OPERATOR'S MANUAL

CL 3000

RESIDUAL CHLORINE
CHLORINE DIOXIDE - D.OZONE
MICROPROCESSOR CONTROLLER
** potentiostatic **

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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 Hefer Systems & Controls 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 mantained 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.

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.
Autoranging function may be activated for the measuring range 0/1.999 ppm.
Autoranging 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 deadband, 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 autocleaning 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 usefull 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 allows 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 mde 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 sugested 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.

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 7602 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.

SPECIFICATIONS

The DEFAULT values are correspondent to the factory calibration values.

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

1)	OPERATING MODE	DEFAULT
	Automatic/Measuring/Input simulation	Auto
2)	MEASURING TYPE	
*	Chlorine/Chlorine dioxide/D.Ozone	Chlorine
3)	INPUT SCALES	
*	Input range: 2.000/20.00 PPM	20.00
	Display resolution at 20 °C: 1/2000	
*	Software filter 90% RT: 0,6/99,9 sec	
	Current at 20°C: 250/5000 nA/PPM	2000nA/PPM
	Cell Sensitivity: 12.5/250%	100%
	Zero: +/- 2 0 µA adjustment	0 µA

*	Comp. Temp. Coefficient Cl/ClO2: 0/4.0 %/°C	2.0%/°C
*	Comp. Temp. Coefficient O3: 0/4.0 %/°C	2.5%/°C
*	Polarization Voltage:	-200mV

4) TEMPERATURE

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) SET A/B

*	Selectable actions:	
	ON-OFF	
	PFM - Pulse frequency proportional	
	PWM - Pulse width proportional	
*	Action: ON-OFF	SET B
	Value: 0/2.000 - 0/20.00 PPM (as scale selected)	0 PPM
	Hysteresis: 0/0.200 - 0/2.00 PPM (as scale selected)	0.2 PPM
	Activation delay: 0/99.9 "	0.0"
*	Function: HI/LO (Max/min)	LO
*	Action: PFM	SET A
	Value: 0/20.00 PPM (as scale selected)	0 PPM
	Proportional band: 0/0.200 - 0/2.00 PPM (as scale selected)	0.2 PPM
	Pulse max. Frequency: 0/120 pulse/minute	100imp/m
	Pulse width:	0.1"
*	Function: HI/LO (Max/min)	LO
*	Action: PWM	
	Value: 0/0.200 - 0/20.00 PPM (as scale selected)	0 PPM
	Proportional band: 0/0.200 - 0/2.00 PPM (as scale selected)	0.2 PPM
	Pulse width: 0/99.9"	20.0"
	Min. pulse width:	0.3"
*	Function: HI/LO (Max/min)	LO
	Relay Contacts: SPDT 220V 5Amps Resistive load	

6) ALARM (RELAY C)

High value: 0/2.000 - 0/20.00 PPM (as scale selected)	20.00PPM
Low value: 0/2.000 - 0/20.00 PPM (as scale selected)	0.00PPM
Delay: 0/99.9 "	0.0"
* Alarm on max. SA: ON/OFF	OFF
* Max. time SA: 0/60 minuts	60 min
* Alarm on max. SB: ON/OFF	OFF
* Max. time SB: 0/60 minuts	60 min
* Contact type: ACT/DEA	ACT
Relay Contact: SPST 220V 5Amps Resistive load	

7) CLEANING FUNCTION (RELAY D)	
* Action: Disable/Manual Clean/Auto+Manual Clean	Disable
Auto Clean:	
Time repetition: 0.1/24.0h	24.0h
* Cleaning time: 0.5/60.0"	15.0"
* Hold time: 0.1'/20.0'	3.0'
Relay contacts: SPST	

8) ANALOG OUTPUT Nr. 1	
* 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	0.00PPM
RANGE 2.000 PPM: 0.000/2.000	0.000PPM
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	I20.00PPM
RANGE 2.000 PPM: 0.000/2.000	I2.000PPM
TEMPERATURE: 0.0°C/50.0°C (Option 091.3711)	50.0 °C
Response time: 10 Sec. for 98 %	
Isolation: 250 Vca	
Rmax: 600 Ohm	

9) ANALOG OUTPUT N°2 (only for Option 091.3711)	

* 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	0.00PPM
RANGE 2.000 PPM: 0.000/2.000	0.000PPM
TEMPERATURE: 0.0°C/50.0°C	0.0 °C
* Point 2 corresponding to 20 mA	
RANGE 20.00 PPM: 0.00/20.00	20.00PPM
RANGE 2.000 PPM: 0.000/2.000	2.000PPM
TEMPERATURE: 0.0°C/50.0°C	50.0 °C
Response time: 10 Sec. for 98 %	
Isolation: 250 Vca	
Rmax: 600 Ohm	

10) SERIAL COMMUNICATION (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: ±20.00ppm ±50.0°C Data sent every: 0.4 sec.

11) PARAMETERS ON CONFIG. BLOCK (See for *)

Free calibration (access code not required):	
Keyboard Lock/Unlock.	Unlocked
LCD contrast (0/7).	4
Under access code number: (0)	0
Type of measure:Cl/ClO2/O3	Cl
Measuring range: 2.000/20.00	20.0PPM
Autoranging: On/Off	Off
Software filter response time	15 sec
Polarization	- 200mV
Immediate/postponed calibration mode	Immediate
Temperature Coefficient	2.0%
Input connected to the output N°1	Cl2
Analog output N°1 range (0/20 4/20 mA)	0/20 mA
Point 1 corresponding to 0 mA or 4 mA	0.00PPM

Point 2 corresponding to 20 mA	20.00PPM
Input connected to the output N°2	| Cl2
Analog output N°1 range (0/20 4/20 mA)	| 0/20 mA
Point 1 corresponding to 0 mA or 4 mA	| 0.00PPM
Point 2 corrsponding to 20 mA	20.00PPM
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/DIS)	| 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

10) 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 sec for HI range
< 15 sec for LO range

Operating Temperature : 0/50 °C

Humidity : 95% without condensate

Power supply : 110/220 Volt ac +/- 10% 50/60 Hz

Isolation : 4000 Volt between primary and secondary (IEC 348)

Power : 5 VA max.

Terminal block : extractable

Weight : 850 gr.

Dimensions : 96 x 96 x 155 mm.

INSTALLATION

Physical 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 or corrosive fumes.

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

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

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

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 V
- connect ac power to 1 - 3 terminals if power voltage 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**

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 teminal 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 Autoclean D.

Control relay "A" Set-point "SA"

terminal 6 marked C : common contact
terminal 5 marked NO : normal open contact
terminal 7 marked NC : normal closed contact

Control relay "B" Set-point "SB"

terminal 9 marked C : common contact
terminal 8 marked NO : normal open contact
terminal 10 marked NC : normal closed contact

Alarm relay "C"

terminal 12 marked C : common contact
terminal 11 marked NO : normal open contact

Autoclean relay "D"

terminal 12 marked C : common contact
terminal 13 marked NO : 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 Ohm.

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 connected.

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.

KEY BOARD

KEY	SYMBOL	FUNCTION
MODE / DISP	**[MODE]**	- allows the operator to go to the next Display - allows to revert to the main Display. The eventual parameter values will not be memorized
CAL	**[CAL]**	- allows the access to calibration sequences
△	**[/\]**	- allows to increment the displayed parameters - allows to choose between different functions
_	**[\/]**	- allows to decrement the displayed parameters

| \/ | - allows to choose between different functions

| ENT| | **[ENT]** - allows to enter the selected data and to return
| <--| | to the main Display pD0p

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 pDOp.

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

Press [MODE] to visualize the following Display:

pDOp - actual Cl/ClO2/O3 values, Set-point status/functions
pD1p - actual Cl/ClO2/O3 values
pD2p - Temperature value
pD3p - Set-point A parameters
pD4p - Set-point B parameters
pD5p - alarm parameters
pD6p - cleaning function parameters
pD7p - input/analog output N°1 values
pD7BISp - input/analog output N°2 values
pD8p - configuration display
pD9p - instrument code and software release

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pD0p **|0 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 activation is delayed
relay activated

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 SB are in alarm (see alarm section)
" CLEAN "	autocleaning activated (relay D on)
" HOLD "	Unit in Hold

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

[MODE] to go to

---

pD1p |**0.700 ppm Cl2 _**| Cl/ClO2/O3 values

[CAL] to activate the Zero/Sensitivity calibration procedure

[MODE] to go to

---

pD2p |**TEMP.: 22.0°CM**| Temperature value

M: manual value

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

[MODE] to go to

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pD3p |**SA: 0.60 * F L**| Set-point A parameters display

0.60:set-point value
: set-point actual state
*: the alarm function (time of the active relay state) of

the 1st set-point is 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

---

pD4p |**SB: 0.80 * O H**| Set-point B parameters display

0.80: set-point value
: set-point actual state
*: the alarm function (time of the active relay state) of the 1st set-point is 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

---

pD5p |**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

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pD6p |**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

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pD7p |**01 10.0mA/1.0 pp**| Analog output N°1 / ppm value

[MODE] to go to

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pD7BISp |**01 10.0mA/1.0 pp**| (Option 091.3711)
Analog output N°2 / (ppm value or temp. value)

[MODE] to go to

---

pD8p |**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

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pD9p |**CL7685 R:2.3x** | P/N and Software release

[MODE] to go back to the main Display pD0p

CALIBRATION SEQUENCES

The following procedures will be activable whenever the instrument is not in the keyboard lock condition.
To unlock the keyboard follows the procedures mentioned in chapter "Configuration".
The following procedures allows the sensors calibration, the Set-point and alarms parameters programming.

Operating Mode Selection

Normally the instrument works in automatic mode.

1. **[MODE]** to go to

   pD0p |**0.700ppm A B**|

2. **[CAL]** to access the operation mode selection

3. **[/\] [\/]** to select one of the following display

   |**CAL MODE:AUTO** | (MEAS or SIM)

   [MODE] to stop the procedure and to go back to pD0p

4. **[ENT]** - to confirm the selected operating mode
   - to go back to pD0p

   MESSAGE

   | **" UPDATE "** | selection memorized

ZERO AND SENSITIVITY CALIBRATION.

Zero calibration

1. **[MODE]** to go to

   pD1p |**0.700 ppm Cl2** |

2. **[CAL]** to access the calibration sequences

   |**ZERO: 0.5 µA** | 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 pD1p
[ENT] to confirm the selected zero of the cell
[/\]+[\/]+[ENT] press the three keys to turn to factory calibration

MESSAGE	FUNCTION
UPDATE	the calibration is accepted

Error message

Z > 2µA	Zero > 2µA

The above messages will last for 5 minutes

[ENT] to acknowledge the error messages

NO UPDATE	the calibration is not accepted

Sensitivity calibration

|**SENS: 100.0 %** | Sensitivity visualization

[MODE] to go back to pD1p
[ENT] - to confirm the displayed value
- to go back to pD1p

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 pD1p
[Λ]+[V]+[ENT] press the three keys to turn to factory calibration

2A. **[Λ]+[V]** to set the value
3A. **[ENT]** - to confirm the selected value
- to go back to pD1p

MESSAGE	FUNCTION
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 pD1p
[/\]+[\/]+[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 pD1p.

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 pD1p
[/\]+[\/]+[ENT] to press the three keys to turn to factory calibration

3B.**[/\]+[\/]** 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 pD1p

MESSAGE	FUNCTION
UPDATE	the calibration is accepted

Error message

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	the calibration is not accepted

Temperature calibration

1. **[MODE]** to go to

   pD2p |**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 pD2p
   [/\]+[\/]+[ENT] to press the three keys to turn to factory calibration

3. **[/\] [\/]** to modify the actual reading
4. **[ENT]** to confirm and to go to the manual Temperature adjustment

MESSAGE	FUNCTION
" UPDATE "	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 "** | The calibration is not accepted

Manual Temperature calibration

|**CAL T.M: 20.0°C**|

[MODE] to stop the procedure and to go back topD2p

1. **[/\] [\/]** to modify the actual value
2. **[ENT]** to confirm and to go back to pD2p

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

pD3p |**SA: 0.60 * F L**| Set-point A display

or

pD4p |**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 pD3p/pD4p

3. **[/\] [\/]** 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 pD3p/pD4p

5A. **[/\] [\/]** 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 pD3p/pD4p

7A. **[/\] [\/]** to insert the delay time value
8A. **[ENT]** to confirm and to go back to pD3p/pD4p

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 pD3p/pD4p

5B. **[/\] [\/]** 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/s**|

F:100 i/s: actual pulse frequency value

[MODE] to stop the procedure and to go back to pD3p/pD4p

7B. **[/\] [\/]** to select the frequency value
8B. **[ENT]** to confirm and to go back to pD3p/pD4p

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 pD3p/pD4p

5C. **[/\] [\/]** 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 5.0s: actual pulse length value

[MODE] to stop the procedure and to go back to pD3p/pD4p

7C. **[/\] [\/]** to select the pulse length value
8C. **[ENT]** to confirm and to go back to pD3p/pD4p

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

   pD5p |**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 pD5p

3. **[/\] [\/]** 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 pD5p

5. **[/\] [\/]** 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 pD5p

7. **[/\] [\/]** to select the value
8. **[ENT]** to confirm and to go back to pDp4

MESSAGE	FUNCTION
" UPDATE "	the new data have been memorized

Cleaning function calibration

1. **[MODE]** to go to

   pD6p |**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 pD6p

3A. **[/\] [\/]** to select START or WAITING
4A. **[ENT]** to confirm selection

- If START is selected the unit go back to pD0p and a new Clean Cycle starts

- If WAITING is selected the unit go back to pD6p.

Automatic cleaning function (AUTO CLEAN)

|**NEXT CYCLE:24.0h**|

24.0h: time to the next cleaning cycle

[MODE] to stop the procedure and to go back to pD6p
[/\]+[\/]+[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 autocleaning

|**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 pD6p

4B. **[/\] [\/]** to select START or WAITING
5B. **[ENT]** to confirm selection

- If START is selected the unit go back to pD0p 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**|

24.0h: period of repetition

[MODE] to stop the procedure and to go back to pD6p

6B. **[/\] [\/]** to select the time value
7B. **[ENT]** to confirm and to go back to pD6p

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

CONFIGURATION

The following operations are possible:

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

1. **[MODE]** to go to Display pD8p

   pD8p |**Configuration**|

2. **[CAL]** to access the configuration sequences

Keyboard locked/unlocked

|**KB UNLOCKED**| |**KB LOCKED**|

keyboard unlocked keyboard locked

[MODE] to go to pD8p

3. **[/\] [\/]** to select one of the two options (locked/unlocked)

4. **[ENT]** to confirm and to go to the next step

LCD Display contrast

|**LCD contrast: 4**|

[MODE] to go to pD8p

1. **[/\] [\/]** to select the contrast from 0 to 7
2. **[ENT]** to confirm and to go to the access number insertion

Access number

|**Access Nr.: 0**| access number request

[MODE] to go to pD8p

1. **[/\] [\/]**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

Type of measuring

|**Input source:Cl2**| |Input source:ClO2|

|**Input source:O3** |

Active keys: **[MODE] - [/\] [\/] - [ENT]**

Input range:

It's possible to select the scale 20 ppm or 2 ppm

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

Active keys: **[MODE] - [/\] [\/] - [ENT]**

Autorange

|**Autoranging:OFF** | |**Autoranging:ON** |

Active keys: **[MODE] - [/\] [\/] - [ENT]**

Software filter

|**SW 90% RT: 15.0s**|

Active keys: **[MODE] - [/\] [\/] - [ENT]**

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] - [/\] [\/] - [ENT]**

Calibration mode

|**MODE OF CAL:POST**|

POST: Postponed calibration mode selected

Active keys: **[MODE] - [/\] [\/] - [ENT]**

Temperature coefficient

|**CAL TC: 2.00%/°C**|

2.00%/°C: Temperature coefficient value

Active keys: **[MODE] - [/\] [\/] - [ENT]**
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] - [/\] [\/] - [ENT]**

Analog output n°1 range

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

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

Active keys: **[MODE] - [/\] [\/] - [ENT]**

|**CAL P1: 0.000 Cl**|

P1: begin of range
0.000 Cl: measuring value related to 0/4 mA

Active keys: **[MODE] - [/\] [\/] - [ENT]**

|**CAL P2: 2000 Cl**|

P2: end of range
2000Cl: measuring value related to 20 mA

Active keys: **[MODE] - [/\] [\/] - [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.

Input related to analog output n°2 (Option 091.3711)

|**CAL OUT2: Cl** | (°C)

Cl: input selected for analog output N°2

Active keys: **[MODE] - [/\] [\/] - [ENT]**

Analog output n°2 range

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

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

Active keys: **[MODE] - [/\] [\/] - [ENT]**

|**CAL P1: 0.000 Cl**|

P1: begin of range
0 ppm : measuring value related to 0/4 mA

Active keys: **[MODE] - [/\] [\/] - [ENT]**

|**CAL P2: 2.000 Cl**|

P2: end of range
2.000Cl: measuring value related to 20 mA

Active keys: **[MODE] - [/\] [\/] - [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.

Set-point A operating mode

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

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

Active keys: **[MODE] - [/\] [\/] - [ENT]**

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] - [/\] [\/] - [ENT]**

Set-point B operating mode

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

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

Active keys: **[MODE] - [/\] [\/] - [ENT]**

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] - [/\] [\/] - [ENT]**

Alarm on Set-point A

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

Active keys: **[MODE] - [/\] [\/] [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**|

10m: activation time

Active keys: **[MODE] - [/\] [\/] - [ENT]**

Alarm on Set-point B

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

Active keys: **[MODE] - [/\] [\/] - [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**|

10m: activation time

Active keys: **[MODE] - [/\] [\/] - [ENT]**

Alarm relay activation.

Two possible alternative:

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

ACT: active alarm = relay activated
DEA: active alarm = relay deactivated

Active keys: **[MODE] - [/\] [\/] - [ENT]**

Cleaning function

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

|**CAL CF:AUTO** |

Active keys: **[MODE] - [/\] [\/] - [ENT]**
Cleaning time (relay D ON)

|**CLEANING T:15.0"**|

Active keys: **[MODE] - [/\] [\/] - [ENT]**
Holding time

|**HOLDING T: 3.0'**|

Active keys: **[MODE] - [/\] [\/] - [ENT]**

New access number

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

NO : access number changing not required
YES: access number changing required

Active keys: **[MODE] - [/\] [\/] - [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] - [/\] [\/] - [ENT]**

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

|**Confirm Nr.: 0** |

Active keys: **[MODE] - [/\] [\/] - [ENT]**

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

CALIBRATION

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 (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.

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 (ClO2/O3) 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)

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 deionized 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.

CL 3000 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 output channel 1 and 2 (-)
17.	Sensor input (white)
18.	Sensor input (black)
19.	Reference electrode (shield) input
23.	Pt100 input
24.25.	Pt100 common input