

OPERATOR'S MANUAL

CL 7685

RESIDUAL CHLORINE

CHLORINE DIOXIDE - D. OZONE

MICROPROCESSOR CONTROLLER

*** potentiostatic ***

Rev. C
Valid for Option 091.3711

Range: 0/2.000/20.00 PPM
Temperature range: -2/+52 °C
Power supply: 110/220 Vac

Software: R 2.3x

Cod. 28006765

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Index

| | | |
|------|--|----|
| 1 | GENERAL | 4 |
| 1.1 | Functional specifications | 5 |
| 1.2 | Physical description | 8 |
| 2 | SPECIFICATIONS | 9 |
| 3 | INSTALLATION | 14 |
| 3.1 | Physical installation | 14 |
| 3.2 | Electrical installation | 14 |
| 3.3 | Operating the system | 17 |
| | Pre-operation check | 17 |
| 4 | KEYBOARD | 18 |
| 5 | READOUT SEQUENCES | 19 |
| 6 | CALIBRATION SEQUENCES | 22 |
| 6.1 | Operating mode selection | 22 |
| 6.2 | Zero and Sensitivity calibration | 22 |
| 6.3 | Temperature calibration | 26 |
| 6.4 | Set-point A/B calibration | 27 |
| 6.5 | Alarm adjustment | 29 |
| 6.6 | Cleaning function calibration | 30 |
| 7 | CONFIGURATION | 32 |
| 7.1 | Keyboard locked/unlocked | 32 |
| 7.2 | LCD Display contrast | 32 |
| 7.3 | Access number | 33 |
| 7.4 | Type of measuring | 33 |
| 7.5 | Input range | 33 |
| 7.6 | Auto range | 33 |
| 7.7 | Software filter | 33 |
| 7.8 | Cell polarization voltage | 34 |
| 7.9 | Calibration mode | 34 |
| 7.10 | Temperature coefficient | 34 |
| 7.11 | Input related to analog output n°1 (Option 091.3711) | 34 |
| 7.12 | Analog output n°1 range | 35 |
| 7.13 | Input related to analog output n°2 (Option 091.3711) | 35 |
| 7.14 | Analog output n°2 range | 36 |
| 7.15 | Set-point A operating mode | 36 |
| 7.16 | Set-point A function | 36 |
| 7.17 | Set-point B operating mode | 37 |
| 7.18 | Set-point B function | 37 |
| 7.19 | Alarm on Set-point A | 37 |
| 7.20 | Alarm on Set-point B | 38 |
| 7.21 | Alarm relay contact function | 38 |
| 7.22 | Cleaning function | 38 |
| 7.23 | Cleaning time (relay D ON) | 38 |

| | | |
|------|-----------------------------|----|
| 7.24 | Holding time | 39 |
| 7.25 | New access number | 39 |
| 8 | CALIBRATION..... | 40 |
| 8.1 | Electrical calibration..... | 40 |
| 8.2 | Chemical calibration..... | 40 |
| 9 | PREVENTIVE MAINTENANCE..... | 41 |

1 GENERAL

This series of controllers with built-in microprocessor forms an advanced system of measurement and regulation of pH - ORP - Conductivity - Dissolved Oxygen - Chlorine in industrial processes.

Compiled into these instruments is all the know-how of B&C Electronics built up over more than 20 years of experience in the field of industrial electrochemical analysis.

We have continually developed and updated these products keeping in mind the maximum consideration for quality, reliability, completeness of functions, simplicity of handling, and also the cost.

The computing capability and the versatility of the microprocessor are accompanied by friendly software specially designed to make the use of the instrument, the programming of its functions, routine checks and calibrations easily accessible even for an untrained operator.

The alpha-numeric backlit liquid crystal display helps the operator supplying him with all the information on functioning and on operating, while the software suggests possible steps for calibration and set-up.

The display supplies, at the same time as the measurement, an indication of present status of the output relays and of the output current.

For a higher level of checks, the display gives an indication of the operating conditions of the electrochemical sensors, the current status of the calibrations, set points and analog output.

The user friendly operation of the instrument saves the operator feats of memory and continual reference to the instruction manual.

All operations are carried out using the five key pads on the front panel, for the mode selection, the input of calibration and set point data and the setting-up. (Fig. 1)

There are no knobs or switches to manipulate in order to operate the unit. This makes the instrument rugged and more corrosion resistant.

A non-volatile EEPROM memory assures measurement parameters are maintained in the event of a power interruption.

The software is provided with a "watch-dog" check for correct functioning of the programs.

The electrical circuit is protected by a device which comes back into operation automatically following an overload or a wiring error.

1.1 FUNCTIONAL SPECIFICATIONS

Input

The instrument accepts input from potentiostatic sensor for Active Chlorine, Chlorine Dioxide and D.Ozone measuring.

A second input is provided for 3 wires Pt100 Temperature sensors.

Temperature compensation

The unit is supplied with manual or automatic Temperature compensation and Temperature information may be displayed on LCD.

The instrument detects the absence or malfunctioning of the Temperature sensor and automatically switches to manual operation mode.

Measuring ranges

The unit provides an input range which may be selected from 0/1.999 or 0/19.99 PPM.

Auto ranging function may be activated for the measuring range 0/1.999 PPM.

Auto ranging allows the operator to calibrate the unit in the low range, against a high concentration of standard solution.

Analog output

Either a 0/20 mA or 4/20 mA isolated output may be selected, provided for interface with computer or data loggers.

A special routine allows selection of the analog output range.

If the instrument is programmed for high range, the output may be set anywhere from 0/20.00 PPM.

If low range is selected, the output may be set anywhere from 0/2.000 PPM.

Control relays

The monitor is equipped with two SPDT control relays.

These output relays may be used in a variety of ways, and the function of each relay is programmable by operator.

Control relays can be used in one of 3 different output modes: on/off, pulse width modulation and pulse frequency modulation.

The on/off mode of operation is used for simple control or for alarm purposes. Each control relay may be programmed for set-point, high/low, hysteresis or dead band, delay time for actuation.

The proportional mode of operation is used for more accurate control.

Each control relay may be programmed for set-point, high/low, proportional band, Frequency or Width modulation.

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

Alarm relay

The unit contains a SPST relay designated as an alarm relay.

This relay may be used to warn of various conditions that might indicate operational problems. The relay will activate on either high or low concentration 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.

Cleaning function

The unit contains a SPST relay designed for the auto clean cycle.

It's possible manually activate the cleaner to test its operation.

The operator can change the frequency of cleaning.

The configuration routine selects:

- auto/manual operation
- the cleaning time
- the holding time.

During cleaning and holding time:

- messages are flashing
- analog output is held constant
- set-points and alarm relays are deactivated.

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 mode of operation the display indicates only the concentration 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 mode of operation is useful for start up or for manual operation of disinfection plants.

- Simulated operation (SIM.):

This mode of operation would normally only be used for control system troubleshooting. The unit does not provide the measuring values, but will allow the relays to be manually activated and the analog output corresponding to the values on the display, to be manually selected by the operator. The display does not indicate the measuring units (PPM) and access to calibration of the parameters is not allowed. The message "SIM" is shown on the display, indicating the current operation mode of the instrument.

Calibration mode

The instrument may be programmed for the immediate or postponed calibration.

The immediate calibration mode allows the operator to calibrate the unit immediately against a field measurement on the same sample that the sensor is measuring.

The postponed calibration mode allows the operator to calibrate the unit against a laboratory measurement on the same sample that the sensor is measuring. The calibration may be performed later even if the sample concentration that the sensor is measuring has changed.

Software filter

The unit is provided with a programmable software filter, to be inserted when the readout is not stable. In order to maintain a satisfactory speed of response of the system it is suggested to insert a time value which is equal to 1/2 or 1/4 the response time of the sensor itself.

Configuration

The electronics for the monitor is designed to be as flexible as possible. A number of programming functions are provided in the Configuration menu and are protected by an access number, which must be entered to allow changes in this setting. The routine allows programming of a custom access code number.

Front panel lock

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 Dual isolated and programmable output
The operator may select an output for Temperature.
- 091.404 24 VAC power supply.
- 091.701 RS232 isolated output
The output sends the data (PPM, °C) to the serial port of the computer.

1.2 PHYSICAL DESCRIPTION

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.

2 SPECIFICATIONS

The DEFAULT values are correspondent to the factory calibration values.

Parameters marked by " * " can be modified in the Configuration procedures.

| | | |
|----|--|----------------|
| 1) | <u>OPERATING MODE</u> | <u>DEFAULT</u> |
| | Automatic/Measuring/Input simulation | Auto |
| 2) | <u>MEASURING TYPE</u> | |
| * | Chlorine/Chlorine dioxide/D. Ozone | Chlorine |
| 3) | <u>INPUT SCALES</u> | |
| * | Input range: 2.000/20.00 PPM | 20.00 |
| | Display resolution at 20 °C: 1/2000 | |
| * | Software filter 90% RT: 0.6/99.9 s | |
| | Current at 20 °C: 250/5000 nA/PPM | 2000 |
| | Cell Sensitivity: 12.5/250% | 100% |
| | Zero: +/- 2 0 µA adjustment | 0 µA |
| * | Comp. Temp. Coefficient Cl/ClO ₂ : 0/4.0 % / °C | 2.0% / °C |
| * | Comp. Temp. Coefficient O ₃ : 0/4.0 % / °C | 2.5% / °C |
| * | Polarization Voltage: | -200 mV |
| 4) | <u>TEMPERATURE</u> | |
| | Input: RTD Pt100 | |
| | Connection: 2/3 wires | |
| | Measuring and compensation range: -2/+52 °C | |
| | Resolution: 0.1 °C | |
| | Zero adjustment: +/- 2°C | 0 °C |
| | Manual Temperature compensation: 0/50 °C | 20 °C |

| | | |
|----|---|--|
| 5) | <u>SET A/B</u> | |
| * | Selectable actions: ON-OFF PFM - Pulse frequency proportional PWM - Pulse width proportional | |
| * | * Action: ON-OFF Value: 0/2.000 - 0/20.00 PPM (as scale selected) Hysteresis: 0/0.200-0/2.00 PPM (as scale selected) Activation delay: 0/99.9 " | SET B 0 PPM 0.2 PPM 0.0" |
| * | Function: HI/LO (Max/min) | LO |
| * | Action: PFM Value: 0/20.00 PPM (as scale selected) Proportional band: 0/0.200 - 0/2.00 PPM (as scale selected) Pulse max. Frequency: 0/120 pulse/minute Pulse width: | SET A 0 PPM 0.2 PPM 100 p/m 0.1" |
| * | Function: HI/LO (Max/min) | LO |
| * | Action: PWM Value: 0/0.200 - 0/20.00 PPM (as scale selected) Proportional band: 0/0.200 - 0/2.00 PPM (as scale selected) Pulse width: 0/99.9" Min. pulse width: | 0 PPM 0.2 PPM 20.0" 0.3" |
| * | Function: HI/LO (Max/min) Relay Contacts: SPDT 220 V 5 A Resistive load | LO |
| 6) | <u>ALARM</u> (RELAY C) | |
| | High value: 0/2.000 - 0/20.00 PPM (as scale selected) Low value: 0/2.000 - 0/20.00 PPM (as scale selected) Delay: 0/99.9 " | 20.00 PPM 0.00 PPM 0.0" |
| * | Alarm on max. SA: ON/OFF | OFF |
| * | Max. time SA: 0/60 minutes | 60 min |
| * | Alarm on max. SB: ON/OFF | OFF |
| * | Max. time SB: 0/60 minutes | 60 min |
| * | Contact type: ACT/DEA Relay Contact: SPST 220 V 5 A Resistive load | ACT |

| | | |
|----|---|-----------|
| 7) | <u>CLEANING FUNCTION (RELAY D)</u> | |
| * | Action: Disable/Manual Clean/Auto+Manual Clean | Disable |
| | Auto Clean: | |
| | Time repetition: 0.1/24.0 h | 24.0 h |
| * | Cleaning time: 0.5/60.0" | 15.0" |
| * | Hold time: 0.1/20.0' | 3.0' |
| | Relay contacts: SPST | |
| 8) | <u>ANALOG OUTPUT Nr. 1</u> | |
| * | Current range: 0-20/4-20 mA | 0/20 mA |
| * | Point 1 corresponding to 0 mA or 4 mA | |
| | RANGE 20.00 PPM: 0.00/20.00 | 0.00 PPM |
| | RANGE 2.000 PPM: 0.000/2.000 | 0.000 PPM |
| | TEMPERATURE: 0.0°C/50.0°C (Option 091.3711) | 0.0 °C |
| * | Point 2 corresponding to 20 mA | |
| | RANGE 20.00 PPM: 0.00/20.00 | 20.0 PPM |
| | RANGE 2.000 PPM: 0.000/2.000 | 2.000 PPM |
| | TEMPERATURE: 0.0°C/50.0°C (Option 091.3711) | 50.0 °C |
| | Response time: 10 s for 98 % | |
| | Isolation: 250 Vca | |
| | Rmax: 600 Ω | |
| 9) | <u>ANALOG OUTPUT N°2 (only for Option 091.3711)</u> | |
| * | Current range: 0-20/4-20 mA | 0/20 mA |
| * | Point 1 corresponding to 0 mA or 4 mA | |
| | RANGE 20.00 PPM: 0.00/20.00 | 0.00 PPM |
| | RANGE 2.000 PPM: 0.000/2.000 | 0.000 PPM |
| | TEMPERATURE: 0.0 °C/50.0 °C | 0.0 °C |
| * | Point 2 corresponding to 20 mA | |
| | RANGE 20.00 PPM: 0.00/20.00 | 20.00 PPM |
| | RANGE 2.000 PPM: 0.000/2.000 | 2.000 PPM |
| | TEMPERATURE: 0.0 °C/50.0 °C | 50.0 °C |
| | Response time: 10 s for 98 % | |
| | Isolation: 250 Vca | |
| | Rmax: 600 Ω | |

| | | |
|-----|--|-----------|
| 10) | <u>SERIAL COMMUNICATION</u> (Option 091.701) | |
| | Baud Rate: 4800 bit/s | |
| | Nr. of bit: 8 bit | |
| | Nr. of stop bit: 1 bit | |
| | Parity: None | |
| | Isolated from measure circuits | |
| | Example of data sent: ± 20.00 PPM ± 50.0 °C | |
| | Data sent every: 0.4 s | |
| 11) | <u>PARAMETERS ON CONFIG. BLOCK</u> (See for *) | |
| | Free calibration (access code not required): | |
| | Keyboard Lock/Unlock | Unlock |
| | LCD contrast (0/7). | 4 |
| | Under access code number: (0) | 0 |
| | Type of measure: Cl/ClO ₂ /O ₃ | Cl |
| | Measuring range: 2.000/20.00 | 20.00 PPM |
| | Auto ranging: On/Off | Off |
| | Software filter response time | 15 s |
| | Polarization | - 200 mV |
| | Immediate/postponed calibration mode | Immed. |
| | Temperature Coefficient | 2.0% |
| | Input connected to the output N°1 | PPM |
| | Analog output N°1 range (0/20 4/20 mA) | 0/20 mA |
| | Point 1 corresponding to 0 mA or 4 mA | 0.00 PPM |
| | Point 2 corresponding to 20 mA | 20.00 PPM |
| | Input connected to the output N°2 | PPM |
| | Analog output N°1 range (0/20 4/20 mA) | 0/20 mA |
| | Point 1 corresponding to 0 mA or 4 mA | 0.00 PPM |
| | Point 2 corresponding to 20 mA | 20.00 PPM |
| | Action of relays A (On-Off/PFM/PWM) | PFM |
| | Function of the A (HI/LO) | LO |
| | Action of relays B (On-Off/PFM/PWM) | On-Off |
| | Function of the B (HI/LO) | LO |
| | Alarm on max. operating time of SA | Off |
| | Max. operating time of SA for alarm | 60 m |
| | Alarm on max. operating time of SB | Off |
| | Max. operating time of SB for alarm | 60 m |
| | Alarm relay status (ACT/DEA) | ACT |
| | Cleaning function (Auto/Manual/Disabled) | Disabled |
| | Cleaning time: 0.5/60.0" | 15.0" |
| | Holding time: 0.1'/60.0' | 3.0' |
| | Access number: 0/999 | 0 |

12) GENERAL SPECIFICATIONS

Alphanumeric display: 1 line x 16 characters

Response time to 98% of value changing,

with TC=2% / °C - T=20 °C - S=100% :

< 5 s for HI range

< 15 s for LO range

Operating Temperature: 0/50 °C

Humidity: 95% without condensate

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 g

Dimensions: 96 x 96 x 155 mm

3 INSTALLATION

3.1 PHYSICAL INSTALLATION

The controller may be installed close to the areas 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, excessive moisture and corrosive fumes.

The cable from the probe must be protected by a sheath and not installed near power cables.

Interruption on cables must be avoided or carried out by high insulation terminals.

When installing "in line" electrodes it is suggested to follow the specific instructions given by the sensor's manufacturer.

3.2 ELECTRICAL INSTALLATION

All connections within the controller are made on detachable terminal strips located on the rear side. (Fig. 2)

All 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.

The electrical installation consists of:

Connecting the power

- connect ground to terminal 4
- connect ac power to 1 - 2 terminals if power voltage is 110 Vac
- connect ac power to 1 - 3 terminals if power voltage is 220 Vac
- 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 inductive loads
- separate power supply wires from signal ones
- control the mains voltage value

Connecting the sensor

- Sensor cabling is a critical part of the whole system.
- Use original cable supplied with the sensor
- Avoid interruption on the cable

- connect the White wire (Counter electrode) to the terminal 17 marked EL
- connect the Black wire (Measuring electrode) to the terminal 18 marked IN
- connect the shield (Reference electrode) to the terminal 19 marked R

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 SPST relay corresponding to Alarm C.

The output connection referred to auto-clean consists of SPST relay corresponding to Auto clean D.

Control 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 |

Control 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 |

Alarm relay "C"

| | | | |
|--------------------|--------|-----------|-----------------------|
| Terminal <u>12</u> | marked | <u>C</u> | : common contact |
| Terminal <u>11</u> | marked | <u>NO</u> | : normal open contact |

Auto clean relay "D"

| | | | |
|--------------------|--------|-----------|-----------------------|
| Terminal <u>12</u> | marked | <u>C</u> | : common contact |
| Terminal <u>13</u> | marked | <u>NO</u> | : normal open contact |

Connecting a recorder

A current output for a remote recorder or P.I.D. regulators is available on terminals 14-16.

Connect the recorder high (+) to terminal 14

Connect the recorder low (-) to terminal 16

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

If the 091.3711 dual output option is installed, a second isolated and programmable output is available between 15-16 terminals.

Output N°1 and Output N°2 are isolated and selectable 0/20 or 4/20 mA.

Connecting the RTD

The instrument has the automatic Temperature compensation carried out by means of RTD Pt100.

To operate the automatic Temperature compensation, connect the RTD as shown in the "connection" figure.

A three wire connection is suggested to achieve an accurate compensation over a long distance between the sensor and the controller.

3-wire connection

- connect the terminal of RTD to terminal 23 of the meter;
- connect the common terminal of RTD to terminals 24 - 25 of the meter;
- the 3 wire-cable must not be interrupted on the overall length.
If an extension is needed, the cable must be fastened to the high insulation terminal strip;
- keep the cable away from power wires.

The RTD connection as above described allows the controller to provide a digital readout of Temperature.

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

2-wire connection

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

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

3.3 OPERATING THE SYSTEM

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 unit is on.

The cards of the controllers are adjusted at the factory.

If sensors and probes 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.

4 KEYBOARD

| <u>KEY</u> | <u>SYMBOL</u> | <u>FUNCTION</u> |
|---|---------------|--|
|  | [MODE] | <ul style="list-style-type: none">- allows the operator to go to the next Display- allows to go back to the main Display. The eventual new parameter values will not be memorized |
|  | [CAL] | <ul style="list-style-type: none">- allows the access of calibration sequences |
|  | [^] | <ul style="list-style-type: none">- allows to increase the displayed parameters- allows to choose between different functions |
|  | [v] | <ul style="list-style-type: none">- allows to decrease the displayed parameters- allows to choose between different functions |
|  | [ENT] | <ul style="list-style-type: none">- allows to enter the selected data and to return to the main Display D0 |

5 READOUT SEQUENCES

Applying the power to the instrument the display will show the input selected for approximately 3 seconds, then will show the main display DO.

| Cl2 meter | | ClO2 meter | | O3 meter |

Press [MODE] to visualize the following Display:

- DO - actual Cl/ClO₂/O₃ values, set-point status/functions
- D1 - actual Cl/ClO₂/O₃ values
- D2 - temperature value
- D3 - set-point A parameters
- D4 - set-point B parameters
- D5 - alarm parameters
- D6 - cleaning function parameters
- D7 - input/analog output N°1 values
- D7BIS - input/analog output N°2 values
- D8 - configuration display
- D9 - instrument code and software release

D0 | 0.700 ppm ■ A □ B | | 0.700 ppm MEAS | | 0.700 SIM ■ A □ B |

0.700PPM: actual Cl/ClO₂/O₃ value

MEAS/SIM: mode of operation

A: set-point A state and function

- deactivated relay
- the process has reached the set-point and the relay
- activated relay

B: set-point B state and function

MESSAGE

MEANINGS

| | |
|--------------------|--|
| " ---- " | the instrument is changing the scale |
| " >>>> " | the present value is over range |
| " <<<< " | the present value is under range |
| "display flashing" | the present measuring value is in alarm range or the set-point SA or SB are in alarm (see alarm section) |
| " CLEAN " | autoclean activated(relay D on) |
| " HOLD " | Unit in Hold |

[CAL] to activate the manual/automatic mode selection procedure

[MODE] to go to

 D1 | 0.700 ppm Cl2 | Cl/ClO₂/O₃ values

[CAL] to activate the Zero/Sensitivity calibration procedure

[MODE] to go to

 D2 | TEMP.: 22.0 °C | Temperature value

M: manual value

[CAL] to activate the Temperature calibration or the manual Temperature value selection procedures

[MODE] to go to

 D3 | SA: 0.60 * F ■ L | Set-point A parameters display

0.60 :set-point value

■ :set-point actual state

* : Alarm on set point A activated

F : selected action (F=PFM - W=PWM - O=on/off)

L : selected function low/high (L-H)

[CAL] to activate the programming sequences for set-point A value, hysteresis and delay time

[MODE] to go to

 D4 | SB: 0.80 * O □ H | Set-point B parameters display

0.80 : set-point value

□ : set-point actual state

* : Alarm on set point B activated

O : selected action (F=PFM - W=PWM - O=on/off)

H : selected function (L-H)

[CAL] to activate the programming sequences for set-point B value, hysteresis and delay time

[MODE] to go to

D5 | AL 0.0/20.0ppm | Alarm parameters display

0.0 PPM: lower value limit
20.0 PPM: higher value limit

[CAL] to activate the alarm values programming sequences

[MODE] to go to

D6 | CLEANING OFF | Cleaning function display

CLEANING OFF: cleaning function disabled
MANUAL CLEAN: manual cleaning function
AUTO CLEAN: automatic cleaning function

[CAL] to activate the cleaning function programming sequences of relay D

[MODE] to go to

D7 | 01 10.0mA/1.0 pp | Analog output N°1 / ppm value

[MODE] to go to

D7BIS | 01 10.0mA/1.0 pp | (Option 091.3711)
Analog output N°2 / (PPM value or temp. value)

[MODE] to go to

D8 | Configuration | Configuration display

[CAL] - to activate the keyboard lock/unlock and LCD display contrast selection
 sequences
 - to activate the configuration sequences

[MODE] to go to

D9 | CL7685 R:2.3x | P/N and Software release

[MODE] to go back to the main Display D0

6 CALIBRATION SEQUENCES

The following procedures will be available whenever the instrument has the keyboard unlocked.

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

The following procedures allows the sensors calibration, the Set-point and alarms parameters programming.

6.1 OPERATING MODE SELECTION

Normally the instrument works in automatic mode.

1. [MODE] to go to
 D0 | 0.700 ppm ■A □B |
2. [CAL] to access the operation mode selection
3. [^] [V] to select one of the following display
| CAL MODE : AUTO | (MEAS or SIM)
 [MODE] to stop the procedure and to go back to D0
4. [ENT] - to confirm the selected operating mode
 - to go back to D0
MESSAGE
| " UPDATE " | selection memorized

6.2 ZERO AND SENSITIVITY CALIBRATION

Zero calibration

1. [MODE] to go to
 D1 | 0.700 ppm C12 |
2. [CAL] to access the calibration sequences
| ZERO : 0.5 μ A | Zero visualization
 [ENT] - to confirm the displayed value
 - to access the sensitivity cell
 visualization/calibration

3. [CAL] to access the zero calibration routine

| CAL ZERO: 0.5 |

0.5: Current value from sensor

4. choose one of the following actions:

[MODE] to stop the procedure and to go back to D1

[ENT] to confirm the selected zero of the cell

[^]+[V]+[ENT] press the three keys to turn to factory calibration

MESSAGE

FUNCTION

| UPDATE |

the calibration is accepted

Error message

| Z > 2 μ A |

Zero > 2 μ A

The above messages will last for 5 minutes

[ENT] to acknowledge the error messages

| NO UPDATE |

calibration not accepted

Sensitivity calibration

| SENS: 100.0 % |

Sensitivity visualization

[MODE] to go back to D1

[ENT] - to confirm the displayed value

- to go back to D1

1. [CAL] to access the sensitivity calibration routine

The Sensitivity calibration is suggested when the readout is very low compared with the DPD test. This adjustment must be effected when installing the flow cell and Chlorine or D.Ozone sensor after the stabilization of the readout.

The instrument features two calibration mode: Immediate and Postponed

IMMEDIATE CALIBRATION

This mode of calibration is useful when the concentration of the sample is stable and the value is known.

The instrument shows for a few seconds the following message:

| IMMEDIATE CAL |

Then it will show the measuring value:

| CAL CL: 0.80 ppm | (ClO₂-O₃)

CL 0.80: actual value

[MODE] to stop the procedure and to go back to D1
 [^]+[V]+[ENT] press the three keys to turn to factory calibration

- 2A. [^]+[V] to set the value
 3A. [ENT] - to confirm the selected value
 - to go back to D1

MESSAGEFUNCTION

| UPDATE | the calibration is accepted

Error messages

| SENS > 250.0% | Sensitivity > 250.0%

| SENS < 12.5% | Sensitivity < 12.5%

The above messages will last for 5 minutes

[ENT] to acknowledge the error messages

| NO UPDATE | calibration is not accepted

POSTPONED CALIBRATION

This mode of calibration is useful when the value of Chlorine (ClO₂/O₃) on water is unstable or when an immediate test is not available.

The instrument shows for a few seconds the following message:

| SAMPLE VAL. REC. |

Then it will show the measuring value:

CAL CL: 0.80 ppm (ClO₂-O₃)

CL 0.80: actual value

[MODE] to stop the procedure and to go back to D1
[^]+[V]+[ENT] to press the three keys to turn to factory calibration

2B. [ENT] to confirm the value

The instrument will show the following message:

SAMPLE V. UPDATE

After a few seconds the unit go back to D1.

When the correct Chlorine (ClO₂/O₃) value will be known from laboratory analysis, the operator must access the sensitivity calibration following the same above procedure. The instrument shows for a few seconds the following message:

SAMPLE V. ADJUST

Then it will show the previously stored sample value:

SAMPLE V. : 0.80

[MODE] to stop the procedure and to go back to D1
[^]+[V]+[ENT] to press the three keys to turn to factory calibration

3B. [^]+[V] to display the Chlorine (ClO₂/O₃) value same as the contents into the water

4B. [ENT] to confirm the value and to go back to D1

| <u>MESSAGE</u> | <u>FUNCTION</u> |
|----------------|-----------------------------|
| <u>UPDATE</u> | the calibration is accepted |

Error message

| | |
|-------------------------|----------------------|
| <u>SENS > 250.0%</u> | Sensitivity > 250.0% |
|-------------------------|----------------------|

| | |
|------------------------|---------------------|
| <u>SENS < 12.5%</u> | Sensitivity < 12.5% |
|------------------------|---------------------|

The above messages will last for 5 minutes

[ENT] to acknowledge the error messages

| | |
|------------------|--------------------------|
| <u>NO UPDATE</u> | calibration not accepted |
|------------------|--------------------------|

6.3 TEMPERATURE CALIBRATION

1. [MODE] to go to
D2 | TEMP. : 20.0 °C |
2. [CAL] to access the calibration procedure
| CAL T 20.0 °C |

'>>>>>' ('<<<<<'): Temperature value overrange

[MODE] to stop the procedure and to go back to D2
[^]+[V]+[ENT] to press the three keys to turn to factory calibration
3. [^] [V] to modify the actual reading
4. [ENT] to confirm and to go to the manual Temperature adjustment

MESSAGE

| " UPDATE " |

FUNCTION

The calibration is accepted

Error messages

| Z > 2.0 °C |

Zero > 2.0 °C

The above message will last for 5 minutes

- [ENT] to acknowledge the message

| " NO UPDATE " |

calibration not accepted

Manual Temperature calibration

| CAL T.M: 20.0 °C |

- [MODE] to stop the procedure and to go back to D2
1. [^] [V] to modify the actual value
 2. [ENT] to confirm and to go back to D2

6.4 SET-POINT A/B CALIBRATION

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

For each set-point it is possible:

- to insert the set-point value
- to insert parameters of On/Off - PFM - PWM function

1. [MODE] to go to

| | | |
|----|------------------|---------------------|
| D3 | SA: 0.60 * F ■ L | Set-point A display |
| or | | |
| D4 | SB: 0.80 * O □ H | Set-point B display |
2. [CAL] to access the programming sequences

Set-point adjustment

| CAL SA S: 0.60 |

S 0.60: actual set-point value

[MODE] to stop the procedure and to go back to D3/D4

3. [^] [V] to insert the set-point value
 4. [ENT]
 - to confirm the value
 - to go to one of the following calibration:
- A. On/Off function calibration
 - B. PFM function calibration
 - C. PWM function calibration

Note: to modify only set-point value, press [ENT] twice until "UPDATE" message

On/Off function

The instrument will show the following display:

| CAL SA I: 20 | Hysteresis calibration

I 20: actual hysteresis value

- [MODE] to stop the procedure and to go back to D3/D4
- 5A. [^] [V] to insert the hysteresis value
- 6A. [ENT] to confirm and to go to the delay time selection

| CAL SA D: 10.0s | Delay time calibration

D 10.0 s: actual delay time value

- [MODE] to stop the procedure and to go back to D3/D4
- 7A. [^] [V] to insert the delay time value
- 8A. [ENT] to confirm and to go back to D3/D4

MESSAGE

FUNCTION

| UPDATE | all the date has been memorized

PFM function

The instrument will show the following display:

| CAL SA BP: 0.10 |

BP 0.10: actual proportional band value

- [MODE] to stop the procedure and to go back to D3/D4
- 5B. [^] [V] to select the proportional band value
- 6B. [ENT] to confirm and to go to the selection of the maximum pulse frequency value

| CAL SA F:100 i/m |

F:100 i/m: actual pulse frequency value

- [MODE] to stop the procedure and to go back to D3/D4
- 7B. [^] [V] to select the frequency value
- 8B. [ENT] to confirm and to go back to D3/D4

PWM function

The instrument will show the following display:

| CAL SA BP: 0.10 |

BP 0.10: actual proportional band value

[MODE] to stop the procedure and to go back to D3/D4

5C. [^] [V] to select the proportional band value

6C. [ENT] to confirm and to go to the selection of the pulse length value

| CAL SA D: 5.0/s |

D 5.0 s: actual pulse length value

[MODE] to stop the procedure and to go back to D3/D4

7C. [^] [V] to select the pulse length value

8C. [ENT] to confirm and to go back to D3/D4

6.5 ALARM ADJUSTMENT

The following operations are possible:

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

1. [MODE] to go to

D5 | AL 0.0/20.0ppm | Alarm display

2. [CAL] to access the calibration sequences

| CAL AL L: 0.00 | Minimum alarm value calibration

L 0.00: actual minimum alarm value

[MODE] to stop the procedure and to go back to D5

3. [^] [V] to select the value

4. [ENT] to confirm and to go to the maximum value insertion

| CAL AL H: 20.00 | Maximum alarm value calibration

H 20.00: actual maximum alarm value

[MODE] to stop the procedure and to go back to D5

5. [^] [V] to select the value
 6. [ENT] to confirm and to go to the delay time selection
- CAL AL D: 25.0s | Delay time calibration
- D 25.0 s: actual delay time
- [MODE] to stop the procedure and to go back to D5
7. [^] [V] to select the value
 8. [ENT] to confirm and to go back to D5

MESSAGEFUNCTION

" UPDATE " | the new data have been memorized

6.6 CLEANING FUNCTION CALIBRATION

1. [MODE] to go to
- D6 | CLEANING OFF | (MANUAL CLEAN/AUTO CLEAN)
- CLEANING OFF: cleaning function disabled
 MANUAL CLEAN: manual cleaning function
 AUTO CLEAN: automatic cleaning function
2. [CAL] to access to the calibration sequences
 (only for MANUAL CLEAN or AUTO CLEAN)

Manual cleaning function (MANUAL CLEAN)

The instrument will show the following display:

CLEAN C.:WAITING | (START)

WAITING: the unit is awaiting to start a new Clean Cycle

- [MODE] to stop the procedure and to go back to D6
- 3A. [^] [V] to select START or WAITING
 4A. [ENT] to confirm selection
- If START is selected the unit go back to D0 and a new Clean Cycle starts
 - If WAITING is selected the unit go back to D6.

Automatic cleaning function (AUTO CLEAN)

| NEXT CYCLE: 24.0h |

24.0 h: time to the next cleaning cycle

[MODE] to stop the procedure and to go back to D6
 [^]+[V]+[ENT] press the 3 keys to set to zero the time to the next cleaning cycle

3B. [ENT] to turn the unit to the WAITING/START auto clean

| CLEAN C.: WAITING | (START)

WAITING: the unit is awaiting to start a new Clean Cycle

[MODE] to stop the procedure and to go back to D6

4B. [^] [V] to select START or WAITING

5B. [ENT] to confirm selection

- If START is selected the unit go back to D0 and a manual Clean Cycle starts without modify the time of the automatic Clean Cycle.

- If WAITING is selected the unit turn to the period of repetition calibration (see steps 6B and 7B).

| REPETITION: 24.0h |

24.0 h: period of repetition

[MODE] to stop the procedure and to go back to D6

6B. [^] [V] to select the time value

7B. [ENT] to confirm and to go back to D6

IMPORTANT NOTE: during the calibration procedure the microcomputer turn the unit to the main display if no keys have been pressed within 5 minutes.

7 CONFIGURATION

The following operations are possible:

- Keyboard locked/unlocked selection.
- Display contrast selection.
- Access number insertion.
 1. [MODE] to go to Display D8
 D8 | Configuration |
 2. [CAL] to access the configuration sequences

7.1 KEYBOARD LOCKED/UNLOCKED

| | |
|-------------------|-----------------|
| KB UNLOCKED | KB LOCKED |
| keyboard unlocked | keyboard locked |

[MODE] to go to D8

3. [^] [V] to select one of the two options (locked/unlocked)
4. [ENT] to confirm and to go to the next step

7.2 LCD DISPLAY CONTRAST

LCD contrast: 4

[MODE] to go to D8

1. [^] [V] to select the contrast from 0 to 7
2. [ENT] to confirm and to go to the access number insertion.

7.3 ACCESS NUMBER

| Access Nr. : 0 | access number request

[MODE] to go to D8

1. [^] [V] to insert the access number (when keeping the key pressed the number will scroll with 3 speed level)
2. [ENT] to confirm and to proceed with the configuration

IMPORTANT NOTE: any inserted number different from the right access code, will allow the visualization of the parameters and not the modification.

| 'Cal Inhibition' | Configuration inhibited

7.4 TYPE OF MEASURING

| Input source:C12 | | Input source:C102 |
 | Input source:03 |

Active keys: [MODE] - [^] [V] - [ENT]

7.5 INPUT RANGE

It's possible to select the scale 20 PPM 2 PPM

| Range: 20.00ppm | | Range: 2.000ppm |

Active keys: [MODE] - [^] [V] - [ENT]

7.6 AUTO RANGE

| Autoranging:OFF | | Autoranging:ON |

Active keys: [MODE] - [^] [V] - [ENT]

7.7 SOFTWARE FILTER

| SW 90% RT: 15.0s |

Active keys: [MODE] - [^] [V] - [ENT]

7.8 CELL POLARIZATION VOLTAGE

CAL POL.: -200mV

POL.-200 mV: actual polarization voltage

This polarization voltage is calibrated during the manufacturing and it may be changed by means of the internal trimmer marked BM(R14).

Remove the back panel to adjust the trimmer, watching the readout.

Active keys: [MODE] - [^] [V] - [ENT]

7.9 CALIBRATION MODE

MODE OF CAL: POST

POST: Postponed calibration mode selected

Active keys: [MODE] - [^] [V] - [ENT]

7.10 TEMPERATURE COEFFICIENT

CAL TC: 2.00%/°C

2.00% / °C: Temperature coefficient value

Active keys: [MODE] - [^] [V] - [ENT]

7.11 INPUT RELATED TO ANALOG OUTPUT N°1 (OPTION 091.3711)

This configuration is available only when the dual output option 091.3711 is installed.

The input corresponding to the output range is selectable as Cl₂(ClO₂/O₃) or Temperature for the two outputs.

CAL OUT1: ppm | (°C)

PPM: input range selected for analog output N°1

Active keys: [MODE] - [^] [V] - [ENT]

7.12 ANALOG OUTPUT N°1 RANGE

| CAL OUT1: 0/20mA | | CAL OUT1: 4/20mA |

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

Active keys: [MODE] - [^] [V] - [ENT]

| CAL P1: 0.000 ppm |

P1: begin of range

0.000 PPM: measuring value related to 0/4 mA

Active keys: [MODE] - [^] [V] - [ENT]

| CAL P2: 2.000 ppm |

P2: end of range

2.000 PPM: measuring value related to 20 mA

Active keys: [MODE] - [^] [V] - [ENT]

IMPORTANT NOTE 1: 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.

The display will show OUT2 instead of OUT1 and the operator will follow the same procedure for the output n°2 if the option 091.3711 dual output is installed.

7.13 INPUT RELATED TO ANALOG OUTPUT N°2 (OPTION 091.3711)

| CAL OUT2: ppm | (°C)

PPM: input selected for analog output N°2

Active keys: [MODE] - [^] [V] - [ENT]

7.14 ANALOG OUTPUT N°2 RANGE

| CAL OUT2 : 0/20mA | | CAL OUT2 : 4/20mA |

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

Active keys: [MODE] - [^] [V] - [ENT]

| CAL P1 : 0.000 ppm |

P1: begin of range

0.000 PPM: measuring value related to 0/4 mA

Active keys: [MODE] - [^] [V] - [ENT]

| CAL P2 : 2.000 ppm |

P2: end of range

2.000 PPM: measuring value related to 20 mA

Active keys: [MODE] - [^] [V] - [ENT]

IMPORTANT NOTE 1: 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.

7.15 SET-POINT A OPERATING MODE

| SET A ACT:On/Off | (PWM-PFM)

On/Off, PWM, PFM: set-point A operating mode

Active keys: [MODE] - [^] [V] - [ENT]

7.16 SET-POINT A FUNCTION

| SET A F. : LO | | SET A F. : HI |

LO: minimum (relay activated for meas. below set-point)

HI: maximum (relay activated for meas. above set-point)

Active keys: [MODE] - [^] [V] - [ENT]

7.17 SET-POINT B OPERATING MODE

SET B ACT:On/Off (PWM-PFM)

On/Off, PWM, PFM: set-point B operating mode

Active keys: [MODE] - [^] [V] - [ENT]

7.18 SET-POINT B FUNCTION

SET B F. : LO | SET B F. : HI |

LO: minimum (relay activated for meas. below set-point)

HI: maximum (relay activated for meas. above set-point)

Active keys: [MODE] - [^] [V] - [ENT]

7.19 ALARM ON SET-POINT A

AL SET A: ON | AL SET A: OFF |

Active keys: [MODE] - [^] [V] [ENT]

1. Two possible alternative A or B.
 - 1A. "OFF" alarm function not activated
 - 1B. "ON" alarm function activated
 - 2B. to insert the activation time for set-point A

TIME SET A: 10 m |

10 m: activation time

Active keys: [MODE] - [^] [V] - [ENT]

7.20 ALARM ON SET-POINT B

| AL SET B: ON | | AL SET B: OFF |

Active keys: [MODE] - [^] [V] - [ENT]

1. Two possible alternative A or B.
 - 1A. "OFF" alarm function not activated
 - 1B. "ON". alarm function activated
 - 2B. to insert the activation time for Set-point B

| TIME SET B: 10 m |

10 m: activation time

Active keys: [MODE] - [^] [V] - [ENT]

7.21 ALARM RELAY CONTACT FUNCTION

Two possible alternative:

| AL RELAY: ACT | | AL RELAY: DEA |

ACT: active alarm = relay activated

DEA: active alarm = relay deactivated

Active keys: [MODE] - [^] [V] - [ENT]

7.22 CLEANING FUNCTION

| CAL CF:DISABLED | | CAL CF:MANUAL |

| CAL CF:AUTO |

Active keys: [MODE] - [^] [V] - [ENT]

7.23 CLEANING TIME (RELAY D ON)

| CLEANING T:15.0" |

Active keys: [MODE] - [^] [V] - [ENT]

7.24 HOLDING TIME

| HOLDING T: 3.0' |

Active keys: [MODE] - [^] [V] - [ENT]

7.25 NEW ACCESS NUMBER

| Change Nr.: NO | | Change Nr.: YES |

NO : access number changing not required

YES: access number changing required

Active keys: [MODE] - [^] [V] - [ENT]

Two possible alternative A or B.

- A. "NO" The unit will go back to the Configuration Display; the operator may verify the parameter setting before leaving the Configuration sequences which is now protected by access number.
- B. "YES" The unit is now ready to the new access number selection.

| New Nr.: 0 |

Active keys: [MODE] - [^] [V] - [ENT]

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

| Confirm Nr.: 0 |

Active keys: [MODE] - [^] [V] - [ENT]

The double insertion of the new code assure the memorization of the right code.

As soon as the new code 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.

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

8 CALIBRATION

8.1 ELECTRICAL CALIBRATION

Should a problem arise with the residual monitor, a sensor simulator can be used to determine if the electronic unit is working correctly.

Reset the unit to the laboratory calibration (press Keys up+down+enter as described in the parameters calibration section) and follow the steps:

- Connect to the terminals 18-25 a sensor simulator (for example OD 105.1 B&C Electronics simulator)
- Simulate the value 0 nA and read the value 0.0 PPM on the display.
- Simulate the value 2000 nA and read the value 1.00 PPM on the display.

Return the unit to the factory if these values will not be displayed.

8.2 CHEMICAL CALIBRATION

Zero cell calibration

The zero calibration is necessary when installing the system and during the initial start up in order to compensate the eventual dark current of the measuring cell.

Insert the sensor into the flow cell and adjust to the proper flow rate of distilled water.

Allow the reading to stabilize for 10 - 20 minutes prior to setting the zero calibration (it is not essential that the water be distilled, but it is important that the water is free of Oxidizer).

The zero calibration must be done only after the electric zero calibration that may be effected also keeping the wet sensor out of the flow cell (in air).

Sensitivity calibration

Always check the zero, the proper flow rate and the stabilization of the readout prior to sensitivity calibration.

Collect a sample from the effluent or outlet of the flow cell and do a laboratory analysis to determine the Chlorine (ClO_2/O_3) concentration (DPD method is suggested).

Follow the sensitivity calibration procedure described in the calibration section.

Clean the Platinum rings of the sensor by means of filter paper or similar prior to starting the calibration. (see Maintenance section)

9 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 Platinum surfaces is critical for the normal operation of the system and should be inspected during the recalibration, if deviations of more than 0.2 mg/l as compared to DPD are detected.

Suggested methods for cleaning the electrode include chemical cleaning as following:

- remove the sensor from the cell,
- clean the Platinum rings by dipping the sensor for 30 seconds in a 5% HCl solution,
- rinse thoroughly the sensor into deionised or tap water,
- reinstall the sensor into the cell.

The above procedure does not remove the oxide from the Platinum, maintaining the regular measuring conditions for an immediate calibration.

If necessary clean the Platinum rings by carefully wiping it with a soft tissue eventually soaked with metal shining reagent.

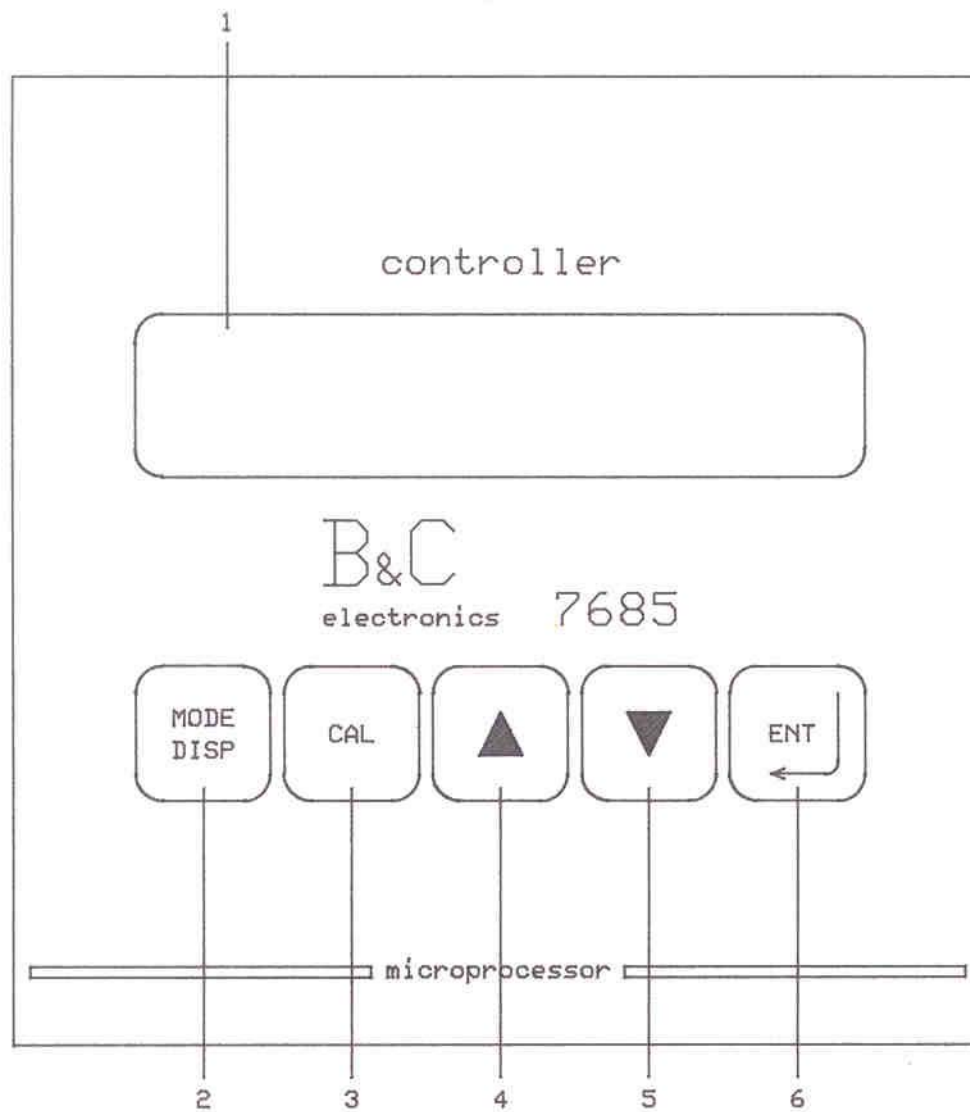
Rinse carefully and re-install the sensor into the cell.

Allow the system to stabilize before calibrating.

The shining Platinum will have a sensitivity 2 times more than regular, so it is necessary to maintain the sensor dipped into the water before calibrating.

This time is required for the new oxide layer generation on Platinum.

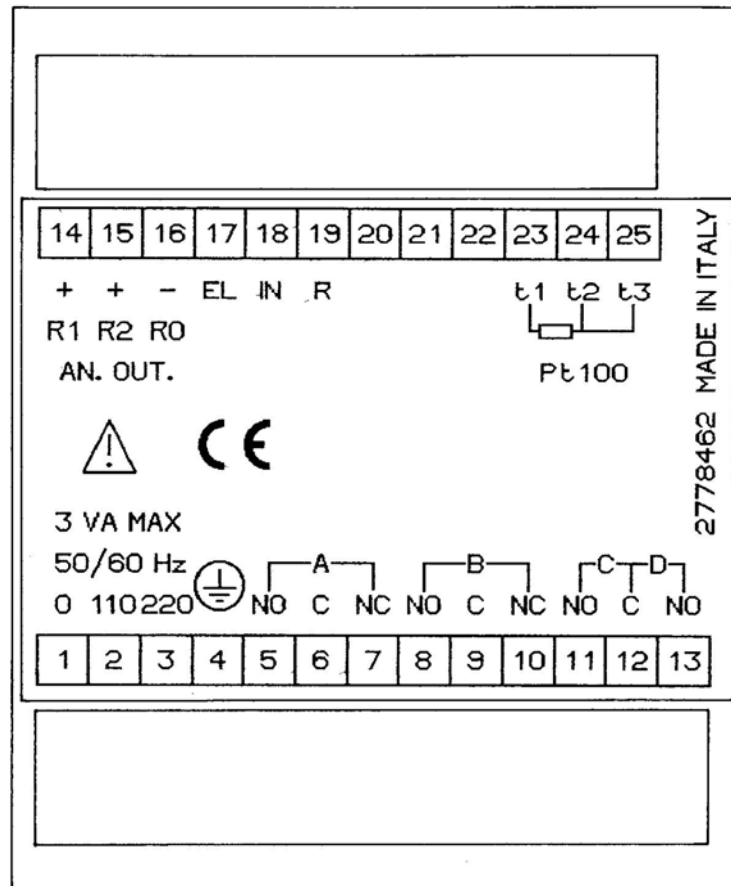
FRONT PANEL



1. Display
2. Mode-display key
3. Calibration key
4. Increase key
5. Decrease key
6. Enter key

Fig. 1

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. (alarm) |
| 12. 13 | D relay N.O. (auto clean) |
| 14. | Recorder output channel 1 (+) |
| 15. | Recorder output channel 2 (+) (option) |
| 16. | Recorder option channels 1 and 2 (-) |
| 17. | Sensor input (white) |
| 18. | Sensor input (black) |
| 19. | Reference electrode (shield) input |
| 23. | Pt100 input |
| 24. 25 | Pt100 common input |

Fig. 2

DIMENSIONS AND DRILL PLAN
(measures in mm)

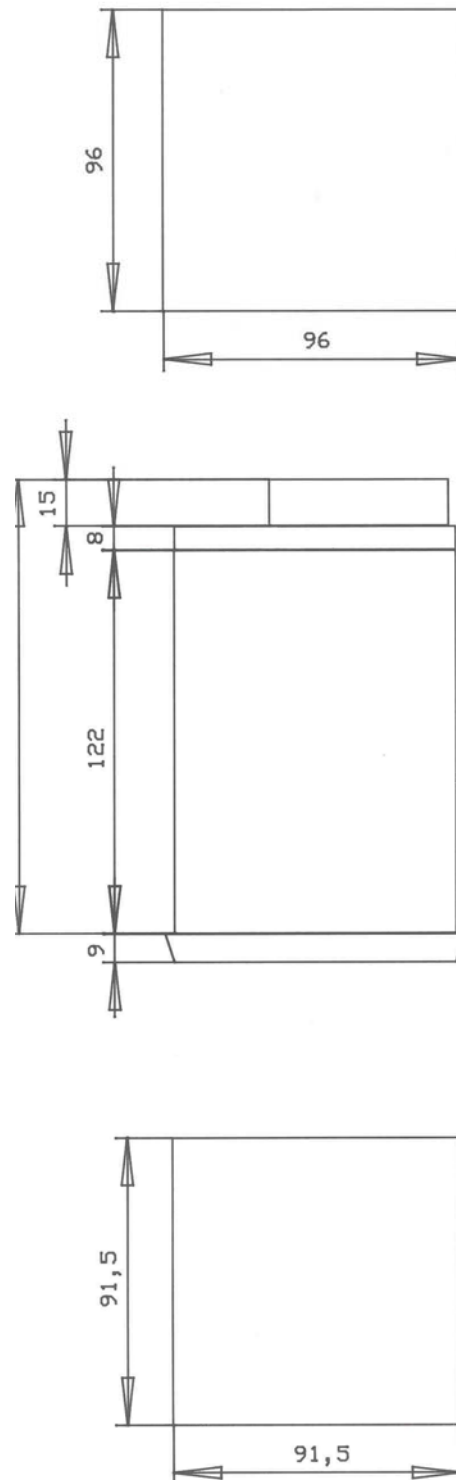


Fig. 3

NOTES