



## Instruction manual

# BC 7687

## UNIVERSAL CONTROLLER - TRANSMITTER

Valido anche per le opzioni

091.xxxx

Scale: -9999 ÷ 9999

Input (+): 0/4-20 mA

Input (-): 0/4-20 mA

Option

S/N

REP N°

Power supply: 85 ÷ 264 Vac

Installed firmware: R 1.0x





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# **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"

Until 19/04/2016:

- 2006/95/EC "Low Voltage" LV
- 2004/108/EC "Electromagnetic compatibility" EMC

From 20/04/2016:

- 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 14)", 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

#### 2.1.1 SINGLE MEASURING

The instrument is used when there is a need to add display function, control, alarm and automatic sensor cleaning to a transmitter with 4-20 mA output.

The system for monitoring and control is made of two important parts:

- the controller described in this instruction manual;
- the 0-20 mA or 4-20 mA transmitter connected to a suitable sensor.

The instrument has the necessary electric circuits and firmware to perform the following functions:

- visualization of the measuring in the selectable range from -9999 to 9999, corresponding to the 0-20 mA or 4-20 mA input from an external device;
- it provides the Vdc power to the 4-20 mA loop powered transmitter;
- it will automatically adjust the measuring, if dosing pumps or solenoids are connected to the specific relays;
- it will give an alarm, if the measure goes outside the low/high limit values;
- it provides a dual analog output for recording and acquiring the measuring values;
- it receives a dual external free voltage contacts to activate the alarm or the hold condition;
- it activates a manual/automatic cleaning cycle.

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

#### 2.1.2 DIFFERENTIAL MEASURING

In some application it is necessary to measure before and after the process in order to obtain the difference of the two measuring. This unit allows a differential measuring, by using two transmitters featuring the same measuring scale.

The system for monitoring and control the differential measuring is made of 3 important parts:

- the controller described in this instruction manual;
- two 0-20 mA or 4-20 mA transmitters connected to a suitable sensor.

In this case the instrument performs the following functions:

- visualization of the differential measuring between two 0-20 mA or 4-20 mA signals applied to the positive and negative input of the instrument;
- it provides the Vdc power to the 4-20 mA loop powered transmitters;
- it will automatically adjust the measuring, if dosing pumps or solenoids are connected to the specific relays;
- it will give an alarm, if the measure goes outside the low/high limit values;
- it provides a dual analog output for recording and acquiring the measuring values;
- it receives a dual external free voltage contacts that activates the alarm or the hold condition;

- it activates a manual/automatic cleaning cycle.

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

## **2.2 ACCESSORIES**

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

Our web site [www.bc-electronics.it](http://www.bc-electronics.it) contains accessories, upgrades and detailed specifications of each product.

Our staff is always available to help costumers 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".

### 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 28)".*

*Maintenance staff could be more interesting in the chapters regarding:*

- "Users instruction (page 28)";*
- "Maintenance instructions (page 31)";*
- "Warranty (page 42)";*
- "Repairs (page 42)".*

*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 transmitter 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 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 disable the calibration of the instrument and of the set points to the user;
- to calibrate the sensors by means of ZERO and SENS keys;
- to set the following parameters:
  - set point 1 and 2 by means of SET1 and SET2 keys
  - set point 1 and 2 hysteresis and delay (ON-OFF)

- PID parameters
- min. and max. alarm value
- alarm delay
- activate/deactivate logic inputs
- autoclean parameters
- to modify password to access setup.

### **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 location of this set parameters can be seen in the right 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:

- operating mode (AUTO/MEAS/SIM);
- 0-20 mA or 4-20 mA input;
- single or differential input;
- measuring unit;
- decimal point position in the display;
- lower point of the scale;
- higher point of the scale;
- filter software selection;
- ON-OFF or PID regulation;
- PFM - PWM or 4-20 mA regulation type;
- min/max function (LO/HI) of set point 1 and set point 2;
- associated alarm to the set point time activation;
- alarm relay status activated/deactivated (ACTIVE/NON ACTIVE) in alarm condition;
- outputs scale associated to the input scale;
- analog outputs range 0-20 mA or 4-20 mA;
- hold/alarm function for logic inputs;
- password to access the configuration.

## **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 reported to the technical specifications.

In case of inactivity, after 3 minutes the display returns to the main measure.

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.

#### **Measuring unit**

The instrument allows the user to select the specific measuring unit (% , NTU, FTU, mg/l, g/l, ppm, uS, mS, pH, mV) or to create a custom one (custom).

#### **Scale**

The scale of the instrument can be configured in the range  $-9999 \div 9999$ , by selecting the lower and the higher values and the decimal point position.

In case of the over/under range the instrument shows the specific message.

At the right top of the display (called "secondary display") the measured value is displayed as a percentage of full scale (0 to 100% IN).

#### **Inputs**

The instrument features an input I1 for a transmitter active output or from a two wire current loop transmitter that is powered by the instrument itself.

In addition it is available an input I2 in order to allow a differential measuring between two transmitters with the same measuring scale.

In case of single input current over/under range the instrument shows the specific message.

In case of differential measuring, if one of the two input is in over/under range, the instrument shows the specific message of indeterminate measuring.

#### **Input current measuring**

The instrument provides the I1 and I2 input current measuring, in order to allow the check of the correct functioning of the transmitters.

## 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 instrument has an alarm relay, which contact are SPDT type.

The alarm condition can be configured for:

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

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

The alarm status and the cause that generated it are displayed.

## Analog outputs

The instrument has two analog current outputs for PID control or to transmit the value of the main measurement and/or temperature.

The output signal is programmable in 0-20 mA or 4-20 mA.

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

## Logic inputs

The instrument is equipped with a dual logic input to connect to external dry contacts.

The input function can be activated/deactivated in the setup menu.

Their function can be selected as hold/alarm, which features are described in chapter "Technical data (page 14)", and it is selected in the configuration menu.

The HOLD condition always prevails over the ALARM.

In case of activation of the hold function in the display Messages section "Display (page 27)" will be displayed HOLD status, in case there is a previous alarm condition will be maintained such indication.

## Autoclean

The instrument is equipped with a relay with SPDT contacts to connect an external device for the self-cleaning of the sensors.

Into the setup menu, you can:

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

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

## Operating mode

The instrument is provided with 3 programmable modes of operation.

### Automatic operation (AUTO)

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

### Measuring operation (MEAS)

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

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

The measuring operation mode is useful for 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 36)").

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

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

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

## Filter software

The input signal has a filter with two selectable response time.

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

## 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.

## Setup

The setup menu access through a specific password allows the user to select:

- disable/enable of the calibration procedure set point values;
- set point, alarm and input logic parameters;
- autoclean cycles parameters;
- new password.

## Configuration

The configuration menu access through a specific password allows the use to select:

- mode of operation (AUTO/MEASURE/SIMULATION);
- input 0-20 / 4-20 mA;
- single or differential input;
- measuring unit;
- decimal point position;
- low and high scale limits;
- filter software (SMALL e LARGE);
- type of control (ON-OFF/PID);
- type PID (FM or WM relay or analog output);
- minimum/maximum function of the set point (LO/HI);
- alarms associated with the operation time of the set point;
- condition of the alarm relay (ACTIVE/NON ACTIVE);
- measure related to the analog outputs;
- outputs 0-20 mA or 4-20 mA scalable;
- hold/alarm function of the logic inputs (HOLD/ALARM);
- password access to the configuration.

## Info menu

The instrument is provided with an information menu to show:

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

## 4.2 TECHNICAL DATA

### 4.2.1 GENERAL SPECIFICATIONS

|                           |                                                                           |
|---------------------------|---------------------------------------------------------------------------|
| Precision                 | 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<br>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<br>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 SPECIFICATIONS

In the left column indicates the number of the display concerning:

- SETUP parameters are indicated by "S xy"
- CONFIGURATION parameters are indicated with "C xy" where  
x = paragraph and y = sequential 1..2..3..4..ecc

| D1.0 | MAIN MEASURING                         |                                                           | Default |
|------|----------------------------------------|-----------------------------------------------------------|---------|
| C1.0 | Operating mode                         | AUTO/MEAS/SIM                                             | AUTO    |
| C1.1 | Transmitters input<br>(passive/active) | 4-20 / 0-20 mA                                            | 4-20 mA |
| C1.2 | Input type                             | SINGLE / DIFFER.<br>(Single / Differential)               | SINGLE  |
|      | Passive transmitters power             | 24 Vdc (max 50 mA)                                        |         |
|      | <u>Programmable scale</u>              |                                                           |         |
| C1.3 | • Measuring unit                       | %, NTU, FTU, mg/l, g/l, ppm,<br>μS, mS, pH, mV,<br>custom | %       |
| C1.4 | • Custom measuring unit                | ABCD (4 characters max)                                   | ABCD    |
| C1.5 | • Decimal point                        | YYYY / YYY.Y / YY.YY / Y.YYY                              | YYY.Y   |
| C1.6 | • LO scale value                       | -9999 ÷ 9999                                              | 0.0 %   |
|      | 4 mA (single 4-20)                     |                                                           |         |
|      | 0 mA (single 0-20)                     |                                                           |         |
|      | -16 mA (diff. 4-20)                    |                                                           |         |
|      | -20 mA (diff. 0-20)                    |                                                           |         |
| C1.7 | • HI scale value                       | -9999 ÷ 9999                                              | 100.0 % |
|      | 20 mA (single 4-20)                    |                                                           |         |
|      | 20 mA (single 0-20)                    |                                                           |         |
|      | 16 mA (diff. 4-20)                     |                                                           |         |
|      | 20 mA (diff. 0-20)                     |                                                           |         |
|      | <u>Resolution</u>                      |                                                           | Digit   |
|      | Interval   HI - LO                     | > 100 digit                                               |         |
|      |                                        |                                                           |         |
|      |                                        |                                                           |         |

| <b>D1.0</b> | <b>MAIN MEASURING</b>                    | <b>Default</b>                      |
|-------------|------------------------------------------|-------------------------------------|
|             | <u>Single input</u>                      |                                     |
|             | Under range (0-20 mA)                    | input < -0.50 mA or display < -9999 |
|             | Over range (0-20 mA)                     | input > 20.50 mA or display > 9999  |
|             | Under range (4-20 mA)                    | input < 3.50 mA o display < -9999   |
|             | Over range (4-20 mA)                     | input > 20.50 mA or display > 9999  |
|             |                                          |                                     |
|             | <u>Differential input</u>                |                                     |
|             | Under range (0-20 / 4-20 mA)             | display < -9999                     |
|             | Over range (0-20 / 4-20 mA)              | display > 9999                      |
|             | Under range (0-20 mA)                    | input 1/2 < -0.50 or > 20.50 mA     |
|             | Over range (4-20 mA)                     | input 1/2 < 3.50 or > 20.50 mA      |
|             |                                          |                                     |
|             | <u>Indeterminate measuring condition</u> |                                     |
|             | • Display                                | - - - -                             |
|             | • Set point                              | Deactivated                         |
|             | • Alarm                                  | Active                              |
|             | • Analog output                          | 20.50 mA                            |
|             |                                          |                                     |
| D1.1        | Zero                                     | ±10 % of the scale                  |
| D1.2        | Sensitivity                              | 12.5 % ÷ 250 %                      |
|             |                                          |                                     |
| C1.8        | Response time at 90 % large signal       | 0.4 ÷ 50.0 seconds                  |
| C1.9        | Response time at 90 % small signal       | 0.4 ÷ 50.0 seconds                  |

| <b>2.0</b> | <b>SCALA 100 %IN AND mA CHECK</b> | <b>Default</b>               |
|------------|-----------------------------------|------------------------------|
| 2.0        | Scale                             | 0.0 ÷ 100.0 %IN              |
|            | Resolution                        | 0.1 %IN                      |
|            |                                   |                              |
| 2.0        | I1 input                          | 0.00 ÷ 20.00 mA (max. 30 mA) |
|            | Resolution                        | 0.01 mA                      |
|            |                                   |                              |
| 2.0        | I2 input (differential only)      | 0.00 ÷ 20.00 mA (max. 30 mA) |
|            | Resolution                        | 0.01 mA                      |

| <b>3.1</b> | <b>SET POINT 1</b> | <b>Default</b>               |
|------------|--------------------|------------------------------|
| C3.1       | Regulation type    | ON-OFF / PID                 |
|            |                    | ON-OFF (referred to relay 1) |

| 3.1   | SET POINT 1                |                                    | Default   |
|-------|----------------------------|------------------------------------|-----------|
|       |                            | PID (referred to relay 1 or OUT1)  |           |
| C3.2  | Regulation referred to PID | FM / WM / OUT1<br>FM/WM to relay 1 | FM        |
|       |                            |                                    |           |
|       |                            | <u>ON-OFF regulation</u>           |           |
| D3.1  | • Set point value          | LO / HI values                     | LO value  |
| S3.1A | • Hysteresis               | 0.0 ÷ 10.0 % FS                    | 0.1 % FS  |
| S3.2A | • Delay                    | 0.0 ÷ 100.0 seconds                | 0.2 s     |
| C3.3  | • Function                 | LO / HI (Min / Max)                | LO        |
|       |                            |                                    |           |
|       |                            | <u>PID regulation</u>              |           |
| D3.1  | • Set point value          | LO / HI values                     | LO value  |
| S3.1B | • Proportional band        | 0.0 ÷ 400.0 % FS                   | 0.1 % FS  |
| S3.2B | • Integral time            | 0.0 ÷ 999.9 minutes                | 0.0 min   |
| S3.3B | • Derivative time          | 0.0 ÷ 999.9 minutes (0=disabl.)    | 0.0 min   |
| C3.3  | • Function                 | LO / HI (Min / Max)                | LO        |
|       |                            |                                    |           |
|       |                            | <u>FM regulation on relay 1</u>    |           |
| S3.4B | • Pulse frequency          | 0 ÷ 120 pulses/minute              | 100 i/min |
|       | • Pulse length             | 0.1 seconds                        |           |
|       |                            |                                    |           |
|       |                            | <u>WM regulation relay 1</u>       |           |
| S3.4B | • Pulse width              | 0 ÷ 99.9 seconds                   | 20.0 s    |
|       | • Minimum width            | 0.3 seconds                        |           |
|       |                            |                                    |           |
|       | Relay contacts             | SPST 220 V 5 A resistive load      |           |
|       | Analog output 1            | 4-20 mA                            |           |

| 3.23.2 | SET POINT 2                |                                    | Default |
|--------|----------------------------|------------------------------------|---------|
| C3.4   | Regulation type            | ON-OFF / PID                       | ON-OFF  |
|        |                            | ON-OFF (referred to relay 2)       |         |
|        |                            | PID (referred to relay 2 or OUT2)  |         |
|        |                            |                                    |         |
| C3.5   | Regulation referred to PID | FM / WM / OUT2<br>FM/WM on relay 2 | FM      |
|        |                            |                                    |         |

| <b>3.23.2 SET POINT 2</b>       |                     |                                 | <b>Default</b>                |
|---------------------------------|---------------------|---------------------------------|-------------------------------|
| <u>ON-OFF regulation</u>        |                     |                                 |                               |
| D3.2                            | • Set point value   | LO / HI values                  | LO value                      |
| S3.5A                           | • Hysteresis        | 0.0 ÷ 10.0 % FS                 | 0.1 % FS                      |
| S3.6A                           | • Delay             | 0.0 ÷ 100.0 seconds             | 0.2 s                         |
| C3.6                            | • Function          | LO / HI (Min / Max)             | HI                            |
| <u>PID regulation</u>           |                     |                                 |                               |
| D3.2                            | • Set point value   | LO / HI values                  | LO value                      |
| S3.5B                           | • Proportional band | 0.0 ÷ 400.0 % FS                | 0.1 % FS                      |
| S3.6B                           | • Integral time     | 0.0 ÷ 999.9 minutes             | 0.0 min                       |
| S3.7B                           | • Derivative time   | 0.0 ÷ 999.9 minutes (0=disabl.) | 0.0 min                       |
| C3.6                            | • Function          | LO / HI (Min / Max)             | HI                            |
| <u>FM regulation on relay 2</u> |                     |                                 |                               |
| S3.8B                           | • Pulse frequency   | 0 ÷ 120 pulses/minute           | 100 i/min                     |
|                                 | • Pulse length      | 0.1 seconds                     |                               |
| <u>WM regulation on relay 2</u> |                     |                                 |                               |
| S3.8B                           | • Pulse width       | 0 ÷ 99.9 seconds                | 20.0 s                        |
|                                 | • Minimum width     | 0.3 seconds                     |                               |
| Relay contacts                  |                     |                                 | SPST 220 V 5 A resistive load |
| Analog output 2                 |                     |                                 | 4-20 mA                       |

| <b>4.0 ALARM</b>                      |                              |                              | <b>Default</b> |
|---------------------------------------|------------------------------|------------------------------|----------------|
| <u>Min/Max alarm</u>                  |                              |                              |                |
| S4.1                                  | • Min. value                 | LO value -5% / HI value + 5% | LO value -5%   |
| S4.2                                  | • Max. value                 | LO value -5% / HI value + 5% | HI value +5%   |
|                                       | • Hysteresis                 | ± 0.1 % FS                   |                |
| S4.3                                  | • Delay                      | 0.0 ÷ 100.0 seconds          | 1.0 s          |
| <u>Set point operation time alarm</u> |                              |                              |                |
| C4.1                                  | • Set point1                 | ON / OFF                     | OFF            |
| C4.2                                  | • Set point1 operation time  | 0 ÷ 60 minutes               | 60 min         |
| C4.3                                  | • Set point 2                | ON / OFF                     | OFF            |
| C4.4                                  | • Set point 2 operation time | 0 ÷ 60 minutes               | 60 min         |

| 4.0  | ALARM            | Default                  |
|------|------------------|--------------------------|
|      |                  |                          |
| C4.5 | Contact function | ACTIVE / NON ACTIVE      |
|      | Relay contacts   | SPDT 220 V 5 A resistive |

| D5.1 | ANALOG OUTPUT 1                  | Default             |
|------|----------------------------------|---------------------|
|      | <u>If not related to SET1</u>    |                     |
| C5.1 | Input related to OUT1            | (measure) / %IN     |
| C5.2 | Output range                     | 0-20 / 4-20 mA      |
|      | Under / Over range (0-20)        | 0.00 / 20.50 mA     |
|      | Under / Over range (4-20)        | 3.50 / 20.50 mA     |
| C5.3 | Point 1 (0 mA or 4 mA) (measure) | LO value / HI value |
| C5.4 | Point 2 (20 mA) (measure)        | LO value/ HI value  |
| C5.3 | Point 1 (0 mA or 4 mA) (% s)     | 0.0 ÷ 100.0 %IN     |
| C5.4 | Point 2 (20 mA) (% s)            | 0.0 ÷ 100.0 %IN     |
|      | Response time                    | 2.5 seconds to 98 % |
|      | Isolation                        | 250 Vca             |
|      | R max                            | 600 ohm             |

| D5.2 | ANALOG OUTPUT 2                 | Default             |
|------|---------------------------------|---------------------|
|      | <u>If not related to SET2</u>   |                     |
| C5.5 | Input related to OUT2           | (measure) / %IN     |
| C5.6 | Output range                    | 0-20 / 4-20 mA      |
|      | Under / Over range (0-20)       | 0.00 / 20.50 mA     |
|      | Under / Over range (4-20)       | 3.50 / 20.50 mA     |
| C5.7 | Point 1 (0 mA o 4 mA) (measure) | LO value / HI value |
| C5.8 | Point 2 (20 mA) (measure)       | LO value/ HI value  |
| C5.7 | Point 1 (0 mA o 4 mA) (% s)     | 0.0 ÷ 100.0 %IN     |
| C5.8 | Point 2 (20 mA) (% s)           | 0.0 ÷ 100.0 %IN     |
|      | Response time                   | 2.5 seconds to 98 % |
|      | Isolation                       | 250 Vca             |
|      | R max                           | 600 ohm             |

| 6.0 | LOGIC INPUTS (D1 and D2) | Default |
|-----|--------------------------|---------|
|     | <u>HOLD condition</u>    |         |
|     | • Analog outputs         | HOLD    |
|     | • Set point              | HOLD    |

| 6.0  | LOGIC INPUTS (D1 and D2)                                        | Default                                             |
|------|-----------------------------------------------------------------|-----------------------------------------------------|
|      | <ul style="list-style-type: none"> <li>Alarm status</li> </ul>  | Alarm relay OFF<br>Alarm indication held on display |
|      | <u>ALARM condition</u>                                          |                                                     |
|      | <ul style="list-style-type: none"> <li>Analog output</li> </ul> | RUN                                                 |
|      | <ul style="list-style-type: none"> <li>Set point</li> </ul>     | OFF                                                 |
|      | <ul style="list-style-type: none"> <li>Alarm status</li> </ul>  | ON                                                  |
| S6.1 | Logic input 1                                                   | ON / OFF                                            |
| C6.1 | Logic input 1 function                                          | HOLD / ALARM                                        |
| S6.2 | Logic input 2                                                   | ON / OFF                                            |
| C6.2 | Logic input 2 function                                          | HOLD / ALARM                                        |
|      | Logic input activation                                          | free voltage contacts                               |

| D7.0 | CLEANING                                                          | Default             |
|------|-------------------------------------------------------------------|---------------------|
| S7.1 | Cleaning function                                                 | OFF / AUTO / MANUAL |
|      | <u>Cleaning parameters</u>                                        |                     |
| S7.2 | <ul style="list-style-type: none"> <li>Repetition time</li> </ul> | 0.5 ÷ 100.0 hours   |
| S7.3 | <ul style="list-style-type: none"> <li>Cleaning time</li> </ul>   | 1.0 ÷ 60.0 seconds  |
| S7.4 | <ul style="list-style-type: none"> <li>Holding time</li> </ul>    | 0.1 ÷ 20.0 minutes  |
|      | <u>Cleaning cycle</u>                                             |                     |
|      | <ul style="list-style-type: none"> <li>Analog output</li> </ul>   | HOLD                |
|      | <ul style="list-style-type: none"> <li>Set point</li> </ul>       | OFF                 |
|      | <ul style="list-style-type: none"> <li>Alarm status</li> </ul>    | OFF                 |

| D50.0 | SETUP                     | Default               |
|-------|---------------------------|-----------------------|
| D50.1 | Password                  | 000 ÷ 999             |
| S1.1  | Calibration and set point | ON / OFF              |
| S3.1A | Hysteresis SET1 (ON-OFF)  | 0.0 ÷ 10.0 % of FS    |
| S3.2A | Delay SET1 (ON-OFF)       | 0.0 ÷ 100.0 seconds   |
| S3.1B | PID band SET1             | 0.0 ÷ 400.0 % of FS   |
| S3.2B | Integral time SET1        | 0.0 ÷ 999.9 minutes   |
| S3.3B | Derivative time SET1      | 0.0 ÷ 999.9 minutes   |
| S3.4B | Pulse frequency PFM SET1  | 0 ÷ 120 pulses/minute |
| S3.4B | Pulse width PWM SET1      | 0.1 seconds           |

| <b>D50.0</b> | <b>SETUP</b>             |                          | <b>Default</b> |
|--------------|--------------------------|--------------------------|----------------|
| S3.5A        | Hysteresis SET2 (ON-OFF) | 0.0 ÷ 10.0 % of FS       | 0.1 %          |
| S3.6A        | Delay SET2 (ON-OFF)      | 0.0 ÷ 100.0 seconds      | 0.2 s          |
| S3.5B        | Band PID SET2            | 0.0 ÷ 400.0 % of FS      | 1.0 %          |
| S3.6B        | Integral time SET2       | 0.0 ÷ 999.9 minutes      | 0.0 min        |
| S3.7B        | Derivative time SET2     | 0.0 ÷ 999.9 minutes      | 0.0 min        |
| S3.8B        | Pulse frequency FM SET2  | 0 ÷ 120 pulses/minute    | 100 i/min      |
| S3.8B        | Pulse width WM SET2      | 0.1 seconds              | 20.0 s         |
| S4.1         | Alarm LO (low value)     | LO value / HI value      | LO value       |
| S4.2         | Alarm HI (high)          | LO value/ HI value       | HI value       |
| S4.3         | Alarm delay              | 0.0 ÷ 100.0 seconds      | 1.0 s          |
| 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                      |                |

| <b>D60.0</b> | <b>CONFIGURATION</b>                  |                                                     | <b>Default</b> |
|--------------|---------------------------------------|-----------------------------------------------------|----------------|
| D60.1        | Password                              | 000 ÷ 999                                           | 0              |
| C1.0         | Operating mode                        | AUTO / MEAS / SIM                                   | AUTO           |
| C1.1         | Input from transmitters               | 4-20 / 0-20 mA                                      | 4-20 mA        |
| C1.2         | Input type                            | Single / Differential                               | Single         |
| C1.3         | Measuring unit                        | %, NTU, FTU, mg/l, g/l, ppm, µS, mS, pH, mV, custom | %              |
| C1.4         | Custom measuring unit                 | ABCD (4 characters max)                             | ABCD           |
| C1.5         | Decimal point                         | YYYY / YYY.Y / YY.YY / Y.YYY                        | YYY.Y          |
| C1.6         | Point LO                              | -9999 ÷ 9999                                        | 0.0 %          |
| C1.7         | Point HI                              | -9999 ÷ 9999                                        | 100.0 %        |
| C1.8         | RT Large Signal                       | 0.4 ÷ 50.0 seconds                                  | 2.0 s          |
| C1.9         | RT Small Signal                       | 0.4 ÷ 50.0 seconds                                  | 10.0 s         |
| C3.1         | SET1 regulation                       | ON-OFF / PID                                        | ON-OFF         |
| C3.2         | SET1 regulation related to (PID only) | RELAY1 FM / RELAY1 WM / OUT1                        | FM             |
| C3.3         | SET1 function                         | LO / HI (Min / Max)                                 | LO             |
| C3.4         | SET2 regulation                       | ON-OFF / PID                                        | ON-OFF         |

| <b>D60.0</b> | <b>CONFIGURATION</b>                  | <b>Default</b>                  |
|--------------|---------------------------------------|---------------------------------|
| C3.5         | SET2 regulation related to (PID only) | RELAY1 FM / RELAY1 WM / OUT1 FM |
| C3.6         | SET2 function                         | LO / HI (Min / Max) HI          |
| C4.1         | Alarm related to SET1 operation time  | ON / OFF OFF                    |
| C4.2         | SET1 operation time                   | 0 ÷ 60 minutes 60 min           |
| C4.3         | Alarm related to SET2 operation time  | ON / OFF OFF                    |
| C4.4         | SET2 operation time                   | 0 ÷ 60 minutes 60 min           |
| C4.5         | Alarm function                        | ACTIVE / NON ACTIVE ACTIVE      |
| C5.1         | Input related to the analog output 1  | (measure)/ % s (measure)        |
| C5.2         | Analog output 1 range                 | 4-20 / 0-20 mA 0-20 mA          |
| C5.3         | Point 1 analog output 1               | -9999 ÷ 9999 0.0                |
| C5.4         | Point 2 analog output 1               | -9999 ÷ 9999 100.0              |
| C5.5         | Input related to the analog output 2  | (measure)/ %IN %IN              |
| C5.6         | Analog output 2 range                 | 4-20 / 0-20 mA 0-20 mA          |
| C5.7         | Point 1 analog output 2               | 0.0 - 100.0 %IN 0.0 %IN         |
| C5.8         | Point 2 analog output 2               | 0.0 - 100.0 %IN 100.0 %IN       |
| C6.1         | Logic input 1 function                | HOLD / ALARM HOLD               |
| C6.2         | Logic input 2 function                | HOLD / ALARM ALARM              |
| C60.1        | Password change                       | XXX                             |

| <b>70.0</b> | <b>INFO MENU</b>        | <b>Default</b>          |
|-------------|-------------------------|-------------------------|
| I1.0        | Release code            | BC7687 R1.0X            |
| 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 h                |

## **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 ELECTRICAL INSTALLATION**

For all the electrical connections refer to the label on the instruments, also shown and described in the chapter "Installation drawing (page 39)".

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

The power connections are on a 13-position terminal block.

The power connections of the input signals of the transmitters are on a 4-position terminal block.

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

#### **5.5.1 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.

### 5.5.2 CONNECTING THE TRANSMITTERS

The connection of the input signals is the most critical part of the whole system because of possible noise or interference.

The application also accidental of signals not originate from the transmitters or from simulators may damage the electronic input circuits.

- Use twisted cables and with low losses along the entire length between the transmitter and the input terminals of the instrument.
- Avoid interruptions of the cable. If necessary use only special terminal blocks with very high insulation and protect from moisture.
- Keep the connection cables far from the power cables also inside the electrical panel.

The transmitters provide output current "active" or "passive".

A transmitter with passive output is not equipped with an own power supply and requires the Vdc power by the instrument BC 7687.

A transmitter with the active output is equipped with an own power supply and does not require the Vdc power by the instrument BC 7687.

#### Connecting a transmitter with active analog output

- Connect the positive terminal of the transmitter to the terminal 22 marked I+.
- Connect the zero of the transmitter to the terminal 23 marked 0V.

### Connecting transmitters with active analog output for differential measurements

- Connect the positive terminal of the transmitter 1 to the terminal 22 marked I+.
- Connect the positive terminal of the transmitter 2 to the terminal 21 marked I-.
- Connect the zero of the transmitters 1 and 2 to the terminal 23 marked 0V.

In this case the display will show the difference between I+ and I-.

### Connecting a transmitter with passive analog output (4-20 mA current loop)

Connect the positive terminal of the transmitter to the terminal 20 marked 24V.

Connect the negative of the transmitter to the terminal 22 marked I+.

### Connecting transmitters with passive analog output for differential measurements

- Connect the positive terminal of the transmitters 1 and 2 to the terminal 20 marked 24V.
- Connect the negative terminal of the transmitter 1 to the terminal 22 marked I+.
- Connect the negative terminal of the transmitter 2 to the terminal 21 marked I-.

In this case the display will show the difference between I+ and I-.

 Do not connect the terminal 20 marked 24V to a transmitter with active analog output. It can damage the instrument BC 7687.

## 5.5.3 CONNECTING ANALOG OUTPUTS

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

- Connect terminal (+) of recorder N°1 to the terminal 15.
- Connect terminal (+) of recorder N°2 to the terminal 14.
- Connect terminal (-) of the two recorders to the terminal 16.

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

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

## 5.5.4 CONNECTING PUMPS, SOLENOIDS AND ALARMS

the relays contacts are available on the terminal block of the instrument.

They consist of two open contacts SPST corresponding to the set point 1 and set point 2 and a contact SPDT corresponding to the alarm.

### SET POINT 1

terminal 5 marked C : common

terminal 4 marked NO : normally open

### SET POINT 2

terminal 7 marked C : common

terminal 6 marked NO : normally open

Drive the loads of the relay by a power different from that of the instrument in order to prevent disturbances arising from loads of inductive nature.

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 functions of the maximum or minimum.

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 33)" and "Setup (page 33)").

To change the minimum/maximum (LO/HI) function of the set point, see chapter "Configuration (page 36)".

## ALARM

terminal 9 marked C : common

terminal 8 marked NO : normally open

terminal 10 marked NC : normally closed

The alarm relay can be configured on/off (ACTIVE/NOT ACTIVE) during alarm conditions of the measurement.

The configuration "disabled" (NOT ACTIVE) allows to signal shutdown or not operation of the instrument.

The alarm condition occurs when:

- the measure exceeds the selected min/max values;
- the operating time of set point 1 and 2 is exceed (if configured);
- contact from logic input 1 and 2 (if configured).

As for set point the user can set a delay (see "Setup (page 33)").

## 5.5.5 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 ("Setup (page 33)") and C6.1 ("Configuration (page 36)").

The hold or alarm function are described in the chapter "Technical data (page 14)".

## 5.5.6 CONNECTING THE CLEAN SYSTEM

The contacts of the cleaning relay are on the terminal block of the instrument.

terminal 12 marked C : common

terminal 11 marked NO : normally open

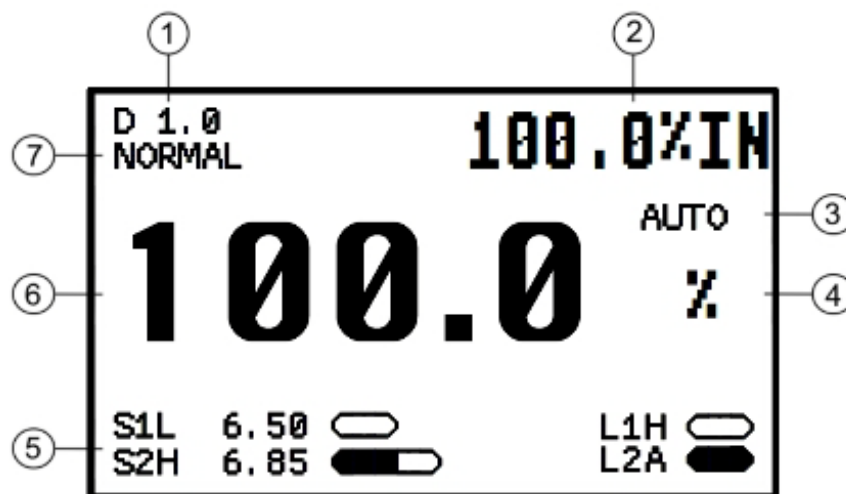
terminal 13 marked NC : normally closed

## 5.6 DISPOSAL

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

## 6 OPERATING PROCEDURES

### 6.1 DISPLAY



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

### 6.2 KEYBOARD

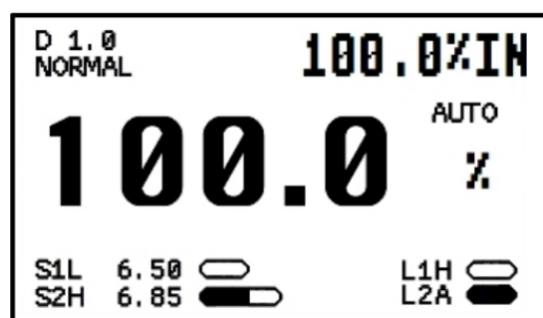
| KEYS                                                                                                | FUNCTION                                                                                                                                        |
|-----------------------------------------------------------------------------------------------------|-----------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

## 6.3 USERS INSTRUCTION

### 6.3.1 MAIN MEASURING

The display shows the measuring value or the differential value in % or measuring unit as selected in the configuration menu. It allows the access to the calibration procedure and set point changing if those functions has not been disabled into the setup menu.

At the right top of the display (called "secondary display") the measured value is displayed as a percentage of full scale (0 to 100% IN).



The instrument configured to operate with single input, will send the over range or under range messages when the measuring or the input current is over or under range.

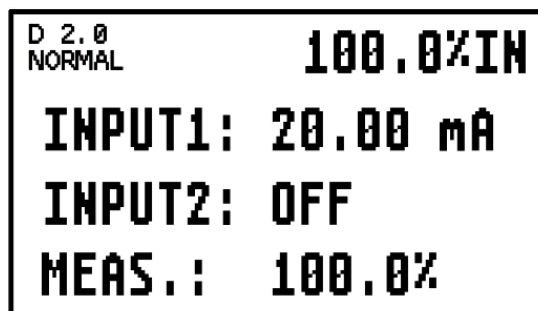
The instrument configured to operate with differential input, will send the indefinite measuring message when one or both inputs current is below or above the scale.

If the cleaning function is activated, during the cycle the display will visualize the measuring value and the running cleaning phase: CLEAN or HOLD.

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

### 6.3.2 INPUT CURRENT VALUES

Press MODE from the display D1.0 to visualize the input current on the input terminals.



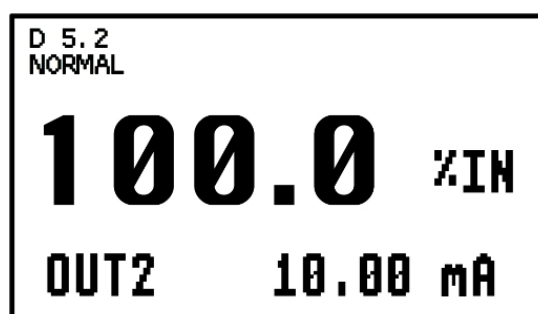
### 6.3.3 ANALOG OUTPUT 1 VALUES

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



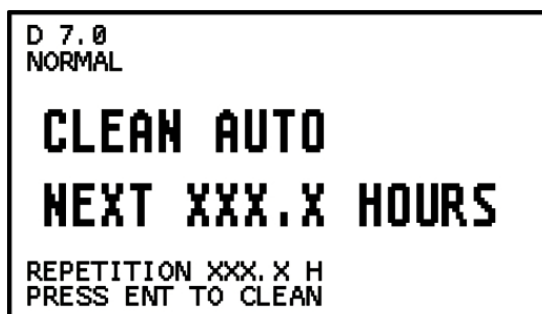
### 6.3.4 ANALOG OUTPUT 2 VALUES

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



### 6.3.5 AUTOCLEAN

Press **MODE** four times from the display D1.0 to visualize the autoclean state, the remaining time to the next cycle and the repetition time as configured in the setup menu.



|     |                            |
|-----|----------------------------|
| ENT | to start a cleaning cycle. |
|-----|----------------------------|

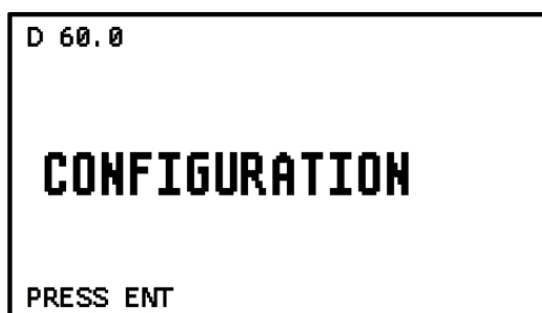
### 6.3.6 PARAMETERS FOR THE MAINTENANCE STAFF

Press **MODE** five times from the display D1.0 to visualize the **SETUP** display to access to the maintenance menu of the unit.



### 6.3.7 PARAMETERS FOR THE PLANT ENGINEER

Press **MODE** six times from the display D1.0 to visualize the **CONFIGURATION** display to access to the installation menu of the unit.



## 6.3.8 INFORMATION MENU

Press MODE seven times from the display D1.0 to visualize the information menu from which you can access the information functions of the instrument.



|            |                                                                      |
|------------|----------------------------------------------------------------------|
| ENT        | press the key to visualize and to confirm in sequence the 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<br>BC7687 R1.00 | P/N e firmware release              |                   |
| I2.0    | LCD BRIGHTNESS<br>8             | Screen brightness                   | 0 ÷ 30            |
| I3.0    | LCD CONTRAST<br>8               | Screen contrast                     | 0 ÷ 30            |
| I4.0    | LCD MODE<br>NORMAL              | Type of visualization of the screen | NORMAL<br>REVERSE |
| I5.0    | TOTAL: XXXXX h                  | Total operating hours               |                   |

## 6.4 MAINTENANCE INSTRUCTIONS

### 6.4.1 PRELIMINARY OPERATIONS

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

If the input terminals are not connected to a current source, the unit will show 0 mA. 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 33)" to verify the parameters without modifying the values.

The display and the keys in the front panel allow 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:

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

and if necessary

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

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

If the transmitters 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

Depending of the application the customer may perform two calibration types in order to get:

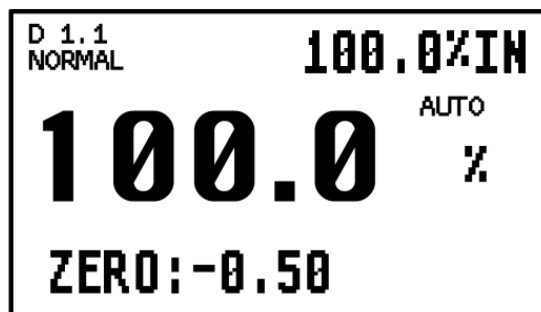
- 1 the correspondence between the input current and the scale of the display as selected into the configuration menu. It is possible to use a mA simulator (i.e. the BC 125 model) or to measure the input current from the transmitter by means of an accurate mA meter;
- 2 the correspondence between the transmitter measuring value and the display value.

The user must consider the following:

- the zero calibration will modify in the same quantity any value within the scale;
- the sensitivity calibration will modify the slope (i.e. the conversion multiplier factor).

### Zero calibration

Press MODE (ZERO) for 3 seconds to get the following display:



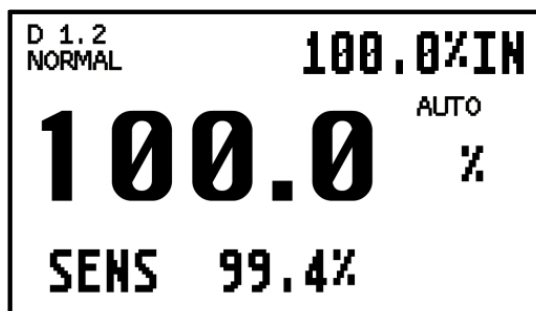
UP or DOWN      press the key to modify the values

ENT              press the key to confirm the new value

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

## Sensitivity calibration

Press UP (SENS) for 3 seconds to get the following display:

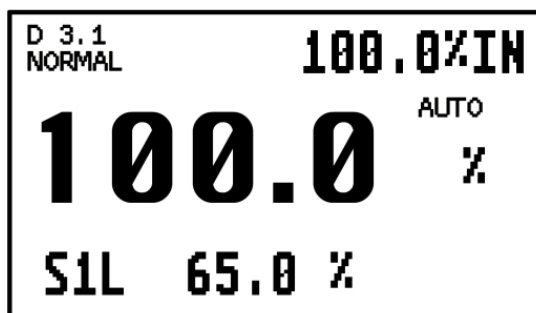


UP or DOWN      press the key to modify the values  
ENT                press the key to confirm the new value

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

### 6.4.4 SET POINT

Press DOWN (SET1) or ENT (SET2) for 3 seconds to get the following display:



UP or DOWN      press the key to modify the values  
ENT                press the key to confirm the new value

### 6.4.5 SETUP

Press MODE five times from the D1.0 display to get the D50.0 display.



|            |                                                                            |
|------------|----------------------------------------------------------------------------|
| 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 D50.0 display any time                        |

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

| Display | Contents                   | Meaning                                                           | Possible values |
|---------|----------------------------|-------------------------------------------------------------------|-----------------|
| D50.1   | PASSWORD SET-UP<br>---     | Password to access the setup menu                                 | 000 ÷ 999       |
| S1.1    | CAL FUNCTION<br>ON         | Inibition of zero/sensitivity calibration and set point changings | ON<br>OFF       |
| S3.1A   | HYSTERESIS SET1<br>0.1 %   | Hysteresis of the set point 1                                     | Selectable      |
| S3.2A   | SET1 DELAY<br>0.2 s        | Delay of the set point 1                                          | 0.0 ÷ 99.0 s    |
| S3.1B   | PID BAND SET1<br>1.0 %     | Proportional band of the set point 1 in PID function              | 0.0 ÷ 10.0 %    |
| S3.2B   | INTEG. TIME SET1<br>0.0 m  | Integral time of the set point 1 in PID function                  | 0.0 ÷ 999.9 min |
| S3.3B   | DERIV. TIME SET1<br>0.0 m  | Derivative time of the set point 1 in PID function                | 0.0 ÷ 999.9 min |
| S3.4B   | IMPULSE F. SET1<br>100 i/m | Pulse frequency of the set point 1 in PID (FM) function           | 0 ÷ 120 i/min   |
| S3.4B   | IMPULSE T. SET1<br>20.0 s  | Pulse width of the set point 1 in PID (WM) function               | 0 ÷ 99.9 s      |
| S3.5A   | HYSTERESIS SET2<br>0.1 %   | Hysteresis of the set point 2                                     | Selectable      |
| S3.6A   | SET2 DELAY<br>0.2 s        | Delay of the set point 2                                          | 0.0 ÷ 99.0 s    |
| S3.5B   | PID BAND SET2<br>1.0 %     | Proportional band of the set point 2 in PID function              | 0.0 ÷ 10.0 %    |
| S3.6B   | INTEG. TIME SET2<br>0.0 m  | Integral time of the set point 2 in PID function                  | 0.0 ÷ 999.9 min |
| S3.7B   | DERIV. TIME SET2<br>0.0 m  | Derivative time of the set point 2 in PID function                | 0.0 ÷ 999.9 min |
| S3.8B   | IMPULSE F. SET2<br>100 i/m | Pulse frequency of the set point 2 in PID (FM) function           | 0 ÷ 120 i/min   |
| S3.8B   | IMPULSE T. SET2<br>20.0 s  | Pulse width of the set point 2 in PID (WM) function               | 0 ÷ 99.9 s      |

| Display | Contents                   | Meaning                               | Possible values            |
|---------|----------------------------|---------------------------------------|----------------------------|
| S4.1    | LO ALARM<br>0.0 %          | Alarm min. value                      | Selectable                 |
| S4.2    | HI ALARM<br>100.0 %        | Alarm max. value                      | Selectable                 |
| S4.3    | ALARM DELAY<br>1.0 s       | Delay of the alarm relay              | 0.0 ÷ 100.0 s              |
| S6.1    | LOGIC INPUT1<br>OFF        | Logic input 1 function                | ON<br>OFF                  |
| S6.2    | LOGIC INPUT2<br>OFF        | Logic input 2 function                | ON<br>OFF                  |
| S7.1    | CLEAN<br>OFF               | Autoclean function                    | OFF<br>AUTOCLEAN<br>MANUAL |
| S7.2    | CLEAN REPETITION<br>24.0 h | Cleaning cycle                        | 0.1 ÷ 100.0 h              |
| S7.3    | CLEAN TIME<br>15.0 s       | Cleaning time                         | 1.0 ÷ 60.0 s               |
| S7.4    | HOLD TIME<br>3.0 min       | Holding time after the cleaning cycle | 0.1 ÷ 20.0 min             |
| S50.1   | PASSWORD MODIFY<br>---     | Password changing of the setup menu   | 0 ÷ 999                    |

## 6.4.6 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 INSTRUCTION

### 6.5.1 SAFETY REQUIREMENTS

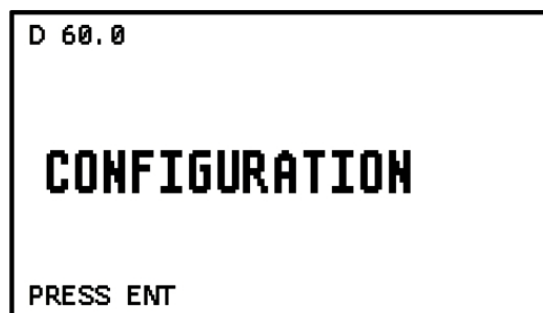
 After performing the installation (see chapter "Installation (page 23)"), before turning the power on and proceed to the configuration of the instrument is recommended to do the following:

- 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

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



|            |                                                                                    |
|------------|------------------------------------------------------------------------------------|
| ENT        | press the key to visualize and to confirm in sequence the configuration parameters |
| UP or DOWN | press the key to modify the values                                                 |
| MODE       | press the key to turn to the D60.0 display any time                                |

 Depending of the instrument configuration some configuration parameters may not be visualized.

| Display | Content                 | Meaning                                   | Possible values     |
|---------|-------------------------|-------------------------------------------|---------------------|
| D60.1   | PASSWORD CONFIG.<br>--- | Password to access the configuration menu | 000 ÷ 999           |
| C1.0    | CONTROLLER MODE<br>AUTO | Operating mode                            | AUTO<br>MEAS<br>SIM |

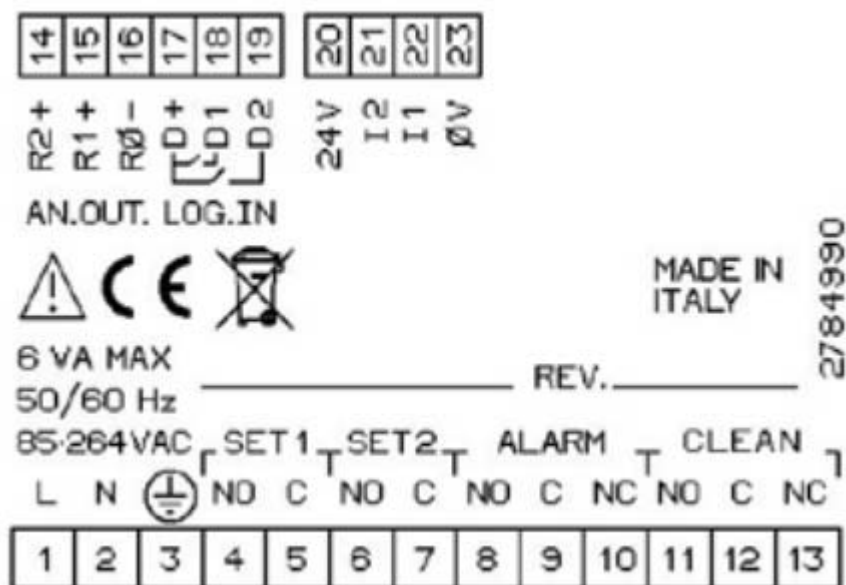
| Display | Content                      | Meaning                                     | Possible values                                              |
|---------|------------------------------|---------------------------------------------|--------------------------------------------------------------|
| C1.1    | INPUT<br>4-20mA              | Input current                               | 4-20 mA<br>0-20 mA                                           |
| C1.2    | INPUT TYPE<br>SINGLE         | Input type (single or differential)         | SINGLE<br>DIFFER.                                            |
| C1.3    | MEASURE UNIT<br>%            | Measuring unit                              | %, NTU, FTU,<br>mg/l, g/l, ppm,<br>uS, mS, pH, mV,<br>custom |
| C1.4    | CUSTOM UNIT<br>ABCD          | Custom measuring unit                       | ABCD                                                         |
| C1.5    | DECIMAL POINT<br>YYY.Y       | Decimal point position                      | YYYY / YYY.Y<br>YY.YY / Y.YYY                                |
| C1.6    | POINT LO 4mA (*)<br>0.0 %    | Value corresponding to 0 (4) mA             | -9999 ÷ 9999                                                 |
| C1.7    | POINT HI 20mA (*)<br>100.0 % | Value corresponding to 20 mA                | -9999 ÷ 9999                                                 |
| C1.8    | RT LARGE SIGNAL<br>2.0 s     | Filter software small                       | 0.4 ÷ 50.0 s                                                 |
| C1.9    | RT SMALL SIGNAL<br>10.0 s    | Filter software large                       | 0.4 ÷ 50.0 s                                                 |
| C3.1    | REGUL. MODE SET1<br>ON-OFF   | Regulation type of the set point 1          | ON-OFF<br>PID                                                |
| C3.2    | ACTUATION SET1<br>FM         | PID type of the set point 1                 | FM<br>WM<br>OUT1                                             |
| C3.3    | SET1 FUNCTION<br>LO          | Function of the set point 1                 | LO<br>HI                                                     |
| C3.4    | REGUL. MODE SET2<br>ON-OFF   | Regulation type of the set point 2          | ON-OFF<br>PID                                                |
| C3.5    | ACTUATION SET2<br>FM         | PID type of the set point 2                 | FM<br>WM<br>OUT2                                             |
| C3.6    | SET2 FUNCTION<br>HI          | Function of the set point 2                 | LO<br>HI                                                     |
| C4.1    | ALARM SET1<br>OFF            | Alarm on the active time of the set point 1 | ON<br>OFF                                                    |
| C4.2    | TIME SET1<br>60 m            | Active time of the set point 1              | 0-60 m                                                       |
| C4.3    | ALARM SET2<br>OFF            | Alarm on the active time of the set point 2 | ON<br>OFF                                                    |
| C4.4    | TIME SET2<br>60 m            | Active time of the set point 2              | 0-60 m                                                       |

| Display | Content                    | Meaning                                                            | Possible values      |
|---------|----------------------------|--------------------------------------------------------------------|----------------------|
| C4.5    | ALARM FUNCTION<br>ACTIVE   | Alarm relay function                                               | ACTIVE<br>NON ACTIVE |
| C5.1    | OUT1 INPUT<br>%__          | Measuring related to the analog output 1                           | (measure)<br>% IN    |
| C5.2    | OUT1<br>0-20 mA            | Range of the analog output 1                                       | 0-20 mA<br>4-20 mA   |
| C5.3    | OUT1 POINT P1<br>0.0 %__   | Point of the analog output 1 related to the beginning of the scale | Variable             |
| C5.4    | OUT1 POINT P2<br>100.0 %__ | Point of the analog output 1 related to the end of the scale       | Variable             |
| C5.5    | OUT2 INPUT<br>%            | Measuring related to the analog output 2                           | (measure)<br>% IN    |
| C5.6    | OUT2<br>0-20 mA            | Range of the analog output 2                                       | 0-20 mA<br>4-20 mA   |
| C5.7    | OUT2 POINT P1<br>0.0 %     | Point of the analog output 2 related to the beginning of the scale | Variable             |
| C5.8    | OUT2 POINT P2<br>100.0 %   | Point of the analog output 2 related to the end of the scale       | Variable             |
| C6.1    | LOGIC INPUT1<br>HOLD       | Logic input 1 function                                             | HOLD<br>ALARM        |
| C6.2    | LOGIC INPUT2<br>ALARM      | Logic input 2 function                                             | HOLD<br>ALARM        |
| C60.1   | PASSWORD MODIFY<br>---     | Configuration password changing                                    | 0 ÷ 999              |

 *In SIM operating mode the user can change the displayed value by means of ENTER key followed by UP and DOWN keys and confirm it with ENTER key.*

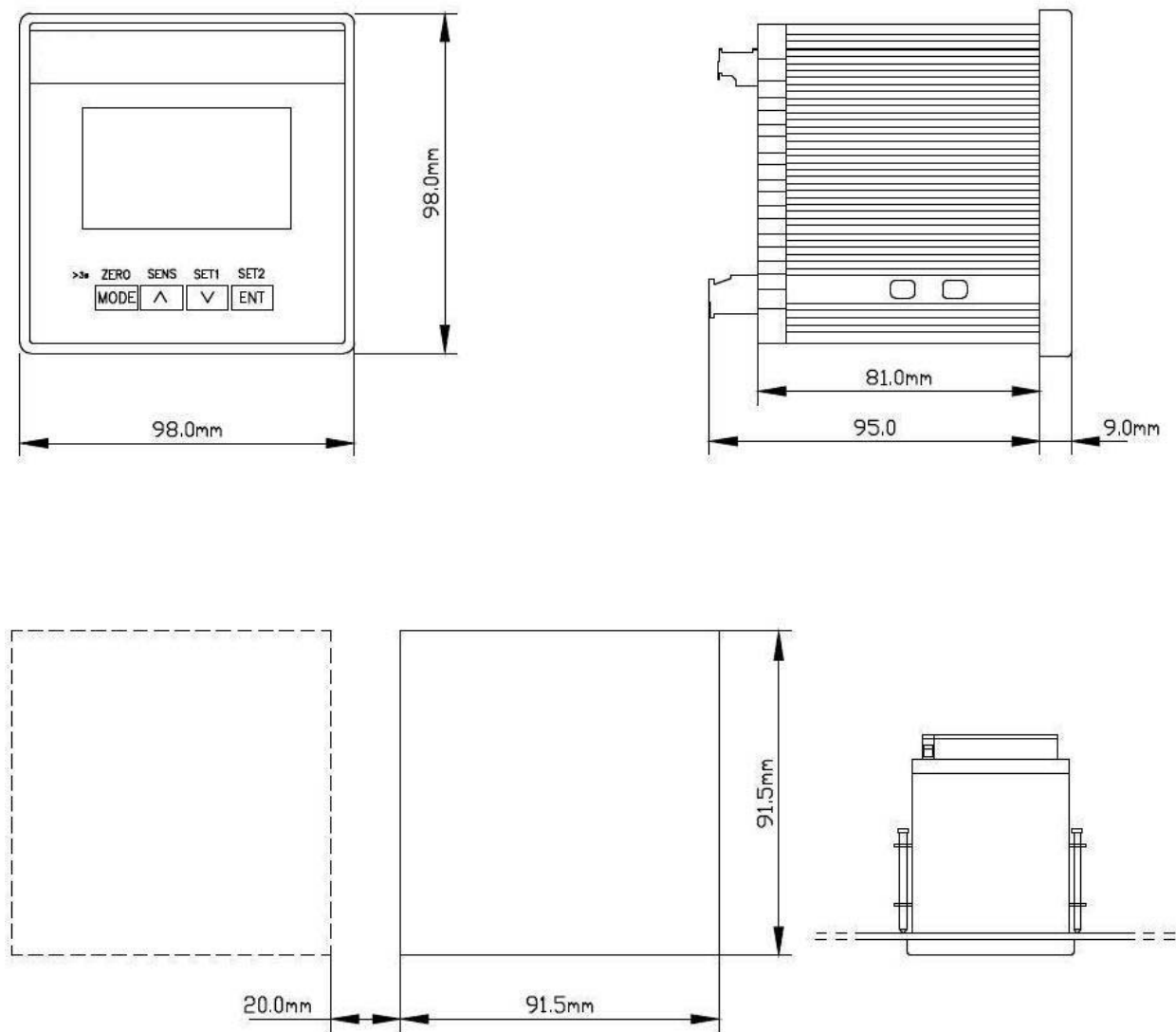
## 7 INSTALLATION DRAWING

### 7.1 CONNECTION DIAGRAM

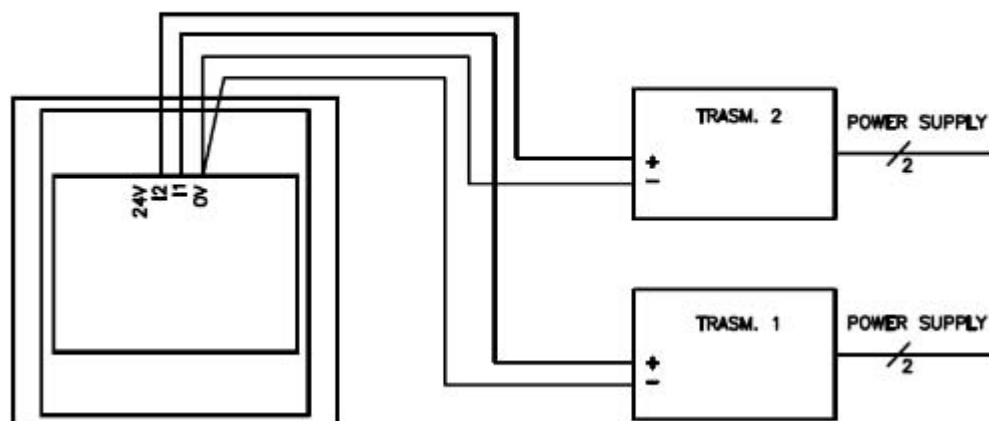


| Terminal | Function                  | Terminal | Function                           |
|----------|---------------------------|----------|------------------------------------|
| 1        | Power supply 85 ÷ 264 Vac | 14       | + Analog output 2                  |
| 2        | Power supply 85 ÷ 264 Vac | 15       | + Analog output 1                  |
| 3        | Ground                    | 16       | - Analog outputs (common)          |
| 4        | NO Set1                   | 17       | Common logic inputs                |
| 5        | C Set1                    | 18       | Logic input 1                      |
| 6        | NO Set2                   | 19       | Logic input 2                      |
| 7        | C Set2                    | 20       | + 24 Vcc transmitters power supply |
| 8        | NO Alarm                  | 21       | Input of transmitter n. 2          |
| 9        | C Alarm                   | 22       | Input of transmitter n. 1          |
| 10       | NC Alarm                  | 23       | Zero of transmitters               |
| 11       | NO Autoclean              |          |                                    |
| 12       | C Autoclean               |          |                                    |
| 13       | NC Autoclean              |          |                                    |

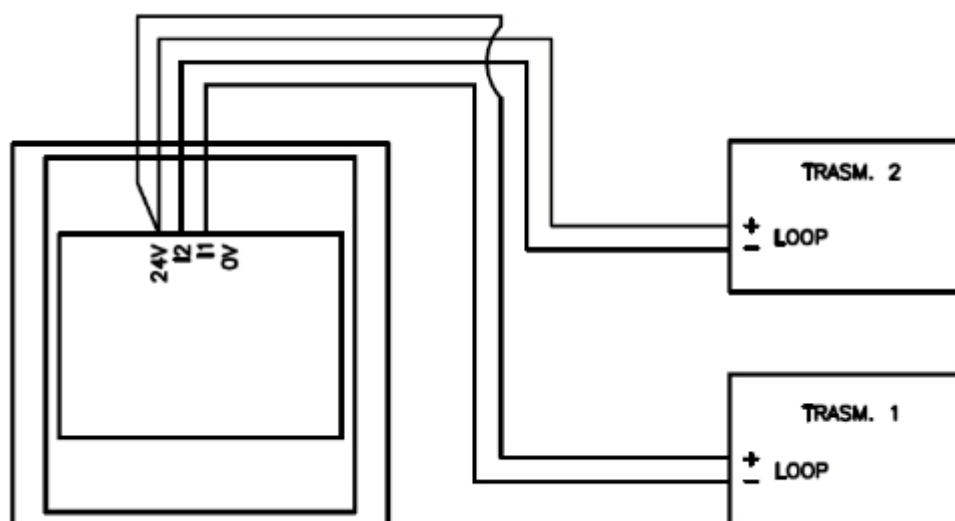
## 7.2 DIMENSIONS



## 7.3 ACTIVE TRANSMITTERS



## 7.4 PASSIVE TRANSMITTERS



## **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

☐ ANALOG OUTPT

☐ POWER SUPPLY

☐ SET POINT

☐ CALIBRATION

☐ RELAYS CONTACTS

☐ DISPLAY

☐ INTERMITTENT PROBLEM

DESCRIPTION OF THE DEFECT

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