Instruction manual

PH 3436

pH/REDOX TRANSMITTER
4-20 mA - RS485

pH scale
0 ÷ 14.00 pH

ORP scales
0 ÷ 1000 mV
0 ÷ -1000 mV
-1000 ÷ 1000 mV
0 ÷ 2000 mV
0 ÷ -2000 mV

Temperature scales
-10.0 ÷ +100.0 °C
14.0 ÷ 230.0 °F

Option
S/N
REP N°

Power supply: 9/36 Vdc
Installed firmware: R 1.0x

Cod. 27861341 Revisione 01

INDEX

1 PRODUCT OVERVIEW

1.1 FUNCTIONAL PURPOSE OF THE DEVICE

The system for the monitoring of pH or ORP consists of two main parts:

- the transmitter object of this instruction manual;
- the pH or ORP measuring electrode.

The instrument operates in analog and/or digital functionality.

Analog operation

In analog mode the transmitter provides an isolated 4-20 mA current loop for direct connection to a PLC or a data logger.

The transmitter can be connected to the B&C Electronics instruments BC7635 - BC7335 - BC7687 - BC6587 which provide the power and perform the functions of display and control.

When operating in analog mode the instrument maintains the operation in digital mode.

Digital operation

In digital mode the transmitter interacts with a master device via the RS485 connection with the protocol B&C (ASCII) or Modbus (function 03) described later in this manual.

In this mode the user transmits the measurements and perform the calibration and the configuration.

The keys of the instrument remain active and have priority over the remote commands.

In order to reduce the power consumption, the user can disable the current loop and operate only in digital mode.

The transmitter performs the following functions:

1 display of the pH or ORP values of the aqueous solutions, by using a suitable measuring electrode;

2 display of the temperature values, by using a Pt100 temperature sensor;

3 perform the manual or automatic temperature compensation;

4 operate in analog or digital mode;

5 activate the hold function of the current loop through an external free voltage contact.

1.2 OPERATING PRINCIPLES

In the case of pH measurement the instrument receives a signal in mV from the sensor and provides the value in pH units, according to the Nernst's law.

In the case of ORP measurement the instrument receives a mV signal from the sensor and provides the value in mV.

In both cases the user can adjust the zero and the sensitivity to compensate for changes in sensor response due to the conditions of use.

The temperature affects the activity of the ionic solution and the signal provided by the sensor.

For this reason, in the pH measuring 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 Pt100 in order to perform the automatic compensation in case the temperature undergoes large changes.

1.3 ACCESSORIES

The items listed below are the ones most commonly used and are to be ordered separately.

Sensors and accessories suitable for different uses and heavy aplications are available.

Ask our staff for the best solutions to your needs.

Submersible probes

SI 161	pH probe, L= 720 mm
SI 181	pH probe, L=1170 mm
SI 262	Gold/ref. ORP probe, L= 720 mm
SI 263	Pt/ref. ORP probe, L=720 mm

Electrodes

SZ 145	pH electrode, epoxy body for clean liquids
SZ 165	pH electrode, glass body for dirty and contaminated liquids
SZ 173	pH electrode, glass body for contaminants liquids
SZ 195.2	pH electrode, glass body for high temperature and contaminated liquids
SZ 1075	pH electrode in antimony, epoxy body for liquids with fluorides
SZ 245	ORP electrode in gold. epoxy body for cyanide treatment
SZ 255	ORP electrode in platinum, epoxy body for clean liquids
SZ 265	ORP electrode in gold, glass body for cyanide treatment
SZ 275	ORP electrode in platinum. glass body for general purpose

SZ 2055	ORP electrode in platinum, epoxy body for high temperature and fluorides
SZ 1140	pH electrode, in PVDF, self cleaning, thread ¾" NPT
SZ 1150	pH electrode, in PVD, self cleaning, thread ¾" NPT, Pt100 built in
SZ 2060	ORP electrode, in PVDF, self cleaning, thread ¾" NPT

Holders

SZ 810	for use in immersion in PVC, L=210 mm
SZ 820	for use in immersion in PVC, L=400 mm
SZ 821	for use in immersion in PVDF, L=400 mm
SZ 860	for use in immersion in PVC, L=720 mm
SZ 880	for use in immersion in PVC, L=1170 mm

SZ 7101	for use in line up to 40 °C, PVC body
SZ 7105	for use in line up to 100 °C, PVDF body
SZ 7108	for use in line up to 110 °C, s.steel body

SZ 7231	for use in flow, for sensor D=12 mm and temperature sensor
SZ 7233	for use in flow, for 3 sensors D=12 mm and temperature sensor

SZ 7261	for use in flow, for sensor D=12 mm and temperature sensor
SZ 7263	for use in flow, for 3 sensors D=12 mm and temperature sensor

Temperature sensors

SI 520	Pt100 in line
SI 540	Pt100 immersion
SP 514	Pt100 in flow
SP51501	Pt1000 in flow, s.steel body, cable 1,5 m
SP51511	Pt1000 in flow, epoxy body, cable 1,5 m

Other accessories

BC 9408	IP65 enclosure for 1 or 2 instruments
BC 9412	IP65 enclosure for 3 instruments

SZ 740	IP65 junction box
SZ 911	stopper

SZ 9215	coax cable D=2,5 mm, L=100 m
SZ 947	cable for SZ 1140 and SZ 2060
SZ 9441	cable for SZ 1150

Standard solutions

SZ 952	buffer pH=4, 250 ml
SZ 954	buffer pH=7, 250 ml
SZ 956	buffer pH=9, 250 ml
SZ 961	buffer 220 mV, 250 ml

2 GENERAL WARNINGS AND INFORMATION FOR ALL USERS

2.1 WARRANTY

This product is guaranteed for all manufacturing defects.

Please take a look at the terms and conditions described on the warranty certificate at the end of the manual.

2.2 AFTER SALES SERVICE

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

- a free of charge technical assistance over the phone 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.

2.3 CE MARKING

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

- 72/23/EEC "Electrical safety – low tension" amended in 93/68/EEC.
- 2004/108/CEE (previously 89/336/EEC) "Electromagnetic compatibility".

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

2.4 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 transmitter must comply with the parameters described in chapter "Technical specifications (page 16)", in order to avoid potential damages and a reduction of its operating life.

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".

3.1 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.

3.2 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.

3.3 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, with its functional purpose and with the necessary accessories or options for its use.

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 types 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:
-"Instruction for the user (page 22)".

Maintenance staff could be more interesting in the chapters regarding:
-"Instruction for the user (page 22)";
-"Instruction for the maintainer (page 23)";
-"Warranty (page 51)";
-"Repairs (page 51)".

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 electronic 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.

3.3.1 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.

3.3.2 PLANT MAINTENANCE STAFF

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 that need to be done during the start-up and the periodical tests are the following:

- to allow only the visualization of the measures during the normal use;
- to calibrate the sensors by means of ZERO and SENS keys;
- to set the following parameters:
  - temperature measuring unit in °C or °F;
  - manual temperature compensation (only pH);
  - response time of the filter software.
- to modify the password to access the setup

3.3.3 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 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:

- pH / ORP electrode;
- ORP scale;
- baude rate of the RS485 interface;
- B&C or Modbus protocol ID;
- password to access the configuration.

4 SPECIFICATIONS

4.1 FUNCTIONAL SPECIFICATION

Display

The instrument is equipped with an alphanumeric LCD display 8x1 characters.

The display shows the measured values and messages which guide the operator in the use of the instrument.

The message scrolls across the display and begin with the identification number reported to the technical specifications.

Keyboard

The instrument has a 4 keys keyboard, who perform a dual function when pressed for more than 3 seconds, which allows access to all functions available.

Inputs

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

The pH value is measured by means of a glass electrode or antimony.

The ORP value is measured by a metal electrode/reference in three fields: positive, negative and negative + positive.

The temperature in °C or °F is measured by 3-wire RTD Pt100.

Scale

The instrument allows the user to select the pH scale and five scales in the field of redox positive, negative or both as indicated in the table in section "Technical specifications (page 16)".

Temperature compensation

The instrument displays the temperature value in the field -10.0 ÷ 100.0 °C or 14.0 ÷ 230.0 °F and it performs the manual or automatic temperature compensation.

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

Calibration

During the pH or ORP calibration, the instrument automatically recognizes standard solutions pH 4 - pH 7 - pH 9 and the standard ORP solution 220 mV.

If you use solutions other than standard, the instrument proposes the closer stored value allowing manual editing.

At the end of the calibration it possible to save the date of completion of calibration.

Analog output

The instrument operates in the current loop 4-20 mA proportional to the value of the principal measure.

The output is galvanically isolated, so to be interfaced directly to a PLC or data acquisition cards.

Serial interface

Through the RS485 interface, the user can connect the transmitter to a PC or a terminal to receive the measures and to perform the sensor calibration (only protocol B&C).

It needs a converter RS485/RS232 or RS485/USB.

The operator can use a simple terminal emulation program.

Using Modbus protocol the function 03 is implemented.

Software filter

On the input signal of the measuring sensor operates a software filter.

The user can set the response time relative to signals of small variation, in order to obtain good stability of reading.

Logic input

The instrument is equipped with a logic input which connects a free voltage contact from an external device.

The function of this input is to maintain in hold the current loop.

Power supply

The instrument is powered (min. 9 Vdc / max. 36 Vdc) through the current loop, directly from a PLC or data acquisition boards that provide the power, or by a power supply in series between the analog output and the apparatus of acquisition.

When operating in digital mode the instrument will be equally fed to the terminals of the current loop (min. 9 Vdc / max. 36 Vdc) minimizing power consumption.

Setup

The instrument is provided with a setup menu protected by a specific password where you can:

- disable the calibration functions;
- choose the response time for the software filter;
- select the unit of measurement of the temperature in °C or °F;
- change the access password.

Configuration

The instrument is provided with a configuration menu protected by a specific password where you can select:

- the pH/ORP measuring;
- the type of pH sensor glass/antimony;
- the ORP scale;
- enabling the current loop;
- the baud rate of the RS485 interface;
- the ID for communication protocols Modbus or B&C;

- a new value of the access password.

Information menu

The instrument is provided with an information menu to show:

- p/n and firmware release;
- last calibration date;
- total operating hours.

4.2 TECHNICAL SPECIFICATIONS

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

D1.0	MAIN MEASURING Default		
C1.1	Measuring type	pH / ORP	pH
	Sensor type		
C1.2A	• pH measuring	elettrodo glass / antimony	Glass
	• ORP measuring	elettrodo redox	
	pH glass electrode	pH glass electrode	
	• Slope	59.16 mV / pH 25 °C	
1.1	• Potential at 7.00 pH	0.0 mV	
1.2	• Zero	± 2.00 pH	0.00 pH
	• Sensitivity	80 % ÷ 110 %	100 %
	• Calibration	man/auto with buffer solution BDH pH 4.00 / 7.00 / 9.00 20°C	
	pH antimony electrode		
	• Slope	50 mV / pH 25 °C	
1.1	• Potential at 7.00 pH	-325.0 mV	
1.2	• Zero	± 2.00 pH	0.00 pH
	• Sensitivity	70 % ÷ 140 %	100 %
	• Calibration	man/auto con buffer solution BDH pH 4.00 / 7.00 / 9.00 20°C	
	ORP electrode		
1.2	• Zero	± 100 mV	0 mV
1.2	• Sensitivity	80 % ÷ 110 %	100 %
	• Calibration	man/auto con buffer solution Mettler 220 mV	
	pH scale	0.00 ÷ 14.00 pH	
	Resolution	0.01 pH	

D1.0	MAIN MEASURING Default		
	Under range	-1.00 pH	
	Overrange	15.00 pH	
C1.2B	ORP scales	Scale	
		0 ÷ 1000 mV	
		0 ÷ -1000 mV	
		-1000 ÷ 1000 mV	
		0 ÷ 2000 mV	
		0 ÷ -2000 mV	
	ORP resolution	1 mV	
	Under range	-2100 mV	
	Overrange	2100 mV	
S1.2	RT 90 % Large Signal RT 90 % Small Signal	2 seconds 1 ÷ 20 seconds	10 s
	Measuring update	0.5 seconds	

D2.0	SECONDARY MEASURING		Default
D2.0	Measure	Temperature	
	Input	RTD Pt100 3 wires	
S2.1	Measuring unit	°C / °F	°C
	Temperature compensation	manual without RTD automatic with RTD	
	Scale	-10.0 ÷ 110.0 °C 14.0 ÷ 230.0 °F	
	Resolution	0.1 °C / °F	
	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

	CURRENT LOOP		Default
C5.1	Current loop	Enabled / Disabled	Enabled

	CURRENT LOOP		Default
	Current loop proportional to main measuring	4-20 mA	
	Under range	3.80 mA	
	Over range	20.80 mA	
	ID of the selected scale		
	• Scale pH	10 mA at switching on for 8"	
	• Scale 1 ORP	11 mA at switching on for 8"	
	• Scale 2 ORP	12 mA at switching on for 8"	
	• Scale 3 ORP	13 mA at switching on for 8"	
	• Scale 4 ORP	14 mA at switching on for 8"	
	• Scale 5 ORP	15 mA at switching on for 8"	

	DIGITAL FUNCTION		Default
	Protocols	B&C protocol ASCII / Modbus RTU The two protocols can coexist	
C8.2	ID B&C protocol	ID=01 ÷ 32 last s/n figure, if 0 ID=10	01 ÷ 10
C8.3	Modbus address	ID=01 ÷ 243 last s/n figure, if 0 ID=10	01 ÷ 10
	The measuring and the parameters are sent after the receiving of the commands (see B&C ASCII and Modbus RTU function 03)		

	SERIAL INTERFACE		Default
	Interface	RS485 isolated not terminated	
C8.1	Baud rate	2400 / 4800 / 9600 / 19200 bit/s	9600 bit/s
	Distance of connection	1000 / 500 / 250 / 125 m	
	Network	32 trasmitters max	

	DIGITAL INPUT		Default
	Input	from free voltage contacts 2 wires in closure	
	Digital function	hold an the 4-20 mA loop (The state of the input is visible on the digital protocols)	

D50.0	SETUP		Default
50.1	Password	000 ÷ 999	000
S1.1	Calibration interdiction	On / Off	
S1.2	Response time (small signal)	1 ÷ 20 seconds (RT=90 %)	2 s
S2.1	Temperature measuring unit	°C / °F	°C
S2.2	Manual temperatre	0 ÷ 100 °C 32 ÷ 212 °F	20 °C
S50.1	Password changing	000 ÷ 999	000

D60.0	CONFIGURATION		Default
60.1	Password	000 ÷ 999	000
C1.1	Type of measuring	pH / ORP	pH
C1.2a	pH sensor	Glass / Antimony	Glass
C1.2b	ORP scale	0 ÷ 1000 mV	0 ÷ 1000 mV
		0 ÷ -1000 mV	
		-1000 ÷ 1000 mV	
		0 ÷ 2000 mV	
		0 ÷ -2000 mV	
C5.1	Current loop	Enabled / Disabled	Enabled
C8.1	Baud rate	2400 / 4800 / 9600 / 19200 bit/s	9600 bit/s
C8.2	ID B&C protocol	ID=01 ÷ 32 last s/n figure, if 0 ID=10	01 ÷ 10
C8.3	Modbus address	ID=0 ÷ 243 last s/n figure, if 0 ID=10	01 ÷ 10
C60.1	Password changing	000 ÷ 999	000

D70.0	INFO MENU		Default
I1.0	P/N and firmware release	PH3436 Rev1.xx	
I2.0	Last calibration date	XX/XX/XX	
I3.0	Total operation hours	XXXXXX h	

	POWER SUPPLY		Default
	Power supply	min. 9 Vdc / max. 36 Vdc	
	Current	current loop 4-20 mA, 22 mA max	
	The current value can be higher during the receiving the commands and the answer in a serial communication.		

4.2.1 GENERAL SPECIFICATIONS

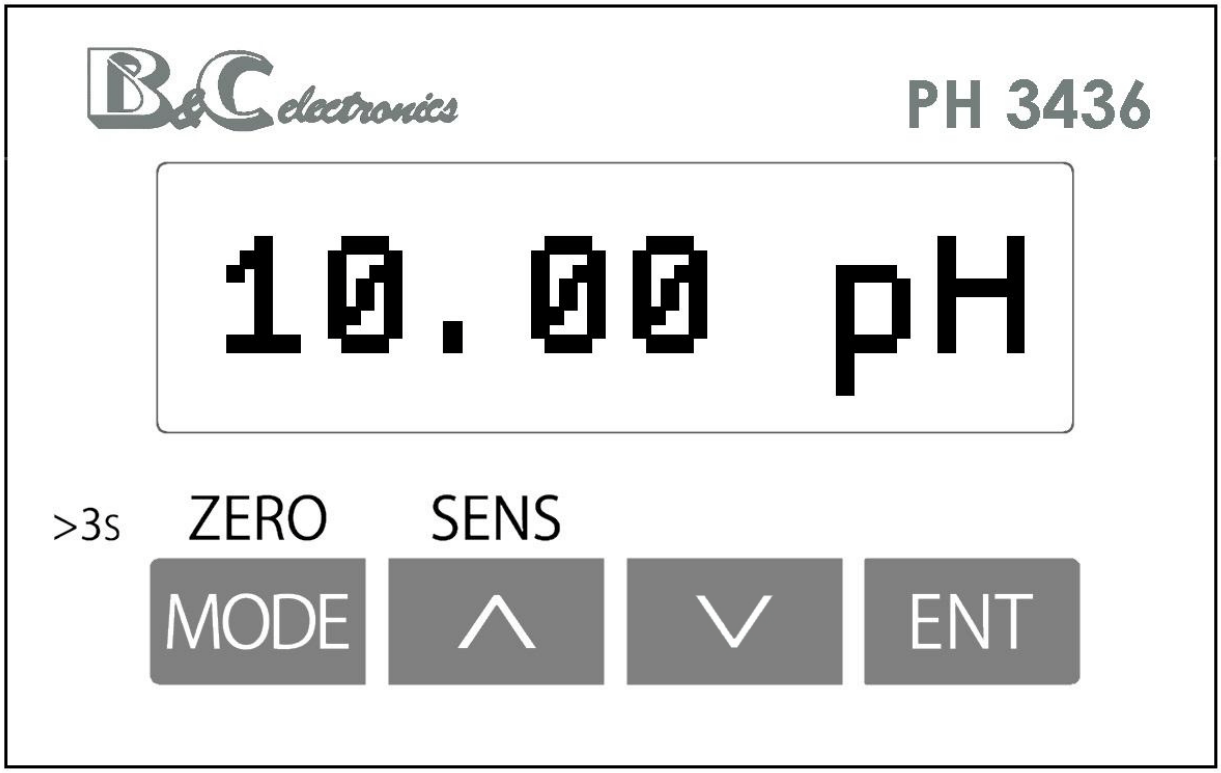
Room temperature	0 °C ÷ +50 °C
Relative humidity	up to 95 % without condensation
Protection of transmitter	IP40
Weight	250 g
Dimensions	71 x 95 x 58 mm
Mounting	Rail din 4 modules
Display	LCD COG 8x1 characters
Characters dimensions	11.97 x 4.97 mm
Long messages	sent alternately (title + variable)
Connections	removable terminal blocks 3.5 mm pitch
Isolation in/out	500 Vdc
Conformity EMC/RFI	EN61326

4.2.2 CONNECTIONS

Terminal	**Function**
2	+ Loop
3	- Loop (9/36 Vdc)
5	RS485 A+
6	RS485 B-
7	RS485 Gnd
7	Digital input
8	Digital input
13	T1 (Pt100)
14	T2 (common Pt100)
15	T0 (common Pt100) (Gnd measure)
16	LO (pH/ORP)
17	HI (pH/ORP)

5 OPERATING PROCEDURES

5.1 DISPLAY



5.2 KEYBOARD

KEY	FUNCTION
ZERO MODE	Key MODE/ZERO - To visualize the functions sequency - To exit without changing the visualized values - >3s To start the zero calibration
SENS ^	Key UP/SENS - To increment the values - To access the parameter changing - >3s To start the sensitivity calibration
v	Key DOWN - To decrement the values - To access the parameter changing
ENT	Key ENTER - To enter the visualized value - To go to the next parameter (into setup and configuration) - To access to secondary parameters

5.3 OPERATING MODE

The transmitter can be configured to operate in analog mode (current loop 4-20 mA = Enable). The digital mode is always active.

The transmitter in the analog mode (current loop) can be connected to a PLC or B&C Electronics instruments BC 7335 - BC7635 - BC7687 - BC6587, which provide power to the transmitter and allow the display of the measurement.

In digital mode the transmitter is a slave device and can be interrogated by a master device with B&C (ASCII) protocol or Modbus protocol.

For digital mode operation, see chapter "Digital operation (page 32)".

5.4 INSTRUCTION FOR THE USER

5.4.1 MAIN MEASURING

The display shows the value of the main measure as selected in the configuration menu.

pH measuring

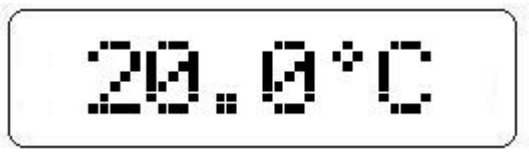
ORP measuring

The following are under range and over range messages: -<<<< and >>>>.

From the main measurement display 1.0 the user can access the calibration procedures of the measuring chain, if they have not been reserved to the maintainer.

5.4.2 TEMPERATURE MEASURING

The display shows the value of the temperature measurement (real or set), the measuring unit (°C or °F) and M in case of absence of the temperature probe.



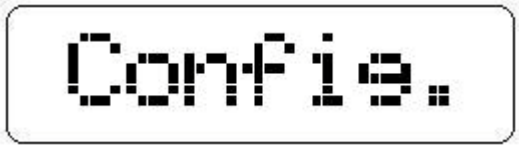
From this display the user can access the calibration procedure of the temperature probe if this has not been reserved to the maintainer.

5.4.3 PARAMETERS RESERVED TO THE PLANT MAINTAINER

From this display the user can access the maintenance menu of the instrument (setup) via password.

5.4.4 PARAMETER RESERVED TO THE PLANT ENGINEER

From this display the user can access the installation menu of the instrument (configuration) via password.



5.4.5 INFORMATION DISPLAY

From this display the user can access the information of the instrument.

ENT	to access to the functioning informations
MODE	to go to the measuring display

5.5 INSTRUCTION FOR THE MAINTAINER

5.5.1 PRELIMINARY OPERATIONS

Any checking operation must be done with the electrode or an adequate simulator connected to the input of the device.

If a simulator is not available, it is possible to short the input terminals to simulate the values pH=7 or mV=0.

In particular, check that the instrument has been properly configured for the type of use.

To verify the parameters without modifying them follow the operating procedures described in paragraph "Setup (page 29)".

The display provides all the information necessary for the preliminary checks of operation.

The lighting of the display indicates that the unit has power and power circuits are working properly.

5.5.2 MAKING MEASUREMENTS

To operate the system installed, verify the connection of the following components:

- the pH/ORP sensor and the eventual RTD in contact with the liquid under test;
- the logic input if necessary;

provide the power to the current loop and read the pH or ORP value of the liquid under test.

If the sensors are connected properly, as described in chapter "Installation drawings (page 47)", the system will operate on a regular basis and require only the calibration.

5.5.3 PH CALIBRATION

Before calibrating check that the glass membrane of the sensor was kept moist during the storage.

If the protective reservoir of the glass membrane is dry, immerse the electrode in a buffer solution or 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 make the standardization of the pH electrode (calibration) the operator can use the standard solutions from B&C Electronics. The instrument automatically recognizes the buffer solutions through the table pH/°C stored in it. The operator must check the value proposed and eventually modify it in accordance with the actual value of the buffer solution used.

Soak the electrode in the pH=7 solution (SZ 954) to calibrate the 1st point (zero calibration).

MODE by pressing this button for more than 3 seconds, the message **Zero Cal** appears alternately to the actual pH value or **Cal lock** if the calibration was inhibited in the setup (Display S1.1).

ENT to access the pH value changing.

If the measured value is close to that of the buffer solution, the value stored will be proposed.

The display will show the measured value **xx.xx pH**.

UP / DOWN to modify the value.

ENT to confirm the new value.

If the new value exceeds the limits of acceptability shown in the technical specifications of the instrument, the error **Zero err** will appear; press the ENT key to delete the error message and return to the main display.

If the new value is accepted, the display will show for a few seconds the message **Last cal** and propose recording the date of calibration.

UP / DOWN to change the value.

ENT to confirm the entered value.

MODE to return to the main display without entering the date.

This date will be shown in the information menu of the instrument and at the end of the next calibration of zero or sensitivity so that it can be changed by the new date to be inserted.

The reset to zero factory in the main display is done as follows:

start the calibration of zero, simultaneously press the UP, DOWN and ENT; the messages ***RES Zero*** *and* ***Last cal*** *will appear for a few seconds.*

Proceed to the insertion or modification of date as in the previous case.

Soak the electrode in the pH=4 (SZ 952) or pH=9.21 (SZ 956) solutions to calibrate the 2nd point (calibration of sensitivity).

UP (SENS) by pressing this button for more than 3 seconds, the message **Sens Cal** will appear alternately to the actual pH value or **Cal lock** if the calibration was inhibited in the setup (Display S1.1).

Wait for the stabilization of the value.

ENT to access the pH value changing.

If the measured value is close to that of the buffer solution, the value stored will be proposed.

The display will show the measured value **xx.xx pH**.

UP / DOWN to change the value.

ENT to confirm the entered value.

MODE to return to the main display without entering the sensitivity.

If the new value exceeds the limits of acceptability shown in the technical specifications of the instrument, the error **Sens err** will appear; press the ENT key to delete the error message and return to the main display.

If the new value is accepted, the display will show for a few seconds the message **Last cal** and propose recording the date of calibration.

UP / DOWN to change the value.

ENT to confirm the entered value.

MODE to return to the main display without entering the date.

This date will be shown in the information menu of the instrument and at the end of the next calibration of zero or sensitivity so that it can be changed by the new date to be inserted.

The reset to sensitivity factory in the main display is done as follows:

start the calibration of sensitivity, simultaneously press the UP, DOWN and ENT; the messages ***RES Sens*** *and* ***Last cal*** *will appear for a few seconds.*

Proceed to the insertion or modification of date as in the previous case.

In some cases it may be considered sufficient to perform the one point calibration by the use of a buffer solution of value as close as possible to that of the current measure.

To make the one point calibration is sufficient to calibrate the 1st and 2nd point in the same buffer solution. In fact, the instrument adjusts the only asymmetry (zero) if the difference between 1° and 2° calibration point is lower in absolute value of 1 pH unit.

If the value is different from that expected 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 (exhausted, badly installed);
- the instrument has made the only zero calibration.

The two error messages provided by the instrument during the calibration indicate that the pH electrode is in unacceptable operating condition (and therefore risky for the plant).

In fact, a zero deviation > 2 pH **Zero Err** *is an indication of excessive pollution of the reference electrode.*

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

In the case of these reports is advisable to replace the electrode.

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 that the sensors have reached a state of thermal equilibrium with the solution itself. This state of equilibrium can be considered achieved when the display marks stable values.

5.5.4 ORP CALIBRATION

In general it is preferable to work with the factory calibration with which the instrument measures the actual mV values supplied by the electrode of redox.

Should it be necessary the calibration is advisable to carry out the only zero calibration.

If the protective reservoir of the glass membrane is dry, immerse the electrode in a buffer solution or 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 make the standardization of the ORP electrode (calibration) the operator can use the standard solutions from B&C Electronics SZ 961 (220 mV).

Soak the electrode in the solution to calibrate the 1st point (zero calibration).

MODE by pressing this button for more than 3 seconds, the message **Zero Cal** appears alternately to the actual ORP value or **Cal lock** if the calibration was inhibited in the setup (Display S1.1).

ENT to access the ORP value changing.

UP / DOWN to modify the value.

ENT to confirm the new value.

If the new value exceeds the limits of acceptability shown in the technical specifications of the instrument, the error **Zero err** will appear; press the ENT key to delete the error message and return to the main display.

If the new value is accepted, the display will show for a few seconds the message **Last cal** and propose recording the date of calibration.

UP / DOWN to change the value.

ENT to confirm the entered value.

MODE to return to the main display without entering the date.

This date will be shown in the information menu of the instrument and at the end of the next calibration of zero or sensitivity so that it can be changed by the new date to be inserted.

*The reset to zero factory in the main display is done as follows: start the calibration of zero, simultaneously press the UP, DOWN and ENT; the messages **RES Zero** and **Last cal** will appear for a few seconds.*

Proceed to the insertion or modification of date as in the previous case.

If it is necessary to perform the sensitivity calibration, soak the electrode in the second buffer solution.

UP (SENS) by pressing this button for more than 3 seconds, the message **Sens Cal** will appear alternately to the actual ORP value or **Cal lock** if the calibration was inhibited in the setup (Display S1.1). Wait for the stabilization of the value.

ENT to access to the ORP values changing.

UP / DOWN to change the value.

ENT to confirm the entered value.

MODE to return to the main display without entering the sensitivity.

If the new value exceeds the limits of acceptability shown in the technical specifications of the instrument, the error **Sens err** will appear; press the ENT key to delete the error message and return to the main display.

If the new value is accepted, the display will show for a few seconds the message **Last cal** and propose recording the date of calibration.

UP / DOWN to change the value.

ENT to confirm the entered value.

MODE to return to the main display without entering the date.

This date will be shown in the information menu of the instrument and at the end of the next calibration of zero or sensitivity so that it can be changed by the new date to be inserted.

The reset to sensitivity factory in the main display is done as follows:

start the calibration of sensitivity, simultaneously press the UP, DOWN and ENT; the messages **RES Sens** *and* **Last cal** *will appear for a few seconds.*

Proceed to the insertion or modification of date as in the previous case.

If the value is different from that expected 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 (exhausted, badly installed);
- the instrument has made the only zero calibration.

The two error messages provided by the instrument during the calibration indicate that the ORP electrode is in unacceptable operating condition (and therefore risky for the plant).

In fact, a zero deviation > 100 mV **Zero Err** *is an indication of excessive pollution of the reference electrode.*

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

In the case of these reports is advisable to replace the electrode.

5.5.5 TEMPERATURE CALIBRATION

It can be made when the Pt100 sensor is connected.

Immerse the Pt100 in a liquid or keep the sensor in the air knowing the value of the temperature.

MODE	press the key from the main display to go to D2.0 display
MODE	press the key (ZERO) for more than 3 seconds

The message **Zero cal** will appear alternately with the temperature value.

Wait for the stabilization of the temperature value on the display.

ENT press to access the values changing.

The display will show the actual value **XXX.X °C** o **°F**.

UP / DOWN to change the value.

ENT to confirm the entered value.

MODE to return to the main display without modify the values.

The message **Update** indicates the calibration is memorized.

If the new value exceeds the limits shown in the specification, the message **Zero err** will appear.

It is possible to reset the zero value of the factory in the main display:
start the calibration of temperature, simultaneously press the UP, DOWN and ENT; the message RES Zero will appear for a few seconds.

5.5.6 SETUP

MODE	press the key two times from 1.0 display to get the message Set-up (display 50.0).
ENT	press the key to scroll through the setup functions
UP e DOWN	press the key to change the value or the option visualized on the display.
ENT	press the key to confirm the changings; the message Update will appear.
MODE	press the key to exit form the procedure and to turn to the 50.0 display.

Display	Contents	Meaning	Possible values
50.1	PASS 000	Password to access the setup menu	000 ÷ 999
S1.1	Cal lock	Inhibition of the zero and sensitivity calibration	On Off
S1.2	RespTime	Response time of the filter software	1 ÷ 20 s
S2.1	T Unit	Measuring unit of the temperature	°C °F
S2.2	T man	Manual temperature values	0.0 ÷ 100.0 °C 32.0 ÷ 212.0 °F
S50.0	Set-up	Password setting	000 ÷ 999

5.5.7 MAINTENANCE OF THE TRANSMITTER

The use of electronic components of high quality gives the instrument characteristics of great reliability.
The frequency of any maintenance depends on the particular use of the instrument.

WARNING: Disconnect the power supply to the unit before performing the following procedures:
- dust removal from the terminal;
- operations on the wires connecting the terminal;
- mounting of the instrument in the switch board.

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

- Periodically check that the device is not subject to excessive moisture.
- Check that the connections to the terminal are free of dust and corrosion.
- Check that the terminal screws are tight.

5.5.8 MAINTENANCE OF THE SENSOR

The instrument can provide incorrect measurements due to the sensor which must be carried out proper maintenance by following the instructions in its specific manual.

The electrodes 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, it is suggested to perform the calibration operations.

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

Do not use distelled water.

5.6 INSTALLATION INSTRUCTION

5.6.1 SAFETY REQUIREMENTS

⚠ After performing the installation (chapter "Installation (page 44)"), before switching on and configurating the instrument do the following operations:

- check that all connections are correct;
- check that all connections are fastened on the terminal;
- check that the mechanical attachment of the cables does not cause any twisting or bending on the terminal blocks.

⚠ WARNINGS: The damage due to incorrect connections during installation are not covered by warranty.

5.6.2 CONFIGURATION

MODE	press the key three times from 1.0 display to get the message Config. (display 50.0).
ENT	press the key to scroll through the configuration parameters
UP e DOWN	press the key to change the value or the option visualized on the display.
ENT	press the key to confirm the changings; the message Update will appear.
MODE	press the key to exit form the procedure and to turn to the 60.0 display.

Depending on the configuration of the instrument configuration parameters may not be displayed.

Display	Contents	Meaning	Possible values
60.1	PASS 000	Password to access the configuration menu	000 ÷ 999
C1.1	Sensor	Selection of the sensor type	pH ORP

Display	Contents	Meaning	Possible values
C1.2a	pH	Selection of the pH electrode type	Glass Antimony
C1.2b	ORPscale	Selection of the ORP scale	Variabile
C5.1	Loop	Current loop enable/disable	Enable Disable
C8.1	BaudRate	Selection of the baud rate	2400/4800 9600/19200
C8.2	B&C ID	ID for the B&C protocol	01 ÷ 32
C8.3	ModbusID	ID for the Modbus protocol	01 ÷ 243
C60.0	Config.	Password setting	000 ÷ 999

6 DIGITAL OPERATION

Two protocol types are available:

- B&C (ASCII) protocol;
- Modbus RTU protocol (only function 03).

6.1 B&C ASCII COMMUNICATION PROTOCOL

Through the RS485 interface, the user can connect the transmitter to a PC for data management and sensor calibration.

It is needed a converter RS485/RS232 or RS485/USB.

It uses a simple terminal emulation program.

The protocol used is similar to the protocol for SA8000 with some variations.

It is maintained by the **A** so to interrogate the probe with a software for PC type SA8000.

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

Format of the commands

2 bytes of ID probe (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 transmitter responds only under the correct received ID or 00.

Do not use the 00 ID if the transmitter is in network, so to avoid communication conflicts.

Beware if the transmitter is set to a different speed is not responding.

6.2 COMMANDS

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

6.2.1 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.

Example of the HELP menu with the pH scale configured

```
-------------------------------------------------------------------------------
HELP MENU, COMMAND LIST       B&C ELECTRONICS
-------------------------------------------------------------------------------
PH3436 pH/ORP TRANSMITTER Rev.fw:1.00  S/N:160589

00H  <cr>  Help menu
00A  <cr>  Acquisition
00Lx <cr>  Current loop:      0001             (0=disable 1=enable)
00Kx <cr>  Sensor type:       0001             (1=pH Glass 2=pH Antim. 3=ORP)
00Rx <cr>  RT90% small signal 0010 s           (1-20s)
00Wx <cr>  Temp. unit         0001             (1=°C 2=°F)
00Jx <cr>  Temp. adjust       not done    0.0  (5.0°C/9.0°F max) (00JR reset)
00Nx <cr>  Tman               20.0 °C          (0.0-100.0°C / 32.0-212.0°F)
00Vx <cr>  Standard zero pH:   0.00 pH         (0.00-14.00 pH)
00Tx <cr>  Standard sens.pH:   0.00 pH         (0.00-14.00 pH)
00Z  <cr>  Zero  calibration: OK         0.12  (2.00 pH max)(00ZR reset zero)
00S  <cr>  Sens. calibration: not done  100.0% (80-110%)    (00SR reset sens)
00Dx <cr>  Last cal date:                      (max 8 characters)
00Ix <cr>  ID B&C:     Actual 0002 Config 0002 (01-32)
00Ex <cr>  ID modbus:  Actual 0002 Config 0002 (01-243)
00Bx <cr>  Baud rate:  Actual 0003 Config 0003 (1=2400 2=4800 3=9600 4=19200)

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
-------------------------------------------------------------------------------
```

The HELP menu with the electrode of antimony is as above with the only variant in the acceptance limits of sensitivity.

Example of HELP menu with the ORP scale configured

```
-------------------------------------------------------------------------------
HELP MENU, COMMAND LIST       B&C ELECTRONICS
-------------------------------------------------------------------------------
PH3436 pH/ORP TRANSMITTER Rev.fw:1.00  S/N:160589

00H  <cr>  Help menu
00A  <cr>  Acquisition
00Lx <cr>  Current loop:      0001              (0=disable 1=enable)
00Kx <cr>  Sensor type:       0003              (1=pH Glass 2=pH Antim. 3=ORP)
00Ox <cr>  Analog out 4/20mA: 0001              (scale=1-5 for ORP)
00Rx <cr>  RT90% small signal 0010 s            (1-20s)
00Wx <cr>  Temp. unit         0001              (1=°C 2=°F)
00Jx <cr>  Temp. adjust       not done    0.0   (5.0°C/9.0°F max) (00JR reset)
00Nx <cr>  Tman               20.0  °C          (0.0-100.0°C / 32.0-212.0°F)
00Vx <cr>  Standard zero ORP:    0 mV           (0-1000 mV)
00Tx <cr>  Standard sens.ORP:    0 mV           (0-1000 mV)
00Z  <cr>  Zero  calibration: OK           20   (100 mV max) (00ZR reset zero)
00S  <cr>  Sens. calibration: not done  100.0% (80-110%)    (00SR reset sens)
00Dx <cr>  Last cal date:                       (max 8 characters)
00Ix <cr>  ID B&C:     Actual 0002 Config 0002 (01-32)
00Ex <cr>  ID modbus:  Actual 0002 Config 0002 (01-243)
00Bx <cr>  Baud rate:  Actual 0003 Config 0003 (1=2400 2=4800 3=9600 4=19200)

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
-------------------------------------------------------------------------------
```

6.2.2 ACQUISITION

Command format: ID + A <cr>

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

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

Record format

```
(x pH)
PH3436- 10 0.0 01/01/01 00:00:00 ± 10.00pH   ±  20.0°C  ±     0stat 18/11/10xx
(x ORP)
PH3436- 10 0.0 01/01/01 00:00:00 ±  1000mV   ±  20.0°C  ±     0stat 18/11/10xx
....+....|....+....|....+....|....+....|....+....|....+....|....+....|....+....| ....+..
```

PH3436	p/n of the transmitter
10	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 transmitter 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)
± 10.00 pH	pH value
± 20.0 °C	Temperature
± 0stat	State of the logic input (0 = open; 1 = closed)

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

18/11/10	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.

6.2.3 CURRENT LOOP

Command format: **ID + L + x <cr>**
Example: if ID=14 and you want to enable the current loop type 14L0 <cr> or 00L0 <cr>

Response of the unit:	**<lf> ID + L + x <cr> <lf>**	command executed correctly
Response of the unit:	none	command failed

It is possible to enable or disable the current loop in the configuration menu by selecting:
x=0 current loop disabled
x=1 current loop enabled

6.2.4 MEASURE TYPE

Command format: **ID + K + x <cr>**
Example: if ID=14 and you want to enable the current loop type 14K0 <cr> or 00K0 <cr>

Response of the unit:	**<lf> ID + K + x <cr> <lf>**	command executed correctly
Response of the unit:	none	command failed

The type of measure can be configured as follows:
x=1 pH measuring with glass electrode
x=2 pH measuring with antimony electrode
x=3 ORP measuring

6.2.5 4-20 MA ANALOG OUTPUT

Command format: **ID + O + x <cr>**

Example: if ID=14 and analog out = 1 scale (range 0 to 1000 mV) type 14O1 <cr> or 00O1 <cr>

Response of the unit:	**<lf> ID + O + x <cr> <lf>**	command executed correctly
Response of the unit:	none	command failed

The 4-20 mA analog output can be assigned to one of the five ORP scales.

6.2.6 SMALL SIGNAL RESPONSE TIME

Command format: **ID + R + x <cr>**

Example: if ID=14 and the response time to 90 % for small signal changes is 5 seconds type 14R5 <cr > or 00R5 <cr>

Response of the unit:	**<lf> ID + R + x <cr> <lf>**	command executed correctly
Response of the unit:	none	command failed

To check whether the entered value has been received, type command **H**.

6.2.7 TEMPERATURE MEASURING UNIT

Command format: **ID + W + x <cr>**

Example: if ID=14 and the unit of measurement of the temperature is °C type 14W0 <cr> or 00W0 <cr>

Response of the unit:	**<lf> ID + W + x <cr> <lf>**	command executed correctly
Response of the unit:	none	command failed

The temperature measuring unit can be configured with the following values:

x=0 measuring unit °C

x=1 measuring unit °F

6.2.8 TEMPERATURE ADJUSTMENT

Command format: **ID + J + x <cr>**

Example: if ID=14 and the temperature value to be taken is 23.2 °C type 14J23.2 <cr> or 00J23.2 <cr>

Response of the unit:	**<lf> ID + J + x <cr> <lf>**	command executed correctly
Response of the unit:	none	command failed

Zero adjustment of the temperature measure.

To verify the results of the temperature correction use the **ID + A**, the temperature reading should be approx same as the adjusted value.

With the command **ID + H** control the line "Temp. adjust: ok / error".

With the command **ID + J?** you can read the result directly.

If the operation has failed (error) the previous zero value is retained.

The "Temp. adjust: not done" message indicates that the parameter has been restored to the default value with the command **ID + JR**.

6.2.9 TEMPERATURE RESET

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

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

Response of the unit:	**<lf> ID + JR <cr> <lf>**	command executed correctly
Response of the unit:	none	command failed

This command allows you to return the value of the zero temperature to the default value.

Verify the outcome of the operation with the command **ID + H** and check the line "Temp. adjust: not done".

6.2.10 TEST OF THE TEMPERATURE ADJUSTMENT

Command format: **ID + J? <cr>**

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

Response of the unit:	**<lf> <8 characters outcome> <blank> <7 digit value> <4 characters unit> <cr> <lf>**	command executed correctly
Response of the unit:	none	command failed

Record format

```
ok       ±   0.2°C
....+....|....+....|....+....|....+....|....+....|....+....|....+....|....+....|
```

The possible results are: ok / not done / error.

6.2.11 MANUAL TEMPERATURE

Command format: **ID + N + x <cr>**

Example: if ID=14 and the manual temperature is 28.3 °C type 14N28.3 <cr> or 00N28.3 <cr>

Response of the unit:	**<lf> ID + N + x <cr> <lf>**	command executed correctly
Response of the unit:	none	command failed

To check whether the entered value has been received, type command **H**.

6.2.12 ZERO STANDARD SETTING

Command format: **ID + V + x <cr>**

Example: if ID=14 and the standard solution for zero calibration is 7.02 pH type 14V7.02 <cr> or 00V7.02 <cr> (max. two decimals for pH scale)
In the case of the ORP the command is the same (no decimal figures).
Example: 14V220 <cr>

Response of the unit:	**<lf> ID + V + x <cr> <lf>**	command executed correctly
Response of the unit:	none	command failed

To check whether the entered value has been received, type command **H**.

6.2.13 SENSITIVITY STANDARD SETTING

Command format: **ID + T + x <cr>**
Example: if ID=14 and the standard solution for the calibration of the pH sensitivity is 10.00 pH type 14T10.00 <cr> or 00T100.00 <cr> (max. two decimals for pH scale)
In the case of the ORP scale the command is the same (no decimal figures).
Example: 14T468 <cr>

Response of the unit:	**<lf> ID + T + x <cr> <lf>**	command executed corectly
Response of the unit:	none	command failed

To check whether the entered value has been received, type command **H**.

6.2.14 ZERO CALIBRATION

Command format: **ID + Z <cr>**
Example: if ID=14 type 14Z <cr> or 00Z <cr>

Response of the unit:	**<lf> ID + Z <cr> <lf>**	command executed correcly
Rsponse of the unit:	none	command failed

Zero calibration (first calibration point).
The value of the solution should be inserted through the command "Standard zero".
The transmitter adjusts the offset to display the value of the calibration solution.
Calibration to be performed preferably at first installation, before calibration sensitivity.
To verify the results of the zero calibration use the **ID + A**, the reading should be about the value of the standard solution.
Through the **ID + H** control the line " Zero calibration: ok / error ".
Through the **ID + Z?** you can read the result directly.
If the operation has failed (error) the unit will maintain the previous zero value.
The message "Zero calibration: not done" indicates that the parameter has been restored to the default value through the command **ID + ZR**.

6.2.15 ZERO RESET

Command format: **ID + ZR <cr>**
Example: if ID=14 type 14ZR <cr> or 00ZR <cr>

Response of the unit:	**<lf> ID + ZR <cr> <lf>**	command executed correctly
Response of the unit:	none	command failed

This command returns the zero to the default value.

Verify the outcome of the operation with the **ID + H** and check the line "Zero calibration: not done".

6.2.16 ZERO CALIBRATION TEST

Command format: **ID + Z? <cr>**

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

Response of the unit:	**<lf> <8 characters outcome> <blank> <7 digit value> <4 characters unit> <cr> <lf>**	command executed correctly
Response of the unit:	none	command failed

Record format

```
ok       ±    10uS
....+....|....+....|....+....|....+....|....+....|....+....|....+....|....+....|
```

Possible results: ok / not done / error.

6.2.17 SENSITVITY CALIBRATION

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

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

Response of the unit:	**<lf> ID + S <cr> <lf>**
Response of the unit:	none

Sensitivity calibration (second calibration point).

The value of the solution should be inserted through the command "Standard sens".

The transmitter adjusts the sensitivity by considering the first calibration point carried out with zero calibration.

The zero is recalculated.

To verify the results of the calibration use the **ID + A**, the reading should be about the value of the calibration solution.

Through the command **ID + S?** the user can read the result directly.

Through the command **ID + H** the user controls the lines lines:

"Zero. calibration: ok / error";

"Sens. calibration: ok / error".

If the operation has failed (error) the unit will maintaine the previous d from the previous zero and sensitivity values.

The message "Sens. calibration: not done" indicates that the parameter has been restored to the default value through the command **ID + SR**.

6.2.18 SENSITIVITY RESET

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

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

Response of the unit:	**<lf> ID + SR <cr> <lf>**	command executed correctly
Response of the unit:	none	command failed

This command allows to return to the default sensitivity value of 100.0 %.

Verify the outcome of the operation through the command **ID + H** and check the line "Sens. calibration: not done".

6.2.19 SENSITIVITY CALIBRATION TEST

Command format: **ID + S? <cr>**

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

Response of the unit:	**<lf> <8 characters outcome> <blank> <7 digit value> <4 characters unit> <cr> <lf>**	command executed correctly
Response of the unit:	none	command failed

Record format

```
ok       ± 100.0%
....+....|....+....|....+....|....+....|....+....|....+....|....+....|....+....|
```

Possible results: ok / not done / error.

6.2.20 LAST CALIBRATION DATE

Command format: **ID + D + cccccccc <cr>**

Example: if ID=14 and the date to be inserted is 13/11/10 type 14D13/11/10 <cr> or 00D13/11/10 <cr>

Response of the unit:	**<lf> ID + cccccccc <cr> <lf>**	command executed correctly
Response of the unit:	none	command failed

This command allows to store the last calibration date.

The date field is 8 characters to be written in any format and syntax.

6.2.21 ID OF THE B&C PROTOCOL

Command format: **ID + I + x <cr>**

Example: if ID=14 and the new ID (identification) to enter is 07 type 14I07 <cr> or 00I07 <cr>

Response of the unit:	**<lf> ID + I + x <cr> <lf>**	command executed correctly
Reponse of the unit:	none	command failed

The transmitter activates the new ID to the next power.

6.2.22 ID OF THE MODBUS PROTOCOL

Command format: **ID + E + x <cr>**

Example: if ID=14 and the new ID (identification) to enter is 07 type 14E07 <cr> or 00E07 <cr>

Response of the unit:	**<lf> ID + E + x <cr> <lf>**	command executed correctly
Response of the unit:	none	command failed

The transmitter activates the new ID to the next power.

6.2.23 BAUDE RATE

Command format: **ID + B + x <cr>**

Example: if ID=14 and the new speed is 2=4800 baud type 14B2 <cr> or 00B2 <cr>

Response of the unit:	**<lf> ID + B + x <cr> <lf>**	command executed correctly
Response of the unit:	none	command failed

The transmitter activates the new baud rate to the next power.

6.3 MODBUS PROTOCOL

On the transmitter, in addition to the ASCII B&C protocol, is implemented the Modbus RTU protocol limited to the function 03.
In Modbus communication network the transmitter 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).

6.3.1 MODBUS FUNCTION 03

Function 03 (MASTER QUERY)

Address	1 byte	01 ÷ 32 (ID transmitter)
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 transmitter considers valid the message if CRC-16 valid, ID valid and function=03.

Address	1 byte	01 ÷ 32 (ID trasmitter)
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 100ms.

6.3.2 DATA THROUGH MODBUS FUNCTION 03

	Name	Measure unit	Range	Data type	Size	R/W	Modbus addr
1	pH	0.01 pH	-100 ÷ 1500	Sign int	2 byte	R	0x0000
2	ORP	1 mV	-2100 ÷ 2100	Sign int	2 byte	R	0x0001
3	Temperature °C	0.1 °C	-100 ÷ 1100	Sign int	2 byte	R	0x0002
4	Temperature °F	0.1 °F	140 ÷ 2300	Sign int	2 byte	R	0x0003
5	Scale	1	0 ÷ 5	Sign int	2 byte	R	0x0004
6	Digital input status	1	0 ÷ 1	Sign int	2 byte	R	0x0005

7 INSTALLATION

7.1 PACKING LIST

The instrument package contains:

- The instrument with s/n label;
- The instruction manual in Italian language.

7.2 UNPACKING AND REPACKING OF THE UNIT

1 Remove from the carton box the instruction manual.

2 Open the box and remove the instrument wrapped in clear plastic guard.

3 Remove the plastic cap and keep the two fastening rods.

If repackaging do the reverse.

7.3 STORAGE AND TRANSPORT

For prolonged storage, keep the product in dry places.

In the case of transportation, pack the product in the carton box.

7.4 INSTALLATION OF THE TRANSMITTER

The instrument can be installed in a special watertight box or DIN rail in an electrical control panel.

7.5 INSTALLATION OF THE SENSOR

Follow the instructions for installation of submersible pressure or flow.

The submersible B&C Electronics probe contains the sensor (also called electrode) and is equipped with a ring to adjust the depth of immersion in the test liquid.

Secure the probe to the tank by a bracket with a hole of about 36 mm.

The installation of the sensors by means of holders in the flow (for example the models of B&C Electronics SZ 7101 - SZ 7105 - SZ 7108) must be carried out keeping the sensor oriented downwards, with a maximum inclination of 45° to the vertical.

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

The interruption of the coax cable can cause disturbances to the measure, therefore, is not recommended.

In case of need of cable extension, use terminal strips with high insulation and protected from moisture (for example the accessory derivation SZ 740).

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

7.6 ELECTRICAL INSTALLATION

For all electrical connections, refer to the drawing printing on the back of the instruments, also shown and described in chapter "Installation drawings (page 47)".

All the connections to the instrument are made using removable terminal blocks.

> ⚠ It should be remembered that the electronic instruments are subject to accidental failure.
>
> Predict the necessary precautions to avoid any damage caused by their dysfunction.

7.6.1 CONNECTION OF THE SENSORS

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

The pH and ORP electrodes are connected to the central wire of the respective coaxial cable.

The reference electrodes are connected to the shield of the respective coaxial cable.

- Connect the central of the coaxial cable to the 17 high impedance terminal marked HI.
- Connect the shield of the coaxial cable to the 16 low impedance terminal marked LO.

Use only the original coax cables supplied by the manufacturer in between sensor and input terminals of the instrument.

> ⚠ WARNINGS
>
> The coax cable generally has a conductive sheath, very thin, between the central conductor and the shield. Remove this sheath for at least 5 mm in order to avoid the contact with the fastening terminal of the central conductor.

7.6.2 CONNECTION OF 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 RTD as shown in chapter "Installation drawings (page 47)", using the appropriate wire gauge.

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

Two-wire PT100 connection for short distances

- Connect the Pt100 to terminals 13-14 and short terminals 14-15.

Three wire Pt100 connection for great distances

- Connect a Pt100 wire to the 13 instrument terminal.
- Connect one common wirel of the Pt100 to terminal 14 and the other common wire to terminal 15 (use two separate wires).

Warnings:

- do not interrupt the connection cable. Use extension cable through high isolation junction box;
- keep the cable away from the power cables;
- in case of interference use shielded cable with the shield connected to the ground terminal 3.

7.6.3 CONNECTION OF THE CURRENT LOOP

The instrument provides an output current proportional to the primary measure to drive an external recorder, PLC or other similar devices.

- Connect the (+) terminal of the power supply to the 2 terminal.
- Connect the return of the loop (-) to the 3 terminal.

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

7.6.4 CONNECTION OF THE LOGIC INPUT

The free voltage contacts in closure from an external device must be applied to the logic input terminals 7 and 8.

⚠ WARNINGS
Do not give any power to the logic input terminals.

7.6.5 CONNECTION TO THE RS485 SERIAL PORT

The instrument can be configured as a slave device and communicate via the serial port. There are two types of protocol as described in chapter "Digital operation (page 32)".

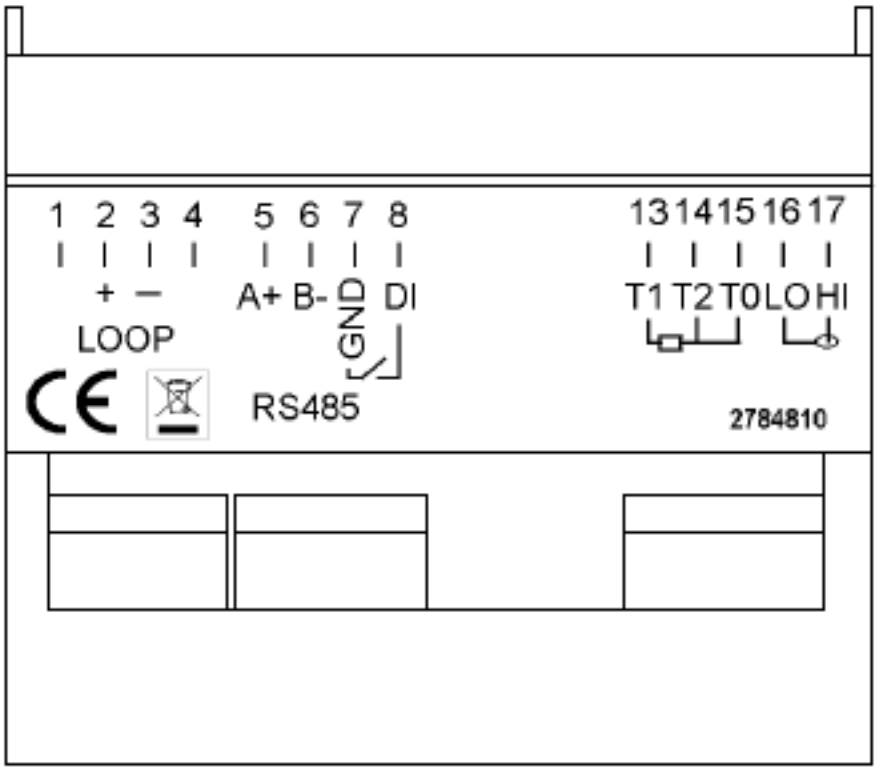
- Connect the (+) or channel A of the RS485 interface to terminal 5.
- Connect the (-) or channel B of the RS485 interface to terminal 6.
- Connect the eventual ground (GND) of the RS485 interface to terminal 7.

7.7 DISPOSAL

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

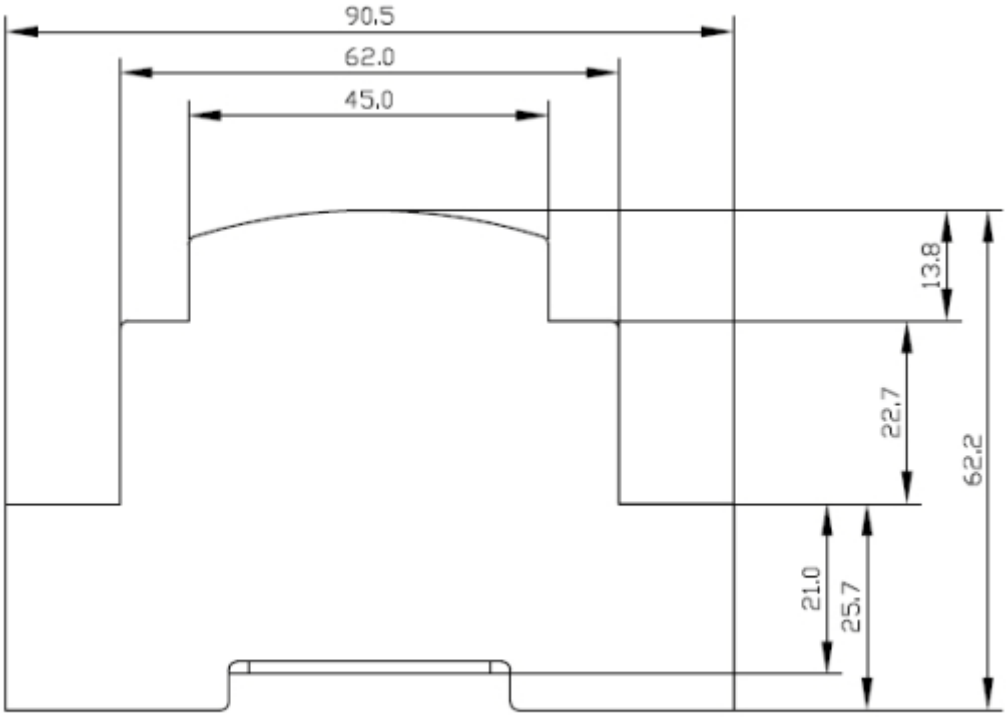
8 INSTALLATION DRAWINGS

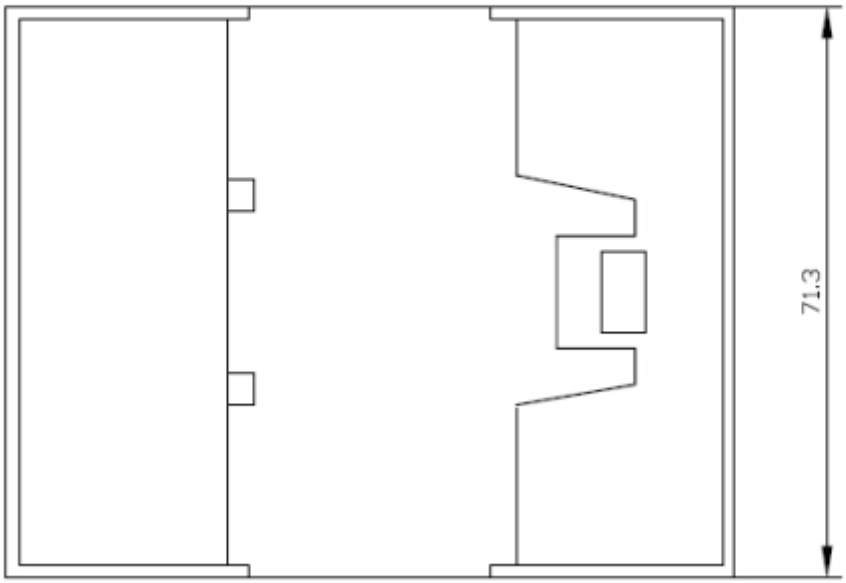
8.1 CONNECTIONS



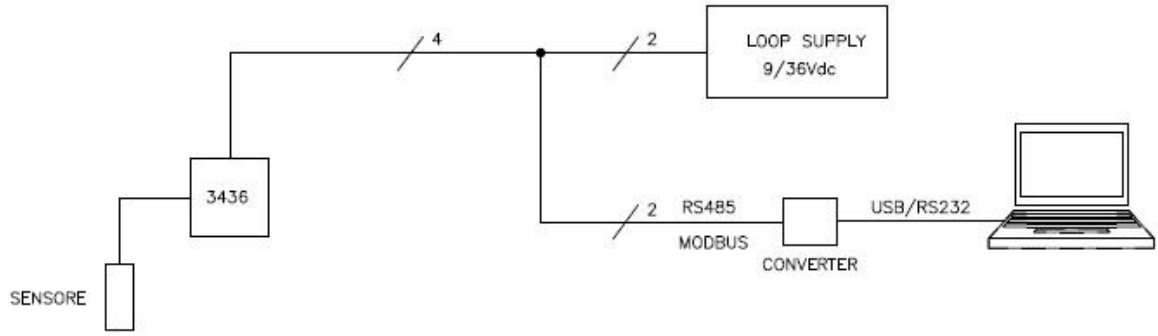
Terminal	Function
2	+ Loop
3	- Loop (9/36 Vdc)
5	RS485 A (+)
6	RS485 B (-)
7	RS485 Gnd
7	Digital input
8	Digital input
13	T1 (Pt100)
14	T2 (common Pt100)
15	T0 (common Pt100) (Gnd measure)
16	LO (pH/ORP)
17	HI (pH/ORP)

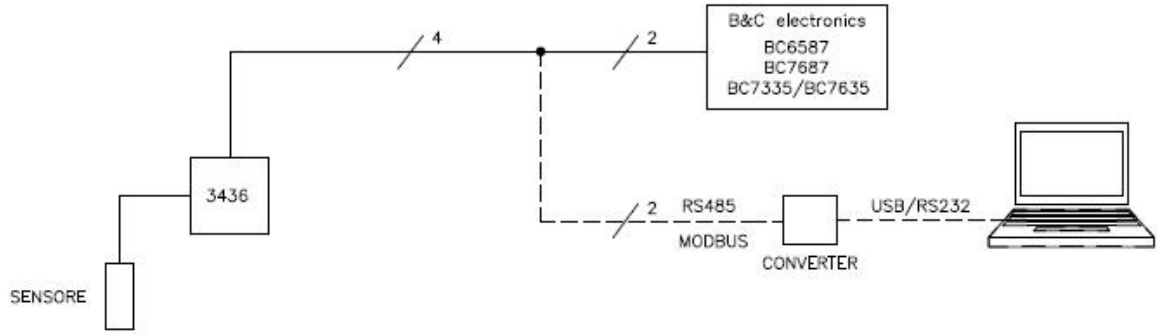
8.2 DIMENSIONS

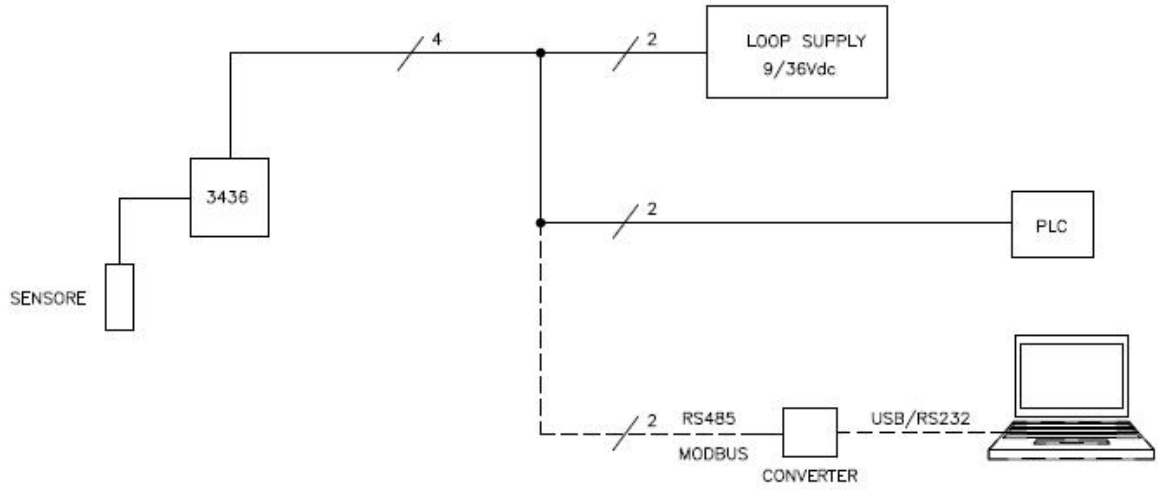




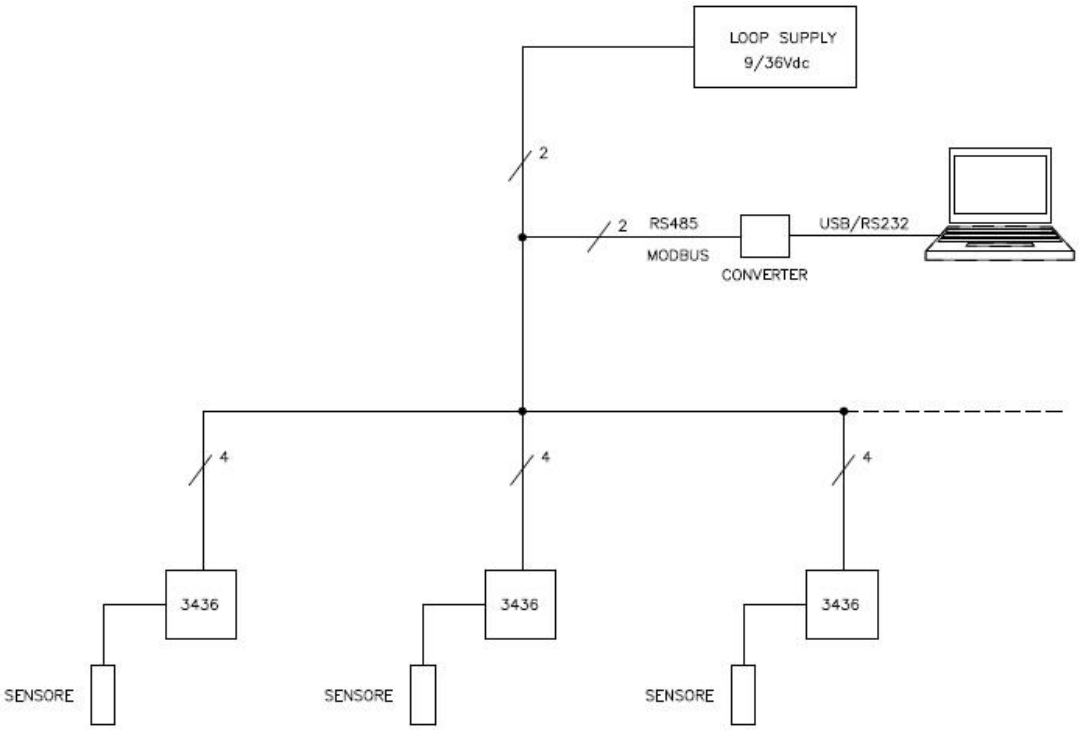
8.3 SINGLE INSTRUMENT CONNECTION

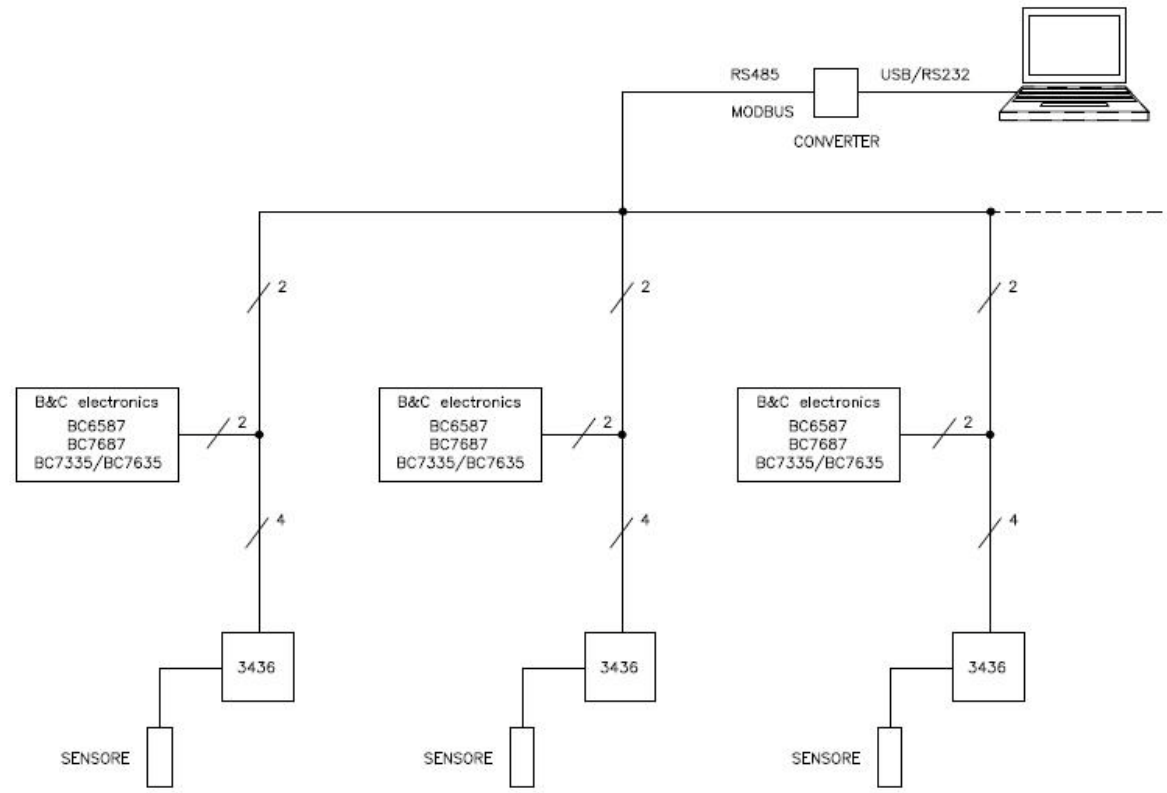






8.4 RS485 NETWORK CONNECTION





9 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 the use of its tools.

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10 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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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