on the nature of each particular application.

⚠ Disconnect the power supply to the unit before performing the following:

- dust removal from the terminals;
- operations on the wires connecting the terminals;
- mounting of the instrument.

As with any electronic device mechanical components such as buttons, relays, terminal blocks, are the parts most subject to failure.

- Periodically check that the device is not subject to excessive moisture.
- Check that the connections to the terminals are free of dust and corrosion.
- Check that the terminals screws are tight.
- Check that the cable glands are properly tightened.

6.5.11 MAINTENANCE OF SENSORS

It is recommened to perform periodical maintenance of the sensor as described below, so to avoid incorrect measurements.

The sensors must be inspected and cleaned regularly, most frequently in the case of applications in alkaline liquids, or fat-containing or organic substances.

Periodically, according to the needs of the application, perform the calibration operations.

In case of no use for long periods, store the potentiostatic sensor with the protective cap containing a storage liquid, or tap water.

Do not use distilled water.

To store membraned sensors please refer to the sensor's instruction manual.

Store the membraned sensors following the sensor instructions.

6.6 INSTRUCTION OF THE INSTALLATION

6.6.1 SAFETY REQUIREMENTS

⚠ After performing the installation (see chapter "Installation (page 40)"), before turning the power on and proceed to the configuration of the instrument is recommended to do the following:

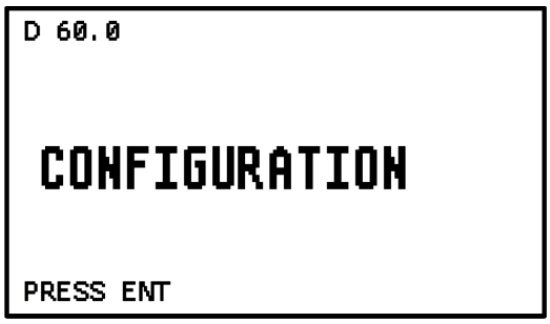
- check that the terminal 3 is grounded;
- check that all connections are correct;
- check that all connections are blocked on the terminals;
- check that the mechanical fixing of the cables does not cause any twisting or bending on the terminal blocks;
- check that eventual protection fuses are of appropriate value.

⚠ The damages due to incorrect connections during the installation are not covered by warranty.

6.6.2 CONFIGURATION

Since the instrument has three independent measuring channels you need to select the input on which to operate.

Press MODE nine times from the D1.0 display to get the D60.0 display (eight times if the autoclean function is not activated).



Sequence to access configuration menu

ENT	press to enter the password
UP and DOWN	press to select system, input A, input B or input C configuration
ENT	press to confirm
ENT	press to display and confirm the sequence of the setup parameter of the unit
UP and DOWN	press to change the displayed value
MODE	press to turn to the D60.3 display any time

Depending on the configuration of the instrument, few configuration parameters may not be visualized.
The display on the top left of each screen identifies the input on which you are working.

Configuration of the system

Display	Contents	Meaning	Possible values
D60.1	PASSWORD CONFIG. ---	Password to access the configuration	000 ÷ 999
C1.1	CONTROLLER MODE AUTO	Operating mode selection	AUTO MEAS SIM
C2.1	TEMP. SENSOR PT100	Pt100/Pt1000 temperature sensor type	PT100 PT1000
C3.1	RELAY 1 SET1 INPUT A	Relay 1 function	NOT USED SET 1 / 2 assigned to INPUT A / B / C
C3.2	RELAY 2 SET1 INPUT B	Relay 2 function	NOT USED SET 1 / 2 assigned to INPUT A / B / C
C3.3	RELAY 3 ALARM	Relay 3 function	NOT USED SET 1 / 2 assigned to INPUT A / B / C ALARM
C3.4	RELAY 4 CLEAN	Relay 4 function	NOT USED SET 1 / 2 assigned to INPUT A / B / C CLEAN
C4.5	ALARM FUNCTION ACTIVE	Alarm relay function if relay 3 = alarm	ACTIVE NON ACTIVE
C5.1	OUT1 INPUT A	Output 1 function	NOT USED OUT 1 assigned to INPUT A / B / C SET 1 / 2 assigned to INPUT A / B / C
C5.2	OUT2 INPUT B	Output 2 function	NOT USED OUT 2 assigned to INPUT A / B / C SET 1 / 2 assigned to INPUT A / B / C
C6.1	LOGIC INPUT1 HOLD	Logic input 1 function	HOLD ALARM
C6.2	LOGIC INPUT2 ALARM	Logic input 2 function	HOLD ALARM

Display	Contents	Meaning	Possible values
C8.1	BAUD RATE 9600	Baud rate	2400 / 4800 / 9600 / 19200 baud
C8.2	ID ASCII 32	ID B&C protocol	1 ÷ 99
C8.3	ID MODBUS 243	ID Modbus protocol	1 ÷ 243
C60.1	PASSWORD MODIFY ---	Password change	0 ÷ 999

The SIM operating mode allows the user to change the displayed value by means of ENTER key followed by UP and DOWN keys and confirm it with ENTER key.

Configuration of the input A

Display	Contents	Meaning	Possible values
C1.1	SENSOR WIRING 3 WIRES	Sensor type selection	3 WIRES 2 WIRES
C1.2A	2 WIRES SENSOR Cl2 F	Type of measure for 2 wires sensor	Cl2 F Cl2 C ClO2 O3 CUST
C1.2B	3 WIRES SENSOR Cl2 F	Type of measure for 3 wires sensor	Cl2 F ClO2 O3 Cl2 T CUST
C1.3A	Cl2 pH COMP. AUTO	pH compensation (free chlorine)	AUTO MANUAL OFF EDIT TABLE[a]
C1.3B	CUSTOM SENSOR ABCDE	Custom chemical species editing	Variable
C1.4	SENSOR CURRENT 160 nA/ppm	Nominal current selection	-2000 ÷ -10 nA/ppm 10 ÷ 2000 nA/ppm
C1.5	POLARIZATION -200 mV	Polarization selection	-1000 ÷ 1000 mV
C1.6	MEASURE UNIT ppb-ppm	Units selection	ppb-ppm µg/l-mg/l

Display	Contents	Meaning	Possible values
C1.7	MEASURE SCALE 20.00 ppm	Measure range selection	200.0 ppb µg/l 2.000 ppm mg/l 20.00 ppm mg/l 200.0 ppm mg/l 2000 ppm mg/l
C1.8	RT LARGE SIGNAL 2.0 s	Large filter software time setting	0.4 ÷ 50 s
C1.9	RT SMALL SIGNAL 10.0 s	Small filter software time setting	0.4 ÷ 50 s
C1.10	HIDDEN NEGATIVE OFF	Hidden negative value selection	ON OFF
C3.1	REGUL. MODE SET1 ON-OFF	Set point 1 regulation type	ON-OFF PID
C3.2	ACTUATION SET1 FM	PID regulation related to set point 1	FM WM
C3.3	SET1 FUNCTION LO	Set point 1 function HI/LO	LO HI
C3.4	REGUL. MODE SET2 ON-OFF	Set point 2 regulation type	ON-OFF PID
C3.5	ACTUATION SET2 FM	PID regulation related to set point 2	FM WM
C3.6	SET2 FUNCTION HI	Set point 2 function HI/LO	LO HI
C4.1	ALARM SET1 OFF	Alarm activation on set point 1 operation time	ON OFF
C4.2	TIME SET1 60 min	Operation time setting	0 ÷ 60 min
C4.3	ALARM SET2 OFF	Alarm activation on set point 2 operation time	ON OFF
C4.4	TIME SET2 60 min	Operation time setting	0 ÷ 60 min
C5.1	OUT1 INPUT ppm	Measure related to the analog output 1	ppm-mg/l °C / °F
C5.2	OUT1 0-20 mA	Range of the analog output 1	0-20 mA 4-20 mA
C5.3	OUT1 POINT P1 0.00 ppm	First point of the analog output 1	Variable
C5.4	OUT1 POINT P2 20.00 ppm	Second point of the analog output 1	Variable
C5.5	OUT2 INPUT ppm	Measure related to the analog output 2	ppm-mg/l °C / °F

Display	Contents	Meaning	Possible values
C5.6	OUT2 0-20 mA	Range of the analog output 2	0-20 mA 4-20 mA
C5.7	OUT2 POINT P1 0.00 ppm	First point of the analog output 2	Variable
C5.8	OUT2 POINT P2 20.00 ppm	Second point of the analog output 2	Variable

[a] = You can change the factory coefficients using the UP and DOWN keys and confirming the value with ENT. To reset the table to factory defaults, simultaneously press the UP, DOWN and ENT.

Configuration of the input B or input C

The configuration parameters are the same for both inputs.

Display	Contents	Meaning	Possible values
C1.1	MEASURE pH	pH/ORP selection	pH ORP
C1.2	pH SENSOR GLASS	pH sensor type	GLASS ANTIMONY EXT. 4-20 mA
C1.3	RT LARGE SIGNAL 2.0 s	Filter software large	0.4 ÷ 50 s
C1.4	RT SMALL SIGNAL 10.0 s	Filter software small	0.4 ÷ 50 s
C3.1	REGUL. MODE SET1 ON-OFF	Set point 1 regulation type	ON-OFF PID
C3.2	ACTUATION SET1 FM	PID regulation related to set point 1	FM WM
C3.3	SET1 FUNCTION LO	Set point 1 function HI/LO	LO HI
C3.4	REGUL. MODE SET2 ON-OFF	Set point 2 regulation type	ON-OFF PID
C3.5	ACTUATION SET2 FM	PID regulation related to set point 2	FM WM
C3.6	SET2 FUNCTION HI	Set point 2 function HI/LO	LO HI
C4.1	ALARM SET1 OFF	Alarm activation on set point 1 operation time	ON OFF
C4.2	TIME SET1 60 min	Operation time setting	0 ÷ 60 min

Display	Contents	Meaning	Possible values
C4.3	ALARM SET2 OFF	Alarm activation on set point 2 operation time	ON OFF
C4.4	TIME SET2 60 min	Operation time setting	0 ÷ 60 min
C5.1	OUT1 INPUT pH	Measure related to the analog output 1	pH / mV °C / °F
C5.2	OUT1 0-20 mA	Range of the analog output 1	0-20 mA 4-20 mA
C5.3	OUT1 POINT P1 0.00 pH	First point of the analog output 1	Variable
C5.4	OUT1 POINT P2 14.00 pH	Second point of the analog output 1	Variable
C5.5	OUT2 INPUT pH	Measure related to the analog output 2	pH / mV °C / °F
C5.6	OUT2 0-20 mA	Range of the analog output 2	0-20 mA 4-20 mA
C5.7	OUT2 POINT P1 0.00 pH	First point of the analog output 2	Variable
C5.8	OUT2 POINT P2 14.00 pH	Second point of the analog output 2	Variable

6.6.3 CHANGING THE TABLE FOR THE PH COMPENSATION

The instrument stores two predefined tables based on the type of sensor used.

If it is necessary to change the preset values of these tables, check the correct calibration and the correct functioning of the pH sensor before proceeding.

When changing the coefficients, only the table in use is changed.

To change the factory preset coefficients corresponding to the non-modifiable pH values, use the UP and DOWN keys and confirm the value entered with the ENT key.

The value of each coefficient can not be lower than the previous one.

To make the inserted table active, it is necessary to modify and/or confirm the value of all the coefficients.

Pressing the MODE key before inserting the last coefficient entails the exit from the modification procedure.

To bring the table back to the factory values, press the UP, DOWN and ENT keys at the same time.

6.7 DIGITAL OPERATION

The instrument is a slave device that interacts with a master device through the RS485 serial interface.

When connecting to a PC you may need a RS485/RS232 or RS485/USB converter (like the BC model 8701).

The communication takes place via the RS485 connection with the B&C protocols (ASCII) and Modbus RTU (function 03 - 06 -16) described in the following chapters.

When used with the B&C protocol, measurements can be received.

When used with the Modbus protocol, functions 03, 06 and 16 are implemented for reading the measurements and related parameters, changing the set point, alarm and cleaning management parameters.

6.7.1 B&C ASCII COMMUNICATION PROTOCOL

Connect the instrument to a PC for data management using a simple terminal emulation program (example Hyperteminal).

Transmission mode

Code set	ASCII
Number of bits per character:	
- start bits	1
- data bits	8
- parity	no parity
- stop bits	1
Error check (only A command)	BCC
Speed	9600 baud (default)

Commands format

2 bytes of ID transmitter (01 ÷ 32)

1 byte of command

n bytes of data to insert if requested by the command

1 byte <cr> (carriage return), end of the command

⚠ The instrument responds only under the correct received ID or 00.

⚠ Do not use the 00 ID if the instrument is in a network to avoid communication conflicts.

⚠ If the instrument is set to a different speed is not responding.

The available commands are listed in the following chapters.

The list of commands implemented in the transmitter is always available by sending the Help command.

HELP

Command format: **ID + H <cr>**

Example: if ID=14 type 14H <cr> or 00H <cr>

By sending the command **H** displays the list of available commands with a brief description of their meaning.

```
-------------------------------------------------------------------------------
HELP MENU, COMMAND LIST       B&C ELECTRONICS
-------------------------------------------------------------------------------
CLXX87.103 Rev.fw:1.00  S/N:160589

00H  <cr>  Help menu
00A  <cr>  Acquisition

Type ID number or 00 before command. Example, if ID=15 type 15A or 00A <cr>
Use 00A <cr> if only one device is connected
-------------------------------------------------------------------------------
```

ACQUISITION

Command format: **ID + A <cr>**

Example: if ID=14 type 14A <cr> or 00A <cr>

By sending the command **A**, the instrument responds by sending a record containing the code, the ID, date, time, and the value of all the measures.

Record format

```
CLXX87- 01 103 01/01/01 00:00:00 ± 20.00ppm  ±  7.00pH   ±   460mV   ±
....+....|....+....|....+....|....+....|....+....|....+....|....+....|....+....|
  20.0°C   ±  2.00%/°C ±     0comp ±  9.00pHM  ± 20.00ppm  ±     0stat
....+....|....+....|....+....|....+....|....+....|....+....|....+....|....+....|
 ±     0alar 01/01/01xx
```

CLXX87	p/n of the unit
10	ID
103	p/n extension
0.0	Power voltage (not implemented)
01/01/01	Date (not implemented)
00:00:00	Hour (not implemented)

Below are transmitted the parameter values measured by the unit with the following format:

Measuring	- Sign of measure (if positive is sent a blank) - Value of measure (6 characters - right alignment)
Measuring unit	- 4 characters - left alignment - 1 blank (ASCII 32)

± 20.00 ppm	Measured value input A
± 14.00 pH	Measured value input B
± 460 mV	Measured value input C
± 20.0 °C	Temperature
± 2.00 %/°C	Temperature coefficient
± 0comp	State of the logic input (0 = open; 1 = close)
± 9.00 pHM	pH value used for free chlorine compensation (pHM = pH manual). 0 = oxidant different from free chlorine or compensation deactivated.
± 20.00 ppm	HOCl value if measuring free chlorine. 0 = oxidant different from free chlorine.
± 0stat	State of the logic input (0 = open; 1 = close) bit0 = logic input 1 state bit1 = logic input 2 state
± 0alar	State of the alarm (0 = no alarm; 1 = alarm) bit0 = input A alarm bit1 = input B alarm bit2 = input C alarm bit3 = alarm set point 1 input A bit4 = alarm set point 2 input A bit5 = alarm set point 1 input B bit6 = alarm set point 2 input B bit7 = alarm set point 1 input C bit8 = alarm set point 2 input C bit9 = logic input 1 alarm bit10 = logic input 2 alarm

At the end of the record the instrument sends the last calibration date, then 2 bytes containing the BCC of the string sent.

10/01/01	Date of the last calibration
xx	2 byte BCC

The record transmission is ended by <cr> <lf>.

BCC calculation

The BCC messages sent by the transmitter is calculated as the XOR of all the bytes of the message (excluding <cr> and <lf>) and divided into two nibbles.

The two nibbles are then transformed into their ASCII codes.

The BCC transmitted at the end of record is used to check the validity of records received.

BCC using

The BCC can be used if you want to create a master program that interrogates the instrument.

The BCC is used to check the validity of records received.

6.7.2 MODBUS PROTOCOL

On the instrument, in addition to the ASCII B&C protocol, is implemented the Modbus RTU protocol limited to the function 03, 06, and 16.

In Modbus communication network the instrument operates as a slave device.

RTU transmission mode

Coding system	8-bit binary
Number of bits per character:	
- start bits	1
- data bits (menus sign before)	8
- parity	no parity
- stop bits	1
Errors verification	CRC-16

RTU messages format

Pause transmission	duration 3,5 bytes
Address	1 byte (8 bits)
Function	1 byte (8 bits)
Data	N bytes (N x 8 bits)
Errors verification	2 bytes (16 bits)
Pause transmission	duration 3,5 bytes

For a correct synchronization of the transmission the receiving unit interprets the end of a message when it doesn't receive any characters (bytes) for a time equivalent to the transmission of 3.5 characters (bytes).

MODBUS FUNCTION 03

Function 03 (MASTER QUERY)

Address	1 byte	01 ÷ 243 (instrument ID)
Function	1 byte	03 (read holding register)
Start address data HI	1 byte	Start address of registers
Start address data LO	1 byte	
Number of registers HI	1 byte	Number of registers (2 byte x register)
Number of registers LO	1 byte	
Errors verification	2 bytes	CRC-16

The instrument considers valid the message if CRC-16 valid, ID valid and function=03.

Function 03 (SLAVE ANSWER)

Address	1 byte	01 ÷ 243 (instrument ID)
Function	1 byte	03 (read holding register)
Number of byte of sent data	1 byte	2x number of sent registers
N byte of data	N byte	Values of registers
Error verification	2 bytes	CRC-16

Time between the end of the query and the beginning of the response about 100 ms.
If an error occurs in the request the response takes the following form:

Address	1 byte	01 ÷ 243 (instrument ID)
Function	1 byte	0x83 (read holding register + error)
Error	1 byte	2 = illegal data address
Error verification	2 bytes	CRC-16

MODBUS FUNCTION 06 (0x06)

Function 06 (MASTER QUERY)

Address	1 byte	1 ÷ 243 (probe ID)
Function	1 byte	06 (write single register)
Address data HI	1 byte	Address of the register
Address data LO	1 byte	
Value of the register HI	1 byte	Value to be written
Value of the register LO	1 byte	
Errors verification	2 bytes	CRC-16

The probe considers valid the message if CRC-16 valid, ID valid and function=06.
Function 06 (SLAVE ANSWER)

Address	1 byte	1 ÷ 243 (probe ID)
Function	1 byte	06 (write single register)
Address data HI	1 byte	Address of the register
Address data LO	1 byte	
Value of the register HI	1 byte	Value to be written
Value of the register LO	1 byte	
Errors verification	2 bytes	CRC-16

If an error occurs in the request, the response takes the following form:

Address	1 byte	1 ÷ 243 (probe ID)
Function	1 byte	0x86 (write single register + error)
Error	1 byte	2 = illegal data address 3 = illegal data value 6 = device busy
Error verification	2 bytes	CRC-16

MODBUS FUNCTION 16 (0x10)

Function 16 (MASTER QUERY)

Address	1 byte	1 ÷ 243 (probe ID)
Function	1 byte	16 (write multiple registers)
Start address data HI	1 byte	Start address of registers
Start address data LO	1 byte	
Number of registers HI	1 byte	Number of registers (2 byte x register)
Number of registers LO	1 byte	
Number of byte	1 byte	2 byte per register
Value of registers	n byte	n = 2 byte x number of registers
Errors verification	2 bytes	CRC-16

The probe considers valid the message if CRC-16 valid, ID valid and function=16.

Function 16 (SLAVE ANSWER)

Address	1 byte	1 ÷ 243 (probe ID)
Function	1 byte	16 (write multiple registers)
Start address data HI	1 byte	Start address of registers
Start address data LO	1 byte	
Number of registers HI	1 byte	Number of registers (2 byte x register)
Number of registers LO	1 byte	
Errors verification	2 bytes	CRC-16

If an error occurs in the request, the response takes the following form:

Address	1 byte	1 ÷ 243 (probe ID)
Function	1 byte	0x90 (write multiple registers + error)
Error	1 byte	2 = illegal data address 3 = illegal data value 6 = device busy
Error verification	2 bytes	CRC-16

MODBUS REGISTERS

The measurement and status data of the instrument are available from the address 0x0000 and can be searched using function 03.

The data relating to the setting of the set-points, the alarm limits and the activation of the cleaning cycle are available from the address 0x0200 and can be modified through function 06 or 16.

Time between the end of the query and the beginning of the response about 100 ms.

DATA THROUGH MODBUS FUNCTION 03

	Modbus address	Parameter	Range	Unit	Scale
1	0x0000	Oxidants scales	-100 ÷ 2100	a	a
2	0x0001	Oxidants scale	1 ÷ 5	1	b
3	0x0002	pH (input 1)	-100 ÷ 1500	0.01 pH	0.00 ÷ 14.00 pH
4	0x0003	ORP (input 1)	-2100 ÷ 2100	1 mV	-2000 ÷ 2000 mV
5	0x0004	Scale input 1	1 ÷ 2	1	1 = pH ; 2 = ORP
6	0x0005	pH (input 2)	-100 ÷ 1500	0.01 pH	0.00 ÷ 14.00 pH
7	0x0006	ORP (input 2)	-2100 ÷ 2100	1 mV	-2000 ÷ 2000 mV
8	0x0007	Scale input 2	1 ÷ 2	1	1 = pH ; 2 = ORP
9	0x0008	Temperature °C	-100 ÷ 1100	0.1	-10.0 ÷ 110.0 °C
10	0x0009	Temperature °F	140 ÷ 2300	0.1	14.0 ÷ 230.0 °F
11	0x000A	Temp. Coeff.	0 ÷ 400	0.01	0.00 ÷ 4.00 %/°C
12	0x000B	Comp. Cl2 F	0 ÷ 2	1	0=OFF ; 1=MAN 2=AUTO
13	0x000C	pH for man. comp. Cl2 F	-100 ÷ 1500	0.01 pH	0.00 ÷ 14.00 pH
14	0x000D	HOCl value	-100 ÷ 2100	a	a
15	0x000E	Logic input state	0 ÷ 4	1	See table 1 below
16	0x000F	Alarm state	0 ÷ 1024	1	See table 2 below
17	0x0010	BCC EEPROM	0 ÷ 65535	1	0 ÷ 65535

[a] = unit and scale depend on what is set in configuration

[b] = see chapter "Technical specification (page 18)"

Data format is integer signed (-32768/+32767).

Table 1 Logic input state 0 = input open 1 = inpute closed	
bit 0	Logic input 1
bit 1	Logic input 2

Table 2 Alarm state 0 = alarm deactivated 1 = alarm active	
bit 0	alarm input A
bit 1	alarm input B
bit 2	alarm input C
bit 3	alarm set point 1 input A
bit 4	alarm set point 2 input A
bit 5	alarm set point 1 input B
bit 6	alarm set point 2 input B
bit 7	alarm set point 1 input C
bit 8	alarm set point 2 input C
bit 9	alarm logic input 1
bit 10	alarm logic input 2

SET POINT - ALARM - CLEANING MANAGEMENT PARAMETERS (address 0x020x)

	Modbus address	Parameter	Range	Unit	Scale	Data type	R/W
1	0x0200	Set 1 IN A	0 ÷ 2000 0 ÷ 2000 0 ÷ 2000 0 ÷ 2000 0 ÷ 2000 a	0.1 0.001 0.01 0.1 1	0.0 ÷ 200.0 ppb 0.000 ÷ 2.000 ppm 0.00 ÷ 20.00 ppm 0.0 ÷ 200.0 ppm 0 ÷ 2000 ppm	IS	R/W
2	0x0201	Set 2 IN A	0 ÷ 2000 0 ÷ 2000 0 ÷ 2000 0 ÷ 2000 0 ÷ 2000 a	0.1 0.001 0.01 0.1 1	0.0 ÷ 200.0 ppb 0.000 ÷ 2.000 ppm 0.00 ÷ 20.00 ppm 0.0 ÷ 200.0 ppm 0 ÷ 2000 ppm	IS	R/W
3	0x0202	Set 1 IN B	0 ÷ 1400 -2000 ÷ 2000 a	0.01 1	0.00 ÷ 14.00 pH -2000 ÷ 2000 mV	IS	R/W
4	0x0203	Set 2 IN B	0 ÷ 1400 -2000 ÷ 2000 a	0.01 1	0.00 ÷ 14.00 pH -2000 ÷ 2000 mV	IS	R/W
5	0x0204	Set 1 IN C	0 ÷ 1400 -2000 ÷ 2000 a	0.01 1	0.00 ÷ 14.00 pH -2000 ÷ 2000 mV	IS	R/W
6	0x0205	Set 2 IN C	0 ÷ 1400 -2000 ÷ 2000 a	0.01 1	0.00 ÷ 14.00 pH -2000 ÷ 2000 mV	IS	R/W
7	0x0206	Alarm LO IN A	0 ÷ 2000 0 ÷ 2000 0 ÷ 2000 0 ÷ 2000 0 ÷ 2000 a	0.1 0.001 0.01 0.1 1	0.0 ÷ 200.0 ppb 0.000 ÷ 2.000 ppm 0.00 ÷ 20.00 ppm 0.0 ÷ 200.0 ppm 0 ÷ 2000 ppm	IS	R/W
8	0x0207	Alarm HI IN A	0 ÷ 2000 0 ÷ 2000 0 ÷ 2000 0 ÷ 2000 0 ÷ 2000 a	0.1 0.001 0.01 0.1 1	0.0 ÷ 200.0 ppb 0.000 ÷ 2.000 ppm 0.00 ÷ 20.00 ppm 0.0 ÷ 200.0 ppm 0 ÷ 2000 ppm	IS	R/W
9	0x0208	Alarm LO IN B	0 ÷ 1400 -2000 ÷ 2000 a	0.01 1	0.00 ÷ 14.00 pH -2000 ÷ 2000 mV	IS	R/W
10	0x0209	Alarm HI IN B	0 ÷ 1400 -2000 ÷ 2000 a	0.01 1	0.00 ÷ 14.00 pH -2000 ÷ 2000 mV	IS	R/W
11	0x020A	Alarm LO IN C	0 ÷ 1400 -2000 ÷ 2000 a	0.01 1	0.00 ÷ 14.00 pH -2000 ÷ 2000 mV	IS	R/W

	Modbus address	Parameter	Range	Unit	Scale	Data type	R/W
12	0x020B	Alarm HI IN C	0 ÷ 1400 -2000 ÷ 2000 a	0.01 1	0.00 ÷ 14.00 pH -2000 ÷ 2000 mV	IS	R/W
13	0x020C	Clean -Relé3 clean -start cycle	 0x8001 = not associated or not enabled 1 = associated and enabled 1 = clean start only if associated, enabled and no local action in progress			IS	 R W

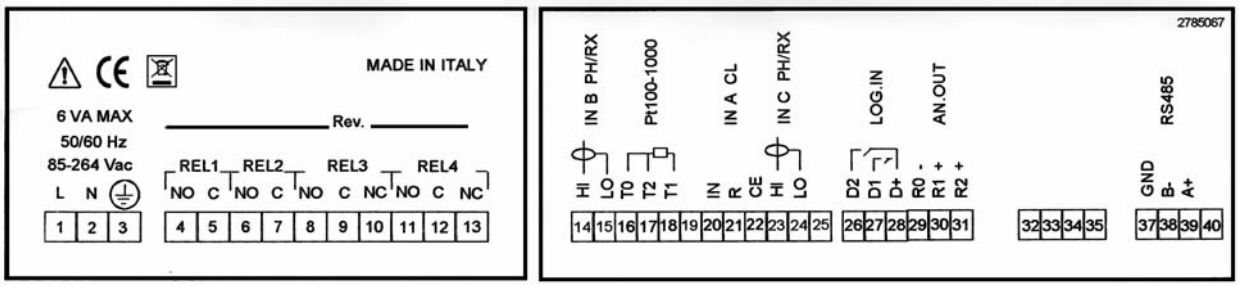
[a] = 0x8001 = non-settable set point (assigned to another function)

IS = integer signed / I = integer
R = read / W = write

Use of BCC EEPROM]
The EEPROM BCC check is the probe configuration state synthesis. After setting the parameters and carry out the calibration the value of the BCC remains constant until the next change of parameters or calibration.
A variation of BCC in the absence of changes warns that an alteration has taken place in the probe configuration data.

7 INSTALLATION DRAWINGS

7.1 CONNECTION DIAGRAM



Terminal	Function
1	Power supply 85/264 Vac
2	Power supply 85/264 Vac
3	Ground
4	NO relay 1
5	C relay 1
6	NO relay 2
7	C relay 2
8	NO relay 3
9	C relay 3
10	NC relay 3
11	NO relay 4
12	C relay 4
13	NC relay 4

Terminal	Function
14	Input B pH/ORP electrode
15	Input B reference electrode
16	Common temperature sensor input
17	Common temperature sensor input
18	Temperature sensor input
20	Input A electrode (cathode)
21	Input A reference electrode
22	Input A counter electrode (anode)
23	Input C pH/ORP electrode
24	Input C reference electrode
26	Logic input 2
27	Logic input 1
28	Common logic inputs
29	- Analog outputs (common)
30	+ Analog output 1
31	+ Analog output 2
37	RS485 Gnd
38	RS485 B-
39	RS485 A+

7.2 DIMENSIONS AND INSTALLATION

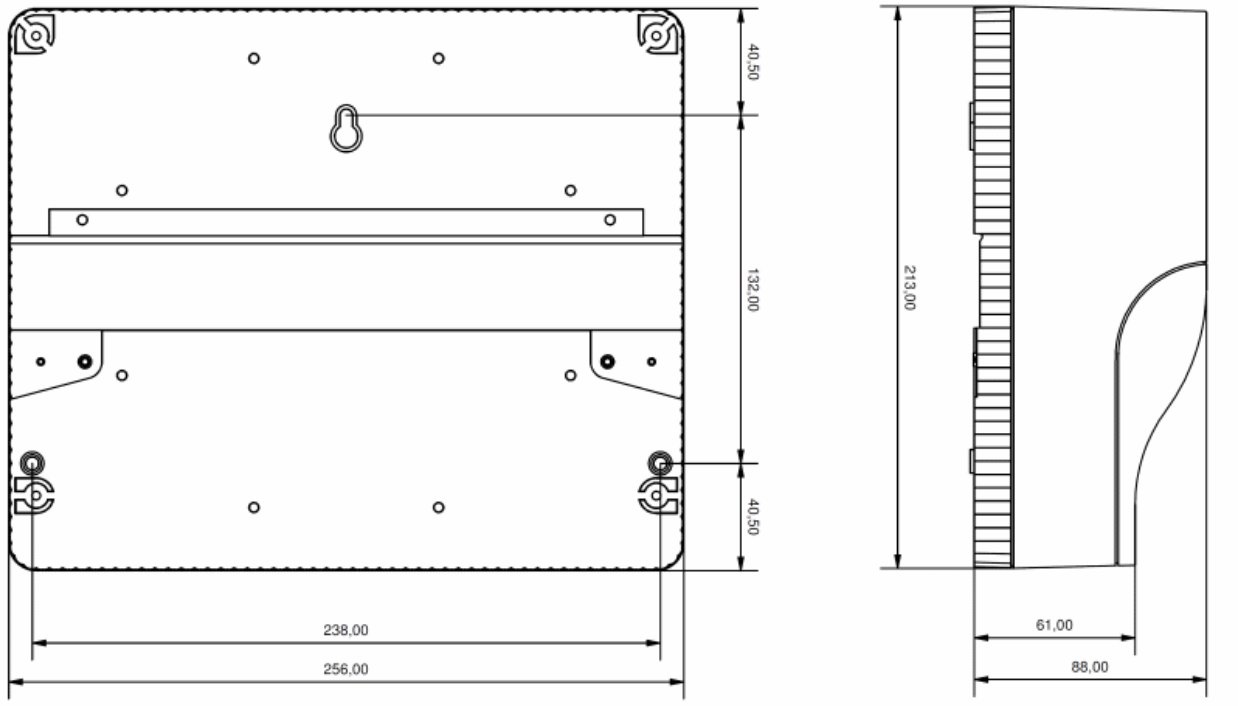


Fig. 1 Dimensions

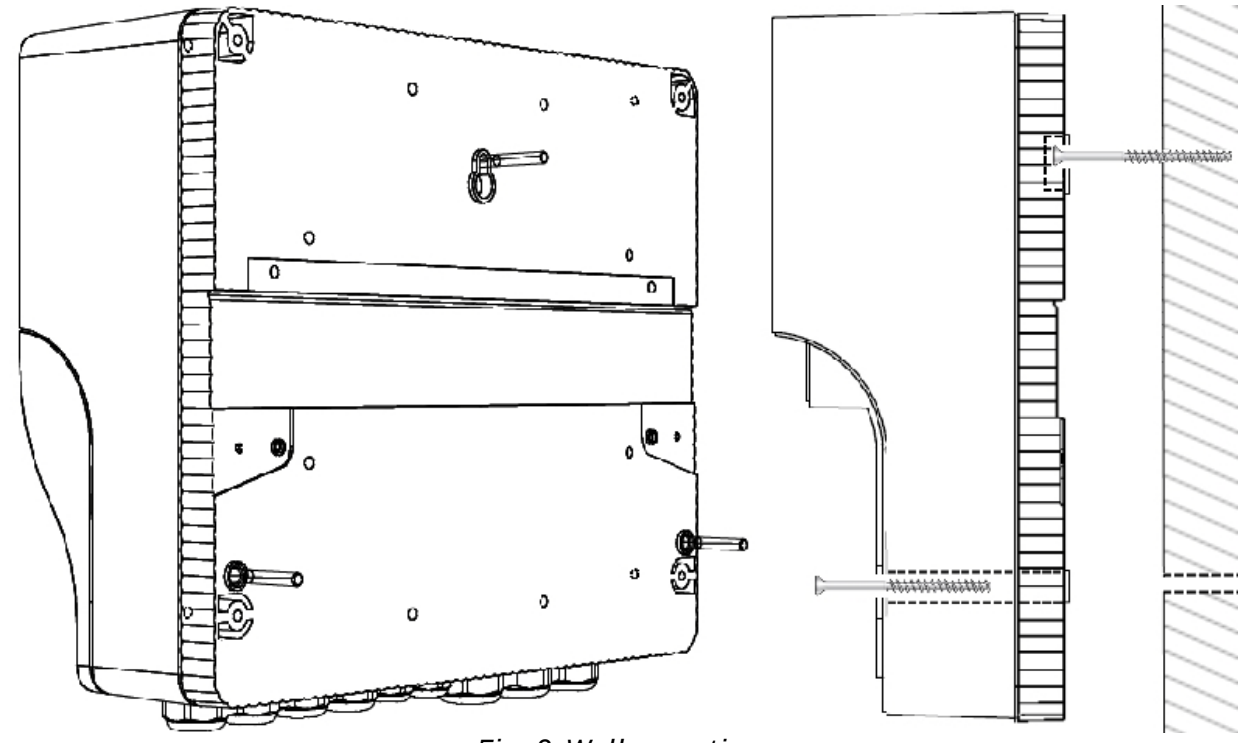


Fig. 2 Wall mounting

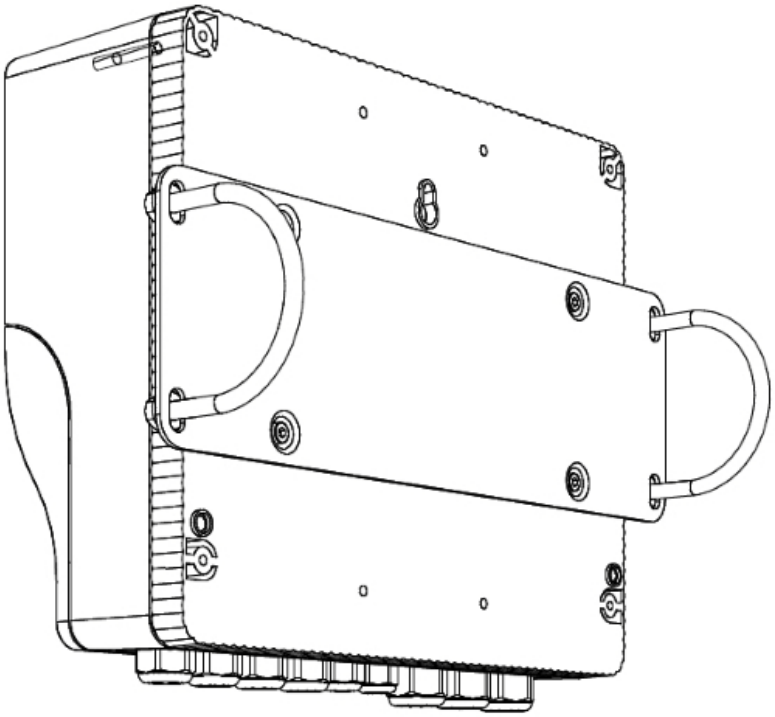


Fig. 3 Pipe mounting (horizontal or vertical)

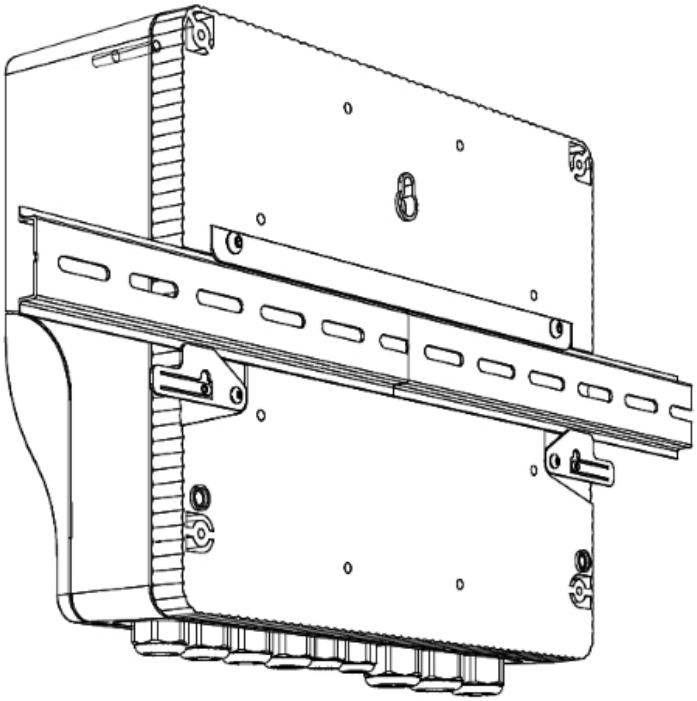


Fig. 4 Rail-DIN mounting

8 WARRANTY

1 Your product is guaranteed for 5 years from the date of purchase, for failure due to manufacturing defects.

2 The warranty is void in case of tampering or deterioration due to improper installation or maintenance.

3 The warranty covers only free repair at the laboratories of the manufacturer.

4 B&C Electronics is not liable for any damage arising from misusing its instruments and products.

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9 REPAIRS

For faster and efficient service it is recommended to fill in the "Information card" for the repair service and attach it to a "Repair order".

1 The estimated cost, if required by the customer, is free if the repair is confirmed. Otherwise flat rate results in a charge for the analytical work performed and expenses incurred.

2 The products to be repaired must be sent to B&C Electronics with freight prepaid. Any expenses incurred on behalf of the client and not previously agreed will be charged.

3 Our sales department will submit to the customer the repair estimate or offer a replacement in the following cases:

- repair cost is considered excessive in relation to the cost of the product;
- the repair is technically impossible or unreliable.

4 In order to reduce the time of delivery of the repaired products, unless otherwise offered or arranged by the customer, the shipment will be made with ex-factory, prepaid carriage by a courier.

INFORMATION SHEET

for service repairs

In the event of a fault, we recommend you contact our repair service, to photocopy and complete this information sheet to be attached to the product to be repaired.

□ ESTIMATE □ REPAIR

COMPANY NAME

ADDRESS ZIP TOWN

REFER TO MR/MRS TELEPHONE

MODEL S/N DATE

Consult the instruction manual to identify the area of the defect and/or describe it:

□ SENSOR
□ POWER SUPPLY
□ CALIBRATION
□ DISPLAY
□ ANALOG OUTPT
□ SET POINT
□ RELAYS CONTACTS
□ INTERMITTENT PROBLEM

DESCRIPTION OF THE DEFECT

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