

OPERATOR'S MANUAL

**IC 7685**

**ION CONCENTRATION CONTROLLER  
MICROPROCESSOR BASED**

Rev. B  
Valid for Option 091.3711

Scales: 10.00/100.0/1000 PPM  
Temperature scale: -10/+110 °C  
Power supply: 110/220 Vac

Software: R2.1x

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# 1 FEATURES

- \* Input from Ion Selective Electrodes
- \* Selectable measuring unit (g/l mbar mg/l mmHg PPM)
- \* Measuring range from 0,01 to 1000 PPM
- \* Selectable scales 10,00 - 100,0 - 1000 PPM
- \* Autoranging
- \* 5 points calibration
  
- \* Temperature input from Pt100
- \* Temperature readout
- \* Automatic and manual Temperature compensation
  
- \* Alphanumeric back-lighted LCD
- \* Software filter on the readout
- \* Automatic and manual operation
  
- \* 0/20 mA or 4/20 mA programmable isolated output
  
- \* Dual set-points with hysteresis, delay and min/max programmable functions
- \* Min/max and set-points timing alarm relay
  
- \* Software:
  - 3 access levels
  - user friendly
  - keyboard lock
  - access code
  - watch-dog
  
- \* EEPROM parameter storage
- \* Automatic overload protection and reset
- \* Extractable terminal blocks
- \* 96X96 (1/4" DIN) housing

## 2 SPECIFICATIONS

### 2.1 FUNCTIONAL SPECIFICATIONS

#### Input

The instrument accepts input from an Ion Selective Electrode.  
A second input is provided for 2 or 3 wires Pt100 RTD Temperature.

#### Software filter

The unit is provided with a programmable software filter, to be inserted when the readout is not stable.

The user may select different filter values for small and large signal fluctuations.

#### Calibration

First calibration carried out by standard solutions (from 2 to 5 concentration values) is necessary.

One point calibration may be performed in order to correct the Reference electrode drift during the regular operation.

#### Temperature compensation

The unit is supplied with manual or automatic Temperature compensation. The instrument detects of the absence or malfunctioning of the Temperature sensor and automatically switches to manual compensation.

#### Analog output

Either a 0/20 mA or 4/20 mA programmable and isolated output may be selected, for use as an interface with computers or data loggers.

The input range corresponding to the output is programmable.

#### Control relays

The monitor is equipped with two SPDT control relays.

Each control relay may be programmed for set-point, high/low, hysteresis or delay time actuation.

The full display indicates the current settings and current status of each relay.

### Alarm relay

The unit contains a third SPDT relay designated as an alarm relay.

This relay may be used to warn of conditions that may indicate operational problems. The relay will activate on either high/low value conditions, or on failure of the control relays to maintain proper control.

In addition this relay may be programmed for either normal or fail-safe operation.

### Operating mode

The instrument is provided with 2 programmable modes of operation.

- Automatic operation:

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

- Manual operation:

This mode of operation would normally be used for control system troubleshooting. The unit will allow the relays to be manually actuated by pushing up/down keys.

The letter "M" flashing on the display, indicates the instrument is in manual operation mode.

### Configuration

A number of programming functions are provided in the Configuration menu and are protected by a selectable access number, which must be entered to allow changes in this setting. The keys on the front panel of the monitor can be used for both changing the display and for calibrations and set-point adjustments.

When the monitor is shipped, all functions are accessible. However, the adjustment and calibration functions may be locked in order to prevent unauthorized adjustments to the instrument.

### Options

- |          |  |
|----------|--|
| 091.3711 | <u>Dual isolated and programmable output.</u><br>Two outputs may be configured for Concentration or Temperature.       |
| 091.701  | <u>RS232 isolated output.</u><br>The output sends the data (Concentration, mV, °C) to the serial port of the computer. |
| 091.404  | <u>24 Vac power supply.</u>  |

## 2.2 TECHNICAL SPECIFICATIONS

The *Default* values are correspondent to the factory calibration values.  
Parameters marked by " \* " can be modified in the Configuration procedures.

<b>OPERATING MODE</b>	<i>Default</i>
Automatic/Manual	Auto
<b>CONCENTRATION</b>	<i>Default</i>
Input: ISE electrodes	
* Ion type: -2/-1/+1/+2	X+
* Measuring unit: g/l mbar mg/l mmHg PPM	PPM
Measuring range: 5 decades from 0.01 to 1000 PPM	
* Scales: 10.00 - 100.0 - 1000 PPM autoranging	100.0PPM
Calibration: min. 2 points / max. 5 points	
1 point calibration: $\pm 100.0$ mV	0.0 mV
Range: $\pm 1100.0$ mV	
Software filter 90% Response Time:	
* Large signal changing ( $>10.0$ mV): 0.4"/20.0"	2.0"
* Small signal changing ( $<10.0$ mV): 0.4"/20.0"	10.0"
<b>TEMPERATURE</b>	<i>Default</i>
Input: RTD Pt100	
Connection: 2/3 wires	
Measuring and compensation range: -10.0/110.0 °C	
Resolution: $\pm 0.1$ °C	
Zero adjustment: $\pm 2$ °C	0°C
Manual Temperature compensation: -10/110°C	20°C
<b>THERMOCOMPENSATION</b>	<i>Default</i>
Thermocompensation: On/Off	Off
Isothermal point: -999.9mV/+999.9mV	0.0 mV
Thermocompensation coefficient: 0.0/1.000%/°C	0.198%/°C
Compensation range: -10/110°C	
Reference Temperature: 20 °C	
<b>SET POINT A/B</b>	<i>Default</i>
Action: ON-OFF	
Set point value: 0/1000	0.0PPM
Hysteresis: 0/100	0.0PPM
Relay delay: 0.0/99.9 sec	0.0 sec
* Function: HI/LO (Max/Min)	LO
Relay contacts: SPDT 220 V 5 Amps Resistive load	

<b>ALARM (C-D)</b>  Low value: 0/1000 High value: 0/1000 Delay: 0.0/99.9 sec * Contact type: ACT/DEA * Alarm on max. SA: ON/OFF * Max. time SA: 0/60 minutes * Alarm on max. SB: ON/OFF * Max. time SB: 0/60 minutes Relay contacts: SPDT 220 V 5 Amps Resistive load	<i>Default</i>  0.0PPM 100.0PPM 0.0 sec ACT OFF 60 m OFF 60 m
<b>ANALOG OUTPUT Nr. 1</b>  * Scale: PPM/°C (option 091.3711) * Range: 0-20/4-20 mA Scale PPM: * Point 1 (out mA min.): 0/1000 * Point 2 (out mA max.): 0/1000 Scale °C: (option 091.3711) * Point 1 (out mA min.): -10.0/110.0°C * Point 2 (out mA max.): -10.0/110.0°C Response time: 2.5 sec. for 98% Isolation: 250 Vca R max: 600 Ohm	<i>Default</i>  PPM 0-20 mA  0.0PPM 100.0PPM  -10.0°C 110.0°C
<b>ANALOG OUTPUT Nr. 2 (option 091.3711)</b>  * Scale: PPM/°C * Range: 0-20/4-20 mA Scale PPM: * Point 1 (out mA min.): 0/1000 * Point 2 (out mA max.): 0/1000 Scale °C: * Point 1 (out mA min.): -10.0/110.0°C * Point 2 (out mA max.): -10.0/110.0°C Response time: 2.5 sec. for 98% Isolation: 250 Vca R max: 600 Ohm	<i>Default</i>  PPM 0-20 mA  0.0PPM 100.0PPM  -10.0°C 110.0°C
<b>SERIAL COMMUNICATION (option 091.701)</b>  Baud Rate: 4800 bit/s Bit length: 8 bit Nr. of Stop bit: 1 Parity: None Isolated from measure circuits Data frequency: 0.4 sec. Example of data transmission: ' ±1000.0 mV 100.0 PPM ±100.0 °C '	<i>Default</i>

<b>CONFIGURATION (*)</b>	<i>Default</i>
Free calibration (Access code not required):	
Keyboard locked/unlocked	unlocked
LCD contrast (0/7)	4
Access code number required for:	
Ion type: (X--/X-/X+/X++)	X+
Measuring unit (g/l mbar mg/l mmHg PPM)	PPM
Set point output scale: (10.00/100.0/1000)	100.0PPM
Large signal RT filter SW: (0.4/20.0)	2.0 sec
Small signal RT filter SW: (0.4/20.0)	10.0 sec
Output Nr.1 scale: (PPM/°C) (option 091.3711)	PPM
Output Nr.1 range: (0/20 4/20)	0/20 mA
Point 1 (for 0 or 4 mA): (0/1000)	0.0PPM
Point 2 (for 20 mA): (0/1000)	100.0PPM
Output Nr.2 scale: (PPM/°C) (option 091.3711)	PPM
Output Nr.2 range: (0/20 4/20)	0/20 mA
Point 1 (for 0 or 4 mA): (0/1000)	0.0PPM
Point 2 (for 20 mA): (0/1000)	100.0PPM
Relay A function: (LO/HI)	LO
Relay B function: (LO/HI)	LO
Alarm on max. operating time of SA: (ON/OFF)	OFF
Max. operating time of SA: (0/60)	60 m
Alarm on max. operating time of SB: (ON/OFF)	OFF
Max. operating time of SB: (0/60)	60 m
Alarm relay status: (ACT/DEA)	ACT
Access number: 0/999	0

### GENERAL SPECIFICATIONS

Alphanumeric display: 1 line x 16 characters  
 Acquisition time: 0/50°C  
 Humidity: 95% without condensation  
 Power supply: 110/220 Volt ac +/- 10 % 50/60 Hz  
 Isolation: 4000 V between primary and secondary (IEC 348)  
 Power: 5 VA max.  
 Terminal block: extractable  
 Weight: 850 gr.  
 Dimensions: 96 x 96 x 155 mm. (DIN 43700)

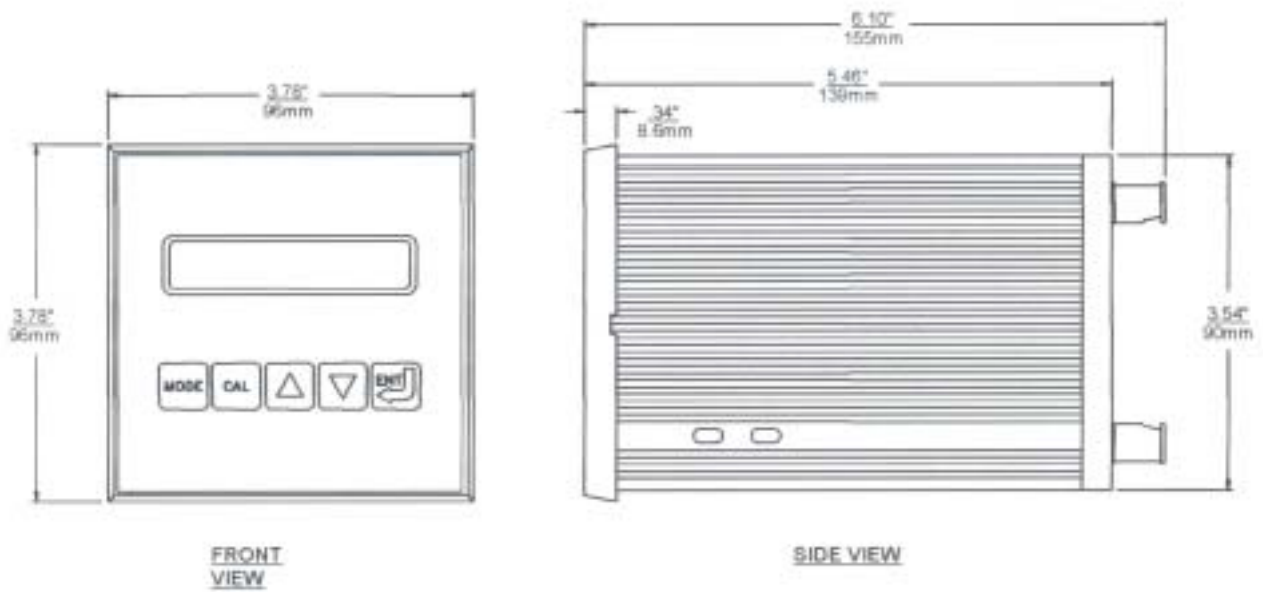


### 2.3 PHYSICAL SPECIFICATIONS

The controller enclosure is designed for surface or panel mounting. It consists of an anodized aluminium case built according to the standard DIN 43700, with an aluminium panel coated with scratch-proof and non-corrosive polycarbonate membrane.

A transparent waterproof front door SZ 7601 can be added to the housing, in order to protect the unit from excessive moisture or corrosive fumes.

Signal and power cable connections are made by using two special extractable terminal blocks placed in the back of the instrument. This makes wiring, installation and general maintenance of the probes and other devices easier. The package is supplied complete with fixing clamps for panel-mounting.





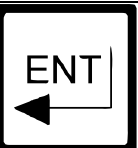


### 3 SOFTWARE DESCRIPTION

#### 3.1 KEYBOARD

KEY

FUNCTION

	<ul style="list-style-type: none"> <li>- it allows the operator to go to the next Display</li> <li>- it allows to go back to the main Display. The eventual new parameter values will not be memorized</li> </ul>
	<ul style="list-style-type: none"> <li>- it allows the access of calibration sequences</li> </ul>
	<ul style="list-style-type: none"> <li>- it allows to increase the displayed parameters</li> <li>- it allows to choose between different functions</li> </ul>
	<ul style="list-style-type: none"> <li>- it allows to decrease the displayed parameters</li> <li>- it allows to choose between different functions</li> </ul>
	<ul style="list-style-type: none"> <li>- it allows to enter the selected data and to return to the main Display <b>D0</b></li> </ul>

### 3.2 READOUT SEQUENCES

Applying the power to the instrument the display will show the Ion selected for approximately 3 seconds, then will show the main display (D0).

ISE meter X+

- X+      positive monovalent ion
- (X++)   positive bivalent ion
- (X-)    negative monovalent ion
- (X--)   negative bivalent ion



Press to visualize the following Display:

D0	xxx.xPPM <input type="checkbox"/> AL <input type="checkbox"/> BH	Concentration Value, set-point status/functions
D1	PPM x point cal	ISE calibration
D2	xxx.x mV X++	mV supplied by ISE
D3	TEMP.: xx.x °CM	Temperature value
D4	Termos.: OFF	Thermocompensation parameters
D5	SA xxx.xPPM*■ LO	Set-point A parameters
D6	SB xxx.xPPM*■ HI	Set-point B parameters
D7	AL x.x/xxx.xpp	Alarm parameters
D8	01 xx.xmA/xxx pp	Analog output Nr. 1/input values
D8bis	02 xx.xmA/xxx pp	Analog output Nr. 2/input values

D9	<div style="border: 2px solid black; border-radius: 10px; padding: 5px; width: fit-content; margin: 0 auto;"> <b>Configuration</b> </div>	Configuration display
D10	<div style="border: 2px solid black; border-radius: 10px; padding: 5px; width: fit-content; margin: 0 auto;"> <b>IC7685      R2.1x</b> </div>	Instrument P/N and software release

-----

(D0) xxx.xPPM  ALM  BH      Concentration value, set-point status/functions

xxx.xPPM      Concentration value  
 (>>>>)      over range  
 (flashing values) alarm condition

(M flashing)      manual operating mode

A      relay A deactivated  
 A      relay A delayed  
 A      relay A activated

B      relay B deactivated  
 B      relay B delayed  
 B      relay B activated

L      minimum function (LO)  
 H      maximum function (HI)

CAL

to activate the procedure of the manual/automatic mode selection

MODE  
DISP

to go to

(D1)

PPM x point cal

ISE calibration

x          Number of memorized calibration points

CAL

to activate the calibration sequence

MODE  
DISP

to go to

(D2)

xxx.x mV X++

mV supplied by ISE

xxx.x mV    mV given by the electrode  
X++          ion valence

MODE  
DISP

to go to

(D3)

TEMP.: xx.x °CM

Temperature value

xx.x          Temperature value  
M             manual value

CAL

to activate the Temperature calibration or the procedure of the manual  
Temperature value selection

MODE  
DISP

to go to

(D4)

TERMOC.: OFF

Thermocompensation parameters

OFF          thermocompensation deactivated  
(ON)        thermocompensation activated

CAL to activate the thermocompensation parameters calibration

MODE  
DISP to go to

(D5) SA xxx.xPPM\*■ LO Set-point A parameters

SA set-point A parameters  
 xxx.xPPM set-point value  
 ■ set-point A status (relay activated)  
 LO selected function (minimum)  
 \* alarm function on set-point A is activated

CAL to activate the set-point value, hysteresis and delay time programming sequences

MODE  
DISP to go to

(D6) SB xxx.xPPM\*■ HI Set-point B parameters

SB set-point B parameters  
 xxx.xPPM set-point value  
 ■ set-point B status (relay activated)  
 HI selected function (maximum)  
 \* alarm function on set-point B is activated

CAL to activate the set-point value, hysteresis and delay time programming sequences

MODE  
DISP to go to

(D7) AL x.x/xxx.xpp Alarm parameters

AL Concentration values alarm (PPM)  
 x.x low alarm value  
 xxx.x actual high alarm value

CAL to activate the alarm values programming sequences

MODE  
DISP

to go to

(D8)

01 xx.xmA/xxx pp

analog output Nr.1/input values

01 selected analog output Nr.1  
xx.xmA analog output value (mA)  
xxx pp input measuring value (PPM)  
(xxx°C) Temperature value (option 091.3711)

MODE  
DISP

to go to

(D8BIS)

02 xx.xmA/xxx pp

analog output Nr.2/input values

02 selected analog output N°2 (option 091.3711)  
xx.xmA analog output value (mA)  
xxx pp input measuring value (PPM)  
(xxx°C) Temperature value

MODE  
DISP

to go to

(D9)

Configuration

Configuration display

CAL

to activate the programming sequences of keyboard lock/unlock, display contrast, visualization and modification of the instrument configuration parameters

MODE  
DISP

to go to

(D10)

IC7685 R2.1x

Instrument P/N and software release

MODE  
DISP

to go back to the main display (D0)

### 3.3 CALIBRATION SEQUENCES

The following procedures will be active whenever the instrument is not in the keyboard lock condition.

To unlock the keyboard follow the procedures mentioned in the "Configuration" chapter.

The following procedures allow the sensor calibration, the set-point and alarm parameters programming.

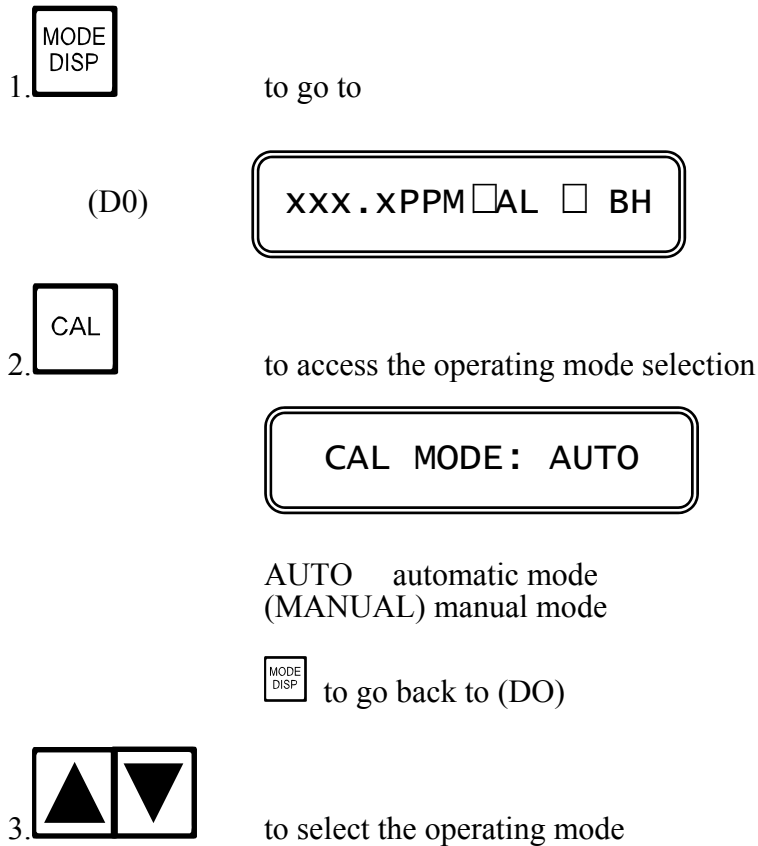
The sequence (1, 2, ....) helps the operator to following the regular calibration sequence.

**IMPORTANT NOTE:** during the calibration procedure the microprocessor turn the unit to the main display if no keys have been pressed within 5 minutes (30 minutes for ISE calibration sequences).

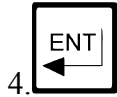
#### 3.3.1 Manual/automatic mode

Normally the instrument works in automatic mode.

Follow this procedure to change operating mode Automatic/Manual.







4. to confirm the selected operating mode and to go back to (D0)

MESSAGE

FUNCTION



the selection has been memorized  
The unit go back to (D0)

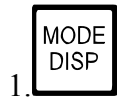
### 3.3.2 Ion Selective Electrode Calibration

This calibration is necessary when installing the new ISE electrode.

It is necessary to provide from 2 to 5 standard solutions.

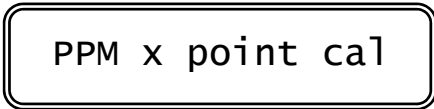
The Concentration of the next solution must be no more of 100 times (2 decades).

The electrode's output of the next solution must be  $\Delta \text{mV} > 10 \text{ mV}$ .

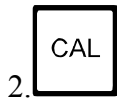


1. to go to

(D1)



#### Calibration point insertion:



2. to access the calibration sequences



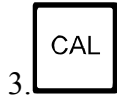
Nr. x number of the calibration points (1/5)



to delete the calibration procedure  
(see "Calibration procedure deletion")

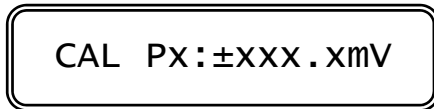


to end the calibration procedure  
(see "Calibration procedure ending")




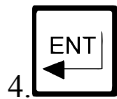
to insert the Nr.x point

Immerse the electrode into the standard solution



xxx.xmV signal supplied by the electrode


 to exit from the procedure



to confirm and to go to the decade selection

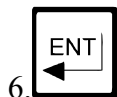


100.0 decade

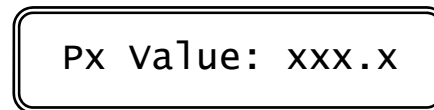
 to exit from the procedure




to select the decade



to access the calibration point value insertion

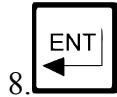


Px calibration point number  
xxx.x actual value of the calibration point Px

 to exit from the procedure

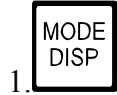


to insert the new calibration value



- 8. - to confirm the calibration value
- to go to the next point Px (from 2 to 5)
- if Px=5 the unit will check the validity of the calibration

Calibration procedure deletion



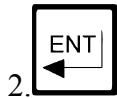
- 1. press this key during the visualization of the calibration point number



(CAL POINT Nr. x)



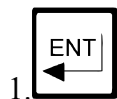
to abort the calibration procedure and to go back to the visualization of the calibration point number



- 2. to delete the calibration and to go back to (D1)

Calibration procedure ending

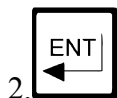
The calibration may be ended from the following display:



- 1. to start the ending of the procedure



to annul the ending procedure and to go back to the visualization of the calibration points number



- 2. to end the calibration and to go to the inserted point check

Calibration validity check

During the validity check, the instrument will show the following message:

CHECK CAL POINT

1. If the inserted points are proper, the following message will be displayed:

VALUE UPDATED



to stop the message and to go to the display D1

2. If the inserted points have any error, the following message will be displayed:

POINT n ERROR

n (2/5) wrong point number



to visualize the type of error

Messages and type of errors during the calibration:

WRONG ION

The response curve is inverse (check the ion type selection).

SLOPE TOO LOW

Slope is  $< 50\%$  of the nominal value.  
 (Nominal value for monovalent ions (X+ X-): 56 mV/decade)  
 (Nominal value for bivalent ions (X++ X--): 28 mV/decade)  
 Check if X++ (X--) has been selected instead of X+ (X-)

SLOPE TOO HIGH

Slope is  $> 200\%$  of the nominal value  
 Check if X+ (X-) has been selected instead of X++ (X--)

POINT TOO FAR

The calibration point is 2 decades far from the previous one.  
Choose a second standard solution with lower concentration. (<100 times)

POINT TOO NEAR

The calibration point is < 10 mV far from the previous one.  
Choose a second standard solution with higher concentration. (>10 times)



to go back to the wrong point calibration

### 3.3.3 Electrodes drift adjustment

This is the regular calibration during the electrode's life.  
Be sure the 2/5 solutions calibration has been done at least one time before start this kind of calibration.

Prepare a standard solution with a Concentration value close to the process value.  
Operate in the same way as described in the chapter regarding the calibration of one point.

End the procedure just after the first point calibration.

The procedure start from the display:

CAL PX: ± XXX.XmV



pressing the 3 keys the unit will turn to the factory calibration (drift adjustment 0.0 mV)

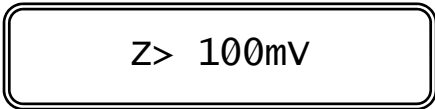
#### Messages during the zero calibration:

If the zero calibration is correct, the instrument will show the following message:

ZERO PNT UPDATED

After 2 seconds the message will disappear and the unit will go back to (D1).

If the deviation value is > 100 mV, the following message will appear:



After 5 minutes the message will disappear and the unit will go back to (D1). The new Zero value is not memorized.

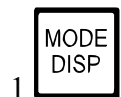
It is necessary to calibrate the unit with 2 standard solutions at least.



to acknowledge the error message.

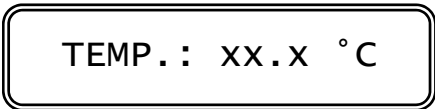
The message 'NO UPDATE' will appear for 2 seconds, then the unit goes back to (D1).

### 3.3.4 Temperature calibration

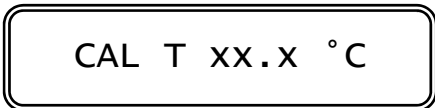


to go to

(D3)



to access the calibration procedure



xx.x measured Temperature value  
>>>>>> Temperature value over range



to exit from the procedure and to go back to (D3)



+



+



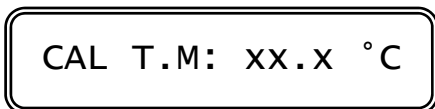
press the 3 keys to turn to factory calibration



to modify the actual value



to confirm and to go to the manual Temperature insertion



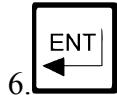
xx.x manual Temperature value



to exit from the procedure and to go back to (D3)



to modify the actual value



to confirm and to go back to (D3)

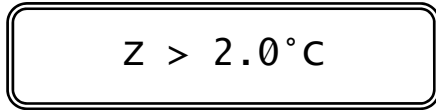
MESSAGE

FUNCTION



The calibration is accepted

ERROR MESSAGES



Zero > 2.0°C The above message will last for 5 minutes.



to acknowledge the error messages

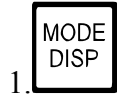


the calibration is not accepted.  
The unit go back to (D3)

### 3.3.5 Thermocompensation parameters

The Automatic Temperature Compensation may be effected only when the isothermal value is known.

Select OFF in the following step 3 if the value is unknown.

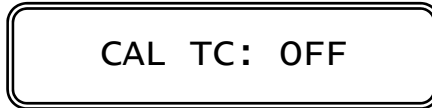


to go to

(D4)



to access the calibration sequences



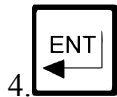
OFF thermocompensation deactivated  
(ON) (thermocompensation activated)



to exit from the procedure and to go back to (D4)



to select ON or OFF



to confirm and to go to the thermocompensation coefficient selection



x.xxx Thermocompensation coefficient value




to exit from the procedure and to go back to (D4)




to modify the value




6.  to confirm and to go to the isothermal point insertion

```
CAL Ipp: xxx.xmV
```

xxx.x electrode's isothermal value

-  to exit from the procedure and to go back to (D4)

7.  to modify the inserted value

8.  to confirm and to go back to (D4)

### 3.3.6 Alarm calibration


The following operations are possible:

- to select the min/max alarm value
- to select the delay time value

1.  to go to

(D7)

```
AL x.x/xxx.xpp
```

2.  to access the calibration sequences

```
CAL AL L: x.xpp
```

AL L low alarm calibration  
x.xpp actual low alarm value

-  to exit from the procedure and to go to (D7)



3. to insert the alarm value



4. to confirm and to go to the high alarm insertion



AL H high alarm calibration  
xxx.xpp high alarm value



to exit from the procedure and to go to (D7)



5. to insert the alarm value



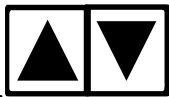
6. to confirm and to go to the delay time selection



AL D delay alarm calibration  
x.xs delay time value



to exit from the procedure and to go to (D7)



7. to insert the delay value



8. to confirm and to go back to (D7)

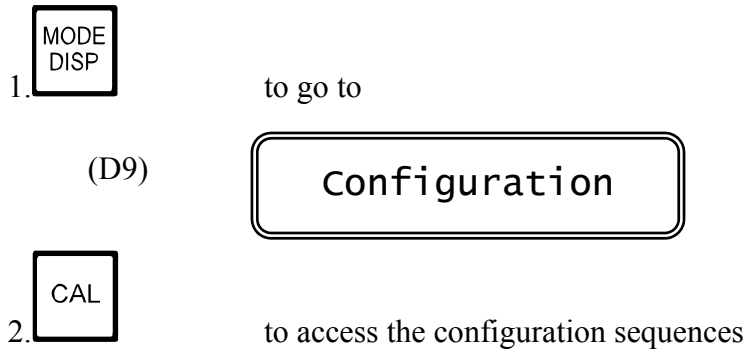


The new data have been memorized

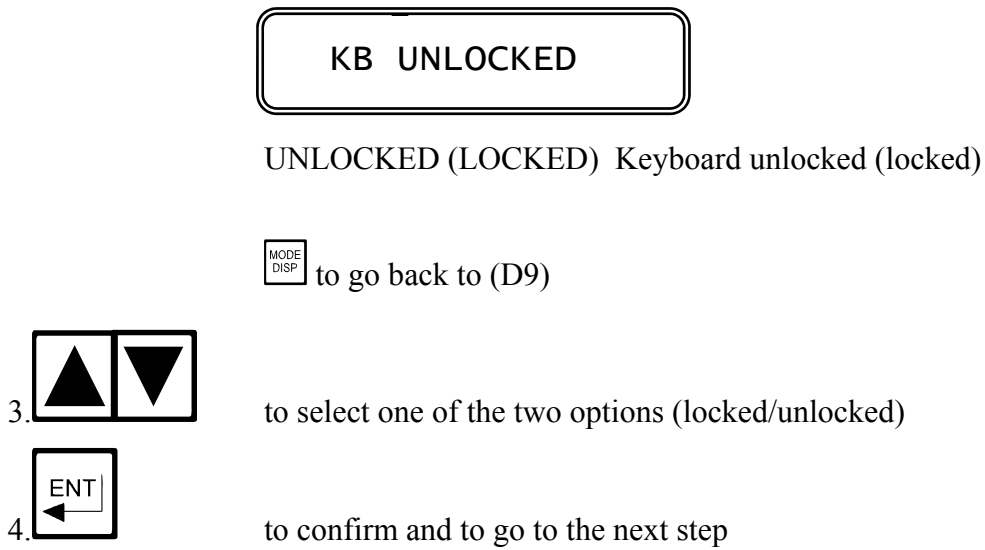
### 3.4 CONFIGURATION

The following operations are possible:

- keyboard locked/unlocked selection
- display contrast selection
- access number insertion




#### 3.4.1 Keyboard locked/unlocked





### 3.4.2 LCD display contrast



x contrast level

 to go back to (D9)

1.  to select the contrast from 0 to 7

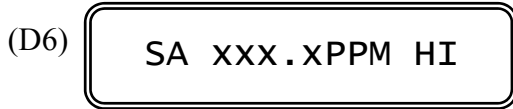
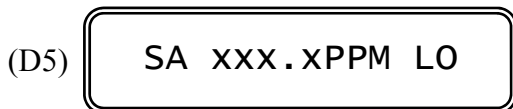
2.  to confirm and to go to the access number insertion

### 3.4.3 Set-point A/B calibration

For each set-point it is possible:

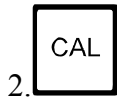
- to insert the set-point
- to insert the hysteresis
- to insert the delay time

1.  to go to



The following procedure are suitable for both set-point A and B.


Set-point value



to access the calibration sequences

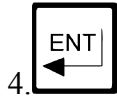


SA set-point A calibration  
xxx.xpp set-point value

 to exit from the procedure and to go back to (D5)/(D6)




to insert the set-point value



to confirm and to go to the next step

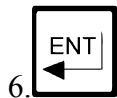


x.xpp actual hysteresis value

 to exit from the procedure and to go to (D5)/(D6)




to insert the hysteresis value





to confirm and to go to the delay time insertion



x.XS actual delay time value

 to exit from the procedure and to go to (D5)/(D6)

7.  to insert the delay time value


8.  to confirm and to go back to (D5)/(D6)


 The calibration is accepted


**3.4.4 Access number**



0 access number request

 to go back to (D9)

1.  to insert the access number (when keeping the key pressed the number will scroll with 3 speed level)

2.  to confirm and to proceed with the configuration


**IMPORTANT NOTE:** any number different from the right access code, will allow the visualization of the parameters and not the modification. The following message will appear:


<u>MESSAGE</u>	<u>FUNCTION</u>
	Configuration changes are inhibited


### 3.4.5 Ion valence



X+(X--)(X-)(X+) type of selected ion


 to go back to (D9)


1.  to select the type of ion

2.  to confirm and to go to the next step

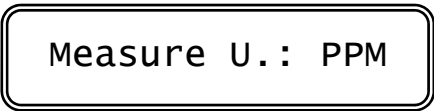
Before modifying the type of ion, the unit need the confirmation.  
The type of ion modification cancels the calibration points previously memorized and turn the unit to the factory calibration.



 to go back to (D9)


3.  to confirm the type of ion and to reset the calibration point

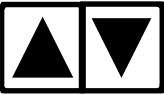
### 3.4.6 Measuring unit




(g/l mbar mg/l mmHg)

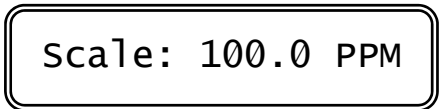
PPM (g/l mbar mg/l mmHg): selected measuring unit

 to go back to (D9)

1.  to select the measuring unit


2.  to confirm and to go to the next step


### 3.4.7 Set-point scale, alarm and analog output




(10.00 - 1000)

100.0 (10.00) (1000) selected scale

 to go back to (D9)

1.  to select the scale

2.  to confirm and to go to the next step


**Note:** set-point, alarm and analog output values will be shown in the scale as selected.



3.4.8 Software filter


Large s RT x.xs

Large s RT response time for large fluctuations  
 x.xs software filter value (sec.)

 to go back to (D9)

1. 


to select the time

2. 

to confirm and to go to the next step


Small s RT: xx.xs

Small s RT response time for small fluctuations  
 xx.xs response time value (in sec.)

 to go back to (D9)

3. 

to select the time


4. 


to confirm and to go to the next step


### 3.4.9 Scale of the analog output n°1

CAL OUT1: PPM

PPM (°C) input/analog output Nr.1

 to go back to (D9)


1.  to select values in PPM (°C)


2.  to confirm and to go to the next step


### 3.4.10 Analog output n°1 range

CAL OUT1: 0/20mA

0/20mA (4/20mA) range selected


 to go back to (D9)

1.  to select the output range

2.  to confirm and to go to the next step

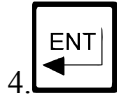
CAL P1: x.xPPM

P1 begin of the output range  
 x.xPPM measuring value related to 0/4 mA

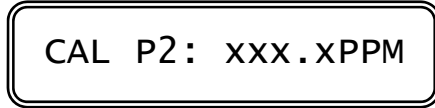
 to go back to (D9)



to choose the value x.x in PPM



to confirm and to go to the next step



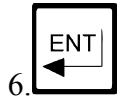
P2 end of the output range  
xxx.xPPM measuring value related to 20 mA



to go back to (D9)



to choose the value xxx.x in PPM



to confirm and to go to the next step

**IMPORTANT NOTE:** if the value related to P1 is higher than the value related to P2, the analog output will be the "reverse", otherwise will be the "direct" type.

### 3.4.11 Scale of the analog output n°2

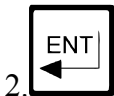
CAL OUT: PPM

PPM (°C) input/analog output n°2

MODE DISP to go back to (D9)



to choose the values in PPM



to confirm and to go to the next step

### 3.4.12 Analog output n°2 range

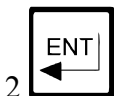
CAL OUT2: 0/20mA

0/20mA (4/20mA) range selected

ENT to go back to (D9)



to select the output range





to confirm and to go to the next step

CAL P1: x.xPPM

P1 begin of the output range  
x.xPPM measuring value related to 0/4 mA


ENT to go back to (D9)


3.  to choose the value x.x in PPM


4.  to confirm and to go to the next step

**CAL P2: xxx.xPPM**

P2 end of the output range  
xxx.xPPM measuring value related to 20 mA

 to go back to (D9)

5.  to choose the value xxx.x in PPM


6.  to confirm and to go to the next step

**IMPORTANT NOTE:** if the value related to P1 is higher than the value related to P2, the analog output will be the "reverse", otherwise will be the "direct" type.

### 3.4.13 Set-point A function

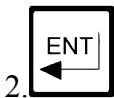


F function  
LO (HI) minimum (maximum)

 to go back to (D9)



to select the function LO or HI




to confirm and to go to the next step

### 3.4.14 Set-point B function

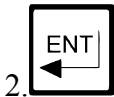


F function  
LO (HI) minimum (maximum)

 to go back to (D9)



to select the function LO or HI




to confirm and to go to the next step

### 3.4.15 Set-point A alarm

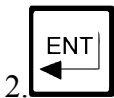


ON (OFF) alarm inserted (not inserted)

 to go back to (D9)



to select ON or OFF



to confirm and to go to the next step

- by selecting OFF the alarm function is not activated.


The unit goes to the next parameter calibration.

- by selecting ON the alarm function is activated.

(when the relay B will be active longer than the time selected in the following procedure).

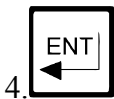


xx m activation time

 to go back to (D9)



to choose the time value




to confirm and to go to the next step

### 3.4.16 Set-point B alarm

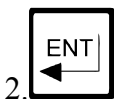


ON (OFF) alarm inserted (not inserted)

 to go back to (D9)



to select ON or OFF




to confirm and to go to the next step

- by selecting OFF the alarm function is not activated. The unit goes to the next parameter calibration.
- by selecting ON the alarm function is activated. (when the relay B will be active longer than the time selected in the following procedure).

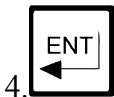


xx m activation time

 to go back to (D9)



to choose the time value




to confirm and to go to the next step





### 3.4.17 Alarm relay contact



ACT (DEA) relay activated (deactivated) when the alarm is active

 to go back to (D9)


1.  to select ACT or DEA


2.  to confirm and to go to the next step


### 3.4.18 New access number



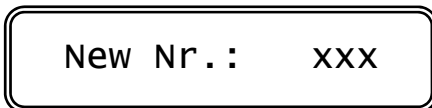
NO (YES) access number changing not required (required)

 to go back to (D9)


1.  to select NO or YES


2.  to confirm and to go to the next step


- by selecting NO the unit will go to the Configuration display
- by selecting YES the unit will go to the following display:



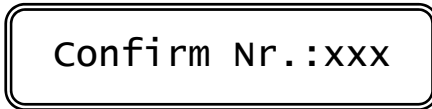
xxx actual access number

 to go back to (D9)


3.  to insert the new access number


4.  to confirm and to go to the next step


The instrument ask the operator to insert again the new access number.



xxx actual access number

 to go back to (D9)


5.  to insert the new access number


6.  to confirm and to go back to the beginning of the Configuration

The double insertion of the new access number assures the memorization of the right code.

As soon as the new number is memorized the message "UPDATE" will appear.

Should the operator insert two different numbers, the instrument will not modify the access number and the message "NO UPDATE" will be shown.

 press several time the key to verify the selected parameters before leaving the Configuration routine.

 press to exit from the Configuration menu.

## 4 INSTALLATION

### 4.1 CONTROLLER INSTALLATION

The controller may be installed close to the points being monitored, or it may be located some distance away in a control area.

The enclosure is designed for panel-mounting.

It should be mounted on a rigid surface, in a position protected from the possibility of damage or excessive moisture of corrosive fumes.

### 4.2 SENSOR INSTALLATION

See the instruction manual of the sensor.

### 4.3 ELECTRICAL INSTALLATION

Connections within the controller are made on detachable terminal strips located on the rear side. (fig. 2)

Power and output-recorder connections are made at the 13 pin terminal strip, while input signal connections are made at the 12 pin terminal strip.

#### Connecting the power

- terminal 4 connect to the ground
- terminals 1-2 connect to the ac power (if power is 110 V)
- terminals 1-3 connect to the ac power (if power is 220 V)

(If 091.404 option is installed, connect 24 Vac to 1-3 terminals)

## WARNINGS

- power the device by means of an isolation transformer
- avoid mains-voltage from an auto-transformer
- avoid mains voltage from a branch point with heavy inductive loads
- separate power supply wires from signal ones
- control the mains voltage value
- an internal device protects the unit against power overloads.  
Disconnect the power and wait few minutes before powering again.

### Connecting the Ion Selective Electrode (ISE)

- terminal 22 connect to the Ion Selective Electrode
- terminal 21 connect to the Reference electrode

(Normally in the combination ISE the Reference electrode is connected to the shield of the coax cable)

Avoid interruption on the cable if a high insulation terminal block is not available.  
Keep the cable away from power wires on the overall length.

### Connecting the RTD

The Temperature readout and the automatic Temperature compensation is provided by connecting the Pt100.

If the Temperature sensor is not connected or damaged, the unit will operate in manual Temperature compensation automatically.

#### 3-wire connection

- terminal 23 connect to the Pt100
- terminals 24 - 25 connect to the Pt100 common

#### 2-wire connection

- terminals 23 - 24 connect to the Pt100
- terminals 24 - 25 install a jumper between terminals

### Connecting a recorder

Connect to terminals 14-16 for the 1st channel output

Connect to terminals 15-16 for the 2nd channel output (091.3711 option)

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

Series connection is required for driving more loads having a total input Resistance lower than 600 ohm for each channel.

### Connecting alarms, pumps, valves

The output connections referred to set-point SA and set-point SB are made at terminal strip and they consist of two independent SPDT relays corresponding to Regulator A and Regulator B.

The output connection referred to alarm consists of SPDT relay corresponding to Alarm C/D.

## RELAY "A" SET-POINT "SA"

terminal <u>6</u> marked <u>C</u>	common contact
terminal <u>5</u> marked <u>NO</u>	normal open contact
terminal <u>7</u> marked <u>NC</u>	normal closed contact

## RELAY "B" SET-POINT "SB"

terminal <u>9</u> marked <u>C</u>	common contact
terminal <u>8</u> marked <u>NO</u>	normal open contact
terminal <u>10</u> marked <u>NC</u>	normal closed contact

## RELAY "C/D" ALARM

terminal <u>12</u> marked <u>C</u>	common contact
terminal <u>11</u> marked <u>NO</u>	normal open contact
terminal <u>13</u> marked <u>NC</u>	normal closed contact

Arc suppressor

Install a suitable snubber between relay terminals if the relay activation causes interferences on the display. (B&C Electronics snubber SX101)

## 5 OPERATING THE SYSTEM

### Checking

Before connecting the system to the power supply:

- check that all cables are properly fastened to prevent strain on the connections
- check that all terminal-strip connections are mechanically and electrically sound
- check that power voltage is correct

### Pre-operation check

The system's controls and indicators are all located on the front panel (see fig.1).

The meter has a LCD display 1 indicating that the unit is on.

The cards of the controllers are adjusted at the factory.

If sensors have been connected correctly, as described in the above sections, the system should function correctly needing only the start up and the parameters calibrations as described in the following section.

### Quick start guide


The unit may be installed for the following purposes:

- measuring
- measuring and regulation
- measuring, regulation and recording

The instrument is shipped with factory calibration and configuration suitable for the most popular applications.







For this reason the operation may require just the following steps:

#### measuring

1. Connect the electrode to the meter.
2. Switching-on the meter will assume the factory calibration.  
The display will go to (D0) Display.
3. The meter is configured for monovalent ions (ion type X+) and 100.0 PPM scale.  
Go to the Configuration menu in order to select other ion types.  
From (D0) press 9 times  to start the Configuration sequence.
4. Carry out the first calibration (from 2 to 5 points).

measuring and regulation

Add the following to the preceding operations:

1. Press    to go to the manual operation. If the automatic mode is selected, go to the step 2
2. A and B relay are configured as LOW (Minimum).  
Select HIGH (Maximum) if necessary.
3. Select the Set-point, the Hysteresis and the Delay of A and B relay. From (D0) press 5 times  to start the Set-point A selection sequence.  
From (D0) press 6 times  to start the Set-point B selection sequence.
4. The alarm on the activation time of A and B relay is deactivated.  
Activate this kind of alarm if necessary.
5. Select alarm values of min/max and delay if necessary.  
From (D0) press 7 times  to start the alarm selection sequence.

measuring, regulation and recording

Add the following to the preceding operations:

1. Analog output is configured as PPM at 0/20 mA corresponding to the input scale.  
Select 4/20 mA and a suitable input span if necessary.
2. If option 091.3711 is installed, follow the step 1. for the second output.  
This option allows to select the analog output as °C scale.

Manual operation

When the instrument is programmed for the manual operation (see Calibration sequences) the flashing "M" will appear on the display.

Analog outputs and alarm relay will remain activated.



while pressing the key, A relay will be activated.



while pressing the key, B relay will be activated.

Temperature compensation

Do not activate the Temperature compensation if the isothermal value and the thermocompensation Coefficient of the electrode are not known.

Following the Nernst's law the thermocompensation Coefficient is:

- 0.198 %/°C (monovalent ions)
- 0.099 %/°C (bivalent ions)

The above values should be confirmed by electrode's manufacturer.

The isopotential point change depending on the type of the measured ion.  
Check the value declared by electrode's manufacturer.

The manual compensation is in alternative to the automatic compensation.  
Do not install The RTD and select the Temperature value and the Temperature coefficient value  
(see Pt100 zero calibration).



## 6 CALIBRATION


### Concentration measuring

This calibration is necessary when:

- the electrode is replaced or the ion type is changed (X--, X-, X+, X++);
- periodically, in order to maintain a good accuracy.

Prepare from 2 up to 5 standard solutions.

We suggest standard solutions corresponding to the decades (0.10/1.00/10.00/100.0/1000).

From (D0) press  to start the calibration procedures. (see 3.1)

During the calibration the unit measures the mV signal from the electrode, while the operator insert the corresponding concentration value in PPM.

The instrument effects the validity check of the calibration points.

If a calibration point is not valid, an error message will appear together with the number of the point.

The operator may repeat the calibration of this point.

The unit consider not valid the following calibration points:

- if between 2 points there are less than 10 mV
- if between 2 points there are more than 2 decades
- if slope is less than 50% or more than 200% of the regular slope
- if the slope is negative instead of positive (or vice versa).

The point corresponding to zero concentration is deleted.

During the calibration, control relays and alarm relay are deactivated.

### Electrode's drift adjustment

This is the regular calibration to be effected during the electrode's life, by using a standard solution having a concentration value close to the process value.

By inserting just one calibration point, the unit will effect the electrode's drift adjustment. (see 3.1.3)

### Temperature calibration

From (D0) press  to start the Temperature calibration sequence.

Immerse the Temperature sensor in a liquid at known Temperature and check the correspondent value on the display.

Follow the first 4 steps of the procedure in the Chapter 3.1.4. to adjust the Temperature value

## 7 PREVENTIVE MAINTENANCE

### Controller

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

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

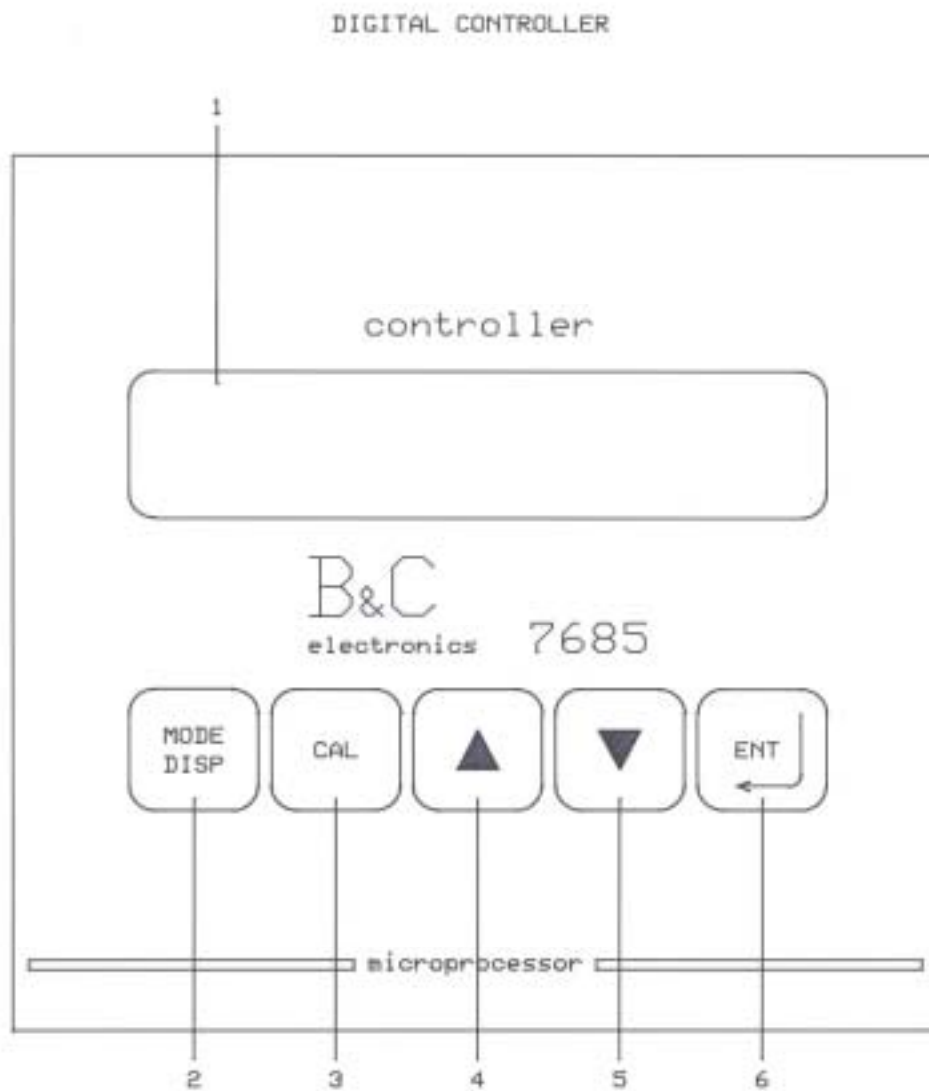
As in any electronic equipment, the mechanical components, such as switches, relays and connectors, are the most subject to damage.

### Sensor

The state of the electrode's surface is critical for the normal operation of the system.

For the ISE maintenance see the manufacturer instruction manual.

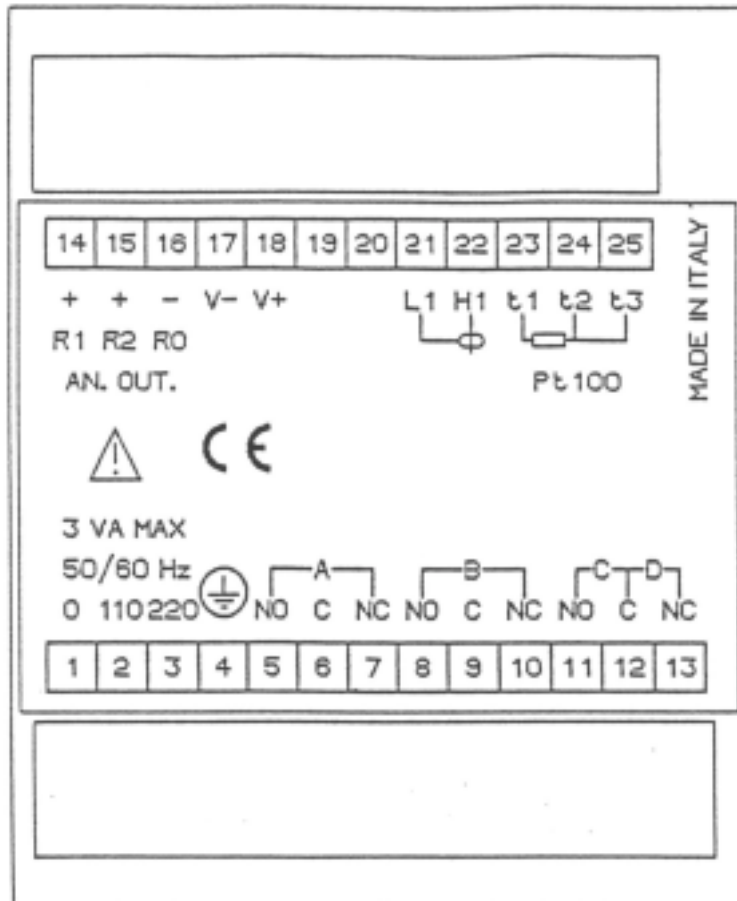
Protect the sensor from humidity, excessive moisture or corrosive fumes.



1. DISPLAY
2. MODE-DISPLAY KEY
3. CALIBRATION KEY
4. INCREASE KEY
5. DECREASE KEY
6. ENTER KEY

FIG. 1

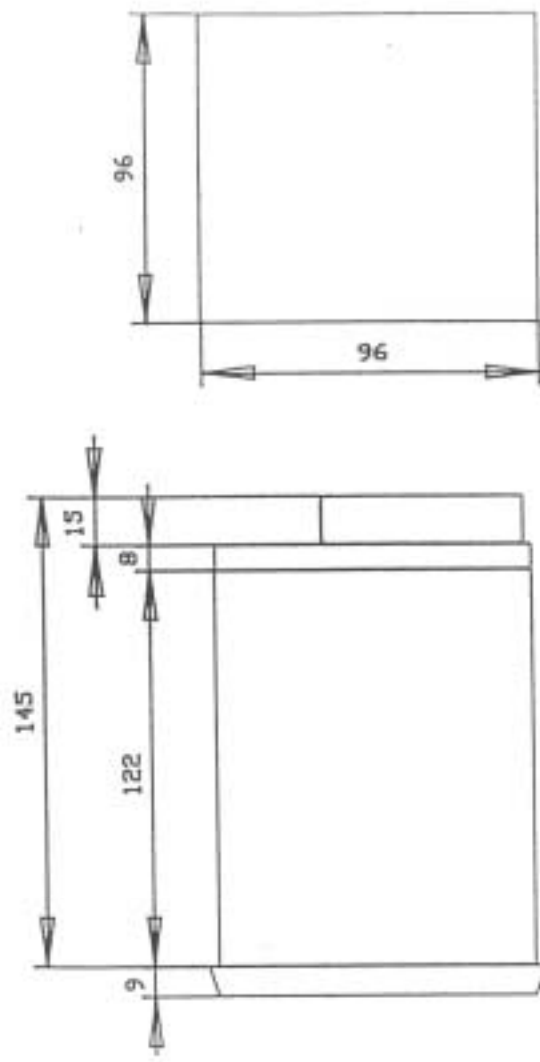
## IC 7685 REAR PANEL CONNECTIONS



- 1.2.            110 V. Power supply
- 1. 3.          220 V. Power supply
- 4.             Ground (power)
- 5. 6.          A Relay N.O. contacts
- 6. 7.          A Relay N.C. contacts
- 8. 9.          B Relay N.O. contacts
- 9.10.        B Relay N.C. contacts
- 11.12.       C Relay N.O. contacts (alarm)
- 12.13.       C Relay N.C. contacts (alarm)
- 14.           Recorder output 1 (+)
- 15.           Recorder output 2 (+) (option)
- 16.           Recorder output 1 and 2 (-)
- 21.           Reference Electrode input
- 22.           Ion Selective Electrode input
- 23.24.25.    Temperature sensor input

FIG. 2

CONTENITORE DIN 43700 MOD. 7685  
BOX



PIANO DI FORATURA  
DRILL PLAN

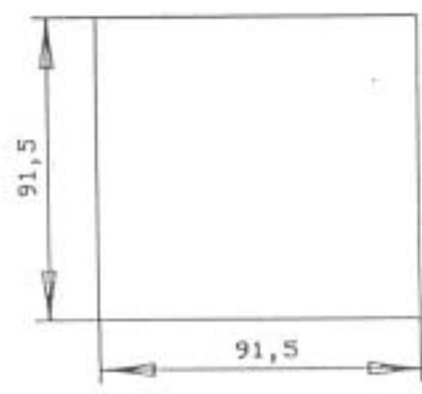


FIG. 3