Instruction manual

MC 7687

MULTICHANNEL MASTER CONTROLLER
3 inputs

Option
S/N
REP N°

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

Cod. 28010761 - Rev. A

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.

2 PRODUCT OVERVIEW

2.1 FUNCTIONAL PURPOSE OF THE DEVICE

This instrument allows the simultaneous management of up to three devices among digital probes and transmitters with RS485 interface of B&C Electronics.

If necessary, the user can connect 2 or 3 devices of the same type to the instrument in order to obtain a double or triple measurement.

The possible measures are as follows:

- turbidity;
- suspended solids;
- dissolved oxygen with optical method;
- inductive conductivity;
- pH;
- ORP;
- conductivity with 2 or 4 electrodes;
- TDS with 2 or 4 electrodes;
- free chlorine;
- combined chlorine;
- total chlorine;
- chlorine dioxide;
- dissolved ozone;
- various types of oxidizers;
- temperature (secondary measurement).

The system for monitoring these measures consists of:

- the multichannel controller that operates as a "master", object of this instruction manual;
- from one to three measuring probes / transmitters, operating as "slave" devices of the controller in Modbus communication.

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

- display of the parameters measured by the connected sensors/transmitters;
- display the measurement of temperature;
- carry out the configuration and calibration of the 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 recording/acquisition of measurements or for PID regulation of main measurements;
- provide a RS 485 digital output with B&C (ASCII) and Modbus RTU protocols;

- 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.

We recommend to use snubber (RC) on the contactor coils to reduce any noise.

The instrument's firmware allows the analog outputs and relays to be configured by assigning them to the input measurements.

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 30)".

Maintenance staff could be more interesting in the chapters regarding:
- "Users instruction (page 30)";
- "Maintenance instructions (page 34)";
- "Warranty (page 60)";
- "Repairs (page 60)".

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 instrument's firmware allows separate access to system parameter setups and to those related to each main measurement.

In the system setup it is possible to disable the user's access to the main measurement calibration sequences and to change the set points and PID control parameters.

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. This indication corresponds to the one shown at the top left of the various displays.

The checks to be carried out during start-up and in the periodic operating checks are the following.

In the system setup

- password to access (also valid for input A / B / C setup menu);
- to disable the calibration of the instrument and of the set points to the user;
- °C or °F temperature scale selection;
- logic inputs enabling;
- autocleaning enabling;
- repetition, cleaning and holding time of the autocleaning;
- password modification.

In the inputs A / B / C setup

- input enabling/disabling;
- setting the specific parameters of the individual input measurements;
- set point 1 hysteresis (ON-OFF);
- set point 1 delay (ON-OFF);
- set point 1 proportional band;
- set point 1 integration time:
- set point 1 derivation time;
- 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 proportional band;
- set point 2 integration time:
- set point 2 derivation time;
- 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. This indication corresponds to the one shown at the top left of the various displays.

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

System configuration

- password to access (also valid for input A / B / C configuration menu);
- operating mode (AUTO/MEAS/SIM);
- transmission speed of the master;
- selection of the device connected to input A;
- selection of the device connected to input B;
- selection of the device connected to input C;
- 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.

In the inputs A / B / C configuration

- setting the specific parameters of the individual input measurements;
- 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;
- 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;
- 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. By pressing the DOWN key it is possible to keep the display selected.

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 4 keys with dual functionality which allow access to all available functions.

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 buttons, see next paragraphs and chapters.

Inputs

The instrument is able to manage up to a maximum of three devices on inputs A, B and C. The following devices can be connected to any input:

C 8825.4	inductive conductivity immersion/inline probe in PVCC
C 8325.5	inductive conductivity immersion/inline probe, body in PVDF
C 8520.5	inductive conductivity inline probe, body in PVDF
OD 8325	optical dissolved oxygen probe, submersible applications
OD 8525	optical dissolved oxygen probe, in flow applications
TU 8325	turbidity probe, submersible applications
TU 8355	turbidity/ suspended solids probe, submersible applications
TU 8525	turbidity probe, in flow applications
TU 8525.5	turbidity probe, in flow applications, body in PVDF
TU 8555	turbidity/ suspended solids probe, in flow applications
TU 8555.5	turbidity/ suspended solids probe, in flow applications, body in PVDF
C 3436	conductivity/TDS transmitter for 2 or 4 wire cells
CL 3436	free/combined/total/dioxide chlorine - dissolved ozone transmitter
PH 3436	pH/ORP transmitter

The communication between each device and the instrument takes place with Modbus RTU protocol, with master/slave logic.

Compatible devices must have a firmware release 3.xx or higher installed.

To use devices with a previous firmware release, contact our Sales Department.

Scales

The instrument is able to manage all the scales and the respective units of measurement provided for each device connected to the three digital inputs.

Secondary measurement

From the instrument display it is possible to display and calibrate the value of the secondary measurement from the connected devices (check signal for the measurement of turbidity/TSS or temperature for the other measurements).

In the case of an input device with temperature compensation, the relative parameters can be set in the setup menu of each individual channel.

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 can be assigned to inputs A / B / C and to the two set points.

If assigned to the inputs it is possible to choose whether to retransmit the main measurement or the temperature.

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 configuration menu:

- configuration of the system to select the operating mode AUTO/MAN/SIM, the transmission speed of the inputs, the combination of the inputs, 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, B, C which takes place by assigning the functions provided for each type of device connected to each individual input.

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; to enable the two logic inputs, to enable the function of cleaning the sensors and the related parameters;
- setup of inputs A, B, C to select the operating and compensation values and the parameters of the regulators associated with the main measurement, the LO / HI alarm values and the delay.

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:

- 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;

- missing or incorrect communications;
- errors related to any connected turbidity probes.

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 specification (page 18)", 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 29)" 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 outputs, 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 38)") in the specific measurement display.

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.

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;
- input configuration;
- communication diagnostics and error counter.

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	4 keys
Operating temperature	-10 ÷ 60 °C
Humidity	95 % without condensate
Power supply	85 ÷ 264 Vac +/- 10 % 50/60 Hz
	9 ÷ 36 Vcc 12 ÷ 24 Vac (091.427 option)
Power	6 VA max.
Isolation	4000 V between primary and secondary
Immunity performance loss	< 1 % full scale
Terminal blocks	extractable
Weight	450 g
Dimensions	98 x 98 x 104 mm 90 x 90 x 95 mm panel cutout
Protection	IP 65 (front panel)
EMC/RFI conformity	EN61326
Registered design	002564666-003

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	TRIPLE MEASUREMENT SYSTEM (SYSTEM)		Default
D1.1	Input A		
D1.2	Input B		
D1.3	Input C		
C1.1	Operating Mode	AUTO / MEAS / SIM	AUTO
C1.2	Master baud rate	2400 / 4800 / 9600 / 19200 baud	9600 baud
	Distance max.	1000 / 500 / 250 / 125 m	
C1.3	Input A (ID = 21)	OFF C3436 EL. COND. CL3436 Cl/OXYD. PH3436 pH/ORP C8X2X IND.COND. OD8X2X OPTIC. DO TU8X2X TURB. NTU TU8X5X TURB. FTU	OFF
C1.4	Input B (ID = 22)	OFF C3436 EL. COND. CL3436 Cl/OXYD. PH3436 pH/ORP C8X2X IND.COND. OD8X2X OPTIC. DO TU8X2X TURB. NTU TU8X5X TURB. FTU	OFF
C1.5	Input C (ID = 23)	OFF C3436 EL. COND. CL3436 Cl/OXYD. PH3436 pH/ORP C8X2X IND.COND. OD8X2X OPTIC. DO TU8X2X TURB. NTU TU8X5X TURB. FTU	OFF

D2.0	SECONDARY MEASURE (SYSTEM)		Default
	The digital probes have a Pt100 sensor inside them to compensate the effects of temperature on the measurement.		
	xx3436 transmitters have an input for connecting a Pt100 sensor for compensation.		
S2.1	Temperature measuring unit	°C / °F	°C

	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	SPDT 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	SPDT 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	

6.0	LOGIC INPUT (2) (SYSTEM)		Default
	• 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 if relay 4 = CLEAN	OFF / AUTO / MANUAL	OFF
	Cleaning parameters		
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	
	Isolation	500 Vac	
C8.1	Baud rate	2400 / 4800 / 9600 / 19200 baud	9600 baud
	Distance max.	1000 / 500 / 250 / 125 m	
	Probes in network	32 probes max	
	Protocols	B&C ASCII Modbus RTU The two protocols coexist	
	B&C protocol	Command A (only reading)	
	Modbus RTU	Function 03 - 06 - 16	
C8.2	ID B&C protocol	ID = 01 ÷ 99 * last s/n digit, if 0 ID=10	1 ÷ 10 *

D8.0	SERIAL INTERFACE (SYSTEM)		Default
C8.3	Modbus address	ID = 01 ÷ 243 * last s/n digit, if 0 ID=10	1 ÷ 10 *

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
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
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
C1.2	Master baud rate	2400 / 4800 / 9600 / 19200 baud	9600 baud
C1.3	Input A (ID = 21)	OFF C3436 EL. COND. CL3436 Cl/OXYD. PH3436 pH/ORP C8X2X IND.COND. OD8X2X OPTIC. DO TU8X2X TURB. NTU TU8X5X TURB. FTU	OFF
C1.4	Input B (ID = 22)	OFF C3436 EL. COND. CL3436 Cl/OXYD. PH3436 pH/ORP C8X2X IND.COND. OD8X2X OPTIC. DO TU8X2X TURB. NTU TU8X5X TURB. FTU	OFF
C1.5	Input C (ID = 23)	OFF C3436 EL. COND. CL3436 Cl/OXYD. PH3436 pH/ORP C8X2X IND.COND. OD8X2X OPTIC. DO TU8X2X TURB. NTU TU8X5X TURB. FTU	OFF

D60.0	CONFIGURATION (SYSTEM)		Default
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 ÷ 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 *
C60.1	Password change	XXX	

70.0	INFO MENU		Default
I1.0	Release code	MC7687 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	
I6.0	Input configuration	IN A / IN B / IN C	
I7.0	Serial communication diagnostics		
I7.1	Communication error counter		

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 OF THE INSTRUMENT

The instrument can be installed in proximity of the sensor, or in a remote area, in the electrical control panel.
Panel installation must be performed on a rigid surface, in a protected position from shock, moisture, and corrosive fumes.

5.5 INSTALLATION OF THE PROBES AND TRANSMITTERS

Refer to the specific manual of the device to be connected.
Protect connection cables from rain or corrosive agents, for example through a sheath.
The interruption of connection cables can cause interferences, therefor is not recommended.
Keep connection cables away from 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 58)".

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 4-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 CONNECTION OF PROBES AND TRANSMITTERS

To connect probes and/or transmitters, refer to the specific product manual.

Below is a description of the connection terminal block.

MC 7687 terminal	Function
40	+12V
37	GND
39	RS485 A (+)
38	RS485 B (-)

⚠ The connection of probes and/or tranmitters 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:

- avoid interruptions in the cables. If necessary use only special high insulated terminal blocks and protect from moisture;

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

5.6.3 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 15 marked R1 +.
- Connect the (+) of the recorder N°2 to the terminal 14 marked R2 +.
- Connect the (-) of the recorder to the terminal 16 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.

5.6.4 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 41)".

- Connect the positive RS 485 interface to the terminal 35 marked A+.
- Connect the negative RS 485 interface to the terminal 34 marked B-.
- Connect the ground RS 485 interface to the terminal 33 marked GND.

5.6.5 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;
- missing or incorrect communications;
- errors related to any connected turbidity probes.

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 35)" and "Setup (page 35)").

To modify the min/max function and the regulation type of the set points see the chapter "Configuration (page 38)".

Set points and alarm feature the delay setting (see "Setup (page 35)").

5.6.6 CONNECTING THE LOGIC INPUTS

The free voltage contacts (in closure) from an external device should be applied to the logic input terminals 18-17 (marked D1-D+) and 19-17 (marked D2-D+).

The activation and the configuration of the logic input are described on the display S6.1 - S6.2 ("Setup (page 35)") and C6.1 - C6.2 ("Configuration (page 38)").

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

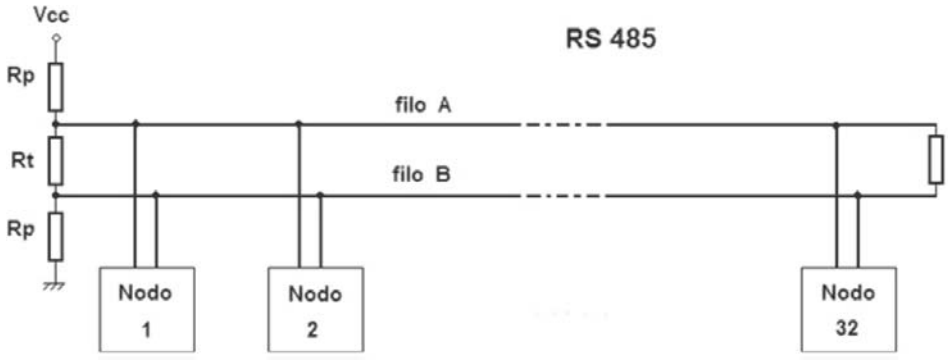
5.6.7 NETWORK CONNECTION (RS485)

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.

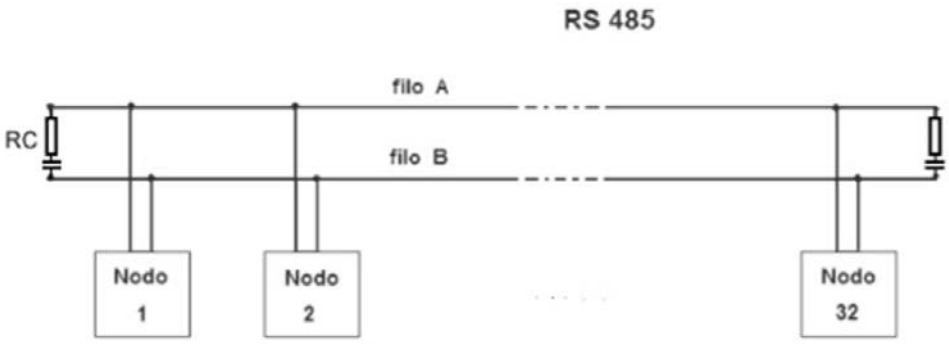
If the driver of the master device has very fast switching fronts, it may be necessary to terminate the beginning and end of the transmission line. In this case it should be inserted in the transmission line a pull-up and pull-down Rp resistors to keep the line polarized and to ensure the starting condition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



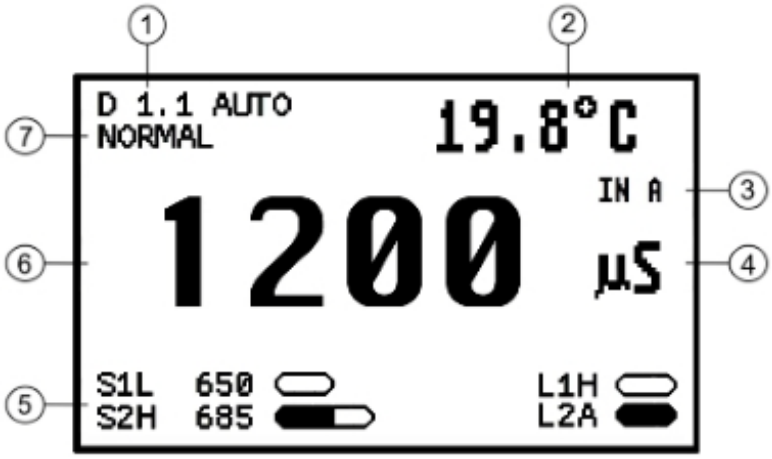
AC termination

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 DISPLAY



1. Display ID
   Operating mode
2. Secondary display
3. Input
4. Measuring information
5. Information display (set points and analog inputs status; messages)
6. Main display
7. Instrument status: NORMAL, CLEAN, HOLD, ALARM (followed by the cause of the alarm)

6.2 KEYBOARD

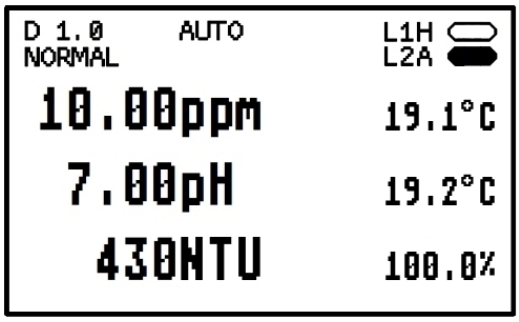
KEYS	FUNCTION
ZERO MODE	- To visualize the available displays - To exit from the not confirmed calibrations sequences - >3 s To access the zero calibration
SENS ∧	Key "UP" - To turn the unit to the main display - To modify (increase) the displayed data - >3 s To access the sensitivity calibration
SET 1 ∨	Key "DOWN" - To modify (decrease) the displayed data - >3 s To access the set point 1 setting
SET 2 ENT	- To enter the effected changings and selections - >3 s To access the set point 2 setting

6.3 USERS INSTRUCTION

6.3.1 MAIN DISPLAY

The instrument display shows the value of the connected inputs, that of the associated secondary measurement and the status of the logic inputs.

If only one input is connected, this display is not displayed.



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.

If the instrument is in alarm condition, one of the following messages will be displayed: ALARM + MEAS / S1 / S2 / L1 / L2 / OFFL / BCC / CONF.

If a turbidity probe is present, the following messages may also appear: DRY / FOULING / EX.LIGHT / ERR.MEAS.

For each entry the following messages may be displayed:

OFFLINE	The device does not respond. Check the connections or retry the ID set-up procedure. [a]
ERR BCC	The BCC of the probe is different from the previous BCC, probable EEPROM device alteration. [a] [b]
LOC. ACT	The BCC of xx3436 is different from the previous BCC, probably changing the parameters from the transmitter's keypad. [a] [b]
ERR CONF	The scale of the device is different from the EEPROM values of the MC 6587 (for "old" devices). [a]
DISABLED	The input has been disabled in the setup (to manage replacement or out of service; if offline to eliminate the alarm).

[a] = in this situation the set point relays are deactivated, the analog outputs are in hold and the alarm condition is active.

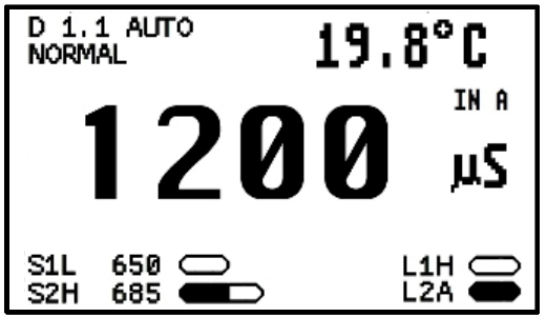
[b] = by pressing ENTER the device is reconfigured with the parameters present in the configuration; it is necessary to check the settings if BCR ERR.

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

6.3.2 INPUT A MEASURING

Pressing the MODE key from the D1.0 display will be possible to visualize in sequence the value measured on the assigned inputs and access the calibration procedures of the measurement chains and the setting of the set points, if these have not been reserved for the maintenance technician.

Refer to the manuals of the individual measurements.

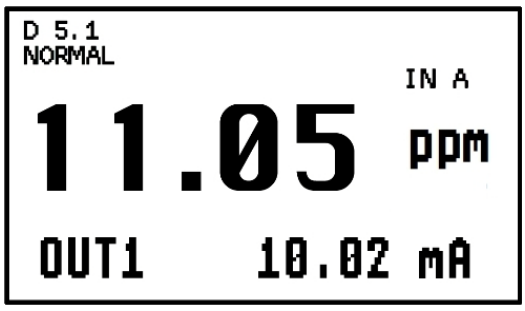


6.3.3 TEMPERATURE MEASURING

By pressing the MODE key again it will be possible to display the value of the secondary measurement in sequence and access the calibration (check signal for turbidity/TSS or temperature measurement for the other measurements).

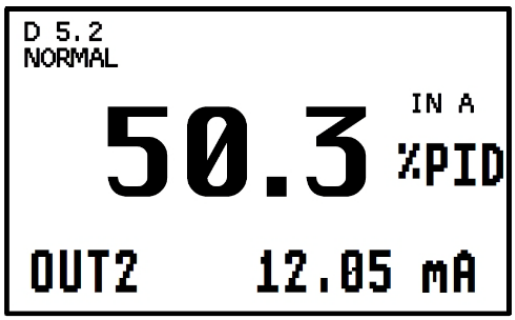
6.3.4 ANALOG OUTPUT 1 VALUES

By pressing the MODE key again it will be possible to view the value of the signal associated with the output and the corresponding current value.



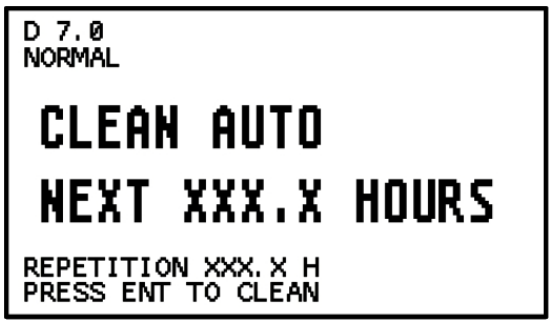
6.3.5 ANALOG OUTPUT 2 VALUES

By pressing the MODE key again it will be possible to view the value of the signal associated with the output and the corresponding current value.



6.3.6 AUTOCLEAN

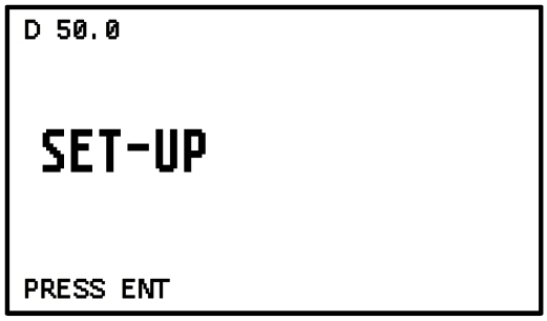
If the cleaning function is assigned to relay 4, by pressing the MODE key again, the instrument will show the autoclean status and, if the automatic mode is activated, the time remaining to the next cycle and the repetition interval setting.



ENT to start a cleaning cycle.

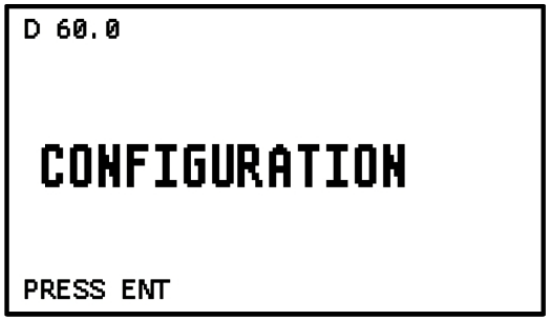
6.3.7 PARAMETERS FOR THE MAINTENANCE

Pressing the MODE button again will display the SET-UP display from which the instrument maintenance menu can be accessed.



6.3.8 PARAMETERS FOR THE PLANT ENGINEER

Pressing the MODE button again will display the CONFIGURATION display from which you can access the instrument installation menu.



6.3.9 INFORMATION MENU

Pressing the MODE key again will display the information display from which it is possible to 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 MC7687 R1.1X	P/N and 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	
I6.0	IN A: OFF|OD8X2X OD8325 ID=21 SN201106 IN B: OFF|TU8X2X TU8325 ID=22 SN201103 IN C: OFF|PH3436 PH3436 ID=23 SN201100	Input configuration	
I7.0	TXA RXA CRC FR OVR TO TXB RXB CRC FR OVR TO TXC RXC CRC FR OVR TO	Communication diagnostics - error counter	

By pressing the DOWN key from the I7.0 display it will be possible to access the error counters. This data may be requested by our technicians in case of assistance.

6.4 MAINTENANCE INSTRUCTIONS

6.4.1 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 35)" 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.

6.4.2 MEASURING OPERATIONS

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

- probes and transmitters with their relative sensors are connected and in operation;
- power and 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 devices are connected as described in the chapter "Installation (page 23)", the system will work correctly and it will need just the calibration, the set points and alarm values selection.

6.4.3 CALIBRATION

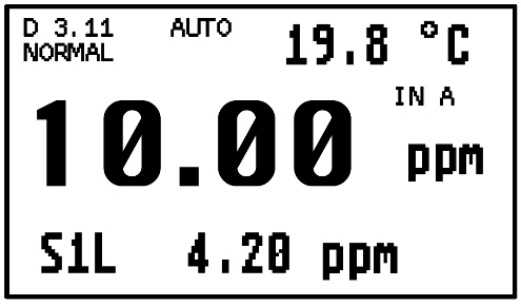
Since the instrument has three independent measuring channels, to carry out zero and sensitivity is necessary to operate the ZERO and SENS keys from the displays D1.1, D1.2 and D1.3 (if the relative inputs are connected).

ZERO or SENS keys are obtained by pressing for at least 3 seconds the MODE or UP keys.

For the calibration procedure, refer to the manuals for the individual measurements.

6.4.4 SET POINT

Pressing DOWN (SET1) or ENT (SET2) for at least 3 seconds 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 assigned to the CL 3436):

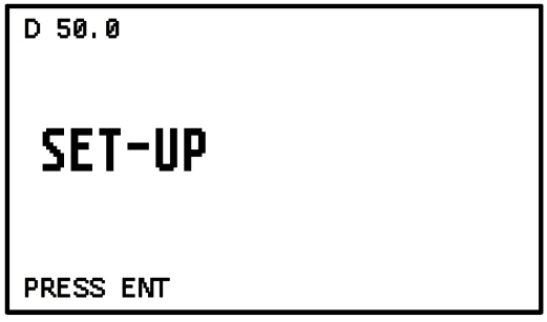


UP and DOWN	to change the displayed value
ENT	to confirm the displayed value

6.4.5 SETUP

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

Press MODE form the D1.0 display to go to the D50.0 display.



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
MODE	press to confirm
ENT	press to display and confirm the sequence of the setup parameter of the unite
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.

System Setup

Display	Contents	Meaning	Possible values
D50.1	PASSWORD SET-UP ---	Password to access the setup menu	000 ÷ 999
D50.3	SET-UP	Setup menu selection	**SYSTEM** INPUTA INPUT B INPUT C
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
S6.1	LOGIC INPUT1 OFF	Logic input 1 setting	ON OFF
S6.2	LOGIC INPUT2 OFF	Logic input 2 setting	ON OFF
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

Refer to the manuals of the individual measurements.

6.4.6 MAINTENANCE OF SENSORS

It is recommened to perform periodical maintenance of the devices 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 the event of non-use for long periods, store the sensors in accordance with the relevant manuals.

6.4.7 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 on the switch board panel.

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.

6.5 INSTALLATION ISTRUCTIONS

6.5.1 SAFETY REQUIREMENTS

⚠ After performing the installation (see chapter "Installation (page 23)"), before turning the power on and proceed to the configuration of the instrument is recommended to do the following:

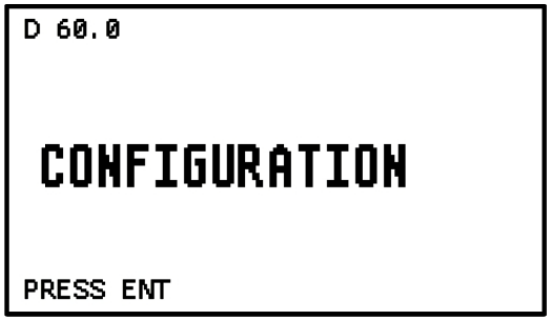
- check that the terminal 3 is grounded;
- check that all connections are correct;
- check that all connections are blocked on the terminals;
- check that the mechanical fixing of the cables does not cause any twisting or bending on the terminal blocks;
- check that eventual protection fuses are of appropriate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

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

6.5.2 CONFIGURATION

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

Press MODE from the D1.0 display to get the D60.0 display.



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
MODE	press to confirm
ENT	press to display and confirm the sequence of the setup parameter of the unite
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
D60.3	CONFIGURATION	Configuration menu selection	**SYSTEM** INPUTA INPUT B INPUT C
C1.1	CONTROLLER MODE AUTO	Operating mode selection	AUTO MEAS SIM
C1.2	MASTER BAUD RATE 9600	Input baud rate	2400 / 4800 / 9600 / 19200

Display	Contents	Meaning	Possible values
C1.3	INPUT A (ID=21) OFF	Input A configuration	OFF C3436 EL. COND. CL3436 Cl/OXYD. PH3436 pH/ORP C8X2X IND.COND. OD8X2X OPTIC. DO TU8X2X TURB. NTU TU8X5X TURB. FTU
C1.3A	SET ID=21 NO	ID input A configuration	
C1.4	INPUT B (ID=22) OFF	Input B configuration	OFF C3436 EL. COND. CL3436 Cl/OXYD. PH3436 pH/ORP C8X2X IND.COND. OD8X2X OPTIC. DO TU8X2X TURB. NTU TU8X5X TURB. FTU
C1.4A	SET ID=22 NO	ID input B configuration	
C1.5	INPUT C (ID=23) OFF	Input C configuration	OFF C3436 EL. COND. CL3436 Cl/OXYD. PH3436 pH/ORP C8X2X IND.COND. OD8X2X OPTIC. DO TU8X2X TURB. NTU TU8X5X TURB. FTU
C1.5A	SET ID=23 NO	ID input C configuration	
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

Display	Contents	Meaning	Possible values
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
C8.1	BAUD RATE 9600	MC 7687 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, B, C

Refer to the manuals of the individual measurements.

6.6 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.

6.6.1 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 ÷ 99)

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
-------------------------------------------------------------------------------
MCXX87     Rev.fw:1.00  S/N:203589

00H  <cr>  Help menu
00A  <cr>  Acquisition
00AA <cr>  Acquisition input A
00AB <cr>  Acquisition input B
00AC <cr>  Acquisition input C

Type ID number or 00 before command. Example, if ID=15 type 15A or 00A <cr>
Use 00A <cr> if only one probe 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

```
MCXX87- 01 0.0 01/01/01 00:00:00
....+....|....+....|....+....|...      (33 char)

x C3436
±  2000uS   ±  18.5°C   ±     0stat
±  1000ppm  ±  18.5°C   ±     0stat    (TDS/INDIRECT)
....+....|....+....|....+....|......   (36 char)
x CL3436
± 20.00ppm  ±  18.5°C   ±     0stat
....+....|....+....|....+....|......   (36 char)
x PH3436
± 10.00pH   ±  20.0°C   ±     0stat
....+....|....+....|....+....|......   (36 char)
x PH3436 (ORP)
±  1000mV   ±  20.0°C   ±     0stat
....+....|....+....|....+....|......   (36 char)
x C8x2x
± 200.0mS   ±  18.5°C   ±  2.00%/°C
± 100.0ppt  ±  18.5°C   ±  2.00%/°C    (TDS/INDIRECT)
....+....|....+....|....+....|......   (36 char)
x OD8x2x
± 200.0%sat ± 20.00ppm  ±  20.0°C
....+....|....+....|....+....|......   (36 char)
x TU8x2x TU8x5x
± 100.0NTU  ± 100.0%    ±     0err
± 100.0mg/l ± 100.0%    ±     0err     (TSS/INDIRECT)
....+....|....+....|....+....|......   (36 char)

±     0STAT ±     0alar 01/01/01xx
....+....|....+....|....+....|.....     (34 char)
```

MCXX87	p/n of the unit
10	Instrument ID
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)

For each input implemented 3 main data concerning the measurement are sent.

C3436

± 2000 µS	Conductivity or TDS/indirect measure value
± 18.5 °C	Temperature
± 0stat	State - bit 0 logic input: 0 = open; 1 = close - bit 1 manual temperature: 0 = auto; 1 = manual

CL3436

± 20.00 ppm	Oxidizer value
± 18.5 °C	Temperature
± 0stat	State - bit 0 logic input: 0 = open; 1 = close - bit 1 manual temperature: 0 = auto; 1 = manual

PH3436 (pH)

± 10.00 pH	pH value
± 20.0 °C	Temperature
± 0stat	State - bit 0 logic input: 0 = open; 1 = close - bit 1 manual temperature: 0 = auto; 1 = manual

PH3436 (ORP)

± 1000 mV	ORP value
± 20.0 °C	Temperature
± 0stat	State - bit 0 logic input: 0 = open; 1 = close - bit 1 manual temperature: 0 = auto; 1 = manual

C8x2x

± 200.0 mS	Conductivity or TDS/indirect measure value
± 18.5 °C	Temperature
± 2.00 %/°C	Temperature coefficient

OD8x2x

± 200.0 % sat	Oxygen concentration value in % sat
± 20.00 ppm	Oxygen concentration value in ppm
± 20.0 °C	Temperature

TU8x2x TU8x5x

± 100.0 NTU	Turbidity or indirect measure value
± 100.0 %	Check signal value
± 0stat	Turbidity probe error state - bit 0 fouling error - bit 1 dry error - bit 2 high external light error - bit 3 indeterminate measure error
± 0STAT	Error state of logic inputs and probe inputs - bit 0 logic input 1: 0 = open; 1 = close - bit 1 logic input 2: 0 = open; 1 = close - bit 2 INPUT A: 0 = disable; 1 = enable - bit 3 INPUT A: 0 = offline; 1 = online - bit 4 INPUT B: 0 = disable; 1 = enable - bit 5 INPUT B: 0 = offline; 1 = online - bit 6 INPUT C: 0 = disable; 1 = enable - bit 7 INPUT C: 0 = offline; 1 = online
± 0alar	State of the alarm (0 = no alarm; 1 = alarm) - bit0 = measure INPUT A - bit1 = measure INPUT B - bit2 = measure INPUT C - bit3 = permanence measurement SET1 INPUT A - bit4 = permanence measurement SET2 INPUT A - bit5 = permanence measurement SET1 INPUT B - bit6 = permanence measurement SET2 INPUT B - bit7 = permanence measurement SET1 INPUT C - bit8 = permanence measurement SET2 INPUT C - bit9 = logic input 1 - bit10 = logic input 2 - bit 11 zero (OD) - bit 12 fouling (TU) - bit 13 dry (TU) - bit 14 error meas. (TU) - bit 15 offline/conf/bcc

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 (not implemented)
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.

ACQUISITION INPUT A / B / C

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

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

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

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

By sending the command **AA** or **AB** or **AC** the instrument queries individually the probe or the transmitter connected to the input A or B or C respectively and retransmits it the answer.

For the detail of the response format to command **A** refer to the specific manual of the probe or transmitter used.

6.6.2 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 probe 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 (0x03)

Function 03 (MASTER QUERY)

Address	1 byte	1 ÷ 243 (probe 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 probe considers valid the message if CRC-16 valid, ID valid and function=03.

Function 03 (SLAVE ANSWER)

Address	1 byte	1 ÷ 243 (probe 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

If you query requesting registers outside the defined limits, the probe answers assigning zero to all of the registers out of range.

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

Address	1 byte	1 ÷ 243 (probe ID)
Function	1 byte	0x83 (read holding register + error)
Error	1 byte	2 = illegal data address 3 = illegal data value
Error verification	2 bytes	CRC-16

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

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 4 = slave device failure
Error verification	2 bytes	CRC-16

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

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 4 = slave device failure
Error verification	2 bytes	CRC-16

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

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.

MEASURE AND STATE (address 0x00xx)

	Modbus address	Parameter	Range	Unit	Scale	Data type	R/W
1	0x0000	INPUT A Measure type	0 ÷ 7 0 ÷ 2	1 1	a b	IS	R
2	0x0001	INPUT B Measure type	0 ÷ 7 0 ÷ 2	1 1	a b	IS	R
3	0x0002	INPUT C Measure type	0 ÷ 7 0 ÷ 2	1 1	a b	IS	R
4	0x0003	Value TSS/indirect measure INPUT A	0 ÷ full scale 0x8001 if input A OFF or no indirect meas.	see 5 and 7	c	IS	R
5	0x0004	Decimal number TSS/indirect measure INPUT A	0 ÷ 3 0x8001 if input A OFF or no indirect meas.	1	d	IS	R
6	0x0005	Full scale TSS/indirect measure INPUT A	100 ÷ 9999 0x8001 if input A OFF or no indirect meas.	see 5 and 7	100 ÷ 9999	IS	R
7	0x0006	Measure unit TSS/indirect measure INPUT A	0 ÷ 9 0x8001 if input A OFF or no indirect meas.	1	e	IS	R
8	0x0007	Value TSS/indirect measure INPUT B	0 ÷ full scale 0x8001 if input B OFF or no indirect meas.	see 9 and 11	c	IS	R
9	0x0008	Decimal number TSS/indirect measure INPUT B	0 ÷ 3 0x8001 if input B OFF or no indirect meas.	1	d	IS	R
10	0x0009	Full scale TSS/indirect measure INPUT B	100 ÷ 9999 0x8001 if input B OFF or no indirect meas.	see 9 and 11	100 ÷ 9999	IS	R
11	0x000A	Measure unit TSS/indirect measure INPUT B	0 ÷ 9 0x8001 if input B OFF or no indirect meas.	1	e	IS	R
12	0x000B	Value TSS/indirect measure INPUT C	0 ÷ full scale 0x8001 if input C OFF or no indirect meas.	see 13 and 15	c	IS	R

	Modbus address	Parameter	Range	Unit	Scale	Data type	R/W
13	0x000C	Decimal number TSS/indirect measure INPUT C	0 ÷ 3 0x8001 if input C OFF or no indirect meas.	1	[d]	IS	R
14	0x000D	Full scale TSS/indirect measure INPUT C	100 ÷ 9999 0x8001 if input C OFF or no indirect meas.	see 13 and 15	100 ÷ 9999	IS	R
15	0x000E	Measure unit TSS/indirect measure INPUT C	0 ÷ 9 0x8001 if input C OFF or no indirect meas.	1	[e]	IS	R
16	0x000F	Logic inputs and probe inputs state	bit0 ÷ bit7 0 ÷ 1		[f] 0 = open/disabled/offline 1 = close/enabled/online	IS	R
17	0x0010	Alarm state	bit0 ÷ bit15 0 ÷ 1	1	[g] 0 = no alarm 1 = alarm	IS	R
18	0x0011	BCC EEPROM	0 ÷ 65535	1	0 ÷ 65535	I	R

[a] = Byte (lo): 0 = OFF / 1 = C3436 / 2 = CL3436 / 3 = PH3436 / 4 = C8X2X / 5 = OD8X2X / 6 = TU8X2X / 7 = TU8X5X

[b] = Byte (HI): 0 = direct meas. / 1 = TDS/TSS meas. / 2 = indirect meas.

[c] = depends on the scale set

[d] = 0 = YYYY / 1 = YYY.Y / 2 = YY.YY / 3 = Y.YYY

[e] = 1 = % / 2 = ppt / 3 = ppm / 4 = ppb / 5 = g/l / 6 = mg/l / 7 = µg/l / 8 = °Bé / 9 = custom

[f] = bit0 = logic in. 1 / bit1 = logic in. 2 / bit2 = IN A enable / bit3= IN A online / bit4= IN B enable / bit5= IN B online / bit6= IN C enable / bit7= IN C online

[g] = bit0 = alarm IN A / bit1 = alarm IN B / bit2 = alarm IN C / bit3 = al. SET1 IN A / bit4 = al. SET2 IN A / bit5 = al. SET1 IN B / bit6 = al. SET2 IN B / bit7 = al. SET1 IN C / bit8 = al. SET2 IN C / bit9 = al. in. log.1 / bit10 = al. in. log.2 / bit11 = zero (OD) / bit12 = fouling (TU) / bit13 = dry (TU) / bit14 = er. meas. (TU) / bit15 = offline/conf/BCC

IS = integer signed / I = integer

R = read / W = write

For each probe/transmitter model connected to the instrument, a table of searchable data is available starting from the address 0x0000 + offset.

Depending on the assignment of the input (INPUT A, B or C) an offset must be added to the addresses:

- for INPUT A offset address 0x0020
- for INPUT B offset address 0x0030
- for INPUT C offset address 0x0040

C 3436

	Modbus address	Parameter	Range	Unit	Scale	Data type	R/W
1	0x0000	Conductivity	-100 ÷ 2100	a	a	IS	R
2	0x0001	TDS	-50 ÷ 1050	a	a	IS	R
3	0x0002	Temperature °C	-100 ÷ 1100	0.1	-10.0 ÷ 110.0 °C	IS	R
4	0x0003	Temperature °F	140 ÷ 2300	0.1	14.0 ÷ 230.0 °F	IS	R
5	0x0004	K cell	1/5/10/100	0.1	0.1/0.5/1.0/10	IS	R
6	0x0005	Scale	1 ÷ 5	b		IS	R
7	0x0006	TDS/EC factor	450 ÷ 1000	0.001	0.450 ÷ 1.000	IS	R
8	0x0007	Reference temperature	25 / 20	°C	20 °C / 25 °C	IS	R
9	0x0008	Temperature coefficient	0 ÷ 350	0.01	0.01 ÷ 3.50 %/°C	IS	R
10	0x0009	State: Dig. Inp. Keyb. lock Man. temp.	 0/1 0/1 0/1	1 bit0 bit1 bit2	 open/close no hold/hold auto/man	I	R
11	0x000A	BCC EEPROM	0 ÷ 65535	1	0 ÷ 65535	I	R

[a] = unit and scale depend on what is set in configuration (see 5 and 6)

[b] = see specific instrument manual

IS = integer signed / I = integer

R = read / W = write

CL 3436

	Modbus address	Parameter	Range	Unit	Scale	Data type	R/W
1	0x0000	Measured value	0 ÷ 2000	a	a	IS	R
2	0x0001	Temperature °C	-100 ÷ 1100	0.1	-10.0 ÷ 110.0 °C	IS	R
3	0x0002	Temperature °F	140 ÷ 2300	0.1	14.0 ÷ 230.0 °F	IS	R
4	0x0003	Measuring unit	1 ÷ 2		1 = ppm 2 = mg/l	IS	R
5	0x0004	Scale	1 ÷ 3	b		IS	R
6	0x0005	Temperature coefficient	0 ÷ 400	0.01	0.01 ÷ 4.00 %/°C	IS	R
7	0x0006	State: Dig. Inp. Keyb. lock Man. temp.	 0/1 0/1 0/1	1 bit0 bit1 bit2	 open/close no hold/hold auto/man	I	R
8	0x0007	BCC EEPROM	0 ÷ 65535	1	0 ÷ 65535	I	R

[a] = unit and scale depend on what is set in configuration (see 5 and 6)

[b] = see specific instrument manual

IS = integer signed / I = integer

R = read / W = write

PH 3436

	Modbus address	Parameter	Range	Unit	Scale	Data type	R/W
1	0x0000	pH	-100 ÷ 1500	0.01	0.00 ÷ 14.00 pH	IS	R
2	0x0001	ORP	-2100 ÷ 2100	1	a	IS	R
3	0x0002	Temperature °C	-100 ÷ 1100	0.1	-10.0 ÷ 110.0 °C	IS	R
4	0x0003	Temperature °F	140 ÷ 2300	0.1	-14.0 ÷ 230.0 °F	IS	R
5	0x0004	Scale	0 ÷ 5	1	b	IS	R
6	0x0005	State: Dig. Inp. Keyb. lock Man. temp.	 0/1 0/1 0/1	1 bit0 bit1 bit2	 open/close no hold/hold auto/man	I	R
7	0x0006	BCC EEPROM	0 ÷ 65535	1	0 ÷ 65535	I	R

[a] = scale depends on what is set in configuration (see 5)

[b] = 0: 0.00 ÷ 14.00 pH scale / 1: 0 ÷ 1000 mV scale / 2: 0 ÷ -1000 mV scale / 3: -1000 ÷ 1000 mV scale / 4: 0 ÷ 2000 mV scale / 5: 0 ÷ -2000 mV scale

IS = integer signed / I = integer

R = read / W = write

C 8x2x

	Modbus address	Parameter	Range	Unit	Scale	Data type	R/W
1	0x0000	Conductivity - scale 1/2/3 - scale 4/5/6	 0 ÷ 2000 0 ÷ 4000	mS	 [a] [a]	IS	R
2	0x0001	TDS - scale 1/2/3 - scale 4/5/6	 0 ÷ 1000 0 ÷ 2000	ppt	 [a] [a]	IS	R
3	0x0002	Scale	1 ÷ 6 [b]			IS	R
4	0x0003	Temperature °C	0 ÷ 1000	0.1	0.0 ÷ 100.0 °C	IS	R
5	0x0004	TDS/conductivity conversion factor	450 ÷ 1000	0.001	0.450 ÷ 1.000	IS	R
6	0x0005	Reference temperature	20 / 25	1		IS	R
7	0x0006	Temperature coefficient	0 ÷ 350	0.01	0.00 ÷ 3.50 %/°C	IS	R
8	0x0007	BCC EEPROM	0 ÷ 65535	1	0 ÷ 65535	I	R

[a] = depend on the configurated scale

[b] = 1: 0.00 ÷ 20.00 mS scale / 2: 0.0 ÷ 200.0 mS scale / 3: 0 ÷ 2000 mS scale / 4: 0.000 ÷ 4.000 mS scale / 5: 0.00 ÷ 40.00 mS scale / 6: 0.0 ÷ 400.0 mS scale

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

OD 8x2x

	Modbus address	Parameter	Range	Unit	Scale	Data type	R/W
1	0x0000	Oxygen % sat	0 ÷ 3200	0.1	0.0 ÷ 320.0 % sat	IS	R
2	0x0001	Oxygen ppm	0 ÷ 3200	0.01	0.0 ÷ 32.00 ppm	IS	R
3	0x0002	Temperature °C	-50 ÷ 500	0.1	-5.0 ÷ 50.0 °C	IS	R
4	0x0003	Salinity ppm	0 ÷ 600	100	0 ÷ 60000 ppm	IS	R
5	0x0004	Pressure mmHg	500 ÷ 800	1	500 ÷ 800 mmHg	IS	R
6	0x0005	Relative humidity % RH	0 ÷ 100	1	0 ÷ 100 % RH	IS	R
7	0x0006	BCC EEPROM	0 ÷ 65535	1	0 ÷ 65535	I	R

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

TU 8x2x

	Modbus address	Parameter	Range	Unit	Scale	Data type	R/W
1	0x0000	Turbidity NTU	0 ÷ 4000	NTU	[a]	IS	R
2	0x0001	Scale	1 ÷ 3 [b]			IS	R
3	0x0002	Check signal %	0 ÷ 2200	0.1	0.0 ÷ 220.0 %	IS	R
4	0x0003	Temperature °C	0 ÷ 500	0.1	0.0 ÷ 50.0 °C	IS	R
5	0x0004	Check fouling %	0 ÷ 100	1	0 ÷ 100 %	IS	R
6	0x0005	Check dry %	100 ÷ 200	1	100 ÷ 200 %	IS	R
7	0x0006	Check error	0 ÷ 2 [c]			IS	R
8	0x0007	External light value %	0 ÷ 1000	0.1	0.0 ÷ 100.0 %	IS	R
9	0x0008	External light error	0 ÷ 2 [d]			IS	R
10	0x0009	BCC EEPROM	0 ÷ 65535	1	0 ÷ 65535	I	R

[a] = depend on the configurated scale

[b] = 1: 0.000 ÷ 4.000 NTU scale / 2: 0.00 ÷ 40.00 NTU scale / 3: 0.0 ÷ 400.0 NTU scale

[c] = 0: no error / 1: fouling error / 2: dry cell error

[d] = 0: no error / 1: high external light error / 2: indeterm. measure error

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

TU 8x5x

	Modbus address	Parameter	Range	Unit	Scale	Data type	R/W
1	0x0000	Turbidity FTU	0 ÷ 1000 0 ÷ 1000 0 ÷ 10000	0.1 1 1	0.0 ÷ 100.0 FTU 0 ÷ 1000 FTU 0 ÷ 10000 FTU	IS	R
2	0x0001	Scale	1 ÷ 3 [a]			IS	R
3	0x0002	Check signal %	0 ÷ 2200	0.1	0.0 ÷ 220.0 %	IS	R
4	0x0003	Temperature °C	0 ÷ 500	0.1	0.0 ÷ 50.0 °C	IS	R
5	0x0004	Check fouling %	0 ÷ 100	1	0 ÷ 100 %	IS	R
6	0x0005	Check dry %	100 ÷ 200	1	100 ÷ 200 %	IS	R
7	0x0006	Check error	0 ÷ 2 [b]			IS	R
8	0x0007	External light value %	0 ÷ 1000	0.1	0.0 ÷ 100.0 %	IS	R
9	0x0008	External light error	0 ÷ 2 [c]			IS	R
10	0x0009	BCC EEPROM	0 ÷ 65535	1	0 ÷ 65535	IS	R
11	0x000A	TSS value	0 ÷ full scale	0.001 0.01 0.1 1	0.000 ÷ full scale 0.00 ÷ full scale 0.0 ÷ full scale 0 ÷ full scale	IS	R

[a] = 1: 0.0 ÷ 100.0 FTU scale / 2: 0 ÷ 1000 FTU scale / 3: 0 ÷ 10000 FTU scale

[b] = 1: no error / 2: fouling error / 3: dry cell error

[c] = 1: no error / 2: high external light error / 3: indeterm. measure error

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

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

	Modbus address	Parameter	Range	Unit	Scale	Data type	R/W
1	0x0200	Set 1 IN A	a	b	b	IS	R/W
2	0x0201	Set 2 IN A	a	b	b	IS	R/W
3	0x0202	Set 1 IN B	a	b	b	IS	R/W
4	0x0203	Set 2 IN B	a	b	b	IS	R/W
5	0x0204	Set 1 IN C	a	b	b	IS	R/W
6	0x0205	Set 2 IN C	a	b	b	IS	R/W
7	0x0206	Alarm LO IN A	a	b	b	IS	R/W
8	0x0207	Alarm HI IN A	a	b	b	IS	R/W
9	0x0208	Alarm LO IN B	a	b	b	IS	R/W
10	0x0209	Alarm HI IN B	a	b	b	IS	R/W
11	0x020A	Alarm LO IN C	a	b	b	IS	R/W
12	0x020B	Alarm HI IN C	a	b	b	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] = range depends on what is set in the configuration / 0x8001 = non-settable set point

[b] = range, unit and scale depend on what is set in the configuration

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

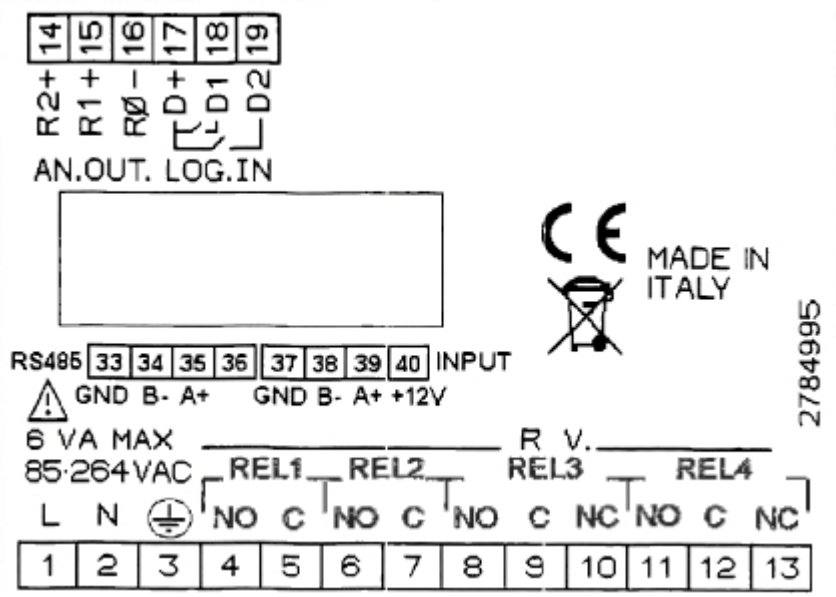
Use of BCC EEPROM

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.

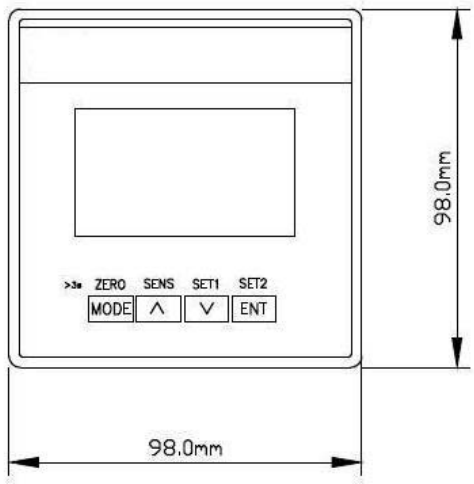
7 INSTALLATION DRAWINGS

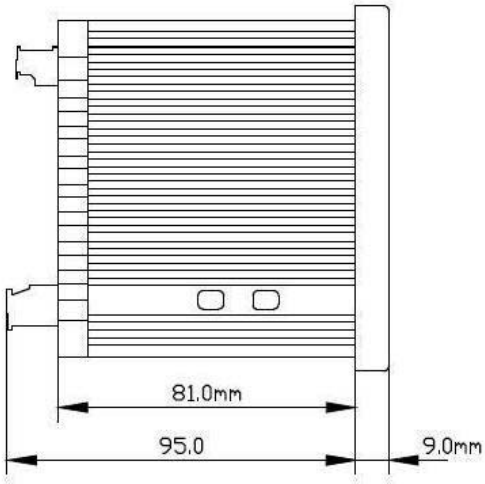
7.1 CONNECTION DIAGRAM

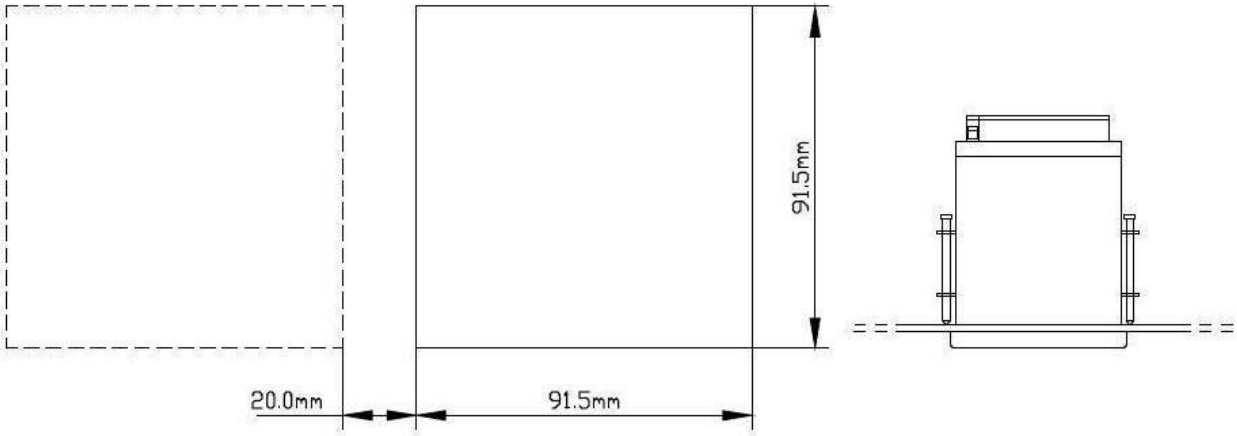


Terminal	Function	Terminal	Function
1	Power supply 85/264 Vac	14	+ Analog output 2
2	Power supply 85/264 Vac	15	+ Analog output 1
3	Ground	16	- Analog outputs (common)
4	NO relay 1	17	Common logic inputs
5	C relay 1	18	Logic input 1
6	NO relay 2	19	Logic input 2
7	C relay 2	33	RS485 Gnd
8	NO relay 3	34	RS485 B-
9	C relay 3	35	RS485 A+
10	NC relay 3	37	Input Gnd
11	NO relay 4	38	Input B-
12	C relay 4	39	Input A+
13	NC relay 4	40	Input +12V

7.2 DIMENSIONS







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.

---

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

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

B&C Electronics s.r.l. – Via per Villanova 3 – 20866 Carnate (MB) – Italia
Tel. +39 039 631 721 – Fax +39 039 607 6099 – bc@bc-electronics.it – www.bc-electronics.it