UNI EN ISO 9001:2000
CERT. N. 9115 BCEL

INSTRUCTION MANUAL

CL 3630

2 – WIRE 4/20 mA LOOP POWERED CHLORINE - D. OZONE TRANSMITTER DIN RAIL

Chlorine / D.Ozone scales: 0/1.999 0/19.99
0/199.9 0/1999

Temperature scale: -10/+120 °C

Option _____

S/N _____

REP N° _____

Power supply: 10/30 Vcc

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1 PRODUCT PRESENTATION

1.1 FUNCTIONAL PURPOSE OF THE UNIT

The basic system for chlorine/dissolved ozone monitoring is made of the following parts:

- the transmitter described in this instruction manual;
- the sensor;
- the flow cell;
- the external Vdc power supply

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

1) as the proper sensor is connected, it displays the chlorine/dissolved ozone concentration values;
2) if a Pt100 temperature sensor is connected, it will display the temperature values;
3) it performs an automatic or manual temperature compensation;
4) it provides a current loop analog output for recording and acquiring the chlorine/dissolved ozone values;

1.2 FUNCTIONAL PRINCIPLES

The measuring of the free chlorine, chlorine dioxide or dissolved ozone is done by means of two types of sensors:

- polarographic cell with two electrodes immersed in the suitable electrolyte and with selective membrane,
- potentiostatic sensor with three electrodes.

A polarization voltage is applied to the anode and cathode of the polarographic cell in order to get an electrical current into the electrolyte, proportional to the chlorine/d.ozone concentration.

A polarization voltage is applied to the anode and counter electrode of the potentiostatic sensor in order to get an electrical current into the sample, proportional to the chlorine/d.ozone concentration.
A reference electrode allows the compensation of the ORP and resistance effects.
As a result the measuring is very accurate even at low concentration levels.

The current through the polarographic or potentiostatic cell is effecting a chlorine/d.ozone consumption, to be renewed by a constant liquid flow.
If the liquid is not regularly renewed the readout will decrease slowly to zero.

This instrument features a manual or automatic temperature compensation, referred to temperature of 20 °C.

1.3 SENSORS AND ACCESSORIES

The listed articles are the most commonly used ones. They must be ordered separately.
Sensors and accessories for heavier and particular applications are also available.

SZ 283 *potentiostatic sensor for free chlorine and d.ozone*, 3 m cable

SZ 7231 *flow cell for SZ283 sensor and temperature*
SZ 7233 *flow cell for SZ283, pH, redox and temperature*

SZ 7251 *flow cell for SZ283 with autoclean*

CL 7901 *polarographic sensor for free chlorine, with flow cell and spares*
OZ 7901 *polarographic sensor for dissolved ozone, with flow cell and spares*

Temperature sensor

SP 514 *Pt100 sensor for flow cell*

Enclosures

BC 9408 *IP 65 enclosure for one instrument*

BC 9412 *IP 65 enclosure for two instruments*

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 accidents. For this, it is important to take all necessary precautions to avoid damages caused by malfunctions.

All types of operations must be performed by authorized and trained staff.

The use of this controller must respect the parameters described in chapter 4.3 “Technical specification”, so 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 REVISION

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: Emission

3.2 SYMBOLS

Throughout the manual You may find the following symbols, which are both dictated by Standard or that are simply conventional:

Symbol	**Meaning**
	*Attention: pay great attention to what written next to this symbol*
---------- **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.*
"*"	*This symbol can be found in those chapters where there have been changes from the previous releases.*

4 SPECIFICATIONS

4.1 FUNCTIONAL SPECIFICATION

This transmitter provides a digital readout of the chlorine or dissolved ozone of aqueous solutions.

The transmitter will perform manual or automatic temperature compensation to correct the readings for temperature related variations.
Temperature information is displayed by pushing button "2" marked "TEMP".

The zero adjustment is done by trimmer "3" marked "zero" on the front panel.
The sensitivity adjustment is done by trimmer "4" marked "sens" on the front panel.

The transmitter is loop powered by an external Vdc power supply and it provides an isolated 4/20 mA output, proportional to the reading value which is suitable for data acquisition systems, recorders, controllers or other input devices that require a 4/20 mA input.

4.2 PHYSICAL SPECIFICATION

The transmitter enclosure is designed for DIN Rail mounting.

It consists of a plastic case with front panel which is coated by a polycarbonate membrane (Fig. 1), to ensure maximum anticorrosion characteristics.

For field applications mounting in a splash proof or weather resistant box is suggested.

Figure 3 describes the physical details and dimensional characteristics.

Connections to power supply, loads, recorder, RTD, electrodes and probe are done through detachable terminal blocks.

4.3 TECHNICAL SPECIFICATIONS

Display:	LCD 3 1/2 digit
Input from:	3 wires potentiostatic sensor
	2 wires galvanic sensor
	2 or 3 wires RTD Pt100
Input current	0,4 - 4 - 40 µA selectable
Scales in ppm	0/1.999 0/19.99 0/1999 selectable
Scale in °C	-10.0/120.0 °C
Polarization:	-200 mV (adj +/-800 mV on request)
Temperature compensation:	manual or automatic
Temperature compensation coefficient:	0/4.0 %/°C (2% for Cl and 2,5% for O_3)
Temperature compensation reference:	20 °C
Output:	4/20 mA isolated current loop
Zero:	+/- 15 % adjustable
Slope:	86/112 % narrow range adjustable
	20/200 % wide range adjustable
Operating temperature:	0/50 °C
Operating humidity:	95 % without condensation
Power supply:	10/30 Vdc
Isolation:	500 V input to output
Terminal block:	detachable
Net weight:	200 g
Dimensions:	105 x 95 x 58 mm (6 modules)
Mounting:	DIN rail

5 PHYSICAL INSTALLATION

The transmitter must be installed into a Din rail enclosure for outdoor or indoor use and it may be located close to the measuring point or some distance away in a control area.

The sensor and the flow cell must be mounted according to the specific instruction manual.
The flow rate must be adjusted according to the specific sensor.

Keep the sensor and power supply cables away from power wires on the overall length.
The cables must not be interrupted on overall length.
If the extension cable is necessary, use high insulation terminal strips.

6 ELECTRICAL INSTALLATION

The electrical installation consists of:

- connecting the power supply to the transmitter
- connecting the sensor to the transmitter
- connecting the temperature sensor
- connecting the load

All connections within the transmitter are made on the detachable terminal block.

6.1 CONNECTING THE POWER

- Connect Vdc power " + " to terminal "1" marked " + "
- Connect the terminal marked " - " to terminal " + " of the load
- Connect Vdc power " - " to terminal " - " of the load

The unit is protected against eventual inverted connections

WARNINGS

- Verify the supply voltage prior to connection to the transmitter.
-Improper wiring connections which result in damage to the transmitter are not covered under warranty.

6.2 CONNECTING THE POTENTIOSTATIC SENSOR

The connection of the sensor SZ283 is critical for a trouble free system operation;

- use the original cable on overall length between sensor and input terminals of the transmitter;

- extension cables should be avoided. When necessary, always use only high insulation terminals;

- avoid installing cable near any power cables;

- connect the **shield** of the cable (reference electrode) to the terminal **12** marked **R**;

- connect the **Black** wire (upper platinum band) to the terminal **10** marked **IN** (measuring electrode);

- connect the **White** wire (lower platinum band) to the terminal **13** marked **EL** (counter electrode);

6.3 CONNECTING THE POLAROGRAPHIC SENSORS

Those special sensors CL 7901 or OZ 7901 provided with the selective membrane must be connected as follow:

- install a jumper between terminals **12-13** marked **R** and **CE**
- connect the **Brown or Orange** wire (cathode) to the terminal **10** marked **IN**
- connect the **White** wire (anode) to the terminal **12** marked **R**

6.4 CONNECTING THE GALVANIC SENSORS

Contact our sales department for the connection of those type of sensors.

6.5 CONNECTING THE TEMPERATURE SENSOR

The model CL 3630 features the automatic temperature compensation carried out by means of a RTD Pt100.

The temperature sensor has to be installed in the same solution being measured, close to the chlorine/dissolved ozone measuring sensor.

Notes

In order to activate the ATC function, prior to connecting the RTD between terminal "4-5-6" marked "T1-T2-T3", it is necessary to remove the jumpers from terminals "3-4" and "5-6".

These jumpers must be reinstalled when operating the transmitter in manual temperature mode.

The RTD connection as above described will also provide a digital display of temperature values.

The temperature value is displayed by pushing the Key pad "2" marked "TEMP" on the front panel. The temperature readout will not interrupt the measuring functions of the transmitter.

6.6 CONNECTING THE LOAD

Loads must be connected in series to the power loop.
See Figure 4.

7 OPERATING THE SYSTEM

7.1 PRE-OPERATION CHECK

The system's controls and indicators are all located on the front panel.

The LCD display will indicate that the unit is on.

Push the key pad "2" to check the sample temperature (if RTD is connected), or the manual temperature value (RTD not connected and jumpers installed).

Push the button "S1" and adjust the temperature coefficient on the display by means of the trimmer "R33" marked "TC". (see Fig. 2)
(Standard value are 2.0 %/°C for the free chlorine and 2.5 %/°C for the dissolved ozone)

7.2 FULL SCALE SENSITIVITY SELECTION

This selection is necessary in order to adapt the input of the transmitter to the signal provided by the different types of sensors.
The factory sensitivity is adjusted at 4 µA for the SZ 283 potentiostatic sensor and scale 1.999 ppm.

The potenziostatic sensor SZ 283 has a nominal sensitivity 2 µA/ppm, and the user will select the following full scales current:

- 4 µA for the 1.999 ppm scale, and decimal point X.XXX (default values)
- 40 µA for the 19.99 ppm scale, and decimal point XX.XX

The polarographic sensors CL 7901 or OZ 7901 have a nominal sensitivity 0.16 µA/ppm, and the user will select the following full scales current:

- 0,4 µA for the 1.999 ppm scale, and decimal point X.XXX
- 4 µA for the 19.99 ppm scale, and decimal point XX.XX
- 40 µA for the 199.9 ppm scale, and decimal point XXX.X

Select the full scale as per following table by the dip-switches S2 marked x10 and S3 marked x100:

Scale Sensitivity	Switch S2	Switch S3
0.4 µA	OFF	OFF
4 µA	ON	OFF
40 µA	OFF	ON

Dip switches S4 and S5 are not active

7.3 DECIMAL POINT SELECTION

The factory decimal point setting is 1.999.
Select the decimal point as per following table by the dip-switch S6 marked DP1, S7 marked DP2 and S8 marked DP3:

Decimal point	Switch S6	Switch S7	Switch S8
XXXX	OFF	OFF	OFF
X.XXX	ON	OFF	OFF
XX.XX	OFF	ON	OFF
XXX.X	OFF	OFF	ON

7.4 MANUAL TEMPERATURE COMPENSATION

The manual temperature compensation is available when the RTD Pt100 is not installed.

- Install the jumpers between "3-4" and "5-6".
- Push the Key pad "2" on the front panel (Fig. 1) and adjust the trimmer "R5" marked " T MAN " to indicate the desired temperature value on the display. (Fig. 2)

7.5 NORMAL OPERATION

If the transmitter has been configured and sensors have been installed correctly as previously described, the system should operate correctly requiring only the calibration.
As the sample passes through the installed flow cell, the display will indicate immediately the corresponding concentration value.

7.6 ZERO CALIBRATION

Install the cell into the flow cell and connect it to the instrument.
By keeping the cell in air or dipped into a sample without chlorine/d.ozone, the display will show zero.
If the readout is different than zero adjust the trimmer 3 marked zero till the readout 0.000.

7.7 SENSITIVITY CALIBRATION

After the installation the unit needs a calibration, by comparison of the readout with the value provided by a field instrument (example a photometer by DPD).
Because of the possible wide difference among signals provide by the sensor, it might be necessary to adjust the sensitivity by means the coarse trimmer R 34 located between the 2 terminal blocks.

Follow the below procedure:

- measure the PPM contents of the sample by a photometer
- adjust the display value according to the above measuring by means of the trimmer 4
- if the trimmer 4 reaches the full rotation, adjust by means of the trimmer R 34 marked SENS ADJ.

8 PREVENTIVE MAINTENANCE

8.1 TRANSMITTER

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

The frequency of such maintenance depends on the nature of each particular application.

As in any electronic equipment, the mechanical components such as switches and connectors, are the most subject to damage.

8.2 SENSOR

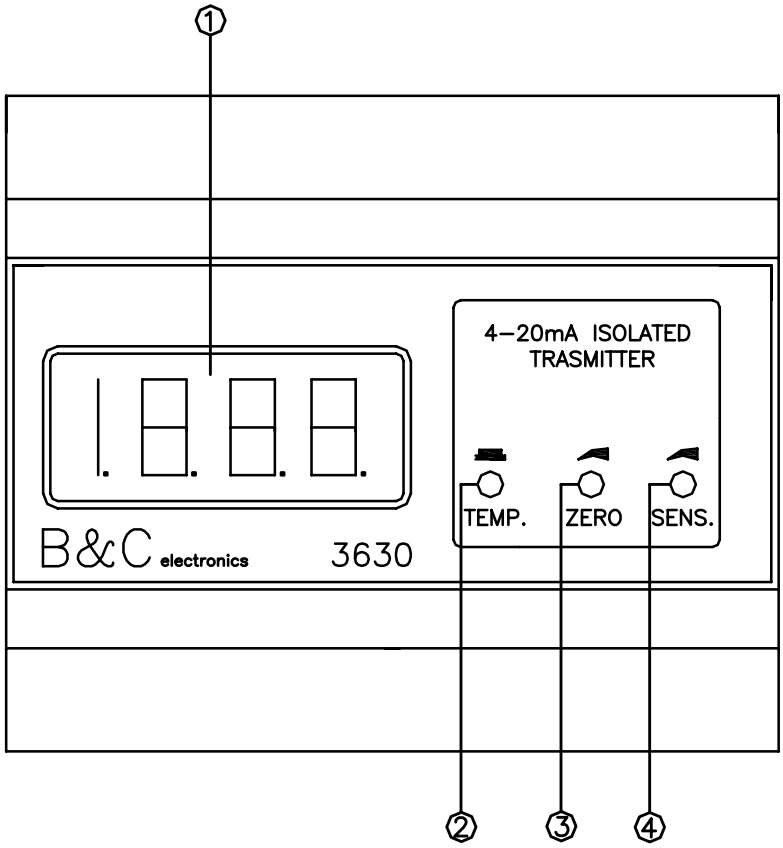
The state of the sensors surface and is critical for the normal operation of the system and should be inspected more frequently when are present oxides, or organic compounds.

Clean the sensor, the flow cell and replace the membrane/electrolyte according to the instruction of the specific sensor.

9 TROUBLESHOOTING GUIDE

SYMPTOMS	PROBABLE CAUSE	REMEDY
LCD not displayed meter reading	Power source problem; incorrect power wiring	Check power supply Check wiring
Display reading too high/low	Sensor failure; meter not calibrated	Clean sensor Calibrate by photometer
Display reading does not change	Sensor is damaged	Sensor replacement Check cable
Slope will not adjust	Sensor is damaged; Sensitivity not enough	Sensor replacement Check ATC sensor/jumpers

FRONT PANEL



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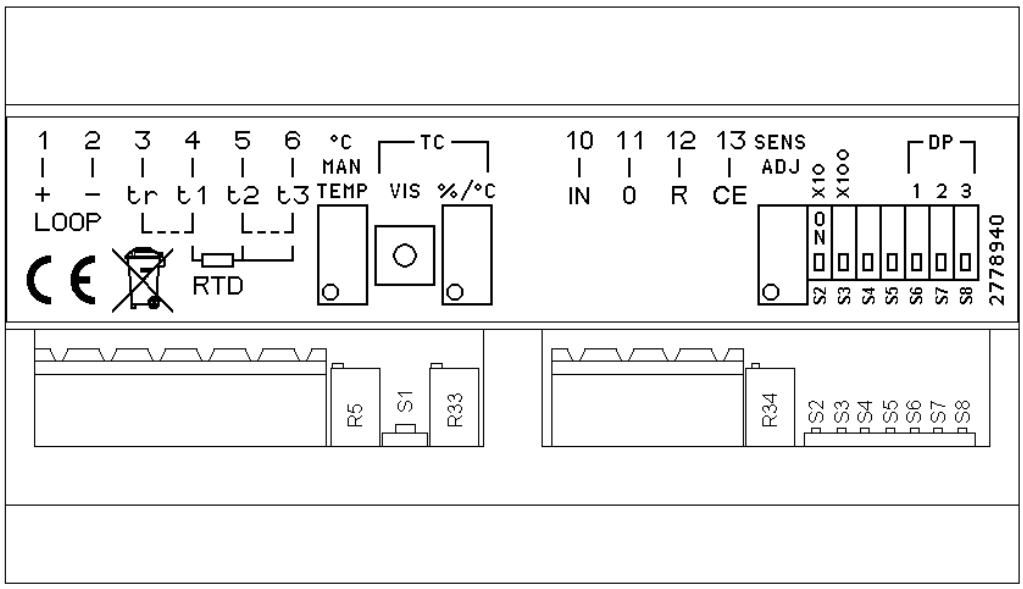
1. Display
2. Temperature display actuator
3. Zero adjustment
4. Slope adjustment

Fig. 1

CONNECTIONS



1.	loop supply (+ input)
2.	loop supply (- input)
3.4.	jumper for temp. compensation
5.6.	jumper for temp. compensation
4.5.6.	Pt100 input
10.12.13.	potentiostatic sensor input
12.13.	jumper for polarographic input
10.12.	polarographic sensor input
10.11.	galvanic sensor input
R5	manual temperature control
R33	temperature coefficient control
R34	coarse sensitivity adjustment
S1	switch to visualize the temperature coefficient
S2.S3	switches for sensitivity selection
S4.S5	switches not active
S6	switch to light the decimal point X.XXX
S7	switch to light the decimal point XX.XX
S8	switch to light the decimal point XXX.X

Fig. 2

DIMENSIONS
(measure in mm)

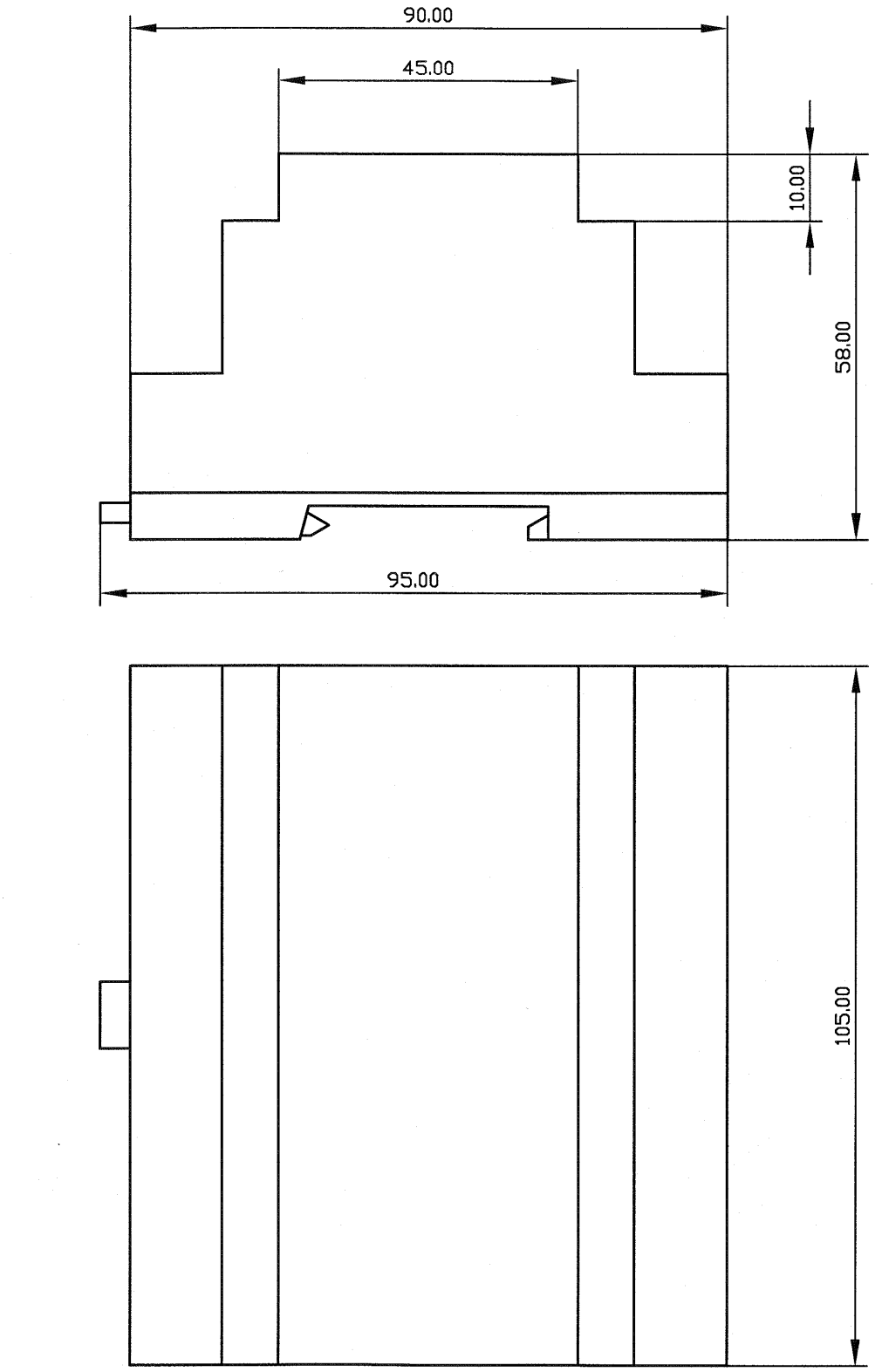


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Fig. 3

CONNECTIONS EXAMPLES

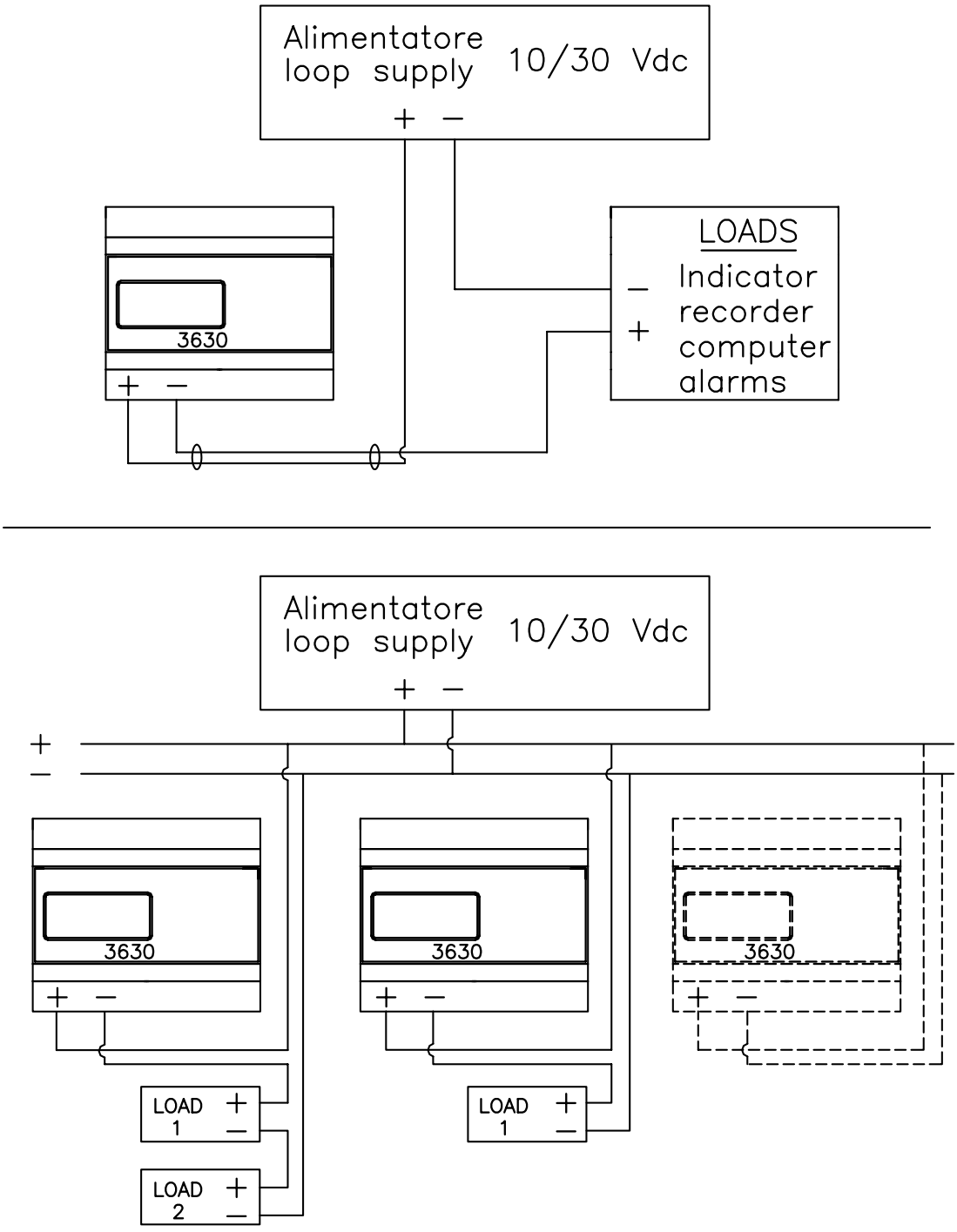

Fig. 4

WARRANTY CERTIFICATE

1) Your product is covered by B&C Electronics Warranty for 5 years from the date of shipment. In order for this Warranty to be valid, the Manufacturer must determine that the instrument failed due to defective materials or workmanship.

2) The Warranty is void if the product has been subject to misuse and abuse, or if the damage is caused by a faulty installation or maintenance.

3) The Warranty includes the repair of the instrument at no charge. All repairs will be completed at the Manufacturer's facilities in Carnate, Italy.

4) B&C Electronics assumes no liability for consequential damages of any kind, and the buyer by accepting this equipment will assume all liability for the consequences of its use by the Customer, his employees, or others.

REPAIRS

1) In order to efficiently solve your problem, we suggest You to ship the instrument along with the Technical Support's Data Sheet (following page) and a Repair Order.

2) The estimate, if requested by the Customer, is free of charge when it is followed by the Customer confirmation for repair. As opposite, if the Customer shall not decide to have the instrument repaired, he will be charged to cover labor and other expenses needed.

3) All instruments that need to be repaired must be shipped pre-paid to B&C Electronics. All other expenses that have not been previously discussed will be charged to Customer.

4) Our Sales Dept. will contact You to inform You about the estimate or to offer you an alternative, in particular when:
   - the repairing cost is too high compared to the cost of a new instrument,
   - the repairing results being technically impossible or unreliable

5) In order to quickly return the repaired instrument, unless differently required by the Customer, the shipment will be freight collect and through the Customer's usual forwarder.

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TECHNICAL SUPPORT

Data sheet

In case of damage, we suggest You to contact our Technical Support by email or phone. If it is necessary for the instrument to be repaired, we recommend to photocopy and fill out this data sheet to be sent along with the instrument, so to help us identifying the problem and therefore accelerate the repairing process.

□ *ESTIMATE* □ *REPAIR*

COMPANY NAME

ADDRESS ZIP CITY

REFER TO MR./MISS. PHONE

MODEL S/N DATE

Please check the operator's manual to better identify the area where the problem seems to be and please provide a brief description of the damage:

□ SENSOR
□ POWER SUPPLY
□ CALIBRATION
□ DISPLAY
□ ANALOG OUTPUT
□ SET POINT
□ RELAY CONTACTS
□ PERIODICAL MALFUNCTIONING

➢ *DESCRIPTION*

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